

PLACING HISTORY

**How Maps, Spatial Data, and GIS Are
Changing Historical Scholarship**

*Edited by Anne Kelly Knowles
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HISTORY AND GIS: IMPLICATIONS FOR THE DISCIPLINE

David J. Bodenhamer

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“Historians begin by looking backward; they often end by thinking backward.”¹ So claimed Friedrich Nietzsche after surveying the amateur scholars of his day. Modern critics reach similar conclusions when considering the slow dawning of new technologies within the discipline: Many historians are still using the tools and methods of earlier, pre-chip generations. Computers may be ubiquitous in history offices, but they serve primarily as communication, writing, and search devices. Despite a flurry of interest in quantitative history in the 1960s and 1970s, historians as a group have remained more comfortable with manuscripts than databases. It comes as no surprise, therefore, to discover that most members of the profession lack any meaningful acquaintance with geographic information systems (GIS), much less possess sufficient knowledge to judge the technology’s usefulness to historical scholarship.²

Even when historians know about GIS, few rush to embrace it, much to the puzzlement of its advocates. The technology is complicated, costly, and at times cumbersome, but its ability to integrate multiple phenomena occurring with a given geography and to visualize results as maps makes its rarity in historical research even more curious. After all, history is about time and space, and GIS is ideal for handling spatial information and is becoming more adept at managing temporal data. Should not this technology be foremost in the methodological grab bag of historians?

Posing the issue this way suggests assumptions about the nature of history that do not always resonate with its practitioners. Arguments about the role of GIS in history often begin outside the discipline and proceed from considerations that may not echo the concerns of historians themselves. If GIS is ever to become central to historical scholarship, it must do so within the norms embraced by historians and from a sophisticated understanding of the philosophy of history and not simply its methods.

History as a discipline comes with definitions advanced in countless books, articles, and ephemera by persons great and obscure. These definitions range from the puerile (Henry Ford: “History is bunk”) to the cynical (Voltaire: “History is a pack of tricks we play on the dead”) to the mystical and confessional (Carl Becker: “History is an act of faith”) to the lyrical conundrum (William Faulkner: “The past is not dead; it is not even past”). Even though every historian likely will cite a different epigram, collectively they would agree that history is a reasoned argument about the known past. It is an inevitable consequence of our human nature, and its purpose is to learn who we are and what we may become as individuals, groups, and societies.

The past, of course, is irretrievable, which is why historians draw a sharp distinction between the past and history. We understand the past's value: it is our source of evidence; without it, we would know nothing or have any sense of who we are. But the past escapes us as soon as it becomes past. We cannot recapture it; we can only represent it. In representing the past, we seek perspective, the point of view that allows us to discern patterns among the events that have occurred. We are not so much trying to transmit accumulated knowledge—culture and tradition do this, among other means—as to understand the significance of our experience.

In its essence, history seeks 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, history differs from social science, which attempts to reach a generalization that holds true in any similar circumstance.³ 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 is fixed: in it the intersection of patterns and singular events can be discovered. Not so in the future, where continuities and contingencies coexist independently of one another. Historians view reality as web-like, to use philosopher Michael Oakeshott's phrase, because they see everything as related in some way to everything else.⁴ Interdependency is the *lingua franca* of historians.

This sense of interrelatedness plays out within two dimensions—space and time. Although the past is always bound by these two elements, historians often treat them as artificial, malleable constructs. Time especially is a complicated concept for historians, who well understand T. S. Eliot's sense of

Time present and time past
Are both present in time future
And time future in time past.⁵

In landscapes and timescapes, we impose divisions—eras and epochs, cultural footprints and spheres of influence—that allow us to manage complexity. We move freely across these grids, ignoring issues of scale as we compare and contrast one

place or one time with another in an effort to recapture a sense of the whole, to illuminate differences, to discover patterns. We go to great lengths to verify and analyze evidence, but we pay little critical attention to its temporal and spatial attributes.

Such casual use of time and space may seem odd for a discipline that, in so many ways, refers to these terms continually. An explanation lies in recognizing that historians seek to portray a world that is lost, not to re-create it precisely. The scholars' goal 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 more completely than most historians would acknowledge is possible. Rather, the goal is to simulate or illustrate a specific set of events. Historians, in a sense, are abstractionists: they have the "capacity for selectivity, simultaneity, and the shifting of scale" in pursuit of the fullest possible understanding of the past.⁶ Traditionally, historians have used narrative to construct the portrait that furthers this objective. Narrative encourages the interweaving of evidentiary threads and permits scholars 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 historian to look askance at any method or tool that appears to reduce complex events to simple schemes. The computer, of course, is a technology that does not tolerate ambiguity, expressing all matter as zeroes and ones and demanding mutually exclusive categories in its data structures. Its insistence on precision does not fit the worldview of historians; indeed, the discipline appears at times to embrace an uncertainty principle—the more precisely you measure one variable, the less precise are other variables. Given this stance, it is no accident that GIS, the tool initially of engineers and earth scientists, has made few inroads into history. Yet of all modern information technologies, GIS may have the most potential for breaching the wall of tradition in history for at least two reasons: it maps information, thus employing a format and a metaphor with which historians are conversant; and it integrates and visualizes information, making it possible to see the complexity historians find in the past.

Representation of the past, John Lewis Gaddis has suggested, 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, 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."⁷ 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 and refine our knowledge.

Gaddis's metaphor is apt for historians. Using maps to display information and aid understanding is an ancient practice. Populated with mythical as well as physical features in their earliest forms, maps always have symbolized what was known or believed about the world. Their usefulness for more than navigation and warfare became well established in the nineteenth century with the "map that changed the world," as Simon Winchester labeled William Smith's geologic masterwork, and with John Snow's pioneering use of spatial analysis to pinpoint the cause of a cholera outbreak in 1854.⁸ Historians of this period often opened their narratives with maps and lengthy descriptions of the landscapes they portrayed. For generations, history teachers have used maps to illustrate the movement of people and the spread of empires. Today, hardly a year passes without the publication of another four-color atlas to help communicate how and where its subject developed. Few types of presentation could be more familiar to chroniclers of the past.

At its core, GIS is a mapping technology with properties that should appeal to historians. Its fodder is physical space—location—and all attributes that coexist with it. Though historians may conceptualize space in flexible terms, the evidence we use comes from some place, no matter how loosely defined. This spatial tag, of course, is the key to GIS in relating one piece of evidence to another from the same geography. Historical data typically has better spatial than temporal markers, though not always, so GIS is equipped to handle most of our evidence. If the evidence has a known location—and the degree of granularity may vary widely—it may be used profitably within a GIS.

The spatial integration of information makes GIS attractive as a platform for history. Many scholars use the technology primarily to manage evidence of different types of data—qualitative, quantitative, and visual—based on the common space they share.⁹ This mixing of formats is nothing new to historians, who always have taken evidence in the form they find it. What is different is the technology's ability to parse large amounts of disparate data quickly and to keep it in relationship with all other information from the same place. Even the geographic uncertainty associated with historical artifacts—some come from known locations; for others, provenance is much less certain—is manageable within the technology.

This integrative ability means that historians can construct multiple perspectives, much as we might in our verbal descriptions of the past. We can shift scales quickly, zoom in and out, and view levels of detail. Spatial relationships can prompt questions we might otherwise ignore; we can intuit connections for further exploration.

We can treat these multiple perspectives literally or figuratively. For some scholars, the ability to re-create a literal view can be instructive. Military historians can place opposing commanders in known locations on a battlefield and determine what they might have seen from their vantage point, or they can use evidence from a hundred soldiers to represent the chaos of war. Urban scholars can simulate the vistas and even the voices of a cityscape, using a map and multimedia with great economy to do what James Joyce took hundreds of pages to do for 1904 Dublin.

Multiple perspectives and shifting scales may cause problems for the cartographer but not necessarily the historian. Students of the past use well-honed methods for critically examining historical evidence. Their methodological toolkit is remarkably large, employing techniques and insights sharpened by a number of disciplines. Reasoning by analogy is part of the historian's approach to evidence, as is comparison of events across time and culture. Both advance the scholar's impulse to understand an event by reference to a similar event, regardless of origin or circumstances, at least initially. Both also invite the development of multiple views, from local to global, for the same problem. Such multiplicity is inherent in the nature of events. An observation, British historian Thomas Carlyle wrote in 1830, is successive in its recounting: one thing follows another in historical accounts, but in fact the events "were often simultaneous" in their occurrence.¹⁰ Since the discipline's goal is an objective representation of reality, a singular view, no matter how precise, inevitably misrepresents the past and can become the enemy of comprehension. In his famous lectures on the nature of history, E. H. Carr implied that multiple perspectives promote the search for an objective past, a valid aim even in the postmodern world of scholarship. "It does not follow," he wrote, "that, because a mountain appears to take on different shapes from different angles of vision, it has objectively no shape at all or an infinity of shapes."¹¹

Multiplicity is inherent in the word-narratives used to communicate history. Words are complex forms of information; they have "halos of meaning," making them wonderfully evocative but imprecise and slippery.¹² The word "holocaust" carries certain dictionary definitions, but capitalized it also labels a horrific period and calls to mind images and emotions ranging from trains to Auschwitz and death camps to the Warsaw ghetto and the cinematic figure of a small girl in a red coat. Historians embrace this range of meanings. We prefer the medium of words and narratives because it permits us to represent the past as multidimensional, complex, and nonlinear, even though structurally our prose and our logic are sequential.

A preference for words suggests that visualization, a key feature of GIS, is perhaps more problematic for historians than for practitioners of other disciplines, even

though it too offers great potential for our work. Images are the accumulation of detail: they allow us to find patterns we might miss by other means of analysis. Ultimately, the shape and size of the forest commands our attention, not the nature of each tree. Maps represent the past in ways we deem helpful because they let us see events in large scale. But we historians rely on maps infrequently because, like other humanists, we are logo-centric. We are far more comfortable with words and narratives than with images. Our evidence usually comes to us wrapped in words. We parse these texts critically to extract the cause-and-effect relationship that feeds our argument and our narrative, the word products of our craft. The problem is not a lack of appreciation for visual communication. We all live in a visual information age, and increasingly turn to photographs, moving images, and the like for evidence to analyze. Our difficulty comes when we seek to communicate visually. We construct textual images that we embed in our story, but we struggle to create visual images that convey our interpretation.¹³

Our difficulty with visual communication stems partly from the training we receive and partly from a disciplinary emphasis on print publication as the preferred expression of our work. Few graduate programs in history offer coursework in visual methods. Most books or articles on historical method fail to address the subject. Our journals and monographs carry densely packed prose; we take it for granted that scholarly history is written history. But the issue goes far deeper than technical training and publication standards: most of us do not understand how to use images to construct narrative. It simply is foreign to our culture.

As a technology, GIS is not yet a facile visualization tool, at least not as experienced by most historians who have used it. This circumstance inhibits its use in history except as a mapping engine. The result is ironic: more than most computer-based technologies, GIS seems well suited to history. Through integration, GIS permits the use of multiple perspectives. Its mapped display of information facilitates the recognition of patterns, and its concept of spatial proximity prompts intuitive inference in much the same way that other proximate relationships do. In sum, its ability to integrate disparate information drawn from the same place and at the same time allows scholars to simulate the complexity of history.

Given its potential for the discipline, why have most historians not embraced GIS? Certainly, some exemplary projects exist. Many of them, such as those noted in *Past Time, Past Place* (2002),¹⁴ involve extensive data collection and creation within a historical GIS, including major national historical GIS projects in Great Britain, Taiwan, China, and the United States, among others. An international consortium, the Electronic Cultural Atlas Initiative, begun in 1997, has sought to speed the development of such

compendia for cross-cultural research. Indeed, much of the so-called spatial turn in social sciences involves such resource development. A major research center, the Center for Spatially Integrated Social Science at the University of California-Santa Barbara, has devoted considerable effort to creating tools and methods of use to historical GIS. Handbooks on GIS for historians are now appearing, as are dedicated workshops and professional journals and networks.¹⁵ The *American Historical Review*, the discipline's major journal, recently experimented with a new article format that included a printed summary with reference to a Web site containing an array of data and views, including some spatial analysis.¹⁶ Still, spatial analysis has yet to make major contributions to historiography.

The nascent literature on historical GIS notes problems with the technology that have slowed its adoption as a tool for historians.¹⁷ One of the most cited impediments is the technology's awkwardness or inability in managing ambiguous, incomplete, contradictory, and missing data. Historians traffic regularly in evidence tinged with uncertainty, if not replete with it. Missing data is a larger problem: the record of the past often reads like a book with only a word or two on every page. Even if we had a full record, scholars understand that artifacts derive their meaning from the culture and circumstances that produce them, which adds another layer of complexity to problems of evidence. History as a discipline has wrestled with these issues for a long time. Researchers have developed numerous methods to create useful generalizations out of evidentiary scraps, though Mark Twain's assessment of nineteenth-century science at times seems to fit historical scholarship: "one gets such wholesale returns of conjecture out of such trifling investments of fact."¹⁸

From its origins, GIS has dealt with objects and events that can be measured, verified, and tested. As with any technology, it requires precision, perhaps not completely, but far exceeding what historians find in their evidence. History comes with a variety of spatial and temporal indicators, the stuff of GIS, but most are general and imprecise even when expressed in language that suggests geographic certainty. Consider land deeds from early colonial America, some of the most precise documents of their day. In an age when surveyors were scarce, the law accepted boundary markers in the landscape—rivers, rock outcroppings, and the like—which it assumed, incorrectly, were sufficiently permanent to assure undisputed ownership and generational transfer of property. When moving outside of legal records, our spatial and temporal indicators become murky in terms of GIS: close to the river, a day's ride from the capital, near the cathedral, on the battlefield. These are difficult concepts to express in a technology that requires polygons to be closed and points to be fixed by geographical coordinates.

Another problem of evidence arises with the lack of GIS-compatible strategic or contextual datasets. Strategic data includes statistical resources, such as censuses, that provide a common framework for large geographies, thus allowing useful comparisons among and across locations. With few exceptions, such as the Great Britain and Irish Historical GIS, we still do not have enough GIS-enabled datasets to frame the international, national, or regional comparative context in which most scholars work. This circumstance is quite unlike what occurs in traditional history, where national and regional narratives form the backdrop for countless local studies. Until strategic data exist in sufficient quantity, it is difficult to imagine the emergence in historical GIS of the "general to particular, particular to general" cycle that animates scholarship about the past. More likely in the near term is a case-study approach in which GIS is a tool in local tests of generalizations reached by other methods.

Accurate historical basemaps form a special subset of the strategic or framework data required for effective use of GIS within the discipline. Creating them presents numerous problems. Many older maps do not have known coordinate systems, which defeats the technology's ability to reproject them. More important is the instability of historical boundaries. Boundaries change continually as societies expand and contract, governments create new functions and jurisdictions, and wars or disputes make boundaries uncertain. Some boundaries are never established formally but are inferred, for example, cultural, linguistic, or conceptual boundaries such as frontiers. GIS can handle the overlap among known boundaries at any given point in time but it currently cannot deal efficiently with continually shifting or vaguely defined boundaries. At one level, we can manage this problem through arbitrary assignment based on the best available information. This practice may be acceptable, since any map, digital or otherwise, is an abstraction. Another solution is standardization of spatial units over time, as Ian Gregory has demonstrated with the Great Britain Historical GIS. While not insurmountable, these barriers must be addressed for historians to feel comfortable using this technology. Maps carry the impression of certainty and, especially in easily manipulated digital formats, may remove us further from the circumstances the map represented originally.

How to handle time, an essential variable in history, is another widely recognized obstacle to adoption of GIS within the discipline. For historians, time is epiphenomenal and causal. As epiphenomenon, time is a secondary characteristic of an event and results associated with it; for example, the Battle of Hastings occurred in 1066. Here, time is a static marker, denoting a point on the calendar when something happened. But time is also dynamic and sequential, linking events in a cause-and-effect

statement: William the Conqueror's victory at Hastings began the redefinition of English society and culture. In GIS, time is fixed as part of the event; it is not dynamic.

One problem relates to the nature of GIS visualization, which traditionally has focused on 2D data, where the vertical dimension and time are attributes rather than inherent parts of the data structure. More recently, the technology has developed better ways of displaying time—time-series animations and rotating views, for example—and new modules make 3D displays much easier. It also is not necessary to cast all geographic visualizations in the form of a traditional map. Time-space cubes, for instance, allow the visualization of information integrated by space but without reference to a map. For most historians, however, GIS manages time inadequately, requiring us to remain within an artificial 2D or 2½D world that does not adequately represent the complexity of the contemporary world, much less the rich tapestry of the past.¹⁹

Other impediments relate less to the nature of data or tools and more to the culture of GIS. Mastering spatial methods and software is, in effect, learning another discipline, another way of thinking. It also means developing expertise in a complicated technology that is continually evolving. GIS uses programming logic and language, second nature to the engineer perhaps but not to historians. The concept of modeling, so necessary to spatial scientists, seems alien to historians. Also, we are statistical impressionists given to the use of categories that have no easy correspondence to ones employed in spatial technologies. Even metadata, the part of GIS most recognizable to historians, exists in a format quite different from the documentation required in humanities scholarship.

The scarcity of financial and technical resources within the humanities presents another obstacle to the development of historical GIS. The technology requires time and money, often lots of it. Users must develop data models and databases, create or locate framework data and get it into GIS-compatible formats, locate or create suitable basemaps, process the data and secure the outputs, decide on the appropriate cartographic form and elements, and interpret the results. Many of these steps must be taken for each data source, which historians develop continuously throughout their projects, thus making it difficult to use GIS as a set piece. For many projects, this process means collaboration with technical and domain experts. Working in a team, itself an act foreign to historians, places a premium on management skills. The cost of this GIS process is high and can only be justified by the analytical benefit performed with the data. Most historians would be hard pressed to make this calculation in their favor at present.

A more significant barrier, perhaps the largest one, is the absence of spatial questions in history. As historians, we understand the importance of place. Former Speaker of the U.S. House of Representatives Thomas P. (Tip) O'Neill's famous dictum, "All

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politics are local," can be applied to history with equal force. Yet for all our allegiance to contextualization, we still treat space and the events associated with it primarily as cultural markers. This lack of interest in spatial problems is largely a product of the last half-century. Earlier historians typically began their narratives with spatial descriptions, judging that human interaction with the physical world partly shaped the resulting societies. Discussions of proximity, topography, and other spatial concepts informed the work of historians from Herodotus to Braudel. But as the modern world collapsed our notion of distance, space became less visible to students of the past. With few exceptions—the Annales school of France, for instance—we long ago ceased to raise spatial questions, and the ones we do pose rarely admit measurement, except in the most elemental sense. While not the fault of its developers, GIS does not strike many historians as a useful technology because we are not asking questions that allow us to use it profitably.

Fortunately, recent advances in GIS may mitigate some of the burdens of adapting spatial technologies for historical research. As evidenced by the efforts of collector David Rumsey, among others, historic maps promise to become more readily available for use in GIS.²⁰ Digital gazetteers are rapidly emerging as one answer to issues surrounding uncertainty, at least as it relates to the location of places, many of which have gone by a variety of names over time. GIScientists are creating new methods of spatial analysis—geographically weighted regression (GWR) and multilevel modeling, for example—to address some of the problems faced by historians who seek to understand local variation as well as the relationship among individual and aggregate data within a defined geography. Some techniques developed for other purposes hold potential for new approaches to historical questions, such as spatial interaction modeling, used primarily in retail and marketing studies, as a tool for counterfactual history.²¹ The Open GIS Consortium and other groups of information scientists are addressing the issue of geo-spatial ontology to allow comparison of data from widely disparate sources, cultures, and times.²² Considerable effort is going into creating spatiotemporal browsers and other tools for managing time more effectively, a quest that has importance for fields far beyond history. Similarly, new visualization techniques and strategies are the object of numerous research initiatives. Once we have ways to visualize the integration of different types of sources, including multimedia, then we can imagine cartographic narratives, historical life maps, spatial stories, and other means of helping historians weave stories that represent the complex past they are interpreting. All of these developments hold great potential for making GIS more compatible with the needs of historians, at least for a new generation of scholars who, as members of a post-computer age, eagerly take up new tools and methods.

What is the future of GIS in history? Assuming continued progress in making the technology more complete and easier to use, it is possible to construct at least two views—one of GIS as a means and one as a medium. In the first scenario, historical GIS is a powerful tool in the management and analysis of evidence, contributing primarily by locating historical exegesis more explicitly in space and time. It aids but does not replace narrative: it finds patterns, facilitates comparisons, enhances perspective, and illustrates data, among other benefits, but its results ultimately find expression primarily in traditional word forms. In this view, historians employ GIS to give geographical context and depth to their interpretation of the past. As a tool, we can imagine wide utility for GIS in many genres of history, such as the following:

- *Religion history*: Do patterns of adherence conform to other geographical or cultural patterns?
- *Immigration history*: Do patterns of migration, typically understood in terms of groups, have a different expression when traced individually and aggregated spatially? What about patterns of demographic or cultural diffusion?
- *Political history*: Do patterns of political affiliation and behavior have an underlying geographical or spatiocultural explanation that is not readily apparent from the socioeconomic analyses typically used by scholars?

Undoubtedly, our treatment of the past would be greatly enriched by answers to these questions and others, although it will remain uncertain for some time if the results shift interpretations, thus providing clear vindication of the significance of historical GIS.

In the second scenario, historical GIS offers the potential for a unique postmodern scholarship, an alternate construction of the past that embraces multiplicity, simultaneity, complexity, and subjectivity. Postmodernist scholarship has sharply challenged the concept of objectivity in history, which has been the lodestar of so-called scientific history since the late nineteenth century.²³ It rejects the supremacy of empiricism, an Enlightenment concept, in favor of knowledge based on all the senses. Postmodernism also has called into question the primacy of texts and logic as the foundation of knowledge. In its epistemology, history is not a grand narrative—an authoritative story of a society's past—but instead a fragmented, provisional, contingent understanding framed by multiple voices and multiple stories, mini-narratives of small events and practices, each conditioned by the unique experiences and local cultures that gave rise to them. Methodologically, postmodernism emphasizes reflexivity, or lived connections among the researcher, the research topic, and the research subject; the importance of giving voice to research subjects; positionality; the non-neutrality of the researcher; the situatedness of all knowledge; and the importance of diversity and difference.

Historians in general have not embraced postmodernism, but it has influenced us, as evidenced by the rise of new genres of history. Many people see this development as further fragmenting a past that already is too splintered. Any notion of a comprehensible, unified past based on a discoverable objective reality was unrealistic, but it also seems clear that we will benefit from some way to meld diverse approaches to the past. GIS may offer a path to this goal, at least in part, because of its ability to integrate information and to make it visual.

Perhaps historical GIS ultimately makes its contribution not as a positivist tool but a reflexive one: integrating the multiple voices and views of our past, allowing them to be seen and examined at various scales; creating the simultaneous context that historians accept as real but unobtainable by words alone; reducing the distance between the observer and the observed; and permitting the past to be as dynamic and contingent as the present.²⁴ In sum, historical GIS offers an alternate view of history through the dynamic representation of time and place within culture. This visual and experimental view fuses qualitative and quantitative data within real and conceptual space. It stands alongside—but does not replace—traditional interpretive narratives, inviting participation by the naïve and knowledgeable alike. Historical GIS is not yet at this point, but some day it could be. It is a vision worth pursuing.