Harmonizing Diversity: Tuning Anthropological Research to Complexity [1]

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Abstract

The contributions in this issue of Social Science Computer Review represent a range of computational approaches to theoretical and disciplinary specializations in anthropology that reflect on and expand the future orientation and practice of the formal and comparative agenda in the context of an increasing emphasis on complexity in anthropology as a discipline. Themes covered in this issue include kinship, funerary burials, urban legends, eye tracking and looking at mode influences on online data collection. A common theme throughout the papers is examining the relationship between global emergent processes and structures and the local individual contributions to this emergence, and how the local and global contexts influence each other. We argue that unless complexity is addressed more overtly by leveraging computational approaches to data collection, analysis and theory building, anthropology and social science more generally face an existential challenge if they are to continue to pursue extended field research exercise, intersubjective productions, deep personal involvement, interaction with materiality and engagement with people whilst generating research outcomes of relevance to the world beyond the narrow confines of specialist journals and conferences.

Keywords

Anthropological methods, complex systems, cognitive science, comparison, cultural change

Introduction

As anthropology has become theoretically and methodologically fragmented the strengths of an inherent holism, and the interdisciplinary and comparative focus of the discipline have succumbed to institutional demands for identifiable, assessable boundaries of the academic disciplines. This has made it more difficult to address profound questions about the diversity and complexity of being human and arguably constitutes a challenge to the continued relevance of anthropology and the social sciences more broadly, outside these arbitrarily defined boundaries. The papers in this issue of *Social Science Computer Review* represent a range of theoretical and disciplinary specializations in anthropology that reflect on and expand the future orientation and practice of the formal and comparative agenda in anthropology as a discipline vis-à-vis new technological and methodological advancements that are happening now and will continue to do so in the decades to come.

Many ideas considered core to the discipline of anthropology, such as 'holism' and 'comparison,' have been recently reassessed, mainly epistemologically. 'Holism' has been reinvigorated and theorized as an interconnected whole rather than analytical totalism (Parkin & Ulijaszek 2007). Comparison has been critically positioned as "the case for new, pluralistic comparative agenda" (Gingrich & Fox 2002: 18). Pluralism therefore becomes one of the binding themes of anthropological research. Such critiques of existing practice sometimes neglect to provide methods or examples of practice needed to address specific problems and provide a path for 'doing' comparative anthropology within a new holistic framework. In other words, while we embrace much of the critique of what does not work in traditional anthropology, we also want some practical ideas for how to carry out comparative research in the context of methodological and analytical pluralism and unprecedented technological development (Ellen 2010; Holy 1987).

Looking beyond anthropology, the goals of the social sciences are far from uniform or complementary. The cognate disciplines that typically get grouped together under this umbrella of 'social sciences' lack paradigmatic harmony or coherence. It is hardly surprising, then, that even within disciplinary boundaries there may be few research questions that might bind everyone around a common set of agendas. While there is much to be said for eclectic diversity, it renders some of the founding principles of the social sciences problematic. If the social sciences do indeed lack paradigms, as Kuhn (1996[1962]) suggested, and significant advances occur largely around paradigmatic revolutions, then how are the social sciences to make concrete advances which both further the disciplinary concerns *and* make valuable contributions to wider human endeavors? This issue brings together a collection of anthropological research which typifies both the diversity and coherence of a social science which, perhaps more than most, has experienced a lack of unifying theoretical and methodological guiding principles. These articles will not by themselves set anthropology on a pathway towards greater coherence, nor are we persuaded that this would be desirable. But these efforts can and do provide a powerful demonstration that it is possible to move towards greater harmony and interoperability within the discipline despite differences in specific methods or theoretical influences. The articles in this collection share a common focus on relational aspects of the social worlds in which people exist, while not reducing the content underlying interoperability between local and global viewpoints. Such a focus inevitably leads research towards complex systems which appear to exhibit both structural rules and contingent processes, properties and behaviors.

Complex systems emphasize relationships between local agents and how these interact and contribute to the collective behaviors of a system which themselves interact and forms new

relationships within local contexts. Complexity offers a pathway to consider the relationship between local and global contexts without losing local detail, history or uniqueness. Smith and Jenks (2006) employ complexity theory for a sweeping critique of the humanist critical orientation that has blossomed over the past thirty years in Sociology and Anthropology, and in this finding room for "the re-emergence of structures":

> … complexity theory is beginning to formulate accounts of structural phenomena that the limited means of older paradigms could not focus or even acknowledge. The former rigidities connoted by structure [are] now reconceptualised as the self-structuring of complex systems ... (Smith & Jenks, 2006 p.23)

Smith and Jenks are not rejecting the underlying contradictions that have nurtured the development of critical humanist approaches, but trying to move past these on the same pathway, in what they denote as "post-humanist social theory", creating a space within which critical theory can be better composited with developments in complexity theory in the sciences. As Urry notes:

> [Global] complexity derives from what I have described as the dialectic of moorings and mobilities. If to express this far too simply, the social world were to be entirely moored or entirely mobile, then systems would not be dynamic or complex. But social life seems to be constituted through material worlds that involve new and distinct moorings that enable, produce and presuppose extensive new mobilities. So many more systems are complex, strangely ordered, with new shapes moving in and through space-time (Urry, 2003: 138).

A more general orientation towards leveraging complexity rather than avoiding complexity is, arguably, one of the more obvious implicit common themes within anthropology. We deal with complex phenomena which are contingent on forces exhibiting apparently high levels of variability. In part, such variability is the inevitable consequence of the level at which we carry out the analysis and so some work within anthropology demonstrates higher levels of contingent uncertainty than others, but we argue that is present in *all* anthropological research (cf. Hannerz, 1996; Lansing, 2006; Strathern, 2004 [1991]). Dealing with complexity poses challenges for researchers. Even at the dawn of ethnography Malinowski recognized that anthropology must be progressive and eclectic to advance its mission: '[t]he Ethnographer has to be inspired by the knowledge of the most modern results of scientific study' (1984 [1922]: 8). It has certainly been possible to address some aspects of complex interactional phenomena with "pen and paper" approaches, but examples of this rather quickly illustrate how demanding such exercises are. When Steward (1955) tried to argue for a systems approach to understanding cultural evolution, the lack of computational tools greatly constrained his capacity to incorporate the range of variables which he clearly understood, at a conceptual level, to be of importance. Similarly, Barth (1959), Leach (1964), Boissevain (1974), to name just a few of the eminent transactionalists in social anthropology, rapidly found limitations to what was possible in locating the unit of analysis at the level of relational transactions between individuals. The computational methods included within this issue address complexity head on in ways which we believe may be moving anthropology, and by extension cognate disciplines, not only towards greater overlap of methods, but actually towards the development of theoretical interoperability or, dare we say it, a kind of paradigmatic integration. Not integration in the sense of everyone singing in the same key, but integration in the sense that results can speak to each other, even if the underlying conceptions, methods and epistemology varies (cf. Latour et al., 2012; Fischer, 2008). To be sure, such theoretical interoperability is not yet in full evidence, either here or

in the discipline as whole (much less across the social sciences), but one of the pleasant outcomes of our focus on computational methods, has been the formation of a set of nascent theoretical ideas about complexity. It is perhaps premature to promote computational methods as a theory building tool capable of instilling interoperability between anthropological approaches, and those of other social science disciplines. Rather, in these contributions computational methods *are* theory building tools and not just tools built *for* and *by* theories.

The relationship between research tool and research concept is iterative. Arguably, the concepts probably come first, but as we develop concrete research tools, or methods, for producing data which might address the research questions triggered by the research concepts, we must necessarily identify aspects of our concepts and questions we can address by tools or methods, often driving development of new tools and methods. Questions about human origins, for example, could not be addressed using DNA until adequate tools for working with DNA were developed. The development of such tools has radically changed the possibilities for studying human origins (and indeed the origins of all life on Earth). The development of the tools came about through a process of iterative adjustments to concepts that were based on research carried out with earlier tools. We see computational tools as part of this process and in the 21st century, one that no social scientists can afford to neglect.

There are, of course, arguments for not aspiring to theoretical unity across the social sciences or even within anthropology. Without subscribing to a simplistic, or dismissive, relativistic notion of science, it is nevertheless the case that scientific research is steeped in sets of accumulated axioms which shape the interpretation of phenomena. Kuhn (1996[1962]) suggests that a chemist might come to very different conclusions about the stars than an astrophysicist, not because he or she employs different methods or applies less rigor to the study, but because of differences between axiomatic presuppositions across the disciplines. Such variation is almost certainly healthy both for science and humanity. So while it might well be more comfortable for some if anthropology were to adopt a common set of axiomatic theoretical presuppositions, it might also lead to rather repetitive and non-illuminating results. Respect for theoretical diversity does not, however, mean that computational methods become less important, for they are not merely relevant as powerful theory building tools. One of the most important contributions of computational methods, in our view, is their role as bridging agents across the social sciences and beyond. If we are not persuaded that unifying theory is inherently 'good', then we are nevertheless resoundingly persuaded that transparent practices *are*. Computational methods require levels of formalism which make them accessible and examinable by others. Where secondary or tertiary researchers come with competing theoretical preoccupations or presuppositions, the various interpretations may not be of interest, but the data can be adapted and used for multiple purposes (White & Johansen, 2005; Houseman & White, 1998; Scweitzer, 1997; Read, 2008). As the primary researcher's own theoretical concepts develop and change, computational methods again ensure that the data will have been produced and managed in ways which are explicit. Computational methods do not, and need not, necessarily result in unifying theory building, but they nevertheless serve a powerful role in promoting interdisciplinary goodness in practice.

This issue offers reflexivity along with an enthusiasm about computation and new technologies. Most of the analytical tools presented here have their roots embedded in the mid-to-late 20th century when pioneers in computation were developing new ways of efficient data collection and analysis (Hymes, 1965; Bernard & Killworth, 1975; Binford, 1966; White, 1968). Graph theory, multivariate and spatial statistics or cladistics have been around for decades but today we see

unprecedented expansion of possibilities for application of these conceptual tools to social phenomena thanks to exponentially more powerful computational resources. Open-source software packages, a plethora of companies developing similar products and competing in the market enable thousands of users to participate in the production of new knowledge. Today, the main questions go beyond the potential of computation *per se* but explore new phenomena and contexts *thanks* to possibilities created by computation tools. The papers in this special issue indicate that similar questions can be tackled by different analytical tools while *different* questions can be approached with the *same* tool. This situation suggests that every scholar is exposed to a plurality of choices during the research process and she or he has to decide which tools are best suited for their problem. The decisions are made based on analytical robustness, efficiency, cost, compatibility, and other factors. The scholars who present their contributions in this issue made specific choices and did their best to answer questions about the social nature of human beings. As Carrithers (2005) suggests, anthropology is, at least in part, about the fact that things could have been otherwise. The contributions in this issue represent a specific set of tools that demonstrate the power of computation in social sciences. This quest, however, shows only the tip of the iceberg of possibilities that contemporary technologies offer and stimulates new questions about the use of old tools for new research problems and new tools for the old ones.

Issue Themes

This special issue of SSCORE examines some of the tensions between theoretical assumptions between different approaches. One of our goals is to demonstrate that such tensions are often unfounded and that by employing formal and scientific methods to research problems we can not only generate reliable data, but we can communicate those data and their analyses to researchers from other disciplines. Ultimately our goal is to ease somewhat disciplinary fragmentation and promote a broad based anthropology which approaches research design as a creative and necessary part of any project. In other words, we argue that research design must be fit for the problem rather than the disciplinary trajectory.

Mathematical Anthropology

All of the contributions in this collection rely on mathematics at a foundational level for their analyses. Read, Leaf and Fischer do this explicitly through the formal development of algebras which can be used to describe and generate kinship terminologies. Stubbersfeld and Tehrani employ methods used in cladistics to identify the simplest possible path of origin for a given set of comparisons, using mathematics that has long been employed by evolutionary biologists to provide insights and support for hypotheses when looking at species ancestry, and which has also been used extensively by textual scholars. Networks analysis is used by Lyon to look at kinship and Sosna et al. mortuary variability based on the mathematics of graph theory, while Sayer and Wienhold use statistical methods combined with GIS management to investigate the significance of spatial patterns.

Cultural Evolution: A New Interdisciplinary Synthesis

Cultural evolution has ben reformed since the 19th century. Gone are the teleological racist assumptions which were instrumental in providing part of the ideological justification for the spread of empires. Some of the papers here reflect the 21st century reformulation of an interest in how cultures evolved. Stubbersfield and Tehrani demonstrate the potential of applying an overtly biological set of methods to domains more common to folklorists. Read, Leaf and Fischer address this issue also, demonstrating that an appeal to biological explanations is unnecessary to account for indigenous formulations of kinship terminologies, even in those societies where people appeal to

biological principles as a component of their understanding of kinship itself. More obviously, the two archaeological contributions in the collection by Sosna et al. and Sayer and Wienhold, pursue classical archaeological interests using novel techniques to make sense of ancient mortuary practices. By concentrating on the relationship between space, time and social differentiation, they are able to produce detailed reconstructions of mortuary patterns over time.

Cognitive Science

In some ways, much of the debates within cognitive sciences have long been central to cultural anthropology. We seek to describe and understand how people know things and communicate things. Where we might differ from more psychologically oriented cognitive scientists is in our emphasis on the sociality implicit in cognition. Eghbal-Azar and Widlok aim to foster communication between cognitive science and anthropology by looking at the concept of culture and research methodology that crosses disciplinary boundaries. Read, Leaf and Fischer fall rather neatly within the realm of cognitive science. Their work, for example, indicates that there are remarkably few informationally efficient kinship algebras present, which we take as strong evidence that the generative kin term algebras are a useful tool for researching human cognition. Gravlee, Bernard, Maxwell and Jacobson address issues of cognition through an examination of the methodological implications of different ways of conducting free-listing exercises. Free-listing has long been an important tool in the battery of cognitive scientists looking for evidence of linguistic associations around concepts, and they argue that the results produced can demonstrate noticeable variation depending on the details of test design.

Historicity

One theme that emerges throughout a number of the papers is the extent to which it is possible to make sense of the present from historical data. Archaeological data shed light on contemporary issues and become hot political themes in their own right in certain contexts (Layton, 1994). Israel and Palestine or Ayodhya Mosque/Temple in India offer two particularly tragic examples of the ways in which archaeology has become entangled in very modern disputes. The archaeological data in this issue (Sosna et al. and Sayer and Wienhold), along with the historical data on land inheritance and marriage patterns in Pakistan (Lyon) and the attempts to construct evolutionary trajectories of myth transmission (Stubbersfield and Tehrani) all point to a clear recognition within anthropology that history is alive and well. People exist in contexts which have been shaped by histories which are constructed and re-configured as new events unfold (cf. Hirsch & Stewart, 2005). The relationships from our histories are subject to the same logical constraints as those of our contemporary social worlds. Unlike classical historians, however, anthropologists cannot count on having documents that were contemporary to our historical fellows. We must often reconstruct events from the past based exclusively on partial physical remains or the stories that living people tell of the past.

Issue Contributors

Stubbersfield and Tehrani apply a cultural evolutionary approach to investigate and analyze the evolution of narratives in "Expect the Unexpected? Testing for Minimally- Counterintuitive (MCI) Bias in the Transmission of Contemporary Legends. A Computational Phylogenetic Approach." Their main method for analyzing these oral narratives is based on cladistics, more commonly associated with classifying species of organisms into groups called clades based on the parsimony of all possible evolutionary trees based on selected characters of the species (or in this case 'urban legends') being grouped. The cladistics software PAUP 4.0 is used to compare different versions of an 'urban legend', "Bloody Mary", addressing the similarities and innovations in different versions

of this oral narrative, and in particular, which aspects of the narrative are transmitted with fidelity. They validate their results employing a novel use of TurnItIn, software used in the academy to detect student plagiarism.

Their study demonstrates that formal evolutionary modeling and associated tools and methods are not restricted to the domain of biology for which these were developed, but are also well suited for modeling other aspects of sociocultural change. Narratives as well biological organisms change over time and the nature of this change can be examined via logic of relationships among ancestors and descendants. Modeling these changes and the search for the most parsimonious phylogenetic trees would be almost impossible without computers that have to deal with thousands or even millions of possible combinations of relations among the 'taxa'.

This evolutionary analysis of narratives focuses on the presence of counterintuitive concepts in the urban narrative 'Bloody Mary', in part following the conventions of comparative linguistics where shared innovations form the basis for reconstructing relationships between languages. The authors build upon existing scholarship indicating that counterintuitive and bizarre elements of narratives are more successfully transmitted in society. On the more general level, this research contributes to theory relating the complex interchange between human communication and cognitive processes. Narratives are transmitted variably in different contexts. By focussing the structure of the changes between variants they are able to relate the versions with each other and relate these with human cognitive processes. The fidelity of the transmission depends on the social composition of actors who participate in the transmission. Narratives performed in groups may differ from the narratives shared among two persons. This study does not get bound up in sophisticated cladistic modeling for the sake of the method or technology itself but takes advantage of these to address challenging questions about the relationship between cognition and communication.

Lyon explores how global patterns of marriage and inheritance interact with local decisions underlying individual marriages, and the pattern of change in this interaction over nearly centuries. In "Networks and Kinship: Formal Models of Alliance, Descent and Inheritance in a Pakistani Punjabi Village", Lyon uses Social Network Analysis powered by PAJEK and the CSAC Kinship Editor to uncover marriage and inheritance patterns in a Punjabi landlord family. In common with other papers in this issue, such as the Sosna et al. archaeological case study from the Bronze Age, the underlying logic is based on the primacy of relations. The coverage of social relationships during the period of more than two hundred years represents a challenge for classic 'pen and paper' approaches. Lyon's Punjabi study exemplifies the utility of formal analytical techniques and computer applications that enable the analyst to explore complex datasets. Lyon's approach also aims to overcome some of the issues relating to the reliability of ethnographic accounts for comparative purposes. In doing so, the author attempts to position anthropology as a truly comparative science of humanity at a time when this aspect of anthropology has lost momentum among some anthropologists resulting in greater fragmentation of the discipline (cf. Kuper and Marks 2011). As the influence of the complexity paradigm expands within anthropology permitting us to finally abandon both extreme essentialist and relativist viewpoints, comparison will be key to understanding human dynamics.

Lyon's study explores the dynamic changes in human behavior and attitudes towards marriage and inheritance. The author points at the necessity of looking at the same dataset with different tools. In this case, CSAC Kinship Editor and PAJEK provide an environment for the investigation of data patterns that can be explored with genealogical rendering packages as well. The plurality of

approaches provides different views of the data, which stimulates a more critical set of analyses of those data. In this respect, the paper makes a significant point; that formal analyses not only produce more reliable and replicable results while capturing the contingency and dynamic character of how these were generated, but also stimulate thinking and generate new questions. Lyon shows that marital alliances and inheritance provide arenas for the negotiation of power among political groups. Different households struggle over the ownership of the land and political power in the context of Islamization of the society. The observed patterns indicate that the changes in marriage patterns affected the life of individual households as well as relationships among different political factions, which themselves then support more change.

Sosna, Galeta, Šmejda, Sládek and Bruzek in, "Burials and Graphs: Relational Approach to Mortuary Analysis" also undertake the investigation of mortuary practices in the past. They develop an account of the organization of an Early Bronze Age cemetery to elucidate the impact of social and temporal factors. Although the research problems of both mortuary papers are similar, the teams use different methods and computational tools to ground their formal analyses of mortuary variability. Although network analysis is becoming increasingly used in sociocultural anthropology and settlement archaeology, little attention has been given to its application to relations among the burials. The authors explore the potential of graph theory and network analysis applied to cemeteries to use a more qualitative model of relationships between graves and evaluating this model quantitatively. The authors demonstrate that the network approach provides an alternative to traditional multivariate analyses of cemeteries that integrates spatial and formal data about the nature of the dead and associated artifacts. This contrasts with Sayer and Wienhold (this issue) using GIS tools to model the differences quantitatively in terms of expected and observed distributions based on patterns grounded in a mathematical measurement of dispersion.

The study of mortuary networks aims at a simple problem; the assumed concentric pattern at the Bronze Age cemetery in the Czech Republic. Two hypotheses about the origins of the concentric pattern are formulated. The first one explains the difference between the centre and the periphery as an effect of social standing of the dead, while the latter explains the pattern as an effect of temporal change. The authors calculate various similarity and dissimilarity matrices based on spatial and artifactual data and model these sets of relationships in Social Network Analysis (SNA) software PAJEK. This approach proves to be fruitful because PAJEK allows the analysts to include both spatial and formal data and shift between the abstract space defined by the nature of burials and geographic space defined by Euclidean distances between pairs of graves. The authors reject both research hypotheses, with the analysis leading them to formulate a new model for the organization of the cemetery based on the contemporaneous use of cemetery's subsections by different corporate groups. This case study indicates that formal modeling of mortuary networks has potential to uncover patterns of social practices in the past. Further, it achieves this by linking global distributional patterns to local features of individual graves and their contents mediated by evidence human agency employed in balancing the dynamic relationship between these.

Sayer and Wienhold's contribution, "A GIS-investigation of four early Anglo-Saxon Cemeteries: Ripley's K-function analysis of spatial groupings amongst graves" relates the potential of embedded spatial statistics for the investigation of mortuary patterns in four early Anglo-Saxon cemeteries in the United Kingdom. The authors employ Ripley's K-function, used for detecting deviations from spatial homogeneity of a distribution of data points, embedded within a Geographic Information Systems (GIS) application, ArcGIS 10, to analyze the relationships among the burials according to their characteristics and spatial location. This contribution builds upon long-term archaeological

interest in interpreting how the spatial organization of burial grounds carries information about mortuary practices in past societies and their social significance. They demonstrate that formal modeling of archaeological data is a powerful tool for understanding social action and values related to the disposal of the dead. GIS powered analysis based on Ripley's K-function and production of kernel densities enables the analysts not only the exploration of mortuary patterns but also formal testing of observed spatial patterns, relating the processes underlying the original choices of burial location to the overall patterns these form in the cemetery.

Early medieval cemeteries represent a good example of diversity in mortuary practices and their change over time. Sayer and Wienhold demonstrate that the material manifestation of shared cultural logic may vary. Their analysis indicates that the spatial organization of the four selected cemeteries is clustered but the clustering itself is highly variable. There are differences in the number of clusters in individual cemeteries and the density of these clusters. The authors emphasize the temporal dimension of mortuary practices, which is reflected in the data by relating to a chronology. The emphasis on temporality and importance of contextual factors in each cemetery is not just a programmatic call reflecting ideas of the authors but is based on weaving through the complex history of the particulars of the site using the results of their formal representation and testing. Ripley's K-function proved to be a useful tool for the investigation of spatial patterning at multiple scales in areas of different shapes. Their approach leverages comparison, not to attempt to form a set of invariants between the sites, but to leverage the differences to make specific interpretations relating the local positioning to the global patterns of these for each site. Generalizations are drawn not about the data patterns themselves, but relating these to the pattern of change within each site and across sites.

Eghbal-Azar and Widlok, in "Potentials and Limitations of Mobile Eye-Tracking in Visitor Studies: Evidence from Field Research in two German Museums", relate the interaction between human senses, cognition and subsequent experience. The authors evaluate a mobile eye-tracking (MET) device as part of an investigation into how visitors perceive and interact with museum collections. The strength of MET technology lies in its ability to infer information relating to dynamic components of visual perception. The device is mounted on the participant's head and records both eye movement and the scene within which the participant moves. This technological innovation opens new possibilities to track instantiations of human cognition under 'natural' settings less impacted by requirements posed by experimental design. Such an advantage goes directly to the heart of ethnography, which puts strong emphasis on the 'ordinary' dimension of everyday life.

The MET project presents case studies from two German museums. The researchers applied MET device combined with cued retrospective reporting and interviewing. This combination of multiple methods proved to be most fruitful way of exploring dynamic aspects of cognition relating to use of space. Widlok and Eghbal-Azar uncover evidence for several cognitive patterns that reoccur among the participants of the research and, therefore, shed light on human mental processes that are common in the study group. They relate the local events associated with user events in the museum space with the overall designed intention of how exhibits are laid out in this space. The MET-associated methods provide direct evidence of how user expectations and understandings of this design relate to the original intentions, effectively providing a kind of test between 'expected' and 'observed' organization, from both the users' and designer's points of view. In particular data on the global expectations and the impact of global organization on the user can be collected and evaluated. The research opens wide potential for social scientists in a broad range of areas; for example, improving understanding of nonverbal communication by relating how participants watch

each other (instead of static objects in museum exhibitions), comparing engagement between people in public spaces in different circumstances, or identifying how people engage visually in a wide range of performances of skills and productions, and these are gathered using a method that promotes comparison as they demonstrate in their study of two museums.

Read, Leaf and Fischer in "What are Kinship Terminologies? And Why do we Care" examine in detail the relationships between kinship terms, their terminological structure, and how these are instantiated by people, over people. This research led to developing a computer program, Kinship Algebra Expert System (KAES), that replicates the field elicitation of the terminologies, assists in the production of algebraic models of the structure of kinship terminologies and in testing these models for logical coherence. Eliciting the kin terms uses a method that avoids direct reference to genealogical or other external concepts, recorded as a graph of the terms called a kinship map. KAES generates algebras directly from the source terminology by reducing the terms and relations to a subset representing the generating terms, terms that are used to create other terms (e.g. father x brother = uncle) using only a very limited set of researcher decisions. The resulting algebra can be instantiated over a given real or model population and reproduce the full set of relationships denoted by the original terms, even though this set was reduced prior to the algebra building process; the algebra is predictive, not simply descriptive. Their approach makes no recourse to hypothetical external reference frameworks such as a genealogical grid. KAES shows, at one and the same time, how a complete kinship structure is generated from the kinship primitives and how the primitives themselves are entailed in and can be reconstructed from almost any set of reciprocal relational usages.

The KAES framework is a good example of how the results of the analysis of an ideational system can be directly introduced into subsequent models without transformation or 'tailoring' for the purpose. That is, it provides a means of representing the potentialities of a cultural system and relating these to specific contexts without performing the reductions a particular context would normally require – reductions are properties of the process of instantiation and the limitations of the domain over which the instantiation is being projected.

To our knowledge this is the first example of a predictive model of a cultural system based entirely on data consisting exclusively of relational judgments between a subset of elements in the system; a result that is not possible by looking at the behavioral data alone, nor by construction of an ideational model alone, but only by combining aspects of both in a single model. It relates local and global relations, and makes predictions about disruptions consistent with those found by Lyon et al. (2012) in examining changes in terminology by the Miskitu during a long period of cultural and material stress.

Gravlee, Bernard, Maxwell and Jacobsohn, in "Mode effects in free-list elicitation: comparing oral, written, and web-based data collection", evaluate gathering free-list data using the internet, comparing this to other modes of collection. Identifying how the mode of collection affects interpretation of data thus collected and what we can infer from that data in different circumstances is thus critical. Many approaches to cognitive studies use semantic domains as a conceptual construct intended to provide a frame of reference to identify how people represent and organize information. If we situate semantic domains within a complexity approach, we are concerned with identifying global patterns we can associate with the semantic domain construct with respect to local cognitive behavior on the part of individuals. Useful data in this context will help us identify what is common to people's classification and understanding of their experiences, and what is

idiosyncratic, and from a complexity perspective the structure of variation between what is shared (and not) by different groups of people. It is critical then that we understand how different modes of collecting data will change this variation -- what aspects of the variation is inherent in how people retain and organize information vs. the means by which the data were collected.

Free-listing is a data collection method that has been in use for many years to collect data relating to this common understanding through semantic domains. Free-listing is a semi-structured method where basically we ask, "Name all the _s you can", sometimes adding probes to encourage more by asking, "Any more?" As the significance of any form of data is in relation to a model or conceptual framework that establishes a means to link data to whatever circumstance one is actually interested in, each mode of collection can vary in the extent to which the data must be qualified. The authors compare free-list data collected online to see if these are comparable to data collected with more conventional face-to-face interviews or self-administered paper questionnaires. Comparing free lists generated for two cultural domains, one diffuse and one well defined, they find that all three modes of collection produced the same set of salient concepts for each domain, although median list length per respondent varied across modes in response in followup probing. For the well-defined domain supplementary probes widened differences among modes but for the more diffuse domain probes erased evidence of mode effects. They conclude that collecting free lists online is viable but may yield different results from other modes of data collection, depending on the study population and attributes of the cultural domains.

Conclusion

The themes emerging from this collection of papers reflect the extent to which anthropology is concerned with relations and space between people, and with how people apply their prodigious cognitive powers to the creation, maintenance and reproduction of these. The stuff that connects people is of fundamental importance to what we do. This can be shared myths and stories, sets of kin terms, non-verbal communication, rituals around key life stage events, socially significant spaces or a host of other things. Such concerns have long figured in anthropology (e.g., Lévi-Strauss, 1949), though the extent to which it was possible to develop elaborated conceptual models of how the relations fit has been hampered by theoretical and methodological limitations. Understandably, anthropologists have used computational tools to record and make sense of these relations and this opens up new possibilities of dealing with multiple scales simultaneously. We have argued that computational methods *are* theory building tools and not just tools built *for* and *by* theories. Our primary data are often, though not always, produced from very local phenomena. We deal with individual transactions around marriages, deaths, initiations, quotidian practices and other events but we want to extrapolate from these data to account for global structures (cf. Schweizer, 1997) and processes, or aim at deeper understanding of local phenomena. The power of computation can be extremely useful not just for searching for global trends but also deeper understanding of very specific contexts. We deal with emergent complexity that has predictive properties. Making sense of how that comes about requires tools that can cope with apparently contradictory and sometimes inconsistent levels of granularity. There can be some benefit to global reductionism which strips away the complexity to identify a handful of the salient causal forces shaping local patterns and processes (some form of Darwinian selection for example), but that is not necessarily appropriate for all research questions. How is it possible to meaningfully use data produced about local instantiations of relations in ways which both allow for local patterns and enables the development of a global viewpoint? Make no mistake, this is an existential challenge for anthropology. If anthropologists are to continue to pursue the Holy Grail implicit in the

extended field research exercise, complete with participant observation, intersubjective productions, deep personal involvement, interaction with materiality and engagement with people far in the past, *and* we are to generate research conclusions which are of relevance to the world beyond the narrow confines of specialist journals and conferences, then we must develop methods and theories which enable us to use those data which we argue are important in novel ways. We believe this collection of papers goes some way towards addressing this challenge and demonstrating the ways in which computational tools have a vital role to play in making anthropology more meaningful and relevant to the pressing questions of humanity.

Bios

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Notes

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Bibliography

Barth, F. (1959). *Political leadership among Swat Pathans* London: University of London, Athlone Press.

Bernard, R. H., & Killworth, P. (1975). *On the Structure of Affective and Effective Sociometric Relations in a Closed Group Over Time. Technical Report BK-107-75, Office of Naval Research N00014-75-A-0417-0001, Code 452.*

Binford, L. R., & Binford, S. R. (1966). A Preliminary Analysis of Functional Variability in the Mousterian of Levallois Facies. *American Anthropologist, 68*, 238-295.

Boissevain, J. (1974). *Friends of Friends*. Oxford: Blackwell.

Carrithers, M. (2005). Anthropology as a moral science of possibilities. *Current Anthropology*, 46(3), 433-456.

Fischer, M. D. (2008). Cultural dynamics: formal descriptions of cultural processes. *Structure and Dynamics, 3(2)*. Retrieved June 1, 2012 from http://www.escholarship.org/uc/item/557126nz

Hirsch, Eric, & Stewart, C. (2005). Introduction: Ethnographies of historicity. *History and Anthropology* 16(3):261-274.

Houseman, M., & White, D. R. (1998). Network mediation of exchange structures: Ambilateral sideness and property flows in Pul Eliya (Sri Lanka). In *Kinship, networks, and exchange*. T. Schweizer & D.R. White, eds. Pp. 59-89. Cambridge: Cambridge University Press.

Hymes, D., ed. (1965). *The use of computers in anthropology*. London: Mouton & Co.

Kuhn, T.S. (1996 [1996]). *The Structure of Scientific Revolutions,* Third Edition ed. Chicago: University of Chicago Press.

Kuper, A. & Marks, J. (2011). Anthropologists unite! *Nature* 470(10 February),166-168.

Lansing, J. S. (2006). *Perfect order: Recognizing complexity in Bali*. Princeton: Princeton University Press.

Latour, B., Jensen, P., Venturini, T., Grauwin, S. & Boullier, D. (2012). Preprint to appear in *British Journal of Sociology*. Retrieved June 1, 2012 from http://www.bruno-latour.fr/sites/default/files/123-WHOLE-PART-FINAL.pdf

Layton, Robert, ed. (1994) *Conflict in the archeology of living traditions*. London: Routledge.

Leach, E. (1964). *Political systems of Highland Burma : a study of Kachin social structure*. Boston: Beacon Press.

Leaf, M.J. (2008). Indigenous Algorithms, Organizations, and Rationality. *Structure and Dynamics, 3(2)*. Retrieved June 1, 2012 from http://escholarship.org/uc/item/996031cv

Lévi-Strauss, C. (1969 [1949]). *The Elementary Structures of Kinship*. Boston: Beacon Press.

Malinowski, B. (1984 [1922]). *Argonauts of the Western Pacific*. Prospect Heights: Waveland Press.

Nettle, D. (2009). Beyond nature versus culture: cultural variation as an evolved characteristic. *Journal of the Royal Anthropological Institute, 15(2)*, 223-240.

Read, D. 2008. A formal explanation of formal explanation. *Structure and Dynamics*, vol. 3(2). Retrieved from: http://escholarship.org/uc/item/91z973j6

Schweizer, T. (1997). Embeddedness of Ethnographic Cases. A Social Networks Perspective. *Current Anthropology 38(5)*, 739 - 760.

Smith, J. & Jenks, C. (2006). *Qualitative Complexity: Ecology, cognitive processes and the re-emergence of structures in post-humanist social theory*. London: Routledge.

Strathern, M. *(*2004 [1991]). *Partial connections*. Walnut Creek: AltaMira Press.

Urry, J. (2003). *Global Complexity*. Cambridge: Polity.

White, D. R. (1968). Societal Research Archives System : Retrieval, quality control and analysis of comparative data. In R. Naroll & R. Cohen (Eds.), *Handbook of method in cultural anthropology* (pp. 676-685). New York: Natural History Press.

White, D. R., & Johansen, U. (2005). *Network analysis and ethnographic problems: process of a Turkish nomad clan.* Oxford: Lexington Books.