

## A GLOBALLY ORIENTED DEEP MAPPING OF BRAZIL

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### Abstract

When William Least Heat-Moon published his *PrairyErth (A Deep Map): An Epic History of the Tallgrass Prairie Country* (1991), on Chase County, Kansas, USA, he popularized the concept of “deep mapping.” Deep mapping explores the way that human individuals have interacted with each other, with elements of their built, institutional, and natural environments, and with the past and their memories continuously to create a place. Commentators often refer to this deep mapping as topographical or vertical, multi-layered travel writing, which can incorporate photographs and other images. This paper takes seriously the “deep map” metaphor.

We explain how geographic information systems (GIS) and related technologies can be used to create cartographic visualizations that significantly enhance intellectual and emotional understanding of human action and place in a critical historical period. Moreover, we will go beyond Heat-Moon’s deep map by varying the scale of ours to take account of the ways the history of a place is shaped by the way it connects to other places and the changes in these connections over time.

Following the travel convention, we center our deep map on the multi-year journey of the Englishman Henry Koster through northeastern Brazil in the period before independence in 1822. In doing so, our approach differs from standard multimedia GIS through its focus on narrative, that of Koster. We use GIS to fuse to our representation of Koster’s narrative the connections with other humans, events, and environments to form a more complex narrative. Practitioners normally use GIS as the foundation of analytical arguments. However, narratives are considered one of the unique and effective forms of knowledge and communication. They enhance the understanding of causality by relating it to time and place, highlight the exceptional, such as the emergence of new forms, and illuminate the factors producing innovation and entrepreneurship. A cartographic visualization of a narrative thus becomes an abstraction that substantially enhances the user’s understanding of the reality out of which Brazilian independence developed. This map incorporates photographs, music, video, narratives, and memoirs –accessible by clicking on features– thereby allowing

the map reader to connect spatial features of a location, such as churches and other buildings, with a cognitively oriented interpretation of space. Our mapping technique differs from a conventional GIS because it does not rely exclusively upon the examination of statistical data, information, and facts. To represent the relationships of actants, we will transition the current flat-table database to an ontology-based one with a revolutionary linking structure not found in any currently available commercial database scheme.

Our deep map of northeastern Brazil relates the spatial features of the major cities, such as Olinda and Recife, and other locations to Koster's own interpretive perspective on the landscape. This interpretation encompassed and was shaped by interactions with chattel slaves, many of them born in Africa, foreign groups, and native-born men and women of different economic conditions. Moreover, the ever-present social segregation based on ethnicity, race, and religion marked Koster's experiences and his account of them.

During a major phase transition in the global economy, northeastern Brazil attracted the attention of the world because of its wealth, built by sugar and cotton exports, and people from different countries gathered there. The multiple cultural environments created by these people shaped their interactions in ways that influenced Brazilian independence and world history. Despite the importance of the British and the region's plantation owners, church leaders, and urban mercantile elite to the process of Brazilian independence, researchers have paid too little attention to the complex processes that shaped the place and its people. Deep mapping will permit users of our cartographic representation to understand better, on various cognitive levels, the way that factors, such as the interests of the British and the Portuguese in Brazil and their relation to marginalized African slaves and Native Americans, influenced one another in multiple ways and functioned as "agents" of history. Brazilian leaders who favored independence felt that only by severing their land's relationship with a crown government based in Lisbon could their "nation" achieve its rightful position among the leading countries of the world. Our deep map will enhance users' quests to understand both the height of the leaders' aspirations and the local and global interactions that kept them from being realized, to the continued frustration of Brazilians.

## **INTRODUCTION**

When William Least Heat-Moon published his *PrairyErth (A Deep Map): An Epic History of the Tallgrass Prairie Country* (1991), on Chase County, Kansas, USA, he popularized the concept of "deep mapping." Deep mapping explores the way that human individuals have interacted with each other, with elements of their built, institutional, and natural environments, and with the past and their memories continuously to create a place. Commentators often refer to this deep mapping as topographical or vertical, multi-layered travel writing, which can incorporate

photographs and other images (Pearson and Shanks, 2001). We also make use of some aspects of the Actor-Network-Theory (ANT) of Bruno Latour (2005), although without accepting his assertion of any sort of balance among the actants in terms of their respective “weights” in their networked interactions. This paper takes seriously the “deep map” metaphor.

## **OBJECTIVES**

We will explain how geographic information systems (GIS) and related technologies can be used to create cartographic visualizations that significantly enhance intellectual and emotional understanding of human action and place in a critical historical period. Moreover, we will go beyond Heat-Moon’s deep map by varying the scale of ours to take account of the ways the history of a place is shaped by the way it connects to other places and the changes in these connections over time.

The project we describe is a component of an ongoing research collaboration as part of the European Science Foundation’s EUROCORES (European Collaborative Research) Scheme’s program “The Evolution of Cooperation and Trading” (on Owens’ project within TECT, see Crespo Solana and Owens, 2008; Owens, 2008). Owens seeks an understanding of how such a cooperation-based economy was possible. We are funded by award number SES-0740345 (\$394,000; 2007-2010) from the U.S. National Science Foundation.

During the period 1400-1800, after a major period of discontinuity in Afroeurasia in the fourteenth century, a world economy developed largely on the basis of connections created and maintained through high levels of cooperation among merchants and others. Ultimately, this first global age of human history passed through a period of discontinuity, bifurcation, and phase transition, roughly between 1750 and 1850, resulting in the new system of a second global age. Our deep mapping of northeastern Brazil explores what it was like to live in a well-connected place in the world economy during a period during which a system was collapsing and undergoing a profound and contested reorganization everywhere of both the social and cultural environments. Because the transformation was also an ontological one, people living in the second global age possess quite different values and perspectives on the world and, therefore, have a great deal of difficulty understanding the people and events of the earlier era. We feel that our project will assist users to grasp the connected processes through which their own time emerged and to understand better the people and communities of the first global age.

## **METHODOLOGY**

The project follows the geographically-integrated history paradigm (described in part in Owens, 2007), which posits that (1) the history of any place is shaped in significant ways by the way the place is connected to other places and by the changes in these connections over time (Bender, 2000; De Blij, 2009); (2) historical periods are complex, dynamic, nonlinear systems that are spatially large, and in more recent

centuries, global in extension, and such systems sometimes become unstable, leading to a phase transition, bifurcation, and the organization of new systems (Puu, 2003; Rosser, 2000); and (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, 2005; Watts, 2003).

Following Heat-Moon's travel convention, we center our deep map on the multi-year journey of the Englishman Henry Koster through northeastern Brazil in the period before independence in 1822 (Koster, 1817). In doing so, our approach differs from standard multimedia GIS through its focus on a narrative, that of Koster. We use GIS to fuse to our representation of Koster's narrative the connections with other humans, events, and environments to form a more complex narrative. Practitioners normally use GIS as the foundation of analytical arguments. However, narratives are considered one of the unique and effective forms of knowledge and communication. They enhance the understanding of causality by relating it to time and place, highlight the exceptional, such as the emergence of new forms, and illuminate the factors producing innovation and entrepreneurship (Anderson and Goolishian, 1988; Bruner, 1985; Geertz, 1973; Hexter, 1971; Hunter, 1991; Launer, 2002). Historians normally write articles and books, which constitute abstractions of reality that are judged on the basis of their fidelity to the sources of information and on the degree to which they enhance the user's understanding of a past reality that cannot be experienced directly. As historians, we employ a cartographic visualization of a narrative as an abstraction in order to enhance substantially the user's understanding of the reality out of which Brazilian independence developed (Staley, 2003).

Koster's account provides us with a narrative onto which the author connects his interpretations of what he saw. To represent cartographically Koster's journey and to provide a framework to which we can attach both his comments and other "documents" to enhance understanding of the place he was trying to comprehend and communicate to his readers, we have first created a digital gazetteer of the places he mentioned. When completed, we will publish this gazetteer as a web document so that it will be available to other researchers interested in Brazilian historical geography. Of course, it is difficult to provide reliable geographic coordinates for many of these spots, either because the built environment has been subsequently transformed or because the geographic feature is vaguely delimited in the surviving sources (Hill, 2006: 28-29). In the Geographically-Integrated History (GIH) Lab, we are currently developing fuzzy rule-based modeling algorithms (Smithson and Verkuilen, 2006; Zadeh, 1997) for determining coordinates for these unknown places and the degree of uncertainty involved. It may become possible to automate some of this process. We are currently exploring digitally available historic cartography of the region and other accounts (De Laet, 2007 [1637]; Lindley, 1805) to add locations to the gazetteer and to increase confidence in the precision of the geographic coordinates we use.

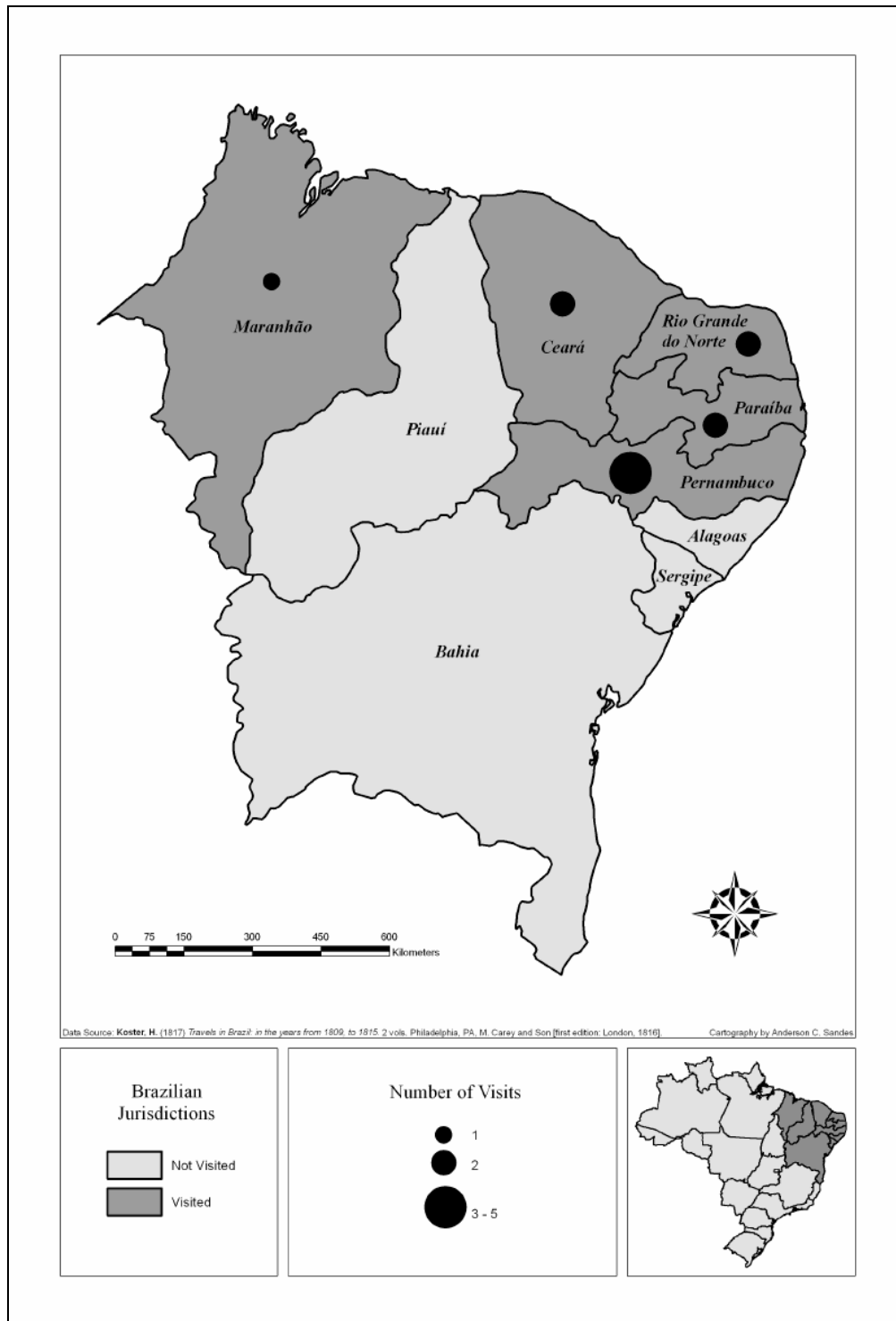


Figure 1. Visits by Henry Koster in Brazilian Jurisdictions between 1809 and 1813.

We are now identifying other material that can be attached to features to enrich the context for evaluating Koster's travel narrative and his reactions. Because the meaning of Koster's account and the geographic features we represent cartographically for the user will be shaped by the way the account is connected to other entities, including aspects of the user's personal experiences and knowledge of subsequent history, we will link photographs, music, video, narratives, and memoirs – accessible by clicking on features– thereby allowing the map “reader” to develop a personal, complex, cognitively oriented sense of place. Clearly, our mapping technique differs from a conventional GIS because it does not rely exclusively upon the examination of statistical data, information, and facts.

Because it is difficult to connect effectively so many actants within a standard flat-table database, especially if a temporal component is involved, the GIH Lab is developing an ontology-based data model, or rather several such models to incorporate the potentially different ontologies of the people of northeastern Brazil and of the peoples to whom the region was connected. These often quite different regional sub-systems were linked and crossed by multiple self-organizing social networks, such as those within which Koster's activities were embedded, which frequently connected with each other in irregular patterns. The fluid nature of self-identity made possible the participation of an individual in multiple networks (Ikegami, 2005; White, 1992. For the relevant historical networks, see Florentino, 2006; Schulte Beerbühl and Vögele, 2004). Because these networks were the major source of innovation and the emergence of new forms, and ultimately of system instability, discontinuity, and bifurcation, they are the principal focus of narrative construction. The meaning of any one of the ontological concepts when applied to a particular unit of time depends on its connections to the other concepts. Thus, ontological research will underpin the development of dynamics GIS (Yuan, 2008; Yuan and Stewart Hornsby, 2008), the means to represent and link complicated entities within databases, and the elaboration of multifaceted historical narratives for knowledge creation.

Following the approach of Actor-Network-Theory (ANT), the resulting deep map of northeastern Brazil will go beyond the content of most social network analysis. The map will emerge as the product of more direct networked interactions between human actors and elements of their built, human manipulated, and natural environments, as well as their interactions with cultural products such as the visual arts and music. In establishing so directly these networked interactions and in employing ANT, our deep map will go beyond the development of the deep map genre by Heat-Moon. Our approach also goes beyond most uses of ANT through the weighting of the “edges” of the connections in the networks through the use of more complicated graphs (Bornholdt and Schuster, 2003; Chartrand and Lesniak, 2005) and a greater recognition of the dynamic nature of the networks.

To facilitate flexible connections within the database by introducing more dynamic connectivity and to permit the creation of more complicated entities, such as weighted graphs, we will transition the current database structure to the Intentionally-Linked-Entities (ILE) model under development by GIH Lab partner Vitit Kantabutra (2007, 2009). Once the data and concepts are organized in this way, a user of our deep map will be able to follow any direction he or she chooses to create an intellectual and emotional context for enhancing understanding. To tie such an ontology-based data model and linked data structure to GIS, the GIH Lab will modify appropriately the open-source *MapWindow* GIS ([www.mapwindow.org](http://www.mapwindow.org); Watry and Ames, 2007).

For example, our deep map of northeastern Brazil relates the spatial features of the major cities, such as Olinda and Recife, and other locations to Koster's own perception of the landscape based on the interpretive schemes he employed. This interpretation encompassed and was shaped by interactions with chattel slaves, many of them born in Africa, foreign groups, and native-born men and women of different economic conditions. Moreover, the ever-present social segregation based on ethnicity, race, and religion marked Koster's experiences and his account of them. In some respects, Brazil is one of the largest African countries in the world. Koster was concerned about chattel slavery, its impact on Pernambuco and the other areas he visited, and its implications for a world economy in which his native Britain was increasingly asserting its centrality. A user of the deep map might wish to explore the slave trade (only ended in 1850) and slavery (only ended in 1888) in relation to multiple political and cultural processes that extended beyond Koster's account back in time to the seventeenth-century Dutch invasion and their subsequent defeat after several decades of occupation, a major aspect of Brazilian historical imagination, through independence (1822), the end of the monarchy (1889), to the contemporary marginalization and misery of so many descendants in modern Pernambuco of slaves with whom Koster interacted. We want the deep map to possess the flexibility and extendability to allow it to be built into an entity that users can use for explorations not foreseen by the initial creators.

In September 2008, we heard a presentation by William Cartwright (2008) on his concept of the "affective map." As historians who use the deep map concept to present information about a particular period of Brazilian history in order to increase the user's cognitive and emotional understanding of a troubling transitional era, we do not propose surrendering this project's organization and cartographic visualization. However, from Cartwright we have adopted the addition of a blog, which will allow users of each link to record their reactions to the content at that point. We feel that by recording and preserving these comments, the understanding of later users will be enhanced by reading how others have responded to Koster's experiences and perspective and to the perspectives of others who lived the same history in the same place, whose information we provide to contrast and confront Koster's narrative.

Idaho State University's master's program in Historical Resources Management (in

which Sandes is a student) is an internship-oriented program, and Sandes will do his internship in May-June 2010 with a cultural institution in northeastern Brazil, most likely in the State of Pernambuco. The deep mapping project will constitute the foundation of this internship. He will identify and integrate the holdings of regional institutions into the deep map, and he will shape it into a more interactive work, either for museum use or as a web application.

Finally, we will shape the Koster deep map so that it can serve as the foundation of an infrastructure project to provide a historical GIS for northeastern Brazil as a model for similar linked projects throughout Brazil and South America. The models we have in mind are the China Historical GIS ([/www.fas.harvard.edu/~chgis/](http://www.fas.harvard.edu/~chgis/)) and the Great Britain Historical GIS ([www.gbhgis.org/](http://www.gbhgis.org/)) and its related Vision of Britain web site ([www.visionofbritain.org.uk/](http://www.visionofbritain.org.uk/)). Given the limited availability of historic maps of northeastern Brazil, we believe the project will serve to encourage the development of a historic Web Map Server on the model of the European DIGMAP project ([portal.digmap.eu/](http://portal.digmap.eu/)).

## CONCLUSION

During a major phase transition in the global economy, northeastern Brazil attracted the attention of the world because of its wealth, built by sugar and cotton exports, and people from different countries gathered there. The multiple cultural environments created by these people shaped their interactions in ways that influenced Brazilian independence and world history. Despite the importance of the British and the region's plantation owners, church leaders, and urban mercantile elite to the process of Brazilian independence, researchers have paid too little attention to the complex processes that shaped the place and its people. Deep mapping will permit users of our cartographic representation to understand better, on various cognitive levels, the way that factors, such as the interests of the British and the Portuguese in Brazil and their relation to marginalized African slaves and Native Americans, influenced one another in multiple ways and functioned as "agents" of history. Brazilian leaders who favored independence felt that only by severing their land's relationship with a crown government based in Lisbon could their "nation" achieve its rightful position among the leading countries of the world. Our deep map will enhance users' quests to understand both the height of the leaders' aspirations and the local and global interactions that kept them from being realized, to the continued frustration of Brazilians.

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