Chapter 9

Conclusion: Connecting the Caribbean

Whatever the twists and turns of a system of threads in space, one can always obtain an expression for the calculation of its dimensions, but this expression will be of little use in practice. The craftsman who fashions a braid, a net, or some knots will be concerned [...with] the manner in which the threads are interlaced.

Alexandre-Théophile Vandermonde (1771, quoted in Przytycki 1998)

The common thread of the previous eight chapters consisted of three sub-strands. The first theme was that of Northeastern Caribbean culture history and the dynamics of the (pan-)regional similarities and differences in the archaeological record of the region. Secondly, I also examined how network approaches can serve to abstract, explore, analyse and interpret archaeological relational data as networks. Thirdly, I have delved into the long-standing archaeological debate on how "pots" and "people", material culture and social life, are related. All three are distinct and highly complex problems. However, the aim of this work – and one could say of archaeology in general – has been to produce relevant social and cultural histories based on substantive *and* systemic studies of material culture. In order to do this I would argue that it is necessary to interlace these separate threads – even if at this point in time the yarn that can be spun will still be somewhat frayed.

A brief review

Chapter 1 started out with a characterization of the Caribbean pre-colonial archaeological record as typified by a complex pattern of homogeneity and diversity. Understanding how these patterns are created through a myriad of movements and interactions of people, objects and ideas is of key importance for understanding the history of the area. Yet traditional models have had tremendous difficulty with connecting archaeological evidence for (pan-)regional and inter-cultural connections to the large range of locally variable practices on the islands. My suggestion has been to approach the problem not by dividing site assemblages and other types of material cultural repertoires into separate categories. This often results in a monolithic view of history that focuses on the boundaries between rather than the connections of social and cultural groups. Instead I have studied them as

networks and explored how these networks in material culture are reflections of social networks. As a result, ideas on what past networks looked like and how they functioned are widespread, even if the network theoretical status of such notions is not explicitly recognized as such. This has also led to a heuristic entanglement between networks of people and things, leading among other things to strong disavowals of the "pots as people" approach. Nevertheless, even in most recent studies the line between past networks of people and "pots" – relations between material culture in the archaeological record – is often blurred.

As was discussed in Chapter 2, there are many factors to be considered when discussing interaction and mobility in the pre-colonial Caribbean from a network perspective. Differential but analogous environments would have reinforced a mixed collective of socio-cultural practices. The geographic layout and the need for maritime voyaging would also have influenced the connections that can be reflected in the archaeological record. In this setting some of the "rules" on what constitute viable actors in traditional (social) network studies should be reconsidered. Amerindians generally have different ideas on what and who can be meaningfully interacted with.

From a bird's eye view the pre-colonial history of the Caribbean is exemplified by networks that expanded and contracted, merging and separating while doing so. Naturally, local network developments may have diverged from the larger developments that were discussed here. The main point is that what happened in certain points in time or in a certain place can be seen as part of a connected process and not as a unique or separate phenomenon (Keegan 2004). In the overview the Archaic-Saladoid-Huecoid interface period and the socio-political networks of the late pre-contact period were highlighted, but there are of course other timeframes, regions and themes that could benefit from archaeological studies incorporating network perspectives and analyses.

In Chapter 3 I outlined which network science methodologies, concepts and measures could serve as a starting point for such an undertaking. Subgraph and centrality analyses were the main focus, because introducing these first basic concepts into archaeological analysis and interpretation is a first necessary step and can already be quite insightful. Some better known network models were also discussed in order to show how various types of networks can potentially be influenced by similar systemic parameters.

However, as was discussed in Chapter 4, one problem with understanding such relations is that the material culture record has traditionally been primarily used as a proxy for social networks, without giving due thought to the impact of things on these networks. Recently, the insight that things are a contributing factor to and are not only indicative of human experience and society has led to a counter-movement, the "material cultural turn", in which anthropologists and archaeologists started to "take things seriously" (Olsen 2010). Studies on the "materiality" of things reveal how they impact an individual's place in the world and, on a larger scale, the fact that society and culture is materially embedded (Knappett 2005).

Nonetheless, although sometimes human relations with things can influence and even usurp other relations this does not imply that "pots" have the same status as people. While things are not people and people are not things, they are structurally integral to each other. This gives rise to new "socio-material" network dynamics. As post-Maussian (1923/1924) ethnography has shown, gifts, for example, are not only total social, but also material total social facts: they can function as gift because they make reference to persons as durable socio-material ties (Graeber 2001; Knappett 2011).

The importance of socio-material interdependence is succinctly and clearly illustrated by the example of the island Melanesian *kula*, arguably the most famous reciprocal exchange system. In the *Kula* ring, the "fame" – a measure of their success – of individual "players" and their clans are directly related to which valuables they own, have owned, and are likely to own in the future. Conversely, the value of individual armbands and necklaces is contingent upon who currently holds them, has owned them in the past and who they are promised to in the future. In this way in the *Kula* ring persons and things are part of a network loop that might continue *ad infinitum*, were it not for the intrusion of other social obligations and the lure of other types of (material) wealth.

Although it is very different from that of island Melanesia, an Amerindian perspective on the relations between things and people presents its own ontologically-grounded version of socio-material dynamics. From indigenous narratives and ethnographic accounts, for example, it becomes clear that Lowland South American things and persons are quite literally dependent on each other. Firstly, the state of human culture and society is the direct result of before-time exchanges (and thefts) of material culture and technical knowledge from non-human subjects. Furthermore, things are perceived as carrying over the life-forces of humans and thereby their circulation contributes to a "political economy of life". Conversely, things also require creative human energies in order to become active as subjects themselves (Santos-Granero 2009 a, b).

Building on the more theoretical and methodological discussion in the previous chapters, Chapters 5 to 8 presented four network explorations of archaeological and ethnohistorical case studies. These network explorations were contrasted to existing but "hidden" network models in Caribbean archaeological theories of culture continuity and change as well as socio-political organization and complexity. The diachronic discussion of lithic production and distribution in Chapter 5 indicated that network analysis holds promise for understanding the deep network history of the Caribbean. It illustrated how the Northeastern Caribbean had formed one network from the earliest moment that human presence can be detected even through to the end of the Archaic-Huecoid-Saladoid interface period, which was the cut-off point for the analysis. However, lithic networks did undergo profound changes between 3200 BC and AD 400. Through these phases of transition raw material sources as network nodes were constantly present. This was the case with Long Island flint before, during and after the Archaic-Early Ceramic Age interface period (800 – 200 BC). Additionally, the network models of Long Island

distribution showed that the production, exchange and use of this stone material connected communities across time and perceived cultural boundaries.

Chapter 6 examined how archaeological networks can be understood from a multi-scalar perspective. The idea of ego-network models was introduced in order to investigate the socio-material interrelations of a site's assemblage. The ego-network of the 14th century site of Kelbey's Ridge 2 on the island of Saba showed that in the Northeastern Caribbean even the goings-on in communities on smaller islands impacted wider island networks. The ego-network furthermore illustrated that certain archaeologically visible features, house structures and shamanic paraphernalia in the case of Kelbey's Ridge 2, would have been central network nodes within the site's ego-network. A comparison between the ego-network of Kelbey's Ridge 2 and Spring Bay 3 also identified two dynamics, a network of "Taíno" objects with an interregional distribution and diachronic shifts in lithic distribution networks.

Other stone material exchange networks (such as those based on the production and exchange of Antiguan carnelian, St. Martin greenstone and Puerto Rican serpentinite) were part of new, emulative dynamics that evolved between 200 BC and AD 400. The creation of intercommunal Authority Ranking relations as indicated by – and presumably partly based on – lithic exchange, did not entail that the network became more segmented. On the contrary, network competition led to the development of increasingly stronger cliques of habitation sites.

The last case studies in Chapter 7 and 8 took a closer look at the connected phenomena of the *cacicazgo* and the distribution of a material cultural repertoire referred to as "Taíno" in the academic literature. To this end, the traditional, pyramid-shaped political model of the *cacicazgo* was contrasted to a *cacical* network collective in which power and obligations were distributed across multiple specialists. This late pre-colonial structure had developed from the more purely triadic political system of earlier times. These initial triadic dynamics of internal and external power relations developed into three, linked political economies: the communal, intercommunal and superhuman network economy. Rather than fragmenting the cultural map of the Caribbean along the territorial lines of emerging polities, a three-pronged and outward looking political system produced polity interdependence and widespread similarities in socio-politically valuable material repertoires. Things with faces were one of the more widespread and recognizable types of material culture during the last phase before contact. This family of objects formed important material counterparts of social networks in their capacity as medium of exchange or as "infrastructural" to intergroup and interpersonal dynamics.

Network approaches evaluated

One of the goals of this research was to show proof of the concept of network science approaches in archaeological cases. It is safe to conclude that the entirety of this study and specifically the four case studies indicate that a variety of data-driven network explorations can be implemented based on archaeological

and ethnohistorical information. Furthermore these network models and their exploration brought new insights that either strengthened support for existing hypotheses or even challenged a number of standing theories. Given the success of archaeological network studies within other regions this is not surprising (see Brughmans 2013; Knappett 2013). Nevertheless, a great deal more can be done in order to advance network approaches in the field of archaeology and material culture studies. Below, I will discuss several strengths, weaknesses, potentials and pitfalls of applying a network approach for archaeological questions and case studies in greater detail.

First of all, it is clear that networks work in archaeology. Moreover, network approaches can provide new perspectives on existing problems or find new dynamics in archaeological data sets. Of course, archaeological relational data are not "perfect". The data sets from which networks have to be abstracted are sparse, fragmented, constrained by temporal and geographical parameters, and highly dependent upon data selection strategies. Nevertheless, this is the case for most if not all studies that abstract real-world networks into model networks for analysis (Brandes, *et al.* 2013; Prell 2012). What makes archaeological network approaches stand out from other network science disciplines is that the phenomena they are interested in (social and cultural systems) is one step extra removed from their source of data (assemblages of objects and associated material practices). My personal views on the strengths and weaknesses of network science approaches in archaeology, the promises they hold, and the threats they face will be discussed below.

There is a large range of spatial, temporal, artefactual – and in the Caribbean and many other regions also historical and ethnographical – sources of information that can serve to create, analyse and interpret past networks. If these sources are used properly and in conjunction, this is almost guaranteed to result in the discovery of new relational dynamics in archaeological studies. This is because, up till now, most archaeological methodologies are designed to compartmentalize parts of the archaeological record into distinct categories. In contrast, the type of network explorations that have been done here can be used in order to look at incidence relations and interdependencies of archaeological relational data. Naturally, "doing networks" is not a sure path to revolutionary breakthroughs. A network model may end-up supporting a previously established idea. However, even in these cases network approaches can yield valuable insights by pointing out the interdependencies in the system that is studied. In addition, they can connect the dynamics of these systems and serve to hypothesize network theories, which can sometimes be cross-checked with theories from other fields of network science (e.g. Golitko, *et al.* 2012; Mills, *et al.* 2013; Sindbæk 2007). Moreover, sometimes archaeological network studies can provide "surprising" insights, in the sense that they contradict standing theories (e.g. Graham 2006; Mizoguchi 2009; Mol and Mans 2013; Terrell 2010).

It is interesting to note that the networks in the case studies in Chapters 5 to 8 were all relatively small-scale, ranging between tens to a maximum of a few dozen nodes. Therefore the size and complexity of the data sets used in this study cannot

be compared to the systems that network science can and very regularly deals with – i.e. networks of hundreds or thousands of nodes potentially related by hundreds of thousands of ties. Even in regards to a number of archaeological network studies the relational databases applied here were rather small (e.g. Brughmans 2013; Mills, *et al.* 2013; Sindbæk 2007). As a result of the small-scale of the database one may claim that the findings of the case studies were obvious from the data themselves and did not need abstraction, analysis and interpretation as networks. In other words, can new insight be acquired by studying relatively simple and small archaeological networks?

I would argue that they can. Several results of these relatively small and simple network analyses were "surprising" in the sense that they contradicted, supported or amended specific models of Caribbean socio-cultural and socio-political history: e.g. Kelbey's Ridge 2 was a strong, local but also diversely connected community during the 14th century Northern Lesser Antilles (cf. Hofman and Hoogland 2011); Hispaniola's political landscape presumably evolved from unstable, *cacical* collectives instead of ascribed status roles of divine *caciques* at the pinnacle of a class-based hierarchy (cf. Curet 2002, 2006; vs. Keegan 2006; Keegan, *et al.* 1998); lithic networks crossed perceived cultural boundaries during the Archaic up to Early Ceramic interface period (vs. Rouse 1992; cf. Rodríguez Ramos 2010); similarity in shell-face design was inversely correlated with regional distributions (vs. Mol 2007). Other conclusions on *cacical*, shell face, lithic distribution and Kelbey's Ridge 2 site-ego networks are too case-specific to re-iterate here. At any rate, it is clear that the network approach applied here provided (small) breakthroughs in longstanding and wide-ranging issues, albeit based on relatively small-scale and "simple" data.

Certain types of material networks can be relatively straightforwardly implemented with the use of existing network approaches. For example flows of goods in pre-colonial distribution networks are theoretically the same as flows of goods in modern networks. Measures and theories of spatial and cost-distance based networks can be the same for network archaeological and geographical studies. Several networks will be unique to archaeology. Indeed, certain network models and analyses the present study takes into account have, to the best of my knowledge, not previously been carried beyond the field of archaeology. Ego-network analysis of site assemblages and 2-mode network analyses of stylistic networks proved to be new and expedient ways of "doing networks".

Ego-networks may be a profitable addition to current archaeological studies (Brughmans 2012). Departing from a site's assemblage they do not necessarily privilege a certain scale of analysis, which is a weakness of existing regional network studies (Knappett 2011). They also allow for a combined network of multiple types of relational data set. Kelbey's Ridge 2 ego-network consisted of relations between house structures, burial assemblages, ceramic and stone provenance, *etc.* All these diverse features of the site assemblage were *a priori* treated as equally material for the identity of the community as a locally and regionally embedded community. Ego-networks are also somewhat less susceptible to sparse databases, since they model outward from a single site assemblage. In ego-network analysis

the idea is not to model a full network of multiple site-nodes (or artefact-nodes), but the network of a single site. Fragmented, incomplete data will still be a threat because the ego-network model presupposes that the view of ties present between nodes is comprehensive. In the case of the ego-networks discussed here this hinges on the comparability of data collection, analysis and research strategies of the site with those of other sites within the network. Archaeological research on Saba has been quite exhaustive, but the majority of its relational databases are relatively comparable.

It is often difficult to identify dyads of the same type in archaeology and it is even harder to construct a network out of node incidents. It is very laborious to accurately pinpoint a node's dyadic partner based on, for example, artefact provenance data. Even if we see a tie entering *into* a node, an artefact in an assemblage that was locally exotic, we do not necessarily know where it came *from*. Even if we can establish a dyadic pair of sites this does not entail this can also be carried out with regard to other nodes in the network. The only reason that a 1-mode network of lithic distribution in Period D and E is relatively robust is because Caribbean lithic specialists have a comparatively clear view of raw material sources and workshop areas for Long Island flint, Puerto Rican serpentinite, Antiguan carnelian, St. Martin greenstone and red jasper from Martinique (Knippenberg 2007). Other types of provenance studies like ceramic (geo-chemical) analyses or isotopic provenance studies of individuals will be able to present less direction to their evidence of out-node, exotic ties (e.g. Isendoorn, *et al.* 2008; Laffoon 2012). It is always possible to apply such databases to model a range of 1-mode models based on probable areas of origin and the subsequent circulation of artefacts or even human beings. However, the range of possible provenances of most archaeologically recovered materials is generally quite high, particularly in the Caribbean (Laffoon 2012). One manner to alleviate this problem is to carry out more systematic analyses of site assemblages based on *chaîne operatoires* and artefact provenance. Casuistic studies of single sites reporting on intermittent exotic ties are not helpful for provenance-based network studies. In order to study "full" networks in archaeology we need to systematically study the complete range of sites within our network database. This requires an expansive archaeometrical programme and strict sampling and dating regime (Hofman, Mol, *et al.* 2011).

Two-mode networks side-step this directionality issue because they do not model direct ties between nodes but incidence ties of one type of node with another type of node. For example, it may not be known where an exotic trait or object found in a site assemblage originates from, but it is possible to connect various site assemblages to each other based on the presence of this trait. The networks presented in this study are by and large 2-mode ones. The hypothetical network of Chremanesia, the shell face style network, the majority of the lithic distribution networks and several parts of Saba's ego-network were based on membership of one type of nodes, such as sites or individual shell faces, to other types of nodes, e.g. presence of a stone material and iconographical facial elements.

It has to be noted that, because their matrix structure differs from 1-mode networks, 2-mode networks are a particular kind of network that are not in all ways as flexible or useful as 1-mode networks – e.g. they cannot be analysed by means of the majority of the measures applied on 1-mode networks (Borgatti, *et al.* 1997). Two-mode networks as such can be insightful. Affiliation networks provide a means to create 1-mode networks from 2-mode networks, allowing for 1-mode measures of 2-mode matrix rows or columns. All in all, I consider 2-mode networks to be of most immediate use to the field of archaeology in the future. It provides a way to connect nodes from interdependent but dissimilar relational data sets to each other. Of these archaeology has a large quantity: co-presence of certain artefact styles in multiple assemblages, house structures or middens and the presence of particular vessel types and shapes, burials and types of burial gifts, artefacts and their iconographic systems, *etc.*

If we shift the focus from the current strengths of network approaches to the future opportunities they may hold, it is clear there are many advances still to be made. In the Caribbean we could do more with existing GIS-models of site relations by modelling them as networks (cf. Torres 2012). The time and resources needed for additional and more advanced network based geographic models went beyond the scope of the present study. Nevertheless, albeit that PPA and MDN analyses of distances between island headlands provide a sound starting point, they are rather crude models of geographic relations. Intervisibility or cost-distance based network models could provide a much larger insight into spatio-cultural dynamics in the Northeastern Caribbean. It has yielded generally good results in other regions (e.g. Brughmans 2013; Knappett, *et al.* 2008). Several tools are already present – knowledge of spatio-temporal site patterning on various islands are quite complete. Travel cost-distance models and wind and current models for sea voyages that have already been tested are available (e.g. Callaghan 1990; Cooper 2008; Torres 2012). Hopefully future research will be able to advance GIS-based network models for the Northeastern and wider Caribbean.

The case-study networks only applied basic concepts and measures from graph theory. The implementation of more advanced models and measures was partly constrained by need. Subgraph and centrality measures sufficed to provide a better understanding of groupings in the case-study networks and point out structurally important nodes and ties. Perhaps even more so than archaeology, network science is an expansive field with many and varied interests and specialisms. This implies numerous opportunities for advancing archaeological network approaches based on the implementation of network models, methods and measures from the wider network sciences.

While the number of archaeological network studies is on the rise, they remain relatively marginal as both an archaeological and network science sub-discipline. Indeed, although they may be an innovation in (Caribbean) archaeology, the network case studies presented here are basic stuff as far as network science goes. The reason is that I have applied network science in an effort to better understand archaeological problems and not make advances in network science. The utilisation of more advanced network science was also inhibited as an archaeologist who has

received only marginal training in network sciences. However, I can see many possibilities for employing more advanced network methods and concepts within the field of archaeology, such as block-modelling of networked site assemblages, multi-graph modelling of multiple lines of evidence, (Exponential) Random Graph Modelling or (E)RGM, genetic modelling of transitional phases in history, analyses of trade network embeddedness, longitudinal developments in distribution networks, autocatalytic networks of innovation spread, or multi-tie modelling of site assemblages and processes. These concepts, models and measures all stem from highly technical fields, which can probably not be fully grasped by non-network specialists.

Archaeology has a rich multi-disciplinary history in which specialists from various fields work together in order to operationalize a certain method or technique for the field of archaeology. We need to do the same with regards to the application of network science methods and techniques in archaeology. In order to incorporate more advanced network methods and theories in our discipline, archaeologists require assistance from network specialists (cf. Knappett, *et al.* 2008). Conversely archaeological networks have several traits – e.g. socio-material interdependencies, geographic and temporal constraints, multi-level networks, dissimilar relational data, longitudinal and evolutionary perspectives – which make them potentially challenging projects for network science specialists.

If we look at the mid-term future of network approaches within archaeology, it is clear that they are threatened in a number of ways. Firstly, they may be pushed towards the margins of archaeological practice because it is generally believed that a certain type of data context or structure is needed to carry out a network analysis. It is, for example, telling that network studies are currently most often found within island and coastal settings (Bright 2011; Broodbank 2000; Hofman, Mol, *et al.* 2011; Isaksen 2013; Knappett, *et al.* 2011; Malkin 2011; Mizoguchi 2009; Phillips 2011; Sindbæk 2007; Terrell 2008, 2010) – with some noteable exceptions (Brughmans 2013; Mills, *et al.* 2013).[1] There is no reason why network approaches could not work equally well in landlocked as in maritime settings. Instead the selection of island settings for network studies may be underlain by the fact that the larger group of archaeologists out there does not fully understand the viability of network approaches, regardless of available sources of data and regional or temporal contexts.

That network approaches are primarily about abstracting, exploring, analysing and modelling patterns of relations in archaeological data sets and not (directly) about identifying social connections in the past should also be better communicated to the wider archaeological discipline. Moreover, the types of systems that archaeology looks at are of a very diverse kind, but at the moment network approaches emphasize (advanced) computer modelling studies. This approach coincides with the methods and aims of GIS, complex systems and

1 Although networks may be of great service within these contexts (Terrell 2008), an "island network archaeology" would continue a flawed scholarly tradition in which islands are seen as bounded, special environments that can therefore more easily be connected to other island nodes (Boomert and Bright 2007).

agent-based modelling studies. However, there is also a wide potential for network approaches to enhance other types of researches. The results of the case studies, for example, were based on basic measures and no modelling of relations in site assemblages, provenance, historic sources and iconographic analysis. Nevertheless, in combination with more substantive lines of evidence, these networks were able to provide new insights into the subject matter.

Another threat is that networks will continue to mainly serve as a metaphor, a buzz-word. Such an implementation of networks in archaeology will be stuck in a semantic discussion dealing with what it implies when referring to the relations we come across in the archaeological record as networks instead of as "webs", "meshes" or "entanglements". Furthermore, networks as key theoretical constructs are part of a wider relational movement in archaeology that comes and goes in waves. If the current wave of relational thinking subsides network approaches may be considered as a remarkable fad and then be discarded. This will perhaps be a small loss for network science as a whole, but a greater one for archaeology. It may entail a return to monolithic histories based on material culture categories and hidden assumptions concerning network structures, processes and dynamics determine interpretations of social and cultural processes and systems. This can be countered if archaeological relational theory is applied in conjunction with network science approaches.

In fact, network science approaches within archaeology will always need to be combined with archaeological theory if it is to be of any interpretive value. It needs to be clear what it entails when a part of the archaeological record is said to be a network. Why features in the record can be designated as a single node and how this node is connected to other, (dis)similar nodes is an issue that always needs to be expounded. We must thus examine on a case-by-case basis why taking a network approach is worthwhile and explain why it is applicable to the question at hand. This can be done by formulating archaeological problems or hypotheses in such a way that they can be explored by means of network approaches. If this is done, the limits of network science approaches are only defined by the inventiveness of archaeologists in recognizing systems of material culture assemblages and practices to be explored.

In any case, although the future of network approaches in archaeology is still unclear, I feel that, even if network as a metaphor will at some point become outmoded, an implementation of network science methods is bound to occur. Network science is a robust and growing discipline and, if developments from other humanities and social sciences can be taken as a sign, will likely become more influential in the future. At the same time, the questions and types of networks that can be modelled based on archaeological data are also gaining increasing attention within the network sciences. Longitudinal developments in networks is one example of this, as is network modelling based on data sets with a lot of "structural zeroes", the type of holes in data sets which are a given in archaeological research. By introducing more diverse set of network science approaches and emphatically coupling of network science method and theory with archaeological method and theory, this will lead to a development in which both disciplines will become

increasingly more relevant for each other. So, network can be partly a theoretical perspective, but may be of most use when applied as a form of data analysis, a "relational statistics". The added benefit hereof is that, aside from being embedded in the discipline of archaeology, network approaches would also be part of an overarching network science discipline, presenting archaeology and archaeologists with a new field of researchers with which they can engage, cooperate, publish with, *etc.*

Socio-material networks: (Un)necessary dualism?

Many concepts in the archaeological and anthropological literature are closely analogous to the term "network": web, actor-network, fields, lines, meshes, flows, entanglements, systems, interaction, social and exchange spheres, *etc.* Although they have specific connotations and intellectual baggage, what they have in common is that they are all phenomena that are best understood relationally. However, even if they are intuitive, complex, and thought-provoking, these concepts remain attempts to capture through metaphor the complex relations they seek to understand. In contrast to this, network science is predicated on the conviction that these relations can be explored and explained – by abstracting, modelling and analysing them qualitatively *and* quantitatively as networks – and provides a strong methodology to back this claim up.

The use of the term "network" in this work was at first primarily for epistemological and methodological reasons. It stemmed from an interest to use network analysis of complex archaeological relational data to gain a better grasp on the variable patterns of interactions. Along the way I realized that the concept of network also entailed a specific way of looking at relations in systems. The realization that network approaches are not only methodologically functional but also present specific views on how these relations operated intrigued me. The idea of interdependency – i.e. that a (social) network does not stand on its own, but is impacted by the dynamics and processes of other "types" of networks – seems to me to be particularly interesting. It presents a new way of connecting the interfaces between material and social fields, a conceptual struggle that has been the subject of over a decade of discussion in both social and material culture studies.

The idea of network interdependence strikes close to what has been written about in (post-)Maussian theories concerning the gift. Gift theories present a framework in which we find mutually constitutive relations between persons and gifts objects, the one cannot really function without the other. To my mind this mutualism between persons and their things is not contained to reciprocal exchange or Equality Matching relations, which was the focus of the enquiry carried out by Mauss. The interdependency between people and their things can be extrapolated to Communal Sharing, Authority Ranking, and Market Pricing relational models, as well – or, in other words, to all forms of human to human relations.

In Chapter 4 I discussed the ideas by Thomas Hobbes and Jean-Jacques Rousseau on sociality in a "state of nature". These Enlightenment theories, on the origin of cooperation and the origin of innovation respectively, make clear that if

we wish to start to understand our social natures it is imperative to understand our material culture and vice versa. Yet the fact that the things we make also make us and especially our connections to others has been an undervalued premise of much of social theory and even most archaeological theory (Olsen 2010; Webmoor 2007; Webmoor and Witmore 2008). As a reaction, certain theories have conceived of things in a similar way as human subjects or agents. Following Maussian theory, specifically the *Essai sur le don* and its reception (Graeber 2001; Mauss 1923/1924), I have argued how this extreme materialist position is based on a confusion that arises from the fact that humans and things are constituent part of each other's networks.

This confusion is to some extent also present in gift theory. Following a Maussian theory of reciprocity, among "archaic" peoples, social relations are maintained because there is an "active force" – based on the idea of the Maori *hau* – ,a spirit in the gift, that moves people to reciprocate the things they are presented with. The majority of ethnographies on gift giving that followed up on Mauss his original idea show that when social relations become material, a different dynamic is at play. One important constituent of that is the "fixity" that things lend to social networks. Social relations may be continuously (re-)negotiated and manipulated, but the exchange of things give such relations a much more irrevocable and immutable character. Through their interdependencies with objects, social relations become more "fixed". Paradoxically, as Mauss showed this fixity is often achieved through the circulation of objects. Through circulation or other ways of becoming part of multiple social relations, humans and objects become part of networks that are both social and material. As I have discussed in the example of the Melanesian *kula* exchange, it only takes a few exchanges to go from a gift relation to a wider socio-material network.

Although such ethnographic analogies can be highly insightful, an Antillean theory of socio-material interdependency can actually be more profitably based on the ontologies of Lowland South American peoples from today or the recent past. Although there is no one-to-one correlation, it is possible to project some of their ideas back into the pre-colonial past of the Antilles. This has been done here by looking at overlaps or contrasts between core ontological concepts as they can be understood from ethnographic studies and the study of artefacts and ethnohistorical documents. This indicates that many different types of dependencies between people and things were conceived of and seen as part and parcel of (social) life.

For example, wider exchange networks may have been created and sustained as part of an "economy of life-forces" in which interacting with others and their things literally provided new life to communities (Santos-Granero 2009a; Vaughn Howard 2001). What is more, being a human, spirit-thing or any other type of subject meant being part of a system of other subjects and all the cosmological, social and political constraints and possibilities that this entailed. Society and culture was thus created by exchanging or otherwise interacting with other subjects, often other than human beings that were sometimes materialized as things. Based on origin narratives such as those of the Warao or the Hispaniolan narratives documented by Pané, it seems that this is even how central values and concepts of society and

culture had been created in "before-time". Important as they were as expressions of society, things as materializations of spirits and other subjects are also highly dependent on humans. For one the potential of things to act as subjects is often only activated through communication and interaction with humans. It can thus be said that the agency and the (pro-)social and cultural character of individuals and collectives, whether they are humans, spirits, animals, or other type of beings, is created and maintained by the material engagement with other subjects.

This provides a particular, Amerindian take on socio-material networks, which can be difficult to recover and interpret through archaeological means. For instance, it may be the case that a subjective engagement with raw materials and their sources as social partners was at the root of the longevity of Long Island flint production, exchange and use, but this remains speculation. It is, however, more clearly exemplified by the model of *cacical* collectives, in which a perspectivist view of the political economy will identify spirit-things as important nodes in the network. *Guaízas* are a particularly interesting example of such socio-material other than human beings. In their capacity as conspicuous, elite ornaments they were both an exchange valuable and a "face" of a living spirit-thing. Thereby they connected communal, intercommunal and ritual economies.

Interestingly, their stylistic network also illustrates that these shell faces can be seen as a loose collective in which highly individualized shell faces were presumably consciously set apart from other specimens. The case-study on *guaízas* also showed that the distribution of things with faces was a core factor behind the formation of late pre-colonial Caribbean patterns of homogeneity and diversity. In fact, if we look at the type of pre-colonial "indigenous art" either neo-Taíno, replica, or real that is most popular nowadays among indigenous revivalists, tourists and collectors, objects with faces still have the greatest appeal. Items acting as socio-material connectors in the past once again present a united face that is projected into the present.

Still, after so much focus has been put on the material side of society and the social side of materials, I feel the need to nuance this standpoint somewhat. The fact that social and material networks are interdependent does not entail that the only way society can exist is by means of material culture. In theory – yet rarely in practice – it would be perfectly conceivable for any social relation to take place in a space devoid of material culture. However, what this interdependency implies is that, given the chance, human beings find it more parsimonious to frame or "scaffold" social relations with things (Knappett 2006, 2011). Regardless of cultural context, individuals will tend to maintain or manipulate their relations with others and seek to produce new ties through the circulation of material culture (Graeber 2001). This also goes the other way around: the "material world" can indeed form systems without the constant presence of people. Imagine, for example, a food web, the nodes and ties of river deltas or a river bank overgrown with roots. Some (near-)present technologies can also bring about independent material networks, such as those based on auto-catalytic ties in self-governing computer networks or self-healing properties of certain types of ceramics and polymers. Still, in general the scope and complexity of material networks is limited without human intervention.

As soon as human beings become involved, however, materials become material culture and new types of material networks come into being.

In contrast to broader views on "materiality" and human engagement or "entanglement" within the world of things (Dant 2005; Hodder 2012; Ingold 2007b; Miller 2005), I would argue that it is specifically in socio-material networks that things and human beings have the greatest impact on one another. This is a concept that was already established in the essentially "socio-material" arm-chair theories of philosophers such as Hobbes, Rousseau and other important thinkers such as Smith and Marx. How the origins of societies and material cultures are in actuality based on the interaction of these two systems is difficult to answer. Despite new insights on this old issue (Coward and Gamble 2008; Dunbar, *et al.* 2010b; Hart and Terrell 2002; Malafouris 2010; Renfrew, *et al.* 2008; Shennan 2002), we still know very little of the deep-time, co-evolution of material culture and social networks. For now any attempt to find the "prime movers", the ultimate causal factors, of social and material networks will lead to a chasing of tails.

Perhaps the real question is whether the age-old differentiation between social and material nature and culture is not the result of a specific Western dichotomy? It could well be that the intricate dialectics of socio-material networks are based on an unnecessary conceptual schism founded on the Enlightenment, Cartesian dichotomy of a human mind reasoning about an external world of things (Corbey, personal communication 2013). Although I am not able to formulate an alternative to this, I perceive that the duality between the social and material states of human nature and culture is ultimately an unnecessary complication.[2] I am especially strengthened in this view after starting to understand more about Amerindian ontologies and the relative efficacy with which human and things are conceptualized as being part of a much larger constellation of subjects. Here, human society does not result from a dualistic social and material culture but from the rhythm of conflicts and coalitions between beings with different perspectival states, of which objects are an integral part. This proves that it may be very fruitful for archaeologists to look closely to and learn from alternative, non-Western conceptualizations of "social networks" and how they coalesce around specific "material" nodes and vice versa.

Culture History 2.0?

Aside from the more general challenges of using network approaches in archaeology, one of the specific criticisms that can be levelled against this work is that, in an attempt to explain the history of the Caribbean in terms of social and material networks, this study remains a thoroughly culture historical undertaking. The critique being here that in the Caribbean, as in many other regional disciplines,

2 This insight comes quite close to the perspective of Actor-Network-Theory of Latour (2005). The major difference between the approach advocated here and ANT is that the latter would deem it impossible or destructive to try and understand the subject matter of social and material interdependency through a systemic study of structure such as graph theory or other network analyses – which is why the name Actor-*Network*-Theory is actually very misleading.

culture historical archaeology is an outmoded theoretical and methodological framework that has failed to come up with relevant answers to the questions of today (Pestle, *et al.* 2013).

I have unfortunately never met Benjamin Irving Rouse in person; he had retired before I even started my studies. However, his phylogenetic, modal-based, culture historical research has shaped my embryonic career as a Caribbean archaeologist. The larger part of the Caribbean archaeological literature I read as an (under)graduate student was either written by Rouse or presented a reaction to his ideas. So, although Rouse was not the only one that made important advances in the study of pre-colonial culture history, he may be considered as the spokesman of a highly successful research programme.[3] Nevertheless, as discussed in Chapter 1, at the beginning of the new millennium it was felt that the regional discipline was in crisis and needed to break free from the culture historical project and specifically the ideas of Rouse if it was to overcome it. With the benefit of hindsight, I think this sense of crisis was misplaced (*pace* Fitzpatrick 2006; Keegan and Rodríguez Ramos 2004). Caribbean archaeology did not find itself in troubled waters as a result of 6 decades of Roussean culture historical archaeology in the Caribbean. The fact is there was never such a crisis to begin with.[4]

It is true that the two most recent decades have seen a huge development in theory and method, an expansion and re-interpretation of archaeological data sets, as well as the geographic and cultural refocusing of research to the Caribbean basin as a whole. This is reflected in the themes forming the basis of the network case studies: the Archaic-Saladoid-Huecoid interface, and the multi-scalar nature of site assemblages, the late pre-colonial socio-political system, and the idea of "veneers" in material cultural assemblages. New developments have not only affected these debates, but are also clear from numerous discussions not mentioned here or only referred to in passing (see Keegan, *et al.* 2013). Some of the results of recent research will neither stand the test of time nor that of falsification, but the face of Caribbean archaeology has already changed for good.

I am inclined to state that, despite these clear achievements, on an epistemological level the core tenets and interests of the discipline have not changed since the early 20th century. Caribbean archaeologists then and now are interested in the

3 One of the major achievements of culture historical archaeology in the Caribbean is the fact that it bundled the efforts of archaeologists from various different mainland and island territories and intellectual traditions into a single research programme. The aim was to understand the absence and presence of ties between groups of material culture and frame this within larger issues of cultural and social developments. This also allowed for cross-cultural analyses and debates, for example in the case of archaeologically observable migrations or the falsification of a cultural ecological theory of chiefdoms and tribes in the Antilles (Rouse 1953, 1986).

4 Unfortunately pre-colonial Caribbean archaeology finds itself in numerous other crises. Two important issues concern the relevancy of pre-colonial Caribbean archaeology for the people living in the region today and the rapid destruction of pre-colonial heritage. Less pressing questions are: how do we present the findings of Caribbean archaeology in such a way that they become more relevant to the academic community at large and how can we continue to cooperate between researchers and research groups, threading together the disparate island archaeological records, while the institutional context and international job market is set up for competition? See also the perspective on the future of Caribbean archaeology by Wilson (2013) and the edited volume on issues facing Caribbean heritage by Siegel and Righter (2011).

social, cultural and political history of the Caribbean seeking to understand these subjects by means of the study of (human) mobility and interaction (Hofman and Bright 2010; Mol 2013; Siegel 2013). In other words, the culture historical project of comprehending patterns of homogeneity and diversity in the Caribbean archaeological record in human and historical terms continues. This has always been and remains for the foreseeable future the overarching research programme that brings the various strands of Caribbean archaeological research together – including the gap between Caribbean pre-historical and historical archaeologies (Curet and Hauser 2011).

In actual fact, what has occurred during the past years is not a Kuhnian paradigmatic shift as the result of a scientific crisis (Kuhn 1962). It was instead a Lakatosian re-focusing of the outer body of Caribbean theory, method and data, leaving its inner core intact (Lakatos 1978). It would be good to remember that successive generations of archaeologists continue to build on the same core research programme, even if some of their particular standpoints are in complete contrast to those of previous generations. This does not entail that Caribbean archaeology is stuck in outmoded theories and methods until it can be advanced by means of a revolutionary crisis, but that new developments and discoveries serve as a scaffold for future work. In this way, new data, methods and ideas can provide increasingly better – not necessarily different – answers to the venerable and central questions on cultural change, similarity and variance in this mainland and island world. The continuation of this research project by professional and avocational archaeologists is in fact one of the great strengths of the regional discipline, rather than a drawback.

As an extension of this insight, my own research referring to networks within the Caribbean can indeed not be called "revolutionary". The archaeological network approach suggested here cannot provide all the answers or even completely new ones. However, there are minor breakthroughs to be made when applying network thinking and analysis to issues of culture history, particularly in the area of categorization. This is best exemplified by the case-study of the *guaíza* design network as consisting not of a discrete category but as group that shared "family resemblances" (cf. Wittgenstein 1958: 32). The idea that there may be only a few or no common denominators for a set of objects, while they can still form a group is something that can be extended to the larger corpus of face-depicting objects in the Caribbean with future study. Furthermore, if this is extrapolated to (Caribbean) stylistic studies as a whole, 2-mode and other types of network-based similarity studies may be used to strengthen or refute many other ideas of diffuse categories like the Saladoid as a "veneer" or the Caribbean as "cultural mosaic" (Keegan 2004, 2007; Wilson 1993).

The Connected Caribbean: first forays into 6000 years of networked histories

The primary aim of my research was to present a network-based exploration of the patterns of homogeneity and diversity in the archaeological record of the Caribbean. This partly arose from a renewed interest in Pan-Caribbean mobility and interactions of people, goods and ideas. It is thus a legitimate question if we can use the socio-material network approach developed here to explore the archaeological record of the pre-colonial Caribbean as whole (Hofman and Bright 2010; Hofman and Hoogland 2011; Rodríguez Ramos and Pagán Jiménez 2006). The answer is negative. Pan-Caribbean networks cannot be abstracted or studied at this point in time or in the foreseeable future. As explained above, this has nothing to do with an incompatibility of network approaches with archaeological theory, method or data. Comprehending the patterns of homogeneity and diversity in *the* Caribbean in terms of socio-material network is impossible because (1) the geographic and temporal span of Caribbean networks is simply too large and (2) the archaeological coverage is too spotty. As I have shown here, it is possible to understand certain aspects of this immense social and cultural system by abstracting and exploring smaller networks from archaeological and historical cases. With more studies of this kind it would even be possible to link "separate" networks together, as they would have been in the past – e.g. study the overlaps between mainland and island lithic production and distribution networks. However, at this point in time we lack the databases as well as the perspective to model networks at the pan-regional level, let alone to grasp the social and cultural mechanisms and motivations behind them.

One of the contributions of the pan-Caribbean theory has been to take a new look at the possibility of long-distance, cross-Caribbean exchange networks that may have been at the basis of cross-regional socio-cultural patterns (Hofman and Bright 2011; Rodríguez Ramos 2010). The problem is that the majority of evidence for such extremely long-distance interactions is tentative or episodic. On the other hand as has become clear it only requires a single tie to connect two previously unconnected regions and even many smaller itinerant steps will finally fuse local networks into one pan-regional network. In other words the pervasiveness and impact of pan-Caribbean networks is an open-ended question in which we should be careful not to consider absence of evidence as evidence for absence. It is simply too early to close the book on this issue (*versus* Fitzpatrick 2013a).

It is better to change our way of thinking regarding this issue and accept it is likely that a constellation of pan-Caribbean social networks existed from the moment the islands and mainlands were inhabited. The question nonetheless remains what its impact has been on daily life on the one hand and culture historical processes on the other? It is specifically this issue concerning the micro- and macro-scale impacts of cross-Caribbean or other interregional ties that cannot be adequately dealt with at the moment, because it would for a start have depended on the frequency of interactions and the diameter of the pre-colonial social network. Can we estimate how many "handshakes" a fisherman from a pre-colonial village on Saba would

have been removed from a Mayan king? No. Of course this is an absurd question to begin with, but it illustrates that at present the impact of pan-regional interactions cannot be systematically assessed by means of a network approach.

For now it is therefore much more feasible and fruitful to discuss specific social and material cultural networks, compare these to Caribbean networks of other types or similar ones from other regions, and perhaps draw general inferences from this, instead of theorizing on the impact of literally immeasurable pan-Caribbean systems. In this way we may at some point better understand how single systems fuse into societal and (material) cultural systems of a pan-regional scale and possibly beyond. In the process this will advance our knowledge of the history of the wider region to the point that we will understand how societal and cultural processes are connected and dynamic instead of monolithic. The case studies in Chapters 5 to 8 represent only some of the first steps in this direction.

At the moment the nature of the available data also affects the possibility of applying (popular) network models, such as the small-world or scale-free model, in order to characterize and explain the formation and evolution of networks that can be abstracted from archaeological assemblages. I do not reject the possibility that it may be feasible to observe small-world, scale-free or other network models in some archaeological data sets. Still, the type of networks I abstracted from the data at hand did not show any correlation with any of the network science models discussed in Chapter 1 – with the exception of the lattice-shaped geographic layout of the Northeastern Caribbean islands. Admittedly, the relational database and type of networks were far from ideal or even typical of such an undertaking. Regardless, as dealt with in Chapter 5, when referring to the tentative sequential growth, preferential attachment and fitness of the lithic distribution networks, applying specific models to archaeological cases without a clear idea of their diachronic and contextual dynamics will not bring the interpretation of a data-driven network any further. It even risks replicating the model's inherent assumptions. In other words, they may be popular, highly cited examples of network models, it remains to be seen if they are best suited for understanding most archaeological cases (cf. Brughmans 2013). Before this topic can be addressed any further we need to have a better base-line understanding of network models as they pertain to archaeological cases.

Based on the case studies it also remains difficult to conclude that a certain model of relation dominated during specific moments in time (Fiske 1991). However, it is feasible to positively identify certain models of relation such as Authority Ranking and Equality Matching in certain periods of the lithic distribution network (e.g. Period C, D and E). Furthermore, in combination with substantive lines of evidence it should be clear that the Caribbean must have seen its fair share of Communal Sharing (see also Mol 2010). For example, Kelbey's Ridge 2's archaeological record presents a set of intense and exclusively communal relations (Chapter 6), while the information on the arrival of Columbus is indicative of a Greater Antillean and perhaps even Pan-Antillean network in which useful bits of information were freely shared (Mol 2011a). Beyond the ethnohistoric accounts of barter the presence of Market Pricing relational models is difficult to substantiate

at present. A future diachronic exploration of Market Pricing and Communal Sharing models in the archaeological record will lead to new and interesting lines of research, especially with regard to the prevalence of such relational models in the early contact period. Irrespective of specific cases, this base-line model opens up traditional notions concerning the limited presence of social economies beyond redistributive, prestige good or gift exchange to include all forms of human social relations.

The networks in Chapters 5 to 8 did allow for many case-specific insights. I shall reiterate some thought-provoking ones here. For example, in Period E (AD 100-400) not more than six "handshakes", or exchanges of stone materials, separated an inhabitant of the village of Maisabel in Puerto Rico from a member of the community of Brighton Beach on St. Vincent. What is more, a longitudinal view of this distribution network shows that material cultural practices and assemblages and the peoples they represent can be connected from the first peopling of the North-east Caribbean to late pre-colonial communities such as those at Kelbey's Ridge 2 on Saba. The ego-network also indicated that even in late pre-historic times smaller communities located in assumedly frontier regions were seated at the heart of multi-levelled interaction networks, in strategic locations with access to important local and regional resources and tapped into a pan-Antillean system of valuables. Stylistic network analysis can show that these valuables had similar yet unique designs, such as a *guaíza* from the Eastern Dominican Republic that had more in common with a shell face from La Désirade (Guadeloupe) than with any other shell face. It can also point out that a group of geographically proximal, shell faces in the Cuban region of Banés had actually little in common with each other. Other lines of evidence can illustrate how *guaíza*s and other valuables were strategically used in flexible, interdependent political economies. This can be combined with an ethnohistorically informed view of *caciqu*es and their networked collectives. This suggests that, with regard to their success, *cacical* collectives were critically reliant on other power figures than the *cacique*, or chief, whether they were other humans or inspirited socio-material beings, like *guaíza*s.

If we connect individual insights such as these and thread them together, it becomes possible to start putting Northeastern Caribbean pre-colonial networks into perspective. One aspect that has become clear from all lines of evidence discussed in the present study is that the networks of the indigenous peoples of the Caribbean were essentially robust, inclusive and outward-looking systems. If we further take into account other lines of evidence for extensive toing and froing within archipelagos and the sometimes extreme (1000 km or more) long-distance procurement of goods, one could even say that throughout history these peoples linked a keen, even entrepreneurial interest in exotic contacts and material culture with strong local traditions.

Such qualifications seem to contradict the stereotyped view of indigenous Caribbean peoples as somewhat naïve, pastoral or barbaric "islanders" which they gained as a result of colonial representations. Yet even when close-reading the primary historic sources it is clear that this stereotype does not do justice to the two-sidedness of early contact situations such as between Guacanagarí and Columbus

discussed in Chapter 4. As was the case with the interactions between these two men from very different parts of the world, before contact wider inter-island networks seem to have been set up in such a way that individuals, communities and their things could interact and wander across various cultural, ethnic and linguistic borders with relative ease, without losing their particular character. Indeed, as seen from the scope of their networks, instead of characterizing them as "islanders" it may be more apt to refer to the indigenous peoples of the Northeastern Caribbean as "archipelagists" – the type of people that mixes a strong local character with an outward-looking attitude.

Although these early contact networks that emerged from the encounters between indigenous and European (and later African) peoples were not a main theme of this work, as a final remark I wish to point out that the deep history of the Caribbean should not be separated from the upheaval of the colonial period. In fact, because they are part of unbroken chains of interaction, pre-colonial networks can even inform us of how the "network society" of our time came to be. Albeit that extensive research has been carried out on the global network that emerged after the first sustained contacts between the Old and the New World, we as yet know very little of the ways in which indigenous Caribbean social and cultural systems contributed to this process. This glaring lapse in our knowledge, underlain by a continued disregard for the value and particularities of alternative histories of non-Western peoples, has served to obscure the impact that indigenous peoples and their networks had on world history. The application of network approaches by means of archaeological and historic sources has a huge potential to connect the history of the pre-colonial and the contemporary Caribbean to that of the rest of the world.[5]

5 This challenge will be undertaken as part of a synergy programme set up by Leiden University (prof. dr. Hofman and prof. dr. Willems) the Free University of Amsterdam (prof. dr. Davies) and Konstanz University (prof. dr. Brandes). This research project, called *Nexus 1492*, is funded by the European Research Council. Having commenced in September 2013, it seeks to establish a new understanding of the role Caribbean indigenous people played in the global transformations that began with the first contacts between them and Europeans in 1492. I will collaborate with other researchers from archaeology and the network sciences in order to continue the line of research explored here as part of a post-doctoral research project.