

Dis-entangling Entanglement: A Response to my Critics

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I very much enjoyed my recent visit to the Institut für Vorderasiatische Archäologie in the Freie Universität Berlin, and am very grateful for the time and thought that had gone into preparing for my visit. The resulting discussion was very productive and in-depth, and I found the written commentary very helpful in thinking through my ideas about entanglement and in developing them further. In answering the discussion points fully I would end up writing another book! I do not feel I can do justice to all the points raised in this relatively brief response. Rather I would like to react to some of the issues selectively, and to make some general points that deal with broad groups of comments, for example those that deal in some way with directionality and the possibility for dis-entanglement.

Directionality

In their commentary the authors state that “many of us might agree that from the perspective of the broad sweep of human history people have become more and more entangled in a material world they have created”. This statement summarizes succinctly and effectively one of the main arguments of *Entangled*. And yet the authors spend the largest part of their commentary arguing the opposite, preferring to focus on contextual diversity and the human potential to disentangle. Regarding the notion that entanglements seem to have increased over the long term, the authors say “we consider this stance to be reductionist, as it insists that historical change has a particular direction”. Why do archaeologists so quickly retreat from, even hide from, their own evidence for long-term change? Why do archaeologists retreat from their own observation that in the “broad sweep of human history people have become more and more entangled in a material world they have created”? We are all aware of the dangers of social evolutionism. But is it not irresponsible to draw attention away from the one conclusion that archaeologists can readily agree on and provide evidence for, especially when the direction of that broad sweep of increasing entanglement is leading us as a species into difficulties?

I have spent most of my career arguing for contextual variation and for the potential of human agency to transform. I have always argued that long-term history is best understood in terms of small-scale change and the manipulation of small things such as pots, calabashes, houses, and ash from the fire. And I still argue that agency has transformative potential. The commentators suggest that my position in

entangled differs from the earlier focus on individual agency. That is not the way I see it at all. I still believe in the centrality of agency to social theory, but have shifted my attention to the effects and conditions of agency. If we are to focus on how individual agents transform their social worlds in the making or using of a tool, or in the negotiation of space or pot design, we also need to understand how those tools or built environments are themselves not isolated as things. Around each thing there are filaments, often largely invisible, that spread outwards to other things. These threads of connection are themselves entangled in each other. And these entanglements have effects in the world that then channel or constrain agency. I have tried to avoid reverting to some form of environmental determinism in understanding this wider frame of action, and to avoid a determinism based in the forces or relations of production. Instead I argue for a heterogeneous entanglement that frames and makes possible forms of agency that can transform and create change.

The argument that entanglements have increased overall is at first solely an empirical statement. And it seems that the commentators mostly agree on the empirical evidence that we have as a species become more entangled. The question of why entanglement has relentlessly increased is a different matter. I do not feel at all certain that I have given the right answer. For the moment, it seems to me possible to argue for a certain logic of increasing entanglement that focuses on the instability and multi-temporality of things and their relations. Things and their interactions are unruly because things tend to fall apart, die out, transform so that they cannot be relied upon. Of course on the day to day we manage to stabilize things, often with a lot of work. But the stone wall is gradually eroding at its base and will one day collapse, the coal will one day run out, as will North Sea gas. Over time bacteria become resistant to antibiotics, and climate is slowly changing as the result of impact over millennia. All these complex interactions and temporalities mean that humans are forever seeking new solutions. These solutions nearly always involve using new materials, new technologies, new restrictions and regulations, new forms of representation. They are additive. Sometimes, the things that are added may be simpler, replacing more complex forms. As I will agree below, it is certainly possible to achieve dis-entanglement. But in most cases most of the time, something new is added – and since all things are embedded in a web of filaments, new strands are added to entanglements. On the whole it makes most sense to fix things as they are in an additive process. This is what I have discussed as

path dependency. It becomes very difficult, costly in economic, social and cultural terms, to disentangle things and go back to the beginning. At some point humans become so invested in particular entanglements that going back can no longer be a preferred option. So while local disentanglements are possible, in the end the tendency is towards increases in entanglement. The hypothesis is that entanglements tend to increase over the long term because of the instability of things and because of path dependency.

This hypothesis about why entanglement tends to increase over the long-term may or may not be shown to be justified by evidence. But whatever the answer to the “why” question, it seems more important to consider the implications of the empirical evidence for increased entanglement for modern predicaments. It is certainly possible to argue on a case by case basis that technological solutions to resource depletion have their environmental dangers. Many will agree, for example, that “fracking” in order to access oil and gas has numerous environmental risks, including contamination of ground water, that lead to greater entanglements. But it is a different and broader argument to point out as an archaeologist that humans have always sought to deal with problems by finding additive technological solutions. Some in the post-environmental movement (Nordhaus and Shellenberger 2007; Latour 2008, 2009) indeed argue that we should focus not on restraint in our relations with the environment but on an increased rate of technological innovation. It seems important that archaeologists use their evidence for the directionality of long-term increased entanglement to contribute to these contemporary debates.

One of my motivations in writing *Entangled* was to draw attention to the dangers of the idea of the Anthropocene. We now live in a world in which all things are effectively human-made, even the weather, climate, soil and air we breathe. This means that humans are having to find solutions on an enormous global scale, and yet the institutions that are needed to find and implement such solutions do not exist, or they do not function effectively: most are in various forms of “gridlock” (Hale et al. 2013). Presumably at some point, solutions will be found and the political road-blocks will be resolved. But the entanglement view is that managing the Anthropocene will be very costly and difficult to reverse. Investing in new technologies will drag us down yet further in the direction of entrapment, constraint and regulation. And there are further dangers. The singularity of the Anthropocene, that fact that we are now all connected in one global system, means that there is little

room for mistake. Things are always going wrong in unexpected ways in human-thing entanglements. In the past, collapse in one system would often allow another to regenerate (see below in the discussion of “hubs”). But today and in the future, the interconnections are such that if something goes wrong there are no alternative places to go.

A good example of socio-material gridlock in the contemporary globalized world is that despite massive global hunger, including the appearance of food banks in developed countries, up to half the food produced in the world is thrown away. In 2013 a series of reports by, for example, the Institution of Mechanical Engineers in the UK and the Natural Resources Defense Council in the USA, provided data showing massive discard of food both at the production end of the food chain and in storage and consumption. While these data were vigorously countered by super-markets, and quantification of the scale of the waste of food is undoubtedly difficult, the problem seems real. The causes of the waste are complex and contested by the different players in the food chain, but they include the globalization of food, the great distances between producers and consumers, the mechanization of storage, the control of food by large super-market conglomerates, and new consumer life-styles that depend on the availability of fast food. Whatever the specific causes of food waste, it is clear that complex socio-material interactions have entrapped us as a species into forms of food procurement that are harmful, unjust and irrational. This is a classic example of entanglement where our dependence on food has led to harmful and destructive dependency.

I would be the first to applaud community gardens, the production of one’s own food, recycling, advocacy of fuel-efficient transport and so on. While such grass-roots movements in the 1960s onwards often seemed exciting and transformative, many in the environmental movement have become disillusioned. The calls for restraint and “small is beautiful” do not seem to have been effective in denting the directionality of increased global warming and social inequality (Nordhaus and Shellenberger 2007). Indeed, it is this sense of inadequacy that has fueled the post-environmentalist concern with new technological, large-scale intervention (Latour 2008). In the terms of the *Entangled* book, these small-scale actions have not been effective because they are not “fitting” – or rather they are fitting in relation to the aspirations of the participants, but they are not fitting in that they have not turned the tide. In my view the reason they are not effective is that they deal only

with the proximate problems, not with the deeper issues which have to do with the directionality of human-thing entanglement. We need to move beyond agency to understand the socio-material entanglements within which agency takes place.

Whether I car share rather than take a taxi, or plant a community garden, or recycle or otherwise take active steps to decrease human-thing entanglements depends itself on those entanglements. Whether there are cars, or space to plant gardens, or recycling systems all depends on entanglements. Take the extreme example of one essential personal human action – taking a breath. Is this an example of individual agency, to fill one’s lungs when and as one wishes with fresh air? As a child in the London smog it was difficult to breathe. Recently in Beijing and Xian I had to retreat to the pharmacy as my breath and health suffered in the pollution. To be able to breathe clean “free” air depends on governments and laws, degrees of industrialization, police that enforce laws, technologies that decrease carbon emissions and so on. All agency is embedded, then, in entanglements that both facilitate and constrain. To recognize the complex entanglements of even taking a breath, is to recognize the forces against which agency arrays itself in order to achieve change.

So yes, of course, there is local disentanglement. The commentators ask “might the scarcity of material objects not imply an intention toward disentanglement (or avoidance of entanglement)”. Of course. As I argued in the book, to be human is to be one with but also separate from things. We depend on things to think, work, be, but we also see ourselves as separate from, free of things. We have an ambivalence towards things, a to-ing and a fro-ing. There have always been movements that eschew materiality, the market, or new technologies. The commentators talk of care and dis-care. And I recognize the excitement of new ideas about the collaborative commons, prosumers (Rifkin 2014) and the common wealth of the multitude (Hardt and Negri 2009), involving sharing rather than possessing things. The commentators argue that Hardt and Negri offer “only one potential way out of the impasse of entrapment in a world of things”. Perhaps we can, in our more sophisticated modern utopic imaginings, stem and even reverse millions of years of increasing entanglement. But at present it is not at all clear that the commons will lead to a lesser entanglement with things. After all, there is the possibility of the “internet of things” (Rifkin 2014), and I have discussed elsewhere the notion that “the cloud begins with coal” (Hodder 2014). Hardt and Negri have very little to say about

the material thingness of the commons, even though the new forms of biopolitical power they describe seem very technology-based.

Over the long-term, dis-entanglement is often temporary and ineffectual in relation to the larger juggernauts of entanglement. Why is it so difficult to change entanglements? I have already outlined above a theory of why entanglements tend to increase, and further discussion takes us to the question of what entanglement is really about and how it differs from related terms like network, behavioral or operational chain analyses, or symmetrical archaeology. Ultimately the problem is that going “to” things is more difficult than getting away “from” them.

What is entanglement?

The commentators say that like symmetrical archaeology, “tracing entanglements means making our way through a strongly heterogeneous world and following links and chains in a fashion that is rhizomatic rather than linear or dendritic”. This focus on relationality is also seen in (social) network analyses although here the relations are between humans rather than between humans and things or between things themselves. Even in archaeological applications of network analyses (Knappett 2013; Barbara Mills et al. 2013), studies use material relations in order to construct human social networks. It is true that entanglement involves taking the thing seriously, and it is right that it focuses on the invisible filaments that spread out from things in behavioral chains, operational chains, commodity chains and many other forms of relation. But entanglements are not just networks or rhizomic flows. They are more than that. This “more” is captured by the ideas of dependence and dependency – that rather than the flatness of many network analyses, there is asymmetry and hierarchy within the networks and flows. To put it another way, the chains, networks and flows are tangled up in each other. As the invisible filaments spread out from things, they get caught up in other filaments that connect other things and humans. So there is a fundamental difference between chains, networks, flows and entanglements. The former are often seen as flat and symmetrical. The focus on entanglement, however, sees the operational sequences and flows as caught up, tangled up in each other in asymmetrical ways.

This point can be made very directly in archaeology. We have become used to the idea of the life-histories or biographies of objects (Appadurai 1988;

Gosden and Marshall 1999; Meskell 2004). Lithic technologists have examined the operational sequences of tool production (Leroi-Gourhan 1993). Behavioral archaeology has explored the sequences of procurement, manufacture, use and discard through which artifacts pass. There has been interesting research on cross-craft interactions (e.g. Brysbaert 2007), and there is much potential for moving beyond single behavioral or operational chains to the ways in which they are entangled or intersect. For example, the top line in Figure 1 shows the operational chain for making and using clay balls as pot-boilers for cooking meat in the lower levels of occupation at Çatalhöyük. But each one of the steps in this operation involves other steps in other operational sequences. In Figure 1 I have attempted to map out these cross-cutting dependencies. The end result is a tracing of an entanglement, if in a rather different way to that provided in Figure 9.2 in *Entangled*. We can, then, move from the study of operational sequences to the study of the grids that lock them together. Because each operational sequence has its own processes, needs and temporal or seasonal rhythms, it is in a dependence and dependency relationship with the other sequences. For example, events in one sequence have to “wait for” events to happen in other sequences. There is thus continual tension and asymmetry.

The question of what is entanglement is also raised by the interesting question of whether entanglement might be a zero-sum game: however much entanglements may change and differ, the degree of entrapment remains the same. It is suggested that “the complexity of the entanglement embodied in human-human relationships is much greater in hunter-gather than in capitalist societies where relationships involving things are the primary locus of complex entanglements”. It is of course the case that there are many forms of entanglement, and that human-human relations, and human-spirit relations are often extremely complex and entangled. Emotional, religious, spiritual, intellectual ties bind humans together in numerous complex ways that involve dependence and dependency. But in fact it is very difficult for humans to separate emotional and spiritual worlds from things. As the vast panoply of material culture studies have shown, in a great variety of social forms things come to have agency within human worlds, however different the ontologies. Humans thus get drawn into things and they get entangled in the way that I have described. It is this thingly nature of human-human interactions which creates the movement towards long-term greater entanglement.

Of course one can also argue that hunter-gatherers are entrapped in very thingly ways in the sense that they have to fit into the natural cycles and rhythms of the environment around them. It might be argued that being entrapped in a natural world is no different from our own entrapment in a human-made world. This takes us close to the blurred boundaries between entanglement and ecology, as illustrated by Darwin’s entangled bank. For some the material world is just another niche – providing a particular selective environment. But my argument is that entanglement is fundamentally different – that gathering and harvesting wild resources at a low and small scale, do not necessarily entrap humans into particular forms of care. Of course, as soon as densities rise and the scale of resource use increases, humans get drawn into management and care. But even at the earliest stage, humans are already transforming their environments and getting drawn into the double bind that is distinctive of entanglement as I have defined it – that is humans depending on things, but also having to produce or care for the things on which they depend.

Shifting hubs

The notion that there is good empirical evidence for the increase in entanglement over the long term leads to the justified criticism that “alternative directions that might have been chosen for some period of time but that did not last over the long term would potentially be written out of history if we follow Hodder’s approach, because they do not fit the progression of growing entanglement that leads us to where we find ourselves today”.

However entanglement is not something like “higher civilization” or “greater complexity in the management of resources, social and economic relations” that are handed down from society to society in a linear flow towards ever more sophisticated and complex systems. As a student of European prehistory I was always struck by the way that the “centers” of things would never seem to stay in the same place. As one studied the development and growth of the Neolithic, the “hot spots” of change and innovation seemed to start in the southern Levant, then move to upper Mesopotamia, and then to central Turkey. For the later prehistory of Europe, Andrew Sherratt (1998) mapped the changing centers north of the Alps through the late Bronze Age and into the Iron Age. The centers shifted between central Europe, Austria and central France through the phases of the Hallstatt and La Tène cultures, partly in response to changing

trade relations with the Mediterranean, and partly as a result of the affordances of river systems and the distribution of ores. On a larger scale, Ian Morris has charted the shifting centers of power within East and West since the end of the Ice Age (Morris 2010: 160, Figure 3.2).

In my view these shifts should not be seen in terms of the linear flow of culture from high to low, from place to place. Of course these various centers were often in contact with and reacting to each other. But an alternative view to the “flow of culture” idea is that the hubs, centers of power, cores were embedded within larger entanglements. Those wider entanglements were continually changing because of the instabilities of things and of human relations with things. These changes resulted from small-scale local problem-solving. As these wider entanglements changed, certain areas afforded a centrality for a time. The shifts of cores occurred as the potentials of particular times and places became realized. Thus in the rise of industrial capitalism Britain came to play a core role for a number of reasons, including supplies of coal and iron, a Protestant work ethic and a long tradition of mercantile investment. Thus certain areas, regions, institutions, social systems, individuals become hubs at certain moments in time not because of some innate superiority, and not because advanced culture has been handed down to them on some evolutionary path towards a better society, but just because they afforded something at a particular place and time. So it is not that specific alternative directions are “written out of history”, but that all directions are brought into play relationally. Whether an entity is a hub depends on place and time within entanglements. There is no determinacy here. It all depends.

Similarly with “collapse”, discussed by the commentators with reference to Patricia Ann McAnany and Norman Yoffee’s (2009) important contribution. From the perspective of entanglement, and indeed following McAnany and Yoffee, “collapse” does not equate to decline. Rather, we need to understand the reasons for shifts in the location of hubs as entanglements transform. Certainly we can talk of the decline of Britain in the mid 20th century, and that is the way it was perceived from the inside. The decline was often experienced as a dis-entanglement from Empire and the world. But from an entanglement perspective, it would be more appropriate to say that the resources and systems of government and management that had previously afforded a core role came to be less relevant in the late-industrial age and as larger economies became more central to global

entanglements. Whether Britain became less entangled would be a matter of empirical analysis (see below), but it is not at all obvious that it did; in many ways it became increasingly part of global networks and processes. It is not obviously the case that “collapse” means less entanglement; it may just mean a different entanglement and one with different cores.

The politics of entanglement: entanglement and power

“His pessimism with regard to the (im)possibility of disentanglement has a fatalistic side to it, one that carries with it a conservative, things-cannot-be-changed-so-why-try message”. I hope it is clear by now why I absolutely reject this claim and indeed find it a strange reading of the book. By way of contrast, in a recent discussion of entanglement, Graham Harman (2014) talks of “Hodder on the Dark Side” because of the focus on asymmetry and the constraints and entrapments produced by human-thing dependencies. For Harman, entanglement has an “utterly radical character” (p. 46) because it asks us to “truly rethink what it means to be human” (p. 47). According to Harman “Hodder’s essay is nothing if not political” (p. 44). At the end of *Entangled* there is a call to arms that focuses on the need for change at a fundamental level in human relations with the world. The Anthropocene is the logical result of the long-term increase in entanglement such that now everything, including the climate and the air we breathe, is a human product, needing our management and intervention. In my view it is important for archaeologists to give their long-term view on this state of affairs, how it has come about, how deeply it is engrained, how much it is a logical result of our humanity.

In my account, the problem of our entrapment is not just capitalism, even if industrialization and capitalism have of course markedly exacerbated human-thing entrapment. But most of the things and processes that entrap us started well before capitalism, including cattle, wheels, fire, iron. We had passed the point where we could return to a pre-wheel technology well before capitalism. Our dependence on fire long preceded the internal combustion engine. Metals had become essential for agriculture and tool-making long before steel factories. To understand the particular entanglements of capitalism and colonialism is important, but the entanglements that entrap us go far deeper and are far more pervasive. *Entangled* does not offer a way out, but it does argue for fundamental rethinking and for grasping the issues at

a deeper and broader level.

I do, however, recognize that *Entangled* should have engaged more with the question of power, and how entrapment and power compare. Indeed what separates entanglement from operational chains, social networks and symmetrical archaeology is precisely a focus on asymmetry. By the latter I mean initially the asymmetries of dependence and dependency between humans and things, but it is often the case that such asymmetries are the basis for or are entangled up with human-human relationships of power.

What is the relationship between entanglement and power? Since entanglement includes dialectical and asymmetrical relations, it seems reasonable to propose that such a link exists. Certainly both entanglement and power describe situations of limitation and constraint – both describe a situation of entrapment, the “Iron Cage” of Max Weber and Talcott Parsons (Baehr 2001). So, is entanglement a form of, or the same as, power? As an example, are we entrapped in our dependence on cars because of vested interest, or because we have got caught up in a set of practical entanglements? Of course there are powerful interests that get profits from cars and control petrol supply. But at least superficially, the entrapment produced by dominant groups and their control of the car industry seems to differ in some respects from our broader entanglements in wheels and cars. We need cars to get to work and the whole economy and social system of, say, California is entirely car-dependent. We seem entrapped in our need for cars whether elites are involved or not.

I do not want to deny that in many situations people get caught by despots into appalling entrapments. But I do want to argue that there is a dimension of entrapment that is not reducible to control by dominant groups. I want to argue that there are practical entanglements in which people find themselves and which it may be in their best interests to sustain. This is perhaps a slightly different argument from Bourdieu’s account of the dispositions of habitus. I am not arguing that people get entrapped in social groups or classes because they have become disposed to act in a certain way. Rather, I argue that they get entrapped because they have little choice in terms of their material and knowledge resources, and it makes strategic sense to work within a system rather than to try to break out of it.

It might be helpful to ask the question, who is most entangled, elites or commoners? While we are

most used to think of non-elites as entrapped and powerless, the entanglement perspective allows us to explore the ways in which elites too are entrapped. They may have more resources at their disposal, but these very resources create entanglements and entrapments. For example, elites may depend on access to prestigious or rare goods, they may take on loans and debts, they may depend on their control of armies. In all these ways they have a lot to lose and it is in their interests to maintain their entanglements. On the other hand, they are more likely to have the resources to find their way out of trouble, to relocate, or re-negotiate terms.

Non-elites seem more circumscribed. Indeed I would argue that they are often doubly entrapped. The first type of entrapment is the practical and everyday process of being caught up in human-thing dependencies. These are the strategic decisions of needing to buy a car in order to get to work because houses near the workplace are too expensive or because there is no viable public transport system. Dealt a certain set of cards, we are positioned and situated, and we work within these parameters as best we can.

And yet on top of this there is a second type of entrapment experienced by non-elites, that is the “power over” wielded by elites. To varying degrees in different societies and contexts, elites can manipulate the entrapments of entanglement, add to them, exploit them, to exacerbate entrapment. The chains of slavery, of abject poverty, of ignorance, of lack of rights can be imposed by elites, causing new realms and levels of entrapment. This human to human entrapment is often based on the control of things, resources and labour. But the human to human entrapment is often possible because the two types of entrapment reinforce each other. It becomes possible for elites to exploit non-elites precisely because non-elites are entrapped in entanglements which afford them very little and give them little room to manoeuvre.

Ultimately this is why it seems to me to be important to separate entanglement from power. It is not enough to deal with power if one does not deal with the deprivation, lack of education, lack of resources that people find themselves caught within. It is important to recognize and address the double bind of dominated groups and classes, to understand why non-elites are so unable to resist or overturn except at specific historical conjunctures. It is important too to recognize that elites may hold on to power at least partly because of the entanglements they find themselves within – they have too much to lose. It is from

these entrapments that their brutality may emerge. It seems to me to be wrong or at least unhelpful to say that humans have a basic “will to power” that surfaces wherever and whenever it can. Rather, power over other humans is produced in particular entanglements; it is the study of those entanglements that leads to a deeper understanding of the intractability of power.

Measuring entanglements

Another area of concern raised by the commentators is whether entanglement can be measured. Is “a rigorous quantified analysis, an endeavor that seems impossible because of the heterogeneity of entanglements as well as their diachronic dimension”? Certainly, there are logical and practical difficulties here. If one could disentangle an entanglement it wouldn't be an entanglement! At one level I think it is important to avoid the simplification and reductionism that numerical analysis brings (even in complexity theory analyses). Narrative forms and thick description may be best able to draw out the specific historical intertwinings of entanglements.

At another level, however, some degree of reductionism and simplification is an important analytical tool and there would clearly be advantages in being able to compare tanglegrams and in being able to measure degrees and intensities of entanglements over time, especially if the empirical claim is made that entanglements have a tendency to increase. I admit that the *Entangled* book paid little attention to these issues. The tanglegram in Figure 9.2 in the book was very much a first attempt and I have since received many suggestions about ways in which tanglegrams might be measured and quantified. Several people have suggested that various aspects of complexity theory could be applied, that agent-based modeling or various forms of cost-benefit analysis would be useful. My own focus has been more recently on adapting graph theory, and in particular network analysis to entanglements and I hope to publish on this shortly. It clearly is possible to produce matrices of dependences and dependencies and from them derive networks of relations between nodes in a more formal way than Figure 9.2 in *Entangled*. Such network analyses allow measures of centrality, or betweenness centrality, as well as a host of other measures that might be seen as proxies for entanglement. A further approach is shown in Figure 1. Here the archaeological evidence as well as experimental research on tool production and heating technologies allow a description of numerous

operational sequences and their interactions. In exploring and comparing the use of clay balls with the later use of cooking pottery, comparisons of these operational tanglegrams allow understanding of change through time.

I do not argue that tanglegrams are any more “objective” than other forms of analysis. An entanglement produced in relation to clay (as in Figure 9.2) will be different from one produced with a focus on obsidian. In Chapter 5 in *Entangled* I argued that a sail boat had different entanglements depending on the perspectives of sailing, entertaining, or protecting the marine ecosystem. This leads to the question of “positionality” discussed by the commentators. Figure 9.2 produces the house as a central node in Neolithic entanglements in the Middle East. One could argue that my long-term interest in the house and domus have led me to produce a biased description of Neolithic entanglements that favor the house as central node. But at least the laying out of all the links around houses allows others to critique and argue for alternatives. In addition, the entanglement network allows us to measure how the betweenness centrality of the house changes over time.

Another issue related to the measurement of entanglement concerns where the entanglement begins and ends. If everything is entangled with everything else then how can one draw the entanglement of, say, clay or the house and differentiate it from other entanglements? I have tried to argue that entanglements are often heterogeneous and partial, more or less connected to other entanglements. Certainly network analysis demonstrates that some nodes are more linked than others (Knappett 2013). For example, at Çatalhöyük, the earliest tanglegrams around pottery are very sparse. In the network analyses, pottery has a low connectivity score. But through time pottery becomes more connected. The affordances of pottery are gradually exploited until it is fully entangled with a wide range of processes. It seems one can measure degrees of entanglement of nodes within the overall unbounded matrix of dependences and dependencies.

Conclusion

Other accounts of directionality in human affairs have often argued for a progress toward higher civilization, or increases in the ability of humans to harness energy from the environment, or increases towards greater complexity. These are all directions that have positive connotations, and such approaches

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