Chapter 1
Beyond GIS: Geospatial Technologies and the Future of History

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1.1 The Spatial Turn

Academic disciplines periodically undergo reorientation as core themes shift to re-direct research and focus attention on new questions or reexamine traditional problems from new perspectives. In the humanities and social sciences, a recent line of inquiry has focused on space, prompting scholars of society and culture to talk about a spatial turn within their disciplines.[1] Even a cursory review of literature reveals the influence of this new direction. Subject matter, once organized largely as periods and eras, increasingly is ordered under spatial themes, such as region, diaspora, contact zones, and borders or boundaries, among others. This shift has been accompanied by and reinforced through an equivalent concern with material culture, built and natural environment, and other markers of space and place.

It is not the first time that attention to space and time has reshaped the way we approach social and cultural questions. A similar turn occurred from 1880 to 1920 when a series of sweeping technological changes created new ways of thinking about time and space. Distance-collapsing innovations—the telephone, wireless telegraph, radio, cinema, automobiles, and airplanes, among others—challenged traditional understandings of how time and space intersected with the social world. It suddenly was possible to know events as they occurred, and this experience of simultaneity refashioned people's sense of distance and direction. It also meant that individuals were no longer cut off from the flow of time; widely available film and photographic images made the past as accessible as the present, while new developments in science and the world fairs that showcased them made the future

[1] A number of recent titles explore this spatial turn in the humanities, including Bodenhamer et al. (2010), Dear et al. (2011), and Daniels et al. (2011). Also see Doorn (2005).

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seem more definite and real. New scientific theories, business practices, and cultural forms reinforced the shift: Einstein's theory of relativity and Freud's conception of psychoanalysis shaped consciousness directly; time-management studies, such as Taylorism, dominated manufacturing; and James Joyce and Marcel Proust explored how to link time and space in novels, while the Cubists challenged notions of spatial perspective and form that had long dominated art.[2]

A continuous thread links the first spatial turn with the one we have experienced more recently, but it is likely that this second turn will have a more profound influence on the theory and practice of history and the humanities. The early twentieth-century conceptions of space and time had less effect on the study of the past than it did on art and literature. Frederick Jackson Turner's frontier thesis and its emphasis on the development of the American West and the history it spawned were exceptions, as was the decade-long work of the Annales movement[3]; both schools reflected an intentional focus on questions of space and time. But the cataclysms of the mid-twentieth century, from world wars and revolutions to mass movements for equality, ultimately spurred historians to search for the roots of momentous events in ideas and politics and technological or social change, causes for which spatial markers were less pronounced. The considerations for space did not disappear, but they became marked by particularity, an emphasis on place, as scholars began to discern how the story of change differed from one location to another. The focus on place reflected and reinforced a postmodernist unease with the grand narrative, which created a literature that increasingly became fragmented, with analyses existing at different geographical and temporal scales and few efforts made to link them. For many humanists, space itself became less geographical and more metaphorical, as scholars found richer meaning in conceptual space—for instance, gendered space, racialized space, or the body as space—than in categories related to the physical environment, the traditional frame of definition for spatial terms.[4]

Today, historians and other humanists are acutely aware of the social and political construction of space and its particular expression as place. Spaces are not simply the setting for historical action but are a significant product and determinant of change. They are not passive settings but the medium for the development of culture: "space is not an empty dimension along which social groupings become structured," sociologist Anthony Giddens notes, "but has to be considered in terms of its involvement in the constitution of systems of interaction" (Giddens 1984, 364). All spaces contain embedded stories based on what has happened there. These stories are both individual and collective, and each of them links geography (space) and history (time). More important, they all reflect the values and cultural codes present in the various political and social arrangements that provide structure to society. In this sense, then, the meaning of space, especially as place or landscape, is always being constructed through the various contests that occur over power.

[2]For more on this earlier spatial turn, see Kern (1983).

[3]See the interview with Emmanuel Le Roy Ladurie in this book to learn more about the *Annales*.

[4]Cresswell (2004) offers a good brief introduction to the postmodern construction of place. Also see Haulttunen (2006), Biernacki and Jordan (2002).

There is nothing new in this development—the earliest maps reveal the power arrangements of past societies—but humanities scholarship increasingly reflects what may in fact, by the greatest legacy of postmodernism, the acknowledgment that our understanding of the world itself is socially constructed.[5]

At its core, the spatial turn rejects the universal truths, grand narratives, and structural explanations that dominated the social sciences and the humanities during much of last century. Above all, it is about the particular and the local, without any supposition that one form of culture is better than another. Its claim is straightforward: To understand human society and culture, we must understand how it developed in certain circumstances and in certain times and at certain places. From this knowledge, we can appreciate that the world is not flat but incredibly complicated and diverse. This view no longer seems new because humanists have embraced it eagerly; now we all recognize the particularity of space, the importance of place. But for all the uses we make of this insight—and for all its explanatory power—the concepts of space and place employed by historians frequently are metaphorical and not geographical. Far less often have we grappled with how the physical world has shaped us or how in turn we have shaped perceptions of our material environment.

1.2 GIS and History

New spatial technologies, especially geographic information systems (GIS), are now facilitating a (re)discovery of geographical space in history and the other humanities. At its core, GIS is a powerful software that uses location to integrate and visualize information. Within a GIS, users can discover relationships that make a complex world more immediately understandable by visually detecting spatial patterns that remain hidden in texts and tables. Maps have served this function for a long time, but GIS brings impressive computing power to this task. Its core strength is its ability to integrate, analyze, and make visual a vast array of data from different formats, all by virtue of their shared geography. This capability has attracted considerable interest from historians, archaeologists, linguists, students of material culture, and others who are interested in place, dense coil of memory, artifact, and experience that exists in a particular space, as well as in the coincidence and movements of people, goods, and ideas that have occurred across time in spaces large and small. Recent years have witnessed a wide-ranging, if still limited, application of GIS to historical and cultural questions: Did the Dust Bowl of the 1920s and 1930s result from over-farming the land or was it primarily the consequence of larger term environmental changes? What influence did the rapidly changing cityscape of London have on literature in Elizabethan England? What is the relationship between

[5]Michel de Certeau reminds us that "space occurs as the effect produced by the operations that orient it, situate it, temporalize it, and make it function as a polyvalent unity of conflictual programs or contractual proximities." And stories are the constructive means we use to transform spaces into places or places into spaces. See de Certeau (1984, 117–118).

rulers and territory in the checkered political landscape of state formation in the nineteenth-century Germany? How did spatial networks influence the administrative geography of medieval China? What spatial influences shaped the development of the transcontinental railroad in the United States? Increasingly, scholars have turned to GIS to provide new perspective on these and other topics that previously have been studied outside of an explicitly spatial framework.[6]

Despite this flurry of interest and activity, most uses to date of GIS in historical and cultural studies have been disparate, application driven, and often tied to the somewhat its more obvious role in census boundary delineation and map making. While not seeking to minimize the importance of such work, these studies have rarely addressed the broader, more fundamental issues that surround the introduction of a spatial technology such as GIS into the humanities. There are core reasons why GIS has found early use and ready acceptance in the sciences and social sciences rather than in the more qualitatively based humanities. The humanities pose far greater epistemological and ontological issues that challenge the technology in a number of ways, from the imprecision and uncertainty of data to concepts of relative space, the use of time as an organizing principle, and the mutually constitutive relationship between time and space. Essentially, GIS and its related technologies currently allow users to determine a geometry of space. In the context of the humanities, it will be necessary to move GIS from this more limited quantitative representation of space to facilitate an understanding of place within time and the role that place occupies in humanities disciplines.

In their essence, historians seek to generalize from the particular, not for the purpose of finding universal laws but rather to glean insights about cause and effect from a known outcome. Here, the humanities differ from much of social science, which attempts to reach a generalization that holds true in any similar circumstance. This difference is significant and influences the way the two groups of scholars create knowledge. For many social scientists, the search for trustworthy generalization focuses on the isolation of an independent variable, the cause that has a predictable effect on dependent variables or ones that respond to the stimulus or presence of a catalyst. They believe it is possible to discover such a variable, given sufficient resources, because the world is not yet lost to them. Historians must contend with fragmentary evidence and are painfully aware that the past is incomplete and irretrievable. They also are skeptical of prediction. The past cannot be changed, even if its interpretation as history is continually in flux, but in it the intersection of patterns and singular events can be discovered. Not so the future, where continuities and contingencies coexist independently of one another.

Historians view reality as weblike, to use philosopher Michael Oakeshott's phrase, because they see everything as related in some way to everything else.

[6]See Knowles (2008a) for a good sample of the application of GIS to various topics in the humanities. Also see the special issue of *The International Journal of Humanities and Arts Computing*, vol 3, no. 1–2, 2009, which is devoted to the use of GIS in a number of humanities disciplines.

Interdependency is the lingua franca of the humanities, and most recently, it has become embodied in practice theory, or in the view of one of its leading proponents, historian William Sewell, "social life may be conceptualized as being composed of countless happenings or encounters in which persons or groups of persons engage in social action." In this view, societies and social systems are "continually shaped and reshaped by the creativity and stubbornness of their human creators" (Sewell 2005, 110–111). Another historian, Ed Ayers, has labeled this concept "deep contingency," an effort to understand society as a whole with "all structures put into motion and motion put into structures" (Ayers 2010, 7).[7]

The goal of historical scholarship is not to model or replicate the past; a model implies the working out of dependent and independent variables for purposes of prediction, whereas replication suggests the ability to know the past and its cultural forms more completely than most humanists would acknowledge is possible. Humanists practice an extractive scholarship: they have the capacity for selectivity and shifting perspectives in the pursuit of the fullest possible understanding of heritage and culture. Traditionally, humanities scholars have used narrative to construct the portrait that furthers this objective. Narrative encourages the interweaving of evidentiary threads and permits the scholar to qualify, highlight, or subdue any thread or set of them—to use emphasis, nuance, and other literary devices to achieve the complex construction of past worlds. All of these elements—interdependency, narrative, and nuance, among others—predispose the humanists to look askance at any method or tool that appears to reduce complex events to simple schemes. An insistence on precision does not fit the worldview of humanities scholars; indeed, these disciplines appear at times to embrace an uncertainty principle—the more precisely you measure one variable, the less precise are other variables.

It is no accident that historians have embraced eclectic methods as fervently as they resist anything that smacks of reductionism. Questions drive historical scholarship, not hypotheses, and the questions that matter most address causation: "why" matters more than "whom," "what," or "when," even though these latter questions are neither trivial nor easy to answer. The research goal is not to eliminate explanations or to disprove the hypothesis but to open the inquiry through whatever means are available and by whatever evidence may be found. This sense of eclectic borrowing has long informed humanities scholarship and even finds strong advocates among some of the most well-known theorists in the humanities, hence the advice offered by Paul de Mans to the Irvine Critical Literature department about its mission to develop "a new kind of skill [...] the capacity to use and feel at home in a whole series of different critical and theoretical codes and systems, as one would use a particular foreign language, without remaining rigidly locked into any one of them, but rather developing the capacity to translate those findings into different codes, systems, critical positions, as the case may require."[8]

[7] See also Ayers et al.'s contribution in this book.

[8] http://chronicle.com/blogPost/how-theory-damaged-the-humanities/6178, last accessed 27 Oct 2011.

A well-presented argument often does not settle a question; it may complicate it or open new questions that previously were unimagined. Similarly, historians are hard-pressed to identify a preferred method because each avenue of investigation yields different evidence and thus different insights. Historians revisit evidence as they discover new data. Their approach is recursive, not linear: The goal is not so much to eliminate answers as to admit new perspectives. These methods doubtless appear quixotic to non-humanists because they do not lead to finality. But for humanists, the goal is not proof but meaning. The challenge, then, is to use geospatial technologies to probe, explore, challenge, and complicate—in sum, to allow us to see, experience, and understand human behavior in all its complexity and to view its deep contingency. As in traditional humanities scholarship, the aim is less to produce an authoritative or ultimate answer than to prompt new questions, develop new perspectives, and advance new arguments or interpretations.

Seeking to fuse GIS with history and the humanities is challenging in the extreme. Latent tension, if not direct conflict, exists in linking a positivist technology with predominantly humanist traditions. The epistemological clash is most apparent in the emphasis within traditional GIS on quantitative data, precise measurement, coordinate systems, and spatial models. Categorizing geographic complexity into entities, fields, objects, attributes, and geometric topology contrasts starkly with the humanities emphasis on ambiguity, complexity, nuance, and plurality. The scientific method that underpins GIS with its computational demands for accuracy and precision, a Euclidian coordinate space, and its algorithmic emphasis on generalization and reductionism stands in sharp relief with the humanist emphasis on the individual and the unique, on contingency and emergent realities, and on narrative as a way to weave the complex threads of space, time, and artifact. It is misleading to speak simply of a qualitative-oriented humanism and a quantitative GIS, yet it also is evident that sharp differences exist between the conceptual mapping of the humanities and the cartographic mapping of GIS. At its core, GIS privileges disambiguation in its organization of knowledge, whereas the humanities treat knowledge as multivalent, equivocal, and protean.

Data and the representations of phenomena, then, are singular factors that challenge the fusion of GIS with the humanities. Yet the GIS abstractions of space, nature, and society, while posing substantial problems, are particularly relevant in the humanities where notions and representations of place, rather than those of space, are primary. To this end, GIScientists have made recent advances in spatial multimedia, in GIS-enabled web services, geovisualization, cybergeography, exploratory spatial data analysis, and virtual reality that provide capabilities far exceeding the abilities of GIS on its own. Together, these technologies have the potential to revolutionize the role of place in the humanities by moving beyond the two-dimensional map to explore dynamic representations and interactive systems that will prompt an experiential, as well as rational, knowledge base.

This notion of a richer, dynamic, and experiential GIS resonates with the evocative and thick descriptions of place and time that humanists have long favored in their scholarship. Even mapping itself comports well with the aims and methods of humanists. Representation of the past, suggests historian John Lewis Gaddis, is

a kind of mapping where the past is a landscape and history is the way we fashion it. The metaphor, one consistent with disciplinary traditions across the humanities, makes the link between "pattern recognition as the primary form of human perception and the fact that all history [...] draws upon the recognition of such patterns" (Gaddis 2002, 33). In this sense, mapping is not cartographic but conceptual. It permits varying levels of detail, not just as a reflection of scale but also of what is known at the time. Like the map, history becomes better and more accurate as we continue to accumulate more detail, observe its patterns, and refine our knowledge.

Significantly, the discipline that provided the home for much GIS development and application, geography, found itself divided over the technology in ways that mimicked the concerns expressed by humanists about quantitative methods generally. The central issue was, at heart, epistemological: GIS privileges a certain way of knowing the world, one that values authority, definition, and certainty over complexity, ambiguity, multiplicity, and contingency, the very things that engaged humanists. From this internal debate came efforts to reposition GIS as GIScience, a shift that corresponded with other efforts to embody the technology with a theoretical framework that it previously lacked. This intellectual restructuring pushed the technology in new directions that were more suitable to the humanities.[9]

Ultimately, what will compel attention from historians and other humanities scholars are the broader ontological and epistemological issues of geographic information science (GISci) and not GIS as a method and technique. The juncture of GISci with the humanities generates a more fertile and intellectually rewarding basis for conceptualizing and representing space than does the spatial tool kit of GIS. GIS is not a panacea for the humanities; its appropriate use demands good judgment and a broader knowledge of the production of space than the simple application of a technology can provide. The spatial turn in the humanities must be more than method: it must understand the role of space in human events. To that end, the spatial humanities need to embrace more than geospatial technologies but also geographical concepts of space.

There are more methods and approaches available to scholars to explore the spatial humanities than the very heavy emphasis on off-the-shelf-software packages provided by GIS vendors. To date, the spatial turn in the humanities is predominantly a GIS-enabled rediscovery of the power of the map, yet many historians have used the 2D format and defaults provided by the software even though these methods, in addition to being cartographically uninformed, flatten the world the humanist seeks to understand. Better suited to the humanities is the related field of geovisualization, ranging from dynamic maps to virtual reality and cybergeography. It offers insightful new ways of seeing and understanding spatial relationships. It also provides significant potential for integrating qualitative data in the form of images and text, the primary evidence used by historians. Virtual GIS combines the elements of virtual reality and serious gaming, with the

[9]Natalie Schuurman relates this development in Schuurman (2004, 21–52); also see Sheppard (2005).

spatial analytic and data-handling capability of GIS to provide an immersive and experiential environment that mimics what historians often seek in their written descriptions of the past. These innovative geovisualization methods, and the spatial analysis they embody, not only avoid the subject-object paradigm embedded in traditional mapping, but they also provide a more powerful framework for using all the available evidence and not simply data in its quantitative form.[10]

Within the field of cultural heritage, archaeologists have used GIS and computer animations to reconstruct the Roman Forum, for example, creating a 3-D world that allows users to walk through buildings that no longer exist, except as ruins. We can experience these spaces at various times of the day and seasons of the year. We see more clearly a structure's mass and how it clustered with other forms to mold a dense urban space. In this virtual environment, we gain an immediate, intuitive feel for proximity and power. This constructed memory of a lost space helps us recapture a sense of place that informs and enriches our understanding of ancient Rome (Digital Roman Forum Project).[11] A similar, although more ambitious, project uses laser-scanning technology (LiDAR, Light Detection and Ranging) to create 3-D models of major heritage sites and allows scholars and others to roam this virtual environment at will.[12] In similar fashion, historians and material culturists have joined with archeologists to fashion Virtual Jamestown.[13] This project, in turn, is seedbed for an even more ambitious attempt to push the technology toward the humanities by placing Jamestown at one vertex of Atlantic world encounters. Its goal is to repopulate a virtual world with the sense of possibilities embedded in the past, what Paul Carter has called "intentional history" (Carter 1987, 3). Viewed within the spatial context for their actions, which includes the presence of proximate cultures, whether indigenous tribes, Spanish, Africans, or Dutch, we then can understand better how contingencies became lost as they butted against the encountered realities within the space the English claimed in 1607.

Historians often fail to see the potential of these approaches for addressing scholarly problems, viewing them instead as mere reconstructions or as artificial environments far removed from the world of causation and argument. What we fail to realize is how much even simple virtual geographic environments can prompt the sympathetic imagination that is at the core of good scholarship. Consider Gettysburg, the most-studied battle of the American Civil War. Historians have used a wide array of evidence to provide minute-by-minute descriptions of the battle yet often have failed to analyze carefully what the generals actually could

[10] A good brief introduction to the various forms of virtual geographic environments—3D models and 2.5D extruded surfaces, computer animations, interactive models, virtual globes, online virtual worlds, games, and semi- or fully immersive virtual reality—can be found in Priestnall et al. (2012).

[11] http://dlib.etc.ucla.edu/projects/Forum/, last accessed on 1 Aug 2008

[12] http://www.ted.com/talks/ben_kacyra_ancient_wonders_captured_in_3d.html, last accessed 3 Jan 2012

[13] http://www.virtualjamestown.org, last accessed on 14 Aug 2008

see (as opposed to what they reported as seeing), even though visual awareness and visual reconnaissance were essential elements in nineteenth-century warfare. A GIS-facilitated reconstruction of the battleground provided clarity on the sightlines and viewsheds enjoyed by commanders, thereby enhancing but not upsetting traditional interpretations. More importantly, the virtual environment raised new questions about issues ranging from military decisions to the emotional and psychological experiences of battle, which now could be seen and understood within the geographical environment in which they occurred (cf. Knowles 2008b). Virtual environments are only one way that GIScience is moving us beyond conventional uses of GIS and mere mapping. The Geospatial Web also holds considerable potential for the spatial humanities to automate the identification and mapping of people, events, places, and spatial relationships from textual resources. Similarly, the ability to transform unstructured text into structured maps through computational text and data mining, semantic synthesis, geoparsing, place-name matching using natural language processing and digital gazetteers, and georeferencing methods promises to be a major contribution to the armory of tools available to the spatial humanities. Spatialization techniques such as self-organizing maps and text clouds identify clusters in text documents that share similar characteristics in metaphorical space and not just geographical space. Text-to-map transformations reflect both absolute and relative space by extracting spatial relationships embedded in text and then using this information to go beyond the strict cartographic map making that dominates current humanities use of GIS (cf. Harris et al. 2010).

These developments from GIScience are important because they quickly are moving us beyond the constraints of a technology illsuited for much humanities research. The same cannot be said with as much assurance about time, which has long been the central lens through which historians view change. The spatial and temporal turns (the New Historicism) go together, and it is unwise to separate the two or prioritize one over the other. GIS has struggled to adequately handle the complexities of these spatiotemporal needs, with the result that the software emphasizes space and treats time as categorical and discontinuous. But the spatial humanities require both time and space: to speak of history as dealing with time and geography with space is too simplistic a divide. Doreen Massey's idea of exploring multiple trajectories through space and time[14] is much more suited to humanities research, but GIS struggles to provide an environment in which this integrated space-time can be explored profitably. The value of animated maps has been acknowledged in helping to understand movement as a basic characteristic of human existence, but, as with text mining, the humanities pose significant challenges to the GIS community to develop components linked specifically to their needs.

For historians and humanists generally, place is more important than space. Although place and place-making are part of the spatial in all social science and humanities disciplines, the highly structured database schemas of GIS cannot

[14]Massey (2005, 9–15) and Massey (1999). A useful discussion also may be found in Peuquet (2002).

accommodate easily, if at all, the contested dynamics of place. The technology cannot speak to the contingent nature of cultural processes or to the agents of change and transformation, nor does it handle the humanities scholar's penchant for dismembering, rethinking, and recombining. GIS also has difficulties managing deep contingency, the notion that all social life is implicated and unpredictable, nor is it good at thick description, the heavily layered ethnography that represents an effort to capture the complicated realities of social life. These methods probe the deeply fused connections of time and space that link the public, private, economic, social, political, religious, and civil realms at various scales and discover how structural transformation at one scale often results in a rupture of social processes at other scales. The focus here is less on causation than on interpreting the consequences and the resonances of events as evidenced through the intersection of place, time, and action. This deeply layered interpretive history draws heavily on space and place as an organizing framework to understand the world, yet it challenges GIS as to how this might be achieved.

1.3 The Spatial Humanities: Spatial Narratives and Deep Maps

Central to the emergence of the spatial humanities is a trust that the contingent, unpredictable, and ironic in history and culture can be embodied within a narrative context that incorporates space alongside of time. For the humanities—and for social scientists who are influenced by the humanities—it is above all the thick weave of events, locations, behaviors, and motivations that make human experience of space into place. Place is the product of deep contingency and of the human effort to render that experience meaningful in language, art, ritual, and in other ways. Place is constructed out of the imagination as much as through what is visible and tangible in experience. Humanists, social scientists, and geographers, and all who are interested in seeing a spatial humanities mature, should plan for increasingly more complex maps (using the term broadly) of the personalities, emotions, values, and poetics, the visible and invisible aspects of a place. The spatial considerations remain the same, which is to say that geographic location, boundary, and landscape remain crucial, whether we are investigating a continental landmass or a lecture hall. What must be added is a spatial narrative that acknowledges how engaged human agents build spatially framed identities and aspirations out of imagination and memory that complement the verbal narrative traditionally employed by humanists.

At its core, a spatial narrative focuses on spatial patterns as a means of understanding social interaction. It is a geography of the constant interaction between structure and process, a continuous interplay between society and the individual and/or group within a spatial environment that both shapes and is shaped by social norms and individual or group agency. As a construct within the humanities, this narrative also must accommodate time and contingency; the social interactions

influenced by and influencing space represent, in fact, a web of choices, and the narrative becomes a braided thread (or multiple threads) of those choices over time. But the real question is not the definition of a spatial narrative—and these definitions are as numerous as they are abstract—but how to tap digital and spatial technologies to move narrative beyond the linear constraints of written language and disciplinary argument into a more fluid and reflexive process in which we can see and experience interaction as a way of understanding it more fully. If the current scholarly interest in networks is understood as an initial foray into the analysis of important interactions, the spatial narrative can be envisioned as a much richer and complex presentation, one that is geared to the analysis of vast data sets and undertaken in such a way as to maximize experimentation with evidence of contingency, contradiction, and oscillation in interactions over time.

Here is where the deep map becomes important. Stemming from the affective stance of unitary urbanism and psychogeography associated with the Situationists International in 1950s France, the approach "attempts to record and represent the grain and patina of place through juxtapositions and interpenetrations of the historical and the contemporary, the political and the poetic, the discursive and the sensual [...]" (Pearson and Shanks 2001, 64–65).[15] The idea of deep mapping has a counterpart in geography in the work of Yi Fu Tuan's *Topophilia* (Tuan 1974), who proposed exploring the connectedness and ties between human emotion and the physical fabric of landscape. As a new creative space, deep maps have several qualities well suited to a fresh conceptualization of GIS and other spatial technologies as they are applied to the humanities. They are meant to be visual, time-based, and structurally open. They are genuinely multimedia and multilayered. They do not seek authority or objectivity but involve negotiation between insiders and outsiders, experts and contributors, over what is represented and how. Framed as a conversation and not a statement, deep maps are inherently unstable, continually unfolding and changing in response to new data, new perspectives, and new insights.

The analogue between a deep map and advanced spatial technologies seems evident. Traditional geographic information systems operate as a series of layers, each representing a different theme and tied to a specific location on planet Earth. These layers are transparent, although the user can make any layer or combination of layers opaque while leaving others visible. A deep map of heritage and culture, centered on memory and place, ideally would work in a similar fashion. The layers of a deep map need not be restricted to a known or discoverable documentary record but could be opened, wiki-like, to anyone with a memory or artifact to contribute. However structured, these layers would operate as do other layers within a GIS, viewed individually or collectively as a whole or within groups, but all tied to time and space, which provide perspectives on the places that interest us. It is an open, visual, and experiential space, immersing users in a virtual world in which uncertainty, ambiguity, and contingency are everpresent, but all are capable of being braided into a narrative that reveals the ways in which space and time influences and

[15] Also see Bodenhamer (2008).

is influenced by social interaction. This space is one in which both horizontal and vertical movement is possible, with the horizontal providing the linear progression we associate with rational argument and vertical movement providing the depth, texture, tension, and resonance of experience.[16]

The concepts of deep contingency and deep mapping go beyond traditional uses of GIS and point to new realms for pursuing phenomenology and for representing emotion and experience within geospatial technologies. They seek to capture the essence of place and a humanistic sense of distance, direction, and identity. Deep mapping moves the user from the GIS world of observation to one of habitation where the material world is experienced through our own embodiment and sense of "being in the world." Nonrepresentational theory and the concepts of deep contingency, deep mapping, taskscapes and affordances, and thick description enable scholars to engage the material world rather than observe it and interrelate theories of practice and agency and how people both create their material world and, in turn, are created by it. This linking of critical geographies, postmodern humanities, and GIScience creates a fresh conceptualization of a humanities-friendly GIS.

What is required ultimately is not simply the integration of GIS into the spatial humanities but of geography and geographical concepts as well. When this occurs—and the increasingly rich conceptual frameworks and tool kits of Web 2.0 and 3.0 suggest the time is not distant—we will fulfill the promise of a spatial humanities that draws on a GIS-enabled fusion of qualitative and quantitative data, that focuses on both space and place, that acknowledges the reality of space-time, that is multi-scalar and dynamic, and that enables the dense layering and deep mapping of place. Grounded in experiential as well as objective space, it will provide a representation of society and culture, past and present, with all its rich contradictions and complexities. It will, above all, be a conceptual and technological framework that is sensitive to the needs of historians and humanities scholars.

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