Narrating stories about the world-system of the First Global Age, 1400–1800

J. B. Owens

This chapter will deal with how narrative and social network analysis (SNA) can be effectively integrated into a world-systems approach to the First Global Age, 1400–1800. The essay takes as its starting point Andre Gunder Frank’s *ReORIENT* (1998). Owens worked closely with Frank during the writing of this book and afterwards. In the book, Frank metaphorically proposed a three-legged stool to represent the factors that must be integrated into a satisfactory world-systems analysis, but because he did not know how to achieve this integration, he concentrated only on the “economic leg,” even then neglecting, as he later realized, the environmental aspects of the issue. In response to Frank’s challenge to show how the social/institutional and cultural environments (the missing two “legs” of the metaphorical stool in *ReORIENT*) shaped human action, Owens (2005) demonstrated the way that competing institutions and multiple, non-hierarchical social norms in the cultural environment shape human activities, events and processes in a nonlinear fashion. Triggered by discussions with Frank about integrating the “legs,” Owens explored geographic information systems (GIS) as an integrative information technology. Prompted by Frank’s insistent questions about what kind of system the First Global Age was, Owens created the “Geographically Integrated History” concept. Owens defined this historical period as a complex, dynamic, nonlinear system, and on this theoretical basis, he offers a different interpretation of Frank’s “inclination” in the world-system, for which Frank never adequately accounted. Frank argued that the world-system was a complex one, which influenced the histories of all locations all of the time, but he continued to frustrate Owens’ attempts to get him to recognize that his failure to consider how local action influenced the system devalued his own activist career. To deal with this aspect of world-system analysis, Owens focused on commercial, political, and other social networks, particularly clandestine ones, to expose how strategic interactions in these networked relationships could produce new forms, which influenced the system of which the networks were a part.

Owens (2007a) has told elsewhere the story of how he was introduced to GIS during a discussion of possible titles for Frank’s book. After a period of study, he recognized that GIS offered both the possibility of integrating data from all three legs of Frank’s metaphorical stool in a context that also permitted representing the webs of connections among geographic locations during the First Global Age (Owens 2007b). However, current GIS integrates poorly with world-systems analysis. Many speakers and writers have attributed to Albert Einstein the assertion that, “Problems cannot be solved by the same level of thinking that created them.” With
Geographically Integrated History, Owens created a level above muddled attempts to harmonize research done, whether using GIS or not, within historical geography and by historians interested in geography (on the muddle, see Baker 2007) and the failed explanations of historians and historical social scientists who have not recognized the importance of geography for an adequate understanding of their problems.

As a research and teaching discipline, Owens founded Geographically Integrated History on the idea that the understanding of historical processes requires an integration of the natural, social, and cultural environments on the basis of place, space, and time and accomplishing this integration poses a challenge, which can be met with modern information management, especially GIS, and visualization techniques. The underlying transformative Geographically Integrated History research paradigm posits that:

1. The history of any place is shaped by the way the place is connected to other places and by the changes in these connections over time (De Blij 2009; Organization of American Historians 2000; Owens 2007b; Subrahmanyan 2004, 2007);

2. Contrary to Frank’s assertion of a 5,000-year world-system, historical periods are complex, dynamic, nonlinear systems, which are spatially large, and in more recent centuries, global in extent, and which sometimes become unstable, leading to a phase transition, bifurcation, and the organization of new systems (on such systems, see Puu 2003: especially Ch. 12; Puu 2006: Ch. 9; Rosser 2000);

3. Within such systems, people and places are connected by self-organizing networks, which are the sources of innovation and the emergence of new forms (Burt 2004; Ikegami 2000, 2005).

Because the emergence of new forms in complex systems often moves research from a topic within one discipline to a topic within another, the attempt to understand the past must be interdisciplinary and collaborative.

The First Global Age, 1400–1800, was a complex, dynamic, nonlinear system. The main characteristics of such systems are:

1. First, although many factors are involved in complex systems, system stability depends on a small number of variables (sometimes only one), which are always near instability (Haken 1983). Rosser (2000: 54–61), after a thorough review of theories of complex systems, argues persuasively that Haken provides the most satisfactory understanding of such systems and, therefore, a point of synthesis for them. The term “stability” does not mean that nothing happened during this four-century period, for the system was highly dynamic.

2. Second, such nonlinear dynamic systems admit only limited predictability and research on them should not be directed to the study of long strings of linear causation but to identifying the system’s characteristics for the understanding of it, of the emergence of new forms, and of the transition to a different system.

3. Third, within the dynamics of the system, new forms emerged that could compensate for weaknesses in the system caused by the proximity to instability of the stability-maintaining “control” factors. However, these weaknesses remained, and the complex, dynamic, nonlinear system of the First Global Age eventually entered into a period of as yet poorly understood systemic chaos, phase transition, and bifurcation during the period 1750–1850. Out of this transition appeared a new system, characterized by new forms of world interaction, institutional organization, values, and perspectives on the world. The point that after a phase transition to a new human system, the cultural environment would be dominated by
new values and perspectives about the world, impairing the ability of people to understand their ancestors in the earlier system, was emphasized for Owens by Sonis (2007).

The discipline of History depends heavily on narrative explanations, and narrative constitutes a unique and valuable form of knowledge (Bruner 1985; Geertz 1973; Hexter 1971; Hunter 1991; Launer 2002). Within the context of new GIS, narrative can provide an effective means to understand the nonlinear dynamics of complex world-systems. However, Frank challenged Owens to discover a way to connect local action to the world-system of the First Global Age and to explain how such local action influenced system dynamics. In response, Owens focused on social networks, particular commercial and political ones, as the key to the human system, and Owens argues that narratives provide an especially good window for understanding network dynamics and the interactions of social network dynamics with natural systems and geography.

Self-organization largely characterized these social networks because in an open system, their participants most often created and shaped them toward increasing complication, rather than depending on the leadership of some authoritarian entity or individual, independent of the networks themselves. Smuggling networks of the First Global Age, which accounted for a high percentage of world commerce, provide particularly striking examples of self-organization (e.g., Erikson and Bearman 2000; Moutoukias 1988; Mui and Mui 1968; Winius 1983). Because of this self-organization, commercial and related social networks constituted important sources of creativity and innovation, which can be understood as the emergence of new forms (Burt 2004; Ikegami 2000, 2005; Landa 1994; Schulte Beerbühl and Vögele 2004: editors’ introduction; Sonis 2009). Although its call to recognize the networks connecting humans to the natural world is useful, Owens largely rejects Latour’s (2005) Actor-Network Theory (ANT) because of its insufficient attention to the variable importance or weight of networked connections and to the plasticity of identity, which permits an actor to participate in polymorphous network domains (White 1995, 2002, 2008). For good introductions to SNA, see Easley and Kleinberg (2010), Grabher (2006), and Scott (2000).

Within the world-system of the First Global Age, events periodically disrupted these social networks. Sometimes, disruptions occurred because of processes within the human system itself, such as war, for example, but disruptions also occurred because of the interactions of the human system with complex, dynamic, nonlinear systems in the natural world, such as disease epidemics or earthquakes, to pick two disruptive interactions of recent concern. To maintain system stability, actors, both men and women, had to counter the disruptions by constituting more robust networks, but the resulting denser webs of connections permitted even more widespread future cascades of disturbances. In the later eighteenth century, such a cascade of innovation initiated a transition to a new historical period, the Second Global Age in which we now live. By combining a social network approach with a world-systems analysis, we offer a world historical account that addresses larger issues of network dynamics and provides a solution to the common criticism of world-system analysis that it ignores the relationships between the local and the larger system (Ngalamulume 2009).

Nonlinear dynamics permit only limited predictability. In other words, changes appeared in the First Global Age rather suddenly, without a long period of development. For reasons best explained in narratives, innovations cascaded through social networks with every disruption, threatening community stability and challenging actors, both men and women, to weave greater network robustness in an effort to protect them from disaster and enhance their ability to survive and prosper, however they understood these concepts. Therefore, knowledge about activities, events, and processes during these four centuries will not come from continuous narratives of developments over the entire period. Instead, each narrative would focus on the way that a cascade of
disruptions and innovations prompted strategic actions to create more robust commercial and other social networks within an expanding geographic space, a process that permitted the emergence of new forms in the social and cultural environments of human action. This emergence of new forms sustained the system by dealing with weaknesses, which might otherwise have led to system collapse, as opposed to a phase transition. In general terms, this process increased network density and adaptation to geography and made the system more robust or stable. However, the complicated ways that multiple networks interlinked with each other over expanding geographic spaces enhanced possibilities that cascading disruptions would affect ever larger portions of the world-system and entail ever more elaborate efforts, ultimately frustrated, to repair damage and prevent such sizable disruptions in the future (for recent work on such cascades, see Buldyrev et al 2010; Vespignani 2010).

“Ultimately frustrated” because as a consequence of the nature of complex systems, the sources of systemic instability would not be eliminated by such repairs, and the increased network density and interlinking would make it ever more likely that, in an event that could not have been predicted, some disruption involving a “control” variable would cascade so widely that the system would enter a period of chaos and transition to a new system. Sometime in the eighteenth century, one or more of the stability-maintaining variables became unstable, and this situation led to system instability and the development of a period of bifurcation around which a new system organized. The sudden weakness of a “control” variable propagated throughout the system from a cluster of individuals who could spread their influence through commercial and other social networks by their impact on individuals who were near them in the nodes of these networks and wished to enhance their ability to survive and prosper (see Watts 2003: 229–44 and 250–52). Gladwell (2000) suggests that it is adoption by the influential and highly connected that leads to a cascade, but Watts’ current work (e.g., Watts and Dodds 2007) shows that such elite influence probably does not exist. Researchers cannot understand the dramatic suddenness, in relative terms, of this process unless they grasp how individuals were involved in multiple social networks and how this involvement required them to shape their social identities depending on the variable contexts of their interactions with others. The global cascade of system instability depended on the irregular linkage of different social networks so that the sources of instability could be propagated before any system-saving repair was possible.

Because SNAs are frequently expressed as graphs, researchers can use evolutionary game theory to explore strategic interaction (e.g., cooperation) among individuals and groups in the creation and maintenance of commercial, political, and other social networks. Gintis (2009) argues that evolutionary game theory can serve as a unifying platform for the social sciences and permit analysis of the interplay of social norms, the integration into models of “gene-culture” co-evolution, and the development of narrative knowledge. The narratives about social networks aid evolutionary game theory in several ways. Lehmann et al (2008) review cooperation research, which is mostly done by evolutionary biologists and economists interested in game theory, and they account for the inadequacy of results by pointing to the failure to deal with the role of individual intentions, which are variables within strategic interactions that historical narratives highlight. By narrating lots of stories of disruptions, world-systems researchers will form an increasingly large catalog of possible interactions as the basis of models and theories. Roca et al (2009) show that so far, the game theory models which have been developed lack generality, for the details of the dynamics and the interactions modify the results in a qualitative manner. For this reason, Sánchez (2009; Sánchez et al 2009) proclaims that we need new models and theories, which are tasks to which world-systems historians can contribute through the generation of narrative knowledge.

In order to produce narratives that are sufficiently complicated to reveal the bases for strategic interactions, we must insert these networks into the dynamic geographic context,
which we wish to express in a GIS capable of updating multiple data types. This geographic context accounted for many of the network disturbances, both in terms of the nonlinear dynamics of natural and human systems and of the opportunities provided by the increased space of human activity and connections among locations of human habitation. These disturbances of existing social networks produced activity, by men and women, to elaborate more robust networks, which led to the emergence of new forms of entrepreneurship, gender and political interactions, and cultural expression across a vast geographic landscape. There have been some recent, tentative efforts to integrate SNA into the networks’ geographic environment, but available software does not permit results that are satisfactory for geographers or historians (e.g., see Radil et al 2010). Therefore, current research focuses on transforming GIS, which is largely static, deals poorly with temporal factors of change and movement, and does not permit the user to deal simultaneously with the interactions of more than a few variables. Historians require a “Dynamics GIS,” to use the phrase of Yuan (2007, 2008, 2009; Yuan and Stewart Hornsby 2008), in order to construct complicated narratives capable of telling the necessary stories of system dynamics.

Although GIS users normally give little consideration to the matter, the database schemes we employ raise significant barriers to a dynamic GIS. We most commonly use relational database schemes, which store information in rows in two-dimensional tables. We store entities as rows, which fixes attributes. If an attribute changes, we must create a new row. This process produces the fragmentation of time within our databases. Almost worse for representing dynamics, we also store relationships in rows, which is a feature that makes it difficult to bundle many relationships to create complicated entities. Recently, Goodchild (2008; Goodchild and Glennon 2008) has advocated employing object-oriented database schemes, but these schemes present a significant barrier to their use by historians. The object-oriented schemes are limited to an arity of two, which means that any entity can only be connected to two other entities, at most. In computer science “arity” refers to the number of arguments that a function or operator can take. Thus, the scheme requires the user to treat all information as though it could be organized ontologically into a strict hierarchy. To destroy these barriers, Owens and his colleagues (Kantabutra et al 2010) now employ a novel database scheme, Intentionally-Linked Entities (ILE). ILE permits the use of entity and relationship sets and effectively removes arity limits. A user may build a complex “object” of an entity and relations. With its great flexibility, ILE permits users to organize dynamic data, expressed in complicated spatial and temporal entities, more effectively, while permitting faster queries and database modifications.

Finally, computers require numerical precision, but much significant historical data are qualitative, imprecise, ambiguous, incomplete, uncertain, contradictory, and otherwise messy and, therefore, difficult to represent in current GIS (Gregory and Ell 2008; Gregory and Healey 2007; Owens 2007a, 2008). The complexity of the human system of the First Global Age and its relation to geography constitutes a veritable fortress against numerical precision. Historians frequently resist any demands that they force their information into fixed categories required by a computational environment because so often, they feel that vital characteristics of some information will be lost when they do not fit precisely into a particular box. As the “domain” experts, after years of reading the surviving documents and examining other period objects, historians develop a sense of the system, of degrees in the characterization of human behavior, and of the meanings conveyed in the natural language of the people they study. Historians find shades of meaning in the evidence that defy conventional numerically based approaches. Animal ecologists and geographers often confront the same ambiguity. For example, where is southeastern Spain? “Essentially, vagueness results in a range of interpretations for a place reference and a range of borderline values for the spatial footprint of each reference” (Hill 2006: 28–29). But we have a way forward.
As a solution to the incompatibility of complexity and precision, Zadeh (1965, 1994, 1997) created fuzzy logic (also, fuzzy set theory) to permit us to think precisely about ambiguous things without losing a record of the ambiguity. Briefly, fuzzy logic possesses several strengths. It provides an effective means of moving efficiently from the available data to developing mathematical models as a basis for analysis and knowledge. Data can be imprecise or vague. Researchers can employ natural language linguistic variables, complete with their “hedges” (predicate modifiers), which are subjective in nature (e.g., “trust”) (Zadeh 1972, 1975). Fuzzy logic uses assessment rules, which are created by the researcher and are transparent and thus readily understood and evaluated by other researchers (Zadeh 1973, 1976). Thus, other scholars can debate the appropriateness of both the rules and the method, contributing to a progressively greater understanding of the system and vital aspects of human action. From the application of the method to the rules, the researcher obtains a “crisp” value, which can be utilized within a computational environment such as a GIS or an analysis of a social network.

To conclude briefly, the First Global Age, 1400–1800, was a complex, dynamic, nonlinear world-system. Within this system, the nonlinear dynamics of the human and natural systems periodically disrupted commercial, political, and other social networks, and these disruptions included those caused by the expansion of opportunities and of the system itself. To maintain system stability, actors, both men and women, had to counter the disruptions by constituting more robust networks, but the resulting denser webs of connections permitted even more widespread future cascades of disturbances. In the later eighteenth century, such a cascade of innovation destabilized at least one of the system’s stability-maintaining “control” variables, which initiated a transition to a new world-system, the Second Global Age in which we now live. In their narration of revealing geographically integrated stories, historians of the First Global Age can combine, using Dynamics GIS, a dynamics approach to SNA with a complex systems analysis, and in doing so, they will offer a world historical account that addresses larger issues of system and network dynamics and provides a solution to the common criticism of world-system analysis that it ignores the relationships between the local and the larger system.

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