



Digital Research in the Arts and Humanities

NETWORKS AND THE SPREAD OF IDEAS IN THE PAST

STRONG TIES, INNOVATION AND KNOWLEDGE EXCHANGE

Edited by Anna Collar



Networks and the Spread of Ideas in the Past

Networks and the Spread of Ideas in the Past: Strong Ties, Innovation and Knowledge Exchange gathers contributions from an international group of scholars to reconsider the role that strong social ties play in the transmission of new ideas, and their crucial place in network analyses of the past.

Drawing on case studies that range from the early Iron Age Mediterranean to medieval Britain, the contributing authors showcase the importance of looking at strong social ties in the transmission of complex information, which requires relationships structured through mutual trust, memory, and reciprocity. They highlight the importance of sanctuaries in the process of information transmission, the power of narrative in creating a sense of community even across geographical space, and the control of social systems in order to facilitate or stifle new information transfer.

Networks and the Spread of Ideas in the Past demonstrates the value of searching the past for powerful social connections, offers us the chance to tell more human stories through our analyses, and represents an essential new addition to the study and use of networks in archaeology and history. The book will be useful to academics and students working in the Digital Humanities, History, and Archaeology.

Anna Collar is a Lecturer in Roman Archaeology at the University of Southampton and a founder of *The Connected Past* international research network and conference series. Her research explores the material culture of religion; social networks; and landscape, mobility, and emotion.

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Networks and the Spread of Ideas in the Past

Strong Ties, Innovation and Knowledge Exchange

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**Strong Ties, Innovation and
Knowledge Exchange**

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Anna Collar
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1 Strong ties, social networks, and the diffusion of new ideas

Who do you trust?

Anna Collar

Introduction: the echo chamber

Donald Trump's victory in the US presidential elections in 2016 and the vote for Brexit by 17.4 million people in the United Kingdom in the same year are just two recent examples which demonstrate the unprecedented power of online social networks to effect political and ideological change. The role of social media was crucial in both these seismic political events, and the psychological and emotional micro-manipulation of individuals through social media channels has been revealed as the new, dark side of politics through the exposure of the practices of British consultancy firm Cambridge Analytica and their even shadier clients.¹ The rise of Facebook, Twitter, and Instagram has fundamentally shifted the way that politics is done, but also the way that human social life is done: we have moved into an era of global online social networks that have the capacity to incorporate widely geographically separate individuals into close-knit groups and communities that bolster and support them and their ideological stance on the world, while the companies that operate the system simultaneously gather and manipulate the rich data freely given by individuals into agglomerated information about the ideological proclivities of different social groups. From such a combination comes the power to market things—and more importantly, ideas—to certain individuals, through emotion: drawing on both an individual's feeling of belonging in a group of like-minded people and on the fears they have about the boundaries of those groups. We are witness to and enmeshed in our own personal echo chambers, whether this concerns fears about vaccinations, trans rights, or imminent ecosystem collapse.

In network terms, this is *homophily*, the tendency for like to attract like. We live in times dominated by homophilic online social networks, and by the powerful emotional perception of the edges of those networks—where 'our' group comes into contact, and conflict, with 'their' group. Such issues around group behaviour have always been at the heart of the study of human history; however, it is only in recent years that archaeologists and historians have had the technological capacity to analyse intra- and inter-group

behaviours as forming *through* the structures and dynamics of interconnected social networks. Partly as a result of the introduction of social media into our daily lives, archaeology and history have seen a huge increase in networks as part of the vocabulary used to talk about and think through the study of the past. Over the last fifteen years, network methods and language have increased in popularity and scope in archaeological and historical applications,² making network approaches to the past one of the strongest emerging research areas in our disciplines. Subjects of study range widely from the interactions of prehistoric Kuril islanders in the north of Japan to the Pueblo cultures of the American Southwest; and from the material remains of the Epipalaeolithic in the Near East to those of the late pre-colonial period in the Caribbean.³

As a central premise, network analysis is concerned with how entities relate to other entities. Such entities are most often called nodes, which are connected via edges, ties, or relationships. What is classified as a node ranges from brain cells to individual people to types of artefact to households to nation states and everything in between; and the ties that connect them range from neural, marriage, type of material, consumption practices to trade, and many more.⁴ Archaeology and history have a more limited range of material than social science, but there is still considerable diversity of data under study using network methods by archaeologists and historians. This diversity reflects also the diversity of scholars with different disciplinary backgrounds: some scholarship has drawn on physics and mathematics to push forward the side of theory that derives from complexity science;⁵ others have focused on the power of computing and agent-based models (ABM) to develop approaches which work to recreate possible past network scenarios *in silico*, and make inferences from similarities between their archaeological dataset and the computer-generated patterns.⁶ Others have been inspired by the work of Bruno Latour in particular, adopting actor-network theory (ANT) to challenge the way we see relations between people, things, and institutions and to re-envision the world as created through these relations rather than existing *a priori*.⁷ And others have derived their methods from sociology and social network analysis (SNA), where the relationships between people and how these relate to social structures are of primary importance. This last approach has perhaps been most effective for those studies with rich historical datasets, such as bodies of letters or papyrological data,⁸ which have had the capacity to examine past social networks between individuals.

Although there is diversity in what is studied, most archaeological uses of network methods rely on similarities between material culture assemblages as proxies for the strength or frequency of social relationships, such as trade, thus elucidating mostly regional interconnections between sites.⁹ Within this body of work and across network science more broadly, the ‘small world network’¹⁰ has had a huge impact: a network structure featuring strong social groups or clusters that are linked together by random

‘weak ties’.¹¹ This network structure, and specifically the presence of these random weak ties between the strongly bound clusters, enables the easy transmission of certain kinds of information between separate groups, or clusters. These weak ties are therefore described as possessing strength, and the small world network has been observed in many different situations across time and space—ranging from the colonising world of the Archaic Greeks to the spread of disease epidemics in modern America.

However, there are issues with ‘complex’ information transfer—such as new religious beliefs, behaviours, or norms—across such weak social ties, precisely because of their weak social integration within a group structure. Weak ties possess little emotional strength, little power to persuade. For complex information transfer that requires trust or reciprocity in order to be accepted and spread, we need to look instead at the social ties that carry emotion—whether this is romantic or familial love, friendship, respect, admiration, or fear—and which bind individuals into meaningful relationships and communities: the strong ties that form human beings’ closest and most important social bonds of family, friendship, and close association through geographical neighbourhood or occupation. Strong ties are central to our social understanding of ourselves. Today, we can have strong tie relationships that are global in scale—for example, family members on the other side of the world, and technology that enables us to maintain those relationships regularly—but in the past, strong tie relations were more localised. Of course, a sense of community or group identity was possible across longer distances, with some aspects of strong emotional social ties maintained by repeated trade or mobilities, the sending of letters, and by religious practice,¹² but at a general level, attachments to place, social norms and behaviours, language, profession, and so on which help to form and maintain strong tie clusters will have been more local in character.

How then, did new ideas or innovations that require introduction through trusted strong tie social bonds travel beyond the local to cross geographical distance? Because the transmission of complex behaviours across great distances can be seen materially in the archaeological record, in the case of certain aspects of ‘globalisation’,¹³ or the adoption of new ways of doing things, such as technological innovations in the production of pottery or metallurgy, or the spread of new religious beliefs. Weak ties that connect local clusters are the obvious answer in network terms, but they cannot provide the whole answer in social terms. The chapters gathered together in this volume showcase the importance of looking beyond weak ties to focus on the role that strong social ties have in the transmission of complex information which, in order to be accepted and lead to social change, require individuals to be bound together by relationships that are structured through mutual trust, memory, and reciprocity. They highlight the vital role of places of gathering in the process of information transmission, in this case sanctuaries; the role of narrative and storytelling in creating a sense of community

even across geographical space; and the role and control of social systems in order to facilitate or stifle new information transfer.

The strength of weak ties and the small world

To understand the importance of strong social ties more fully, we must start with weak ties, and why they have been seen as so socially powerful: why they are understood as structurally strong. Mark Granovetter coined the term ‘the strength of weak ties’ in the title of his seminal paper,¹⁴ because sociologically, people’s relationships or social ties are characterised by their strength or weakness: where strength is ascribed to close, repeated, and regular contact between individuals, with whom they form local groups or clusters; and conversely, weakness is ascribed to acquaintances or people that are not so well known, acquaintances who are part of different social groups. Strong ties exist between dense groups of friends and family, which can also include geographical neighbours and colleagues, binding them into a reciprocal social network, where social cohesion is marked by trust, repetition of interaction, shared memories, and shared emotions. In sociological terms, these individuals have been argued as forming ‘closed triads’, where all members of the triad know each other.¹⁵

By contrast, a ‘weak tie’ in a social network describes the connection that exists between people who are otherwise integrated into *different* tightly knit social networks, and despite the fact that they usually represent a relationship between the two people that is infrequent, casual, or temporary, research has shown time and again how effective these relationships are at spreading certain kinds of information. This is because the network structure of the tightly knit strong tie social groups of which people are generally part is localised: the people with whom we interact most are likely to have access to the same kind of information as ourselves.¹⁶ A person who is a weak tie connector to another social cluster on the network is able to transfer information from their social group into our own. In network terms, these weak tie connections between different strong tie social clusters have a powerful cumulative effect on the structure of the network as a whole: they connect the separate, localised strong tie social groups together and enable information to transfer from one part of the network to the other with relative ease. These ties, although relationally weak, are structurally strong.¹⁷ This phenomenon has been described as the ‘small world’. The weak ties between clusters in a small world network enable local information to have global, that is, full network, reach. It is the weak ties which enable this network quality of a small world: they bring the capacity for ‘short path length’, the network term which describes the ability to directly access other disparate clusters.

The power of weak ties has been amply demonstrated through real-world examples. The spread of disease is a particularly good case in point, where the arrival of one contagious individual into a strongly tied social group can

cause the infection of pretty much everybody. This is a ‘simple’ contagion, that is, the process of exposure, infection, and spread is not dependent on anybody having an opinion about the process, or a choice about whether they are infected. They just catch the virus (though wearing a mask and staying socially distant helps). Granovetter’s example was more sophisticated, exploring instead the way in which information about the labour market was transferred, and where individuals in a group with fewer weak social ties were seen to be at a disadvantage in terms of knowing about job openings at the right moment. If we are part of a very strong, localised social network without weak tie connections to other people in other places or groups, then we are effectively insulated against new information, whether this be about jobs, fashions, news, or new technological or religious innovations.

Weak ties, and the small-world networks that they are instrumental in creating, have been important in the recent iterations of network analysis in archaeology and history, for example, in Irad Malkin’s vision of the interconnected Mediterranean world of Archaic Greece;¹⁸ or the distribution of Clovis lithic points in North America.¹⁹ In these cases, the clustered communities made up of strong ties (often seen as fixed) are changed by agents from outside their group, with connectivity and change coming from weak ties acting as active *brokers* between clusters, bridging the ‘structural holes’²⁰ that otherwise create disconnectedness across the network and impede the flow of information across it. Such people in brokerage positions across structural holes are noted by Burt to be able to manipulate and control the network for their own benefit.²¹ Furthermore, Burt noted that the benefits of taking a position of brokerage between clusters on a network were maximised when that network involved strong relationships and trusted contacts.²² Research has also shown that the strength of weak ties thesis has been overstated even with regard to novel information, and that stronger, more ‘redundant’ ties possess more ‘bandwidth’: that is, because they are more frequent contacts, they pass on larger and richer flows of information, of which a higher proportion will be new.²³

Innovation, persuasion, strong ties, and community

So, it seems that there are a number of issues with the assumptions behind the discovery of small world networks in the past, including the idea that technological or social innovations always come from beyond a localised group or area, the equality of nodes, and even the very idea of a totally random connection. The way human beings work socially means that total equality in a relationship is quite unlikely, as are totally random ties—and Burt has shown that such bridging ties are in any case more effective if they connect into strong and trusted relationships. These asymmetries and imbalances in real human relationships need further consideration in the transfer of information, and innovation. Innovations in particular are

an interesting case here. Job information or news can be passively heard, without requiring anything of the individual listening to this new information. Innovations are different, because they require the active adoption by the individual concerned, and the likelihood of a person's adoption of an innovation is very different from their vulnerability to infectious disease. Although there are different types of innovation—technological, material, ideological—general observations about the social character of their adoption remain: successful diffusion relies on trust; and trust requires strong social ties.²⁴

The diffusion of innovation was first fully explored sociologically by Everett Rogers in the 1960s, when he outlined five major types of human response to innovations.²⁵ He observed broad characteristics of each, relating to social qualities such as status, financial position, and age. Innovators, those who actually do the innovating, are defined as being generally of higher social status, financially well off—which enables them to absorb losses associated with innovations, and are socially connected to 'scientists' which gives them access to new information. The next category of people defined by Rogers were those that are quick to take up an innovation, classed as Early Adopters. These people were defined again by their higher social status, their financial independence, and higher level of education. All these social qualities enable this group to shape the opinion of others regarding innovations; these people are the opinion leaders in society. The third category identified by Rogers was that of the Early Majority, who were observed to adopt innovations considerably later; these people are not opinion leaders, although they are of higher social status. The fourth category he outlined is the Late Majority, who are generally characterised by scepticism, lower social status, and less financial liquidity. Their main social contacts are with others in the Late Majority. The final category of people as discussed by Rogers were classed as Laggards. The key characteristics of this group are connected to their age, their lack of status, their lack of financial liquidity, and their aversion to new ideas, change agents, and the attachment to tradition.

These categorisations represent rather a blunt tool: diffusion processes are highly complex and may differ among different people depending on the nature of the innovation itself and the perception of it. In addition, there is an underlying assumption here that all innovations are positive, again, this is in the eye of the beholder. However, the essential premise of Rogers' work is that the process of diffusion and adoption of innovation is related to our social context and to the behaviour of those around us: if members of our social group that we admire, trust, or wish to emulate have adopted an innovation, then we ourselves are more likely to take up that innovation too. This is related to deeply social factors, such as reluctance to deviate from the social norm, respect for individuals with perceived social power or who are regarded as higher status, and attachment to 'the way things have always been done'. It is here that the sociological

observations surrounding the diffusion of innovations start to intersect with the science of networks: social, crowd behaviour is also intimately bound up with connectivity.

Weak ties have been central to thinking about this connectivity and the spread of information or innovations across networks, and there is a continuing perception, for example, that weak ties are important in the spread of religious ideas,²⁶ but it is worth considering the *kinds* of information or the *content* of an innovation that might be adopted via a weak tie bridge to another part of the network, rather than across a trusted strong tie. It is also important to think about what was being transmitted and why, and what these long-distance connections enabled, and at what cost.²⁷ Recent studies, such as that by Valentine Roux et al.,²⁸ have nuanced both Rogers' categories and the links made by weak ties by accounting for expertise as part of this process of adoption. Their focus was on technological innovation, their case study was on the adoption of kiln technology, and their aim was to characterise conditions which led to technological borrowing.²⁹ They explore the likelihood of weak ties acting as 'bridges' for new information, a condition which they discovered to rest on the perceived expertise and social leadership possessed by the person adopting the innovation *from* that weak tie contact.

In addition to this nuancing of the early adopter category, innovation transmission is also marked by the notions of horizontal and vertical transmission. Horizontal transmission refers to the peer-to-peer diffusion process, often imitative in character, that is, an innovation will spread through observation, emulation, and copying; by contrast, vertical transmission requires depth of knowledge and experience, for instance through conditioned learning, the cultural traditions inherited from family and lived environment, usefully characterised as the individual's *habitus*.³⁰

An individual's socio-religious and socio-political environment is generally vertically inherited, deeply ingrained in the habits and practices of family and neighbourhood, everyday existence, perception, and worldview. This is not to suggest that it cannot be changed, but that in general, a vertically inherited aspect of social identity will be less vulnerable to innovations brought by 'random' change agents—weak ties—in the social network. This is in part because in order to enact religious or ideological change, there needs to be a strong level of trust between the change agent bringing or advocating the innovation, and the individual doing the changing. Therefore, when social, political, or ideological change is introduced via such trusted means, it can have a very powerful effect indeed: for example, recent work has sought to examine the spread of religious violence in the Radical Reformation in Europe, modelling both the horizontal axis of transmission (travelling 'firebrand' preachers) and the vertical axis of transmission (through congregational lineages), and has shown that in this case, the vertical axis exerted more social power in disseminating the idea of religious violence.³¹

The ties that bind: the strength of strong ties

And so we return to strong ties. When it comes to thinking through changes in individual beliefs and practices which have profound social impacts—such as religious conversion or political radicalisation—the ‘strength of weak ties’ is no longer appropriate: these casual acquaintances or geographically distant friends do not exert the necessary social power to enable the adoption of new religious, political, or social ideas. It is certainly possible that a charismatic individual with a mission to convert and persuade may be able to influence people—the apostle Paul offers an example of the power of such methods—but, although he was technically a ‘weak tie’,³² Paul operated within powerfully strong tie contexts. The people to whom he evangelised saw him as part of their strong tie social network: he stayed with them for long periods of time, worshipped with them, led them, motivated them, and communicated with them via letters. The weeping, embracing, and kissing as Paul leaves the Ephesians in Acts 20:36 underscore the strength of the emotional bond that the communities felt with Paul: Paul was felt by the Christian converts of Ephesus to be a strong tie.³³

Strong ties feature certain important aspects: emotional intensity, the time spent with that other person, the intimacy (describing mutual confiding), and the reciprocity between the two people.³⁴ Memory and shared experience also have an important role in the creation and maintenance of strong tie bonds. However, strong ties are not all the same, and they are not simple, unidimensional connections.³⁵ There are multiple different ways in which a social tie can be strong—related to *frequency* of contact, *directionality* of the tie (i.e. although a bond between a mother and child may be strong, there is directionality involved in terms of certain aspects, such as duty of care; moreover, this directionality will also shift across a lifespan), and the *nature* of their strength, that is, whether they are multivalent—that is, they might be related, work together, and live nearby—or whether they represent a simple relationship, where they are only connected in one capacity (e.g. employer/employee).³⁶ Brashears and Quintane have sought to nuance the discussion of strength in social ties, taking on Aral and Van Alstyne’s notion of ‘bandwidth’ to describe the quantity and quality of the relationship in question. They have also questioned the assumption of *redundancy* involved in strong tie (or high bandwidth) relationships, that is, the ‘closed triad’ quality that has long been attributed to strong ties, showing that the *capacity* of a tie to transmit new information is more important, and the *frequency* of the relationship is also vital to the spread of new ideas.³⁷

Mathematically, however, strong ties are weak. In network terms, they do not have the capacity to spread information quickly across a whole network structure. Their path length (their ability to reach into neighbouring clusters) is very long, meaning that they cannot easily access new groups or new information—a point emphasised by Sweetman in her consideration of

Christianisation in the Mediterranean in this volume. However, in real human social terms, strong ties possess the capacity to persuade and to influence. Experiments have shown that when the weak ties in a test case social network were removed, the network shrank a little but did not fully disconnect: the strong ties continued to hold the network together. The authors of this paper concluded that ‘a high-fidelity strong tie social network’ of overlapping clusters was almost as efficient as a small world network at transferring information,³⁸ an observation also echoed by Damon Centola’s work.³⁹

So although weak ties connecting the small world present the most efficient method of spreading certain kinds of information or diseases, it is clear too that a network of overlapping clusters built on the fidelity of strong ties is more important as a model for thinking about the spread of complex new information. With the nuances regarding the nature of strong ties in mind, finding various kinds of strong ties in the past, the ties that bind communities into trusting relationships, will allow us to begin to understand how fundamental alterations in religious, political, and ideological behaviour spread through social networks and contribute to broader-scale systemic changes.

Wide bridges and the places, stories, and systems of information diffusion

Complexity is the key here. Centola and Macy argued that where the new idea or information carries behavioural change which involves social risk or cost, or is controversial, then adoption is not simple, and ‘requires independent affirmation or reinforcement from various sources’.⁴⁰ ‘Complex’, in other words, refers to social innovations such as new religious beliefs, ideologies, or new social norms. Centola and Macy have adopted the language of disease—describing these as ‘complex contagions’—to suggest that in order for behavioural innovations such as a new system of religious belief to be accepted and become the norm across a collective group, they require both trust in the source of the innovation—a strong tie to introduce them—and *also* need to be repeated, ideally from multiple sources in order to receive reinforcement and take hold.⁴¹ Social networks based on trusted strong ties are *required* for complex contagion, to enable risky behavioural changes: they act to create the situation which Centola and Macy have termed ‘wide bridges’. Multiple sources of exposure to the innovation are needed in order to support certain important social factors in the process of adoption, including strategic complementarity—that is, the more that adopt an innovation, the more beneficial it is; the credibility of the innovation, which is enhanced as it is introduced across more and more trusted strong ties; the legitimacy of an innovation—as more people participate in the new behaviour or adhere to the innovative idea, the idea moves away from a position of ‘deviance’ towards one of acceptance and legitimacy; and, as

more adopt an idea, emotional contagion is also increased.⁴² In other words, strong ties are what make ‘complex contagions’ possible.

The purpose of this volume is to bring together scholars using network methods to explore these more ephemeral aspects of the transmission of complex new ideas about religion, politics, or ideology in the past. Sometimes, these will be transmitted hand in hand with other more tangible aspects, such as technological changes, other times, perhaps not. Indeed, whether an idea is successful may in part depend on the connection the idea has with other technological elements, or with particular places of gathering and contact, or ideas may be more likely to take root if they are passed across multiple ties—in Centola and Macy’s terms, ‘wide bridges’. Can we identify occasions when ideas are transmitted in this way, and others when they have been passed through narrower ties? Also relevant to the discussion here will be the reification of ‘ideas’ prior to their analysis. *A priori* categorisation is an acknowledged problem with using network analysis methods,⁴³ and it may be helpful to think about the concurrent formation of ideas through the formation (or temporary stabilisation) of a network, both idea and connectivity in a dynamic process of becoming.

The scholars gathered here address what archaeological and documentary signatures we might find for religious and ideological innovation and change, how these might be tied into other technological changes or particular social networks, and how network methods—digital, methodological, and metaphorical—can help us in the search. Although there is a general focus on the ancient Mediterranean—in part because this is my own area of specialist knowledge and represents in part my own professional social network, other areas are represented, including South India and the United Kingdom; however, there are of course places, bodies of material, and approaches that are missing and through which useful further dialogue could be generated. The temporal range of the contributions stretch from the early Iron Age through to the fifteenth century CE; again, there are limitations in this timespan and interesting observations and comparisons could be made with material from before and after this period—however, the chapters do relate to each other usefully and the volume remains cohesive. It is my view that bringing together case studies from different regions and time periods introduces comparative aspects which helps to strengthen the usefulness of the volume to other sectors of scholarship. In addition, there is a mix presented here between case studies which make use of formal network models to demonstrate and illustrate their arguments, and others which do not. By blending these different approaches, we can highlight the usefulness of visualisations, but also the philosophical strength of the network heuristic.

The book is divided into three sections, each of which addresses a different element of the interface between social networks and the spread of new information or innovations, and the way we can find these in the archaeological and historical record: [Part I](#): Sanctuaries, [Part II](#): Storytelling, and

Part III: Systems. The chapters can all be read as standalone offerings, but by grouping them together in this way, the chapters all also speak to related themes. There is also a chronological flow here: we begin with the earliest case studies, in the Iron Age and Archaic period, and finish with chapters which address various different aspects of Christianity. This progression, although unintentional, is also useful to think through.

Sanctuaries: the places that bind

Part I comprises three chapters, all of which explore the power of sanctuaries to bring people together into temporary communities, and the power of these gatherings to generate strong tie connections even (especially) across great geographical space. The physical setting of the sanctuary in the ancient Greek world, with its neutral status and inviolability, enabled people from across the Mediterranean to participate in festivals—either at official, almost diplomatic levels as we see in the cases of *theoria* and *proxenia* in the Greek world, as a competitor in sacred games, or as a more ordinary general participant and observer of the festivities. The three chapters gathered here think through the role of sanctuaries as places of gathering, the exchange of ideas and of their wider dissemination: in the first, Megan Daniels examines the transmission of the image of standing female nudes across the Iron Age Aegean as a marker of participation in elite affiliation networks, and how this changes over time; in the second, John Mooring looks at the role that panhellenic sanctuaries played in the diffusion of the innovation of coinage in the Archaic Greek world and the relationship this has with elite social networks; and in the third, Sandra Blakely and Joanna Mundy explore the different social networks present at the cult of the Great Gods on Samothrace and their materialisation.

What is clear from all these chapters is that sanctuaries in the ancient Mediterranean were more than just places of worship. These locations were profoundly cross-cultural, and the participation of people from across Greece, Italy, and Asia Minor at events at these sanctuaries enabled the sharing and transmission of a number of new ideas. In her chapter, Megan Daniels examines the rise and fall in popularity of one particular common image, that of the nude female in a standing position, which formed part of the votive repertoire of sanctuaries across the east Mediterranean between c. 800 and 550 BCE. Traditionally, scholarship has seen this nude female imagery either as erotic, or as a symbol of fertility. Daniels demonstrates how both these interpretations are insufficient, and proposes instead that the nude female be seen through the lens of the shared religious and political world of the Iron Age Mediterranean, with a specific semiotic function relating to this interconnected setting. Sanctuaries offered the medium for this semiotic transfer. Daniels argues that sanctuaries, as places of elite meeting, exchange, and situated learning, were nodes which acted as ‘wide bridges’ for the transfer of ideas and materials that created and maintained

elite social networks and identity of the Iron Age east Mediterranean. These nodes were connected by new forms of human mobility, which created strong ties within the Greek world, but also acted as channels for participants from the non-Greek world to engage and transfer new ideas.

Crucial to this argument is the role of dedicated objects within these sanctuaries. Many of these objects have long and complex biographies and far-flung points of origin, but they can also be seen as a demonstration of the multiple overlapping networks that existed in the Iron Age, formed through these multiple kinds of mobility, ranging from trade and diplomacy to military conquest, mercenary service, and marriage contracts. These objects embody and symbolise these points of origin and complex biographies, and so also come to represent these conceptual networks.

Although the image of the nude female had been widespread in the kingly courts of the Late Bronze Age Near East, it only begins to proliferate through the Greek world—as votives in internationally well-connected ‘Orientalising’ sanctuaries dedicated to female deities and also occasionally in graves—during the period of extremely high mobility and new encounter from around 800 BCE onwards. More than just an exotic import or a representation of a particular deity, these votives, which most often took the form of locally made terracotta figurines, indicate a new, popularised representation with particular meaning relating to ideologies of power and protection.

The nude female is shown by Daniels to represent an aspiration towards a connective kin relationship between elites and the divine manifest through the legitimising power of divine breastmilk. The proliferation of the image of the nude standing female across the cosmopolitan sanctuaries of the Iron Age Greek world demonstrates the power of shared cultic rituals and beliefs that were performed and learned in such places, and articulates the connective power of the sanctuary as a wide bridge: these are places which bind communities, however widely dispersed, into communities of practice, communities of behaviour, and communities of concept. As such, when the nude standing female disappears from the repertoire during the sixth century, this can be interpreted not simply as new artistic interests in other subjects, but rather as representative of changing attitudes towards human relationships with the divine, bound up in larger shifts in political and social life in Greece towards something more community-governed and *polis*-based.

Operating across a similar time period as that explored by Daniels, the transmission of the innovation of coinage within the context of panhellenic sanctuaries across the wider Archaic Greek world is the topic explored by John Mooring in his chapter. The invention of coinage represents a profound abstraction of exchange, and was a fundamental shift in the way transactions could be made, with far-reaching implications. The adoption of coinage was a complex process which involves characteristics of the innovation itself, such as the advantages it offers or the compatibility of the

innovation regarding the social setting, but which also requires the consideration of the communication channels, the social ties through which such an innovation can progress. This is a two-step process, first involving the transfer of knowledge about the innovation, and second, the persuasion of people to take it up. Mooring argues that the Archaic Greek world, with homophilous connectivity provided by colonisation and mobility, language and cultural background, was a low-density network and an ideal situation in which weak ties could be powerful in spreading new ideas, as Granovetter has shown. These weak ties are represented by elites participating in festivals and gatherings at panhellenic sanctuaries.

It is the adoption of the innovation which is important though—the decision made in a number of different places to take on coinage and to use it, the persuasion that the innovation was useful, beneficial, and important. Persuasion requires two things: it requires the person bringing knowledge of the innovation to be an opinion leader with strong social network contacts, interpersonal channels through which they can persuade; and it requires trust. Trust in another person entails the recognition that we know how the other is likely to behave, that they are not going to cheat us—that the metal the coinage is made from is worth what they say it is, what the issuing city says it is. Trust is facilitated in small, close-knit and homophilous communities with shared norms and values, and in the small Greek communities of the Archaic period, which, despite being independent politically, shared common values and culture with each other, there was a comparatively high level of trust which enabled the persuasion needed for coinage to spread. Mooring argues that the places where this was possible were the international, panhellenic sanctuaries. He demonstrates through an analysis of official, elite social ties in the form of epigraphic records of *theorodokoi* and *proxenoi* to the major festivals of Hera at Argos, Asklepios at Epidauros, the Pythian games at Delphi, and the Nemean games, that 60% of the cities which engaged in these diplomatic activities were also minting coins in the Archaic period. He supports this with evidence provided by analysing the mints from which coins in Archaic hoards came: showing that in those hoards, 76% of the coins were from cities which also possessed an elite diplomatic presence at panhellenic festivals: the relationship between the spread of the innovation of coinage and participation of elites in international religious gatherings is abundantly clear. The power of these elites as local opinion leaders with strong ties in their local community enabled the innovation to be accepted and take hold.

Beyond the brave new world forged by migrating Greeks during the Iron Age and Archaic period in the east Mediterranean, and the key role that sanctuaries clearly played at this period in bringing these dispersed communities together and transferring new ideas, sanctuaries also acted as binders in other ways and throughout classical antiquity. In the final chapter of this first section, Sandra Blakely and Joanna Mundy focus in on the mysteries that operated at one particular sanctuary, that of the Great Gods

on Samothrace. Becoming an initiate into the mysteries at the sanctuary at Samothrace—about which we know very little, as initiates were sworn to secrecy—afforded a number of benefits, both social and practical: the prestige of joining an elite group of *mystai* that included recent and mythical royalty; perhaps more pressing, given Samothrace's position, safety at sea; and the protection of a mutually non-aggressive network of city-states, where participation in the mysteries acted as a symbolic tie that underwrote social behaviour and cooperation.

They make use of the extensive epigraphic record for participation in the mysteries, largely dating between the second century BCE and the second century CE, although the mysteries themselves operated for far longer, at least from the Archaic period. Although the inscriptions contain little information about names, deities, narrative, or iconography, Blakely and Mundy demonstrate that the dynamics of the diffusion of knowledge about the mysteries (and associated political and social connections) can nevertheless be usefully illuminated using a social network analysis approach. Through the city-names that appear in inscriptions, the cities become the actors on the network and the individuals (mostly unknown) act as proxies for their home town. By assessing the strength of the relationships that the inscriptions record—initiations, the visits of *theoroi*, and grants of *proxenia*, which offer insights into strong ties of differing types, including contractual force, affective intensity, family lines, and the cultural *habitus* of secrecy—the authors are able to bring a focus on betweenness centrality: the nodes in the network that operated as bottlenecks or bridges for the flow of information. Places which demonstrate high betweenness are argued to have a significant role in the diffusion of the rites beyond the island, and to offer places where it is possible to see how the Samothracian rites were used for political and social ends. Such nodes offer insight into complex contagion, in which the diffusion of ideas is enabled by alignment with existing cultural traditions. Thera and Rome emerge from their analyses as bridges between other cities and Samothrace; Rhodes as particularly important as a bottleneck: demonstrating, through the presence of a number of different kinds of institutions on the island, the adaptation and integration of the cult of the Great Gods into the political and civic life of the cities and elites of Rhodes.

Storytelling: the narratives that bind

The second section of this book assesses the creative power of strong tie networks to bind people and places together through storytelling, orality, and the processes of sharing information. Storytelling and narrative in this case means a number of things and is expressed through a number of means—we see in Christina Williamson's chapter, which flows naturally on from the discussion of sanctuaries, an exploration of the transmission of common knowledge across Hellenistic festival networks; in Kevin Stoba's, the discussion is focused on the material and iconographic repertoire of the cult

of Mithras in the Roman world, and what this can tell us about different regional practices; and in Nathanael Andrade's chapter, the analysis centres on texts and the role of social networks in the transformation of oral traditions about Christian saints across South India. Andrade's chapter also brings us towards the final section of the book, flowing into a discussion of systems that were operationalised through strong tie network connections.

As we have seen, the role of sanctuaries in the transfer of ideas is demonstrably crucial. Christina Williamson, whose work also acts as the bridging chapter between the section on sanctuaries and the section on storytelling, explores the strong social ties which were reiterated and renewed at sanctuaries and festivals, in particular the role of interstate diplomats and the inter-city bonding that occurred in these contexts. She argues that festivals—ritual gatherings—are the prime movers in the creation of communities, cities even, and are central in sustaining narratives of belonging. In particular, in the wake of Alexander's conquests, new or renewed festivals act as a fundamental marker of the interconnectivity of the Hellenistic period, but more than this, they offered a vital channel through which narratives of interlinkedness were performed. Her discussion centres on the creation of what she has termed 'portable communities' at festivals: the evidence for participation at Hellenistic festivals challenges the dominant ideas about transmission of information through weak ties, as these festival attendees were carefully invited or delegated, acting to reinforce an inter-city network already in place rather than filling any 'structural holes'.

In these festival spaces, Williamson argues, it was strong tie bonds which were reinforced, through the particular and unique quality of 'festival time' in these temporary gatherings: 'festival time' elided the present with the deep, heroic past, and acted to bring participants together through perceived kinship that was rooted in mythological ancestry. These narratives of community belonging were cemented by participation in collective ritual: music, sacrifice, feasting, and public awards suspend everyday life and create, in Jan Assman's words, 'islands of time'.⁴⁴ The powerful collective experiences and memories generated at festivals both enabled the spread of and also manifest the common knowledge and normative social values that were shared across the Hellenistic world, so demonstrating the globalised nature of that world.

The creation of community through collective experience and memory is also at the heart of Kevin Stoba's chapter exploring the subtle differences in the iconography of Mithras in the Roman world. On the surface, the bull-killing scene famous in Mithraism, the tauroctony, is universally understood as the key image for the cult, although debate remains about how it should be interpreted. However, there are iconographic variations in the tauroctony which are meaningful in terms of transmission of ideas, and which can be used to shed light on localised influences, principles, and social backgrounds of the believers. Stoba's approach arises from the fact that in formal network analysis, all evidence can be treated equally, meaning that

there is no starting assumption of a standardised tauroctony or deviation from it; and as such, each piece of evidence that he compiles and details in the attributes database creates its own unique profile. Stoba's technical work reveals that the tendency for scholars to allocate tauroctonies to regional groups is not borne out by evidence of iconographic similarity.

He concludes this through two major analyses of his data. The first is based around homophily, the tendency in this case of a node to be tied with others that share a significant attribute on the tauroctony. He found that homophilous relationships were much less likely at a regional or provincial level, but significantly likely at a site or settlement level, indicative of the power of strong ties at a local level to foster conformity. This discovery also enables Stoba to suggest that certain groups of iconographic feature spread together, which might indicate different strains of Mithraism that can be extracted from the data, and which also have important connections to certain groups of people, ritual practices, and versions of sacred myths.

The second analysis used only the very strongest ties of similarity between tauroctonies, highlighting iconographic similarities especially across objects of the same medium (e.g. statues, all from Rome) in part because of the difficulties of expressing multiple iconographic elements in certain forms. However, the groupings are nevertheless revealing, with the similarities between the statues in Rome, for example, suggesting a high level of conservatism and conformity in this group of cult objects, some of which represent the earlier known images of Mithras. Stoba argues that the similarity between these representations and the continuing conservatism in Rome supports the proposition that the cult of Mithras originated in Rome and spread from there. The analysis identifies other strong site-based groupings at Sarmizegetusa, Carnuntum, and Alba Iulia, suggestive of localised cult innovations and cult narratives which bound these communities together, but which were able to spread across a strong-tie network of Mithraic adherents.

Geographical proximity can, of course, be crucial to the spread of ideas through strong social ties. However, the 'release from proximity' afforded by objects⁴⁵ which enabled community identities and ways of doing to be generated and to cohere even over long distances is also enabled by narratives. In the final chapter of this section, Nathanael Andrade uses divergent textual sources to reconstruct the social networks that enabled the transmission of narratives about St. Thomas across vast geographical distance, from Edessa in Osroene to South India.

The oral traditions surrounding the story of Thomas the Apostle and his journey through India are difficult to untangle in terms of dates and in terms of content, although it seems fairly likely that the original was composed in Edessa in the third century CE. Andrade contends that situating the *Acts of Thomas* narratives within the weak and strong ties which made up commercial, ecclesiastical, diplomatic and pilgrimage networks in

operation between the Mediterranean and India allows us to consider afresh how the Thomas traditions were shaped across time and space. The *Acts of Thomas* is, in essence, a general imaginary of the apostle's journeys through and martyrdom in India; by contrast, oral traditions of Thomas Christians from South India are much more culturally specific. Andrade argues that the oral traditions of the Keralan coast are based on the general narrative of the *Acts*, but with deeper layers of regional and cultural specificity local to the area. But given their separation by 1300 years, Andrade uses networks to reflect on and identify the intermediary stages of the development and transmission of the narrative.

Key to this discussion is the narrative tradition that Thomas was, for a time, buried in India, but that his body was removed from this tomb—which remained empty—and transferred to Edessa, where the cult of his relics continued. This seems to have emerged in Thomas narratives only during the sixth century; prior to this, Edessa had been understood as the final resting place of Thomas, as seen in pilgrimage texts such as that of the fourth century pilgrim Egeria. Also during the sixth century, another crucial piece of information begins to be added to the narratives: that Thomas was martyred in a place in South India called Kalamene. Andrade contends that this is not coincidental nor a piece of historical fiction: rather, this new place-name indicates a shift in knowledge among Greek and Latin-speaking Christians in the Mediterranean about Thomas worship in South India. Andrade argues that this detail, as well as the augmentations of the Thomas narratives in the Mediterranean of an original burial place in India, and the Indian narrative of a final resting place for Thomas' relics at Edessa, illuminates knowledge transfer about sacred sites across new communication networks between Persian Christians, who had begun to settle in South India in the fifth century CE, and across commercial and pilgrimage networks which also began to operate between the Indian subcontinent and the Mediterranean.

Trust, to varying degrees, is key to the workings of these intertwined and co-dependent commercial, ecclesiastical, diplomatic, and pilgrimage networks.⁴⁶ Commercial networks in the ancient world were often based around regional origin, their participants bound into trust-based social relationships through direct personal contact, and Andrade demonstrates that these communities, of both Roman-Egyptian and Gujarati origin, were in operation across the Arabian Sea between India and the Red Sea. Ecclesiastical connectivity between Egypt, Ethiopia, Arabia, and Mesopotamia extended out across the Persian Gulf and India, crossing boundaries and exploiting these commercial connections. Diplomacy also used the social pathways laid by commercial connectivity; and on the basis of these intertwining and overlapping networks, pilgrimage routes followed—seen in both textual evidence, in coinage found in India and Sri Lanka, and in the transfer of knowledge as witnessed in the narratives about the body and burial of Thomas.

Systems: the structures that bind

In the final section of the book, we move from narratives that bound disparate communities together explicitly into the way that social systems and structures were generated through strong ties, and the ways in which these structures were used to control social behaviour. All three chapters explore the systems built by Christianity and the weak and strong ties that were used in the development and maintenance of the system—Rebecca Sweetman’s discussion of how the architectural manifestation of Christianity spread across the Cyclades, Cyprus, and the coast of Asia Minor, situating this within topographical and social spaces for gathering; the examination, in Kilian Mallon’s chapter, of the frameworks and boundaries of the Christian system as defined by and through Church councils and the construction of ecclesiastical law; and Esther Lewis’ exploration of the transmission of the Lollard ‘heresy’ through the fifteenth century CE social networks in Bristol, where the use of networks destabilises what we thought was known.

That Christianity was beginning to find followers in the Mediterranean world of the Roman Empire in the first century CE is demonstrated by epigraphic and funerary evidence; but the places of gathering and worship of early Christians are largely lacking—make part partly for political and social reasons—until the Edict of Toleration and later adoption of Christianity by the Roman state in the third and fourth centuries CE. The choices made regarding the locating of new church buildings, and the processes by which Christianity spread and was physically established in these early years is the topic of Rebecca Sweetman’s chapter. Sweetman argues that both horizontal and vertical transmission processes come into play in thinking about the spread of church building: the conversion and initial spread of churches operating simultaneously through horizontal peer-to-peer networks, and through vertical, generational ties to landscape, memory, and tradition. By examining the archaeological evidence for this ultimately physical process of conversion and monumentalisation in the east Mediterranean, Sweetman seeks to move beyond generalisations about how and why Christianity was so successful, or geographically deterministic suggestions that favour simple geographical proximity, towards a more topographically and temporally nuanced picture of the processes of church building—and so conversion—in particular cities.

Both weak and strong social ties are emphasised by Sweetman as playing an important role in the spread of new knowledge about Christianity and its monumentalised form. Using evidence for patronage, pilgrimage, and trade, she demonstrates that there were different network factors at play at different times during the process of Christianisation. In the earlier years of the spread of the new religion, mission, and the strong interpersonal social network bonds of tight-knit community were crucial to both the evangelists—who needed to find a place of social acceptance, that is, among family and friends, in order to evangelise—and to the evangelised: in order

to convert to a new religion, the message needs to come from multiple, trusted sources. Churches, where they were built in these early years, were located in places with strong traditions of memory for the community, especially, for example, in cemeteries as at Corinth.

Once Christianity was adopted and endorsed at the level of the Roman state, the situation changed. Sweetman notes the strategically visible locations of churches at Edessa, Antioch, and Ephesus, situated either near points of entry and exit to the city, or near places with heavy footfall such as the baths or gymnasium, and argues that these city locations were known to the investors and were intended to bring in new worshippers. In other cities, such as Athens and Pergamon, Sweetman argues that the destruction of the civic core in the third century disrupted loci of memory and tradition and also caused breakdown in systems of patronage and elite investment in monument building that persisted until the fifth century, when direct imperial involvement seems to have resulted in new church building programmes. In all of these cases, Christianity began to be used to physically structure cities; but the sustaining of some places—in particular Antioch, Ephesus, and Salamis—through the regular visits by weak tie connections (pilgrims, traders, bankers, etc.) led to significantly more obvious monumentalisation processes in these locations.

With the establishment of the Christian system, the regulation of its boundaries—especially across the broad geographical swathes and political fractures of the Late Antique Mediterranean—became of paramount importance. Between the fourth and sixth centuries, bishops and Church officials drafted a complex series of laws designed to regulate the interactions between bishops, clergy, and the laity. Kilian Mallon takes this body of ecclesiastical law data and argues that it represents the maintenance and regulation of strong ties relating to the accessibility of work in churches, mobility, and the right to worship: the ‘boundary work’ that was necessary in order to maintain the structures of Christianity. Christian conversion is usually modelled using three elements: that of personal evangelism, that of secular privileges for Christians accorded by imperial benefactors, and that of familial, inter-generational habituation of children in Christian families. Mallon adds to this repertoire by positing that ecclesiastical regulations regarding strong ties of work and worship were fundamental in building the core of the trust-based institutional system that is the Christian Church. At this point in the development of the system, weak ties offer potentially dangerous methods for spreading doctrinal heresy and sedition—a point to which we shall return in Esther Lewis’ chapter—and which needed heavy, top-down management.

Between the fourth and sixth centuries, the series of ecumenical councils and more regional Church synods met to discuss and clarify theological, doctrinal, and legal issues, in a period of time which saw the role of bishops evolving rapidly and radical changes in the social and political structures of the Roman world. The proceedings of these councils and