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## Further Reading: From Historical GIS to Spatial Humanities: An Evolving Literature

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AS WAS STATED IN THE INTRODUCTION, THE USE OF GIS TO study the past has evolved rapidly over the last decade or so, and we now stand at a position where the field is becoming both deeper and broader. As the field develops, so too does the literature, which has become increasingly voluminous but also increasingly disparate, making it difficult to keep track of developments in the field and to see what other researchers working on different topics but with similar challenges are doing. This chapter attempts to summarize this literature. It starts with publications that provide an overview of the field, moves on to databases and methods, and then turns to applied research before finishing by introducing the emerging fields of humanities GIS and spatial humanities. The chapter describes the current literature. It is not meant to be fully comprehensive and does not include earlier chapters in this book unless completely necessary. It also only includes conventional academic publications, thus ignoring web resources (other than articles in electronic journals), of which there are many. For a more comprehensive list of publications and a list of web resources, see the Historical GIS Research Network website (<http://www.hgis.org.uk>). Suggestions for updates to this site are always welcome.

Although there were a few papers written on HGIS in the 1990s, the growing momentum and maturity of the field was marked by a special edition of *Social Science History* (vol. 24, no. 3), published in 2000 and edited by A. K. Knowles. Since then, this literature has grown rapidly and now includes a significant number of books from high quality university presses and articles in many of the leading journals. Many of the

early papers, such as most of those in the 2000 volume of *Social Science History*, talked about the construction of databases and the potential that these systems would have once they were completed. By the mid-2000s significant works of applied scholarship started to appear in many fields, with urban history, environmental history, historical demography, and medieval history being particularly rich seams. As was discussed in the introduction, two trends are apparent. First, it is becoming increasingly common to talk of spatial history rather than historical GIS, reflecting a move from a technological focus to the applied. Second, from its origins in social science history, the use of GIS is spreading across the discipline and into new humanities subjects. At present its use in these disciplines is perhaps where it was in history several years ago, with the emphasis more on creating databases and their potential for scholarship rather than on finished articles. Nevertheless, this is clearly a rapidly developing and exciting growth area that is often referred to as humanities GIS or spatial humanities.

## HISTORICAL GIS

Perhaps the first book that could be called a historical GIS book, although it predates the term by some years, is M. Goerke, ed., *Coordinates for Historical Maps* (St. Katharinen: Max-Planck-Institut für Geschichte, 1994); however, this is really only of interest as it illustrates just how far the field has developed. After the 2000 volume of *Social Science History*, three publications appeared in quick succession that further defined the field. I. N. Gregory, *A Place in History: A Guide to Using GIS in Historical Research* (Oxford: Oxbow, 2003) outlined what GIS had to offer to historians at a technical level (see <http://www.ccsr.ac.uk/methods/publications/ig-gis.pdf>). A. K. Knowles, *Past Time, Past Place: GIS for History* (Redlands, Calif.: ESRI Press, 2002) and a special edition of *History and Computing* (vol. 13, no. 1 [2001]), edited by P. S. Ell and I. N. Gregory, presented collections of essays on the state of the field at that time. Edited volumes have continued to be produced at an increasing pace, with the work that they contain developing considerably. A special edition of *Historical Geography* (vol. 33) appeared in 2005, and *Placing History: How GIS Is Changing Historical Scholarship* was published in

2008 (Redlands, Calif.: ESRI Press); both are edited by A. K. Knowles. A special edition of *Social Science Computer Review* (vol. 27, no. 3), edited by T. J. Bailey and J. B. M. Schick; a Dutch volume, *Tijd en Ruimte: Nieuwe toepassingen van GIS in de alfawetenschappen* (Time and Space: New applications of GIS in the humanities) (Utrecht: DANS), International Journal of Humanities and Arts Computing (vol. 3, nos. 1–2) that was largely devoted to historical GIS appeared in 2009. Most recently, M. Dear, J. Ketchum, S. Luria, and D. Richardson, eds., *GeoHumanities: Art, History, Text at the Edge of Place* (New York: Routledge, 2011) contains a section of nine chapters on spatial histories.

There is an increasing trend for new collections to be more focused on particular aspects of historical GIS and/or spatial history. These include a 2008 special edition of the *Journal of the Association of History and Computing* (vol. 11, no. 2), which was concerned with teaching using historical GIS; a 2010 special section of *Social Science History* (vol. 34, no. 2) devoted to using historical GIS to study railways and political economy; a 2011 special issue of the *Journal of Interdisciplinary History* (vol. 42, no. 1), edited by J. Marti Henneberg, that again looks at railways and society; and a 2011 special issue of *Social Science History* (vol. 35, no. 4), focused on historical GIS and urban history and edited by D. A. DeBats and I. N. Gregory.

There has also been a developing literature that explores what GIS has to offer to historical research, including I. N. Gregory, K. K. Kemp, and R. Mostern, "Geographical Information and Historical Research: Current Progress and Future Directions," *History and Computing* 13 (2001): 7–24; P. Doorn, "A Spatial Turn in History," *GIM International* 19, no. 4 (2005), [http://www.gim-international.com/issues/articles/id453-A\\_Spatial\\_Turn\\_in\\_History.html](http://www.gim-international.com/issues/articles/id453-A_Spatial_Turn_in_History.html); I. N. Gregory and R. G. Healey, "Historical GIS: Structuring, Mapping and Analyzing the Geographies of the Past," *Progress in Human Geography* 31 (2007): 638–53; I. N. Gregory and P. S. Ell, *Historical GIS: Technologies, Methodologies and Scholarship* (Cambridge: Cambridge University Press, 2007); and two chapters in Knowles, *Placing History*, the first by A. K. Knowles, "GIS and History," 1–26, and the second by D. J. Bodenhamer, "History and GIS: Implications for the Discipline," 219–34.

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There is also literature on teaching historical GIS and teaching history with it. This includes R. Churchill and A. Hillier, "Teaching with GIS," in Knowles, *Placing History*, 61–94; D. J. Bodenhamer and I. N. Gregory, "Teaching Spatial Literacy and Spatial Technologies in the Digital Humanities," in *Teaching Geographical Information Science and Technology in Higher Education*, ed. D. J. Unwin, K. E. Foote, N. J. Tate, and D. DiBiase (Chichester: John Wiley, 2011), 231–46; and J. B. Owens and L. Woodworth-Ney, "Envisioning a Master's Degree Program in Geographically-Integrated History," *Journal of the Association of History and Computing* 8, no. 2 (2005), as well as the 2008 special issue of the *Journal of the Association of History and Computing*.

#### GENERAL GIS BOOKS

It should not be forgotten that there is also a large literature on GIS generally that, while not directly aimed at the historical community, is very relevant to it. Good introductions include N. R. Chrisman, *Exploring Geographical Information Systems*, 2nd ed. (New York: John Wiley, 2002); M. N. DeMers, *Fundamentals of Geographic Information Systems* (New York: John Wiley, 2000); F. Harvey, *A Primer of GIS: Fundamental Geographic and Cartographic Concepts* (New York: Guildford, 2008); D. I. Heywood, S. Cornelius, and S. Carver, *An Introduction to Geographical Information Systems*, 4th ed. (Harlow, UK: Prentice Hall, 2012); D. J. Martin, *Geographical Information Systems and Their Socio-economic Applications* (New York: Routledge, 1996); and R. Nash Parker and E. K. Asencio, *GIS and Spatial Analysis for the Social Sciences: Coding, Mapping, and Modelling* (New York: Routledge, 2008). For a fuller description of GIS as an academic field, see the essays in the two volumes of P. A. Longley, M. F. Goodchild, D. J. Maguire, and D. W. Rhind, eds., *Geographical Information Systems: Principles, Techniques, Management and Applications*, 2nd ed. (New York: John Wiley, 2005), while for more of an overview on the uses of GIS, see the same four authors' book *Geographical Information Systems and Science*, 3rd ed. (New York: John Wiley, 2010). N. Schuurman, *GIS: A Short Introduction* (Malden, Mass.: Blackwell, 2004) provides a more critical look at the epistemology of GIS. J. Pickles, ed., *Ground Truth: The Social Implications of Geographic Information Systems* (New

York: Guildford Press, 1995) was the first attempt to critically explore GIS and caused a considerable controversy at the time. Many of the views expressed in this volume have since moderated, in part as a consequence of the GIS community responding to them, as essays by some of the same authors in Longley et al., *Geographical Information Systems* illustrate.

#### TIME IN GIS

A major issue that GIS is frequently criticized for is its perceived poor handling of time, something that is regarded as particularly important for historical applications. The mainstream GIS community has been exploring the issue of time for many years. One of the earliest books in this field that still expresses the issues well is G. Langran's *Time in Geographical Information Systems* (London: Taylor & Francis, 1992). Slightly more recently, D. J. Peuquet's *Representations of Space and Time* (New York: Guildford, 2002) presents an update of how the field has (and has not) developed over the ensuing ten years. The same author also has a chapter in Longley et al., *Geographical Information Systems* that summarizes many of these themes.

Chapter 6 of Gregory and Ell, *Historical GIS*, discusses the relevance of time in GIS to historical GIS. One area that is particularly relevant here is the use of "areal interpolation" techniques, which allow data collected using different sets of boundaries, such as those at different dates, to be compared. I. N. Gregory and P. S. Ell's "Breaking the Boundaries: Integrating 200 Years of the Census Using GIS," *Journal of the Royal Statistical Society, Series A* 168 (2005): 419–37, and "Error Sensitive Historical GIS: Identifying Areal Interpolation Errors in Time Series Data," *International Journal of Geographical Information Science* 20 (2006): 135–52 describe this application. Their paper "Analysing Spatio-temporal Change Using National Historical GIS: Population Change during and after the Great Irish Famine," *Historical Methods* 38 (2005): 149–67 provides an applied example of this approach. Alternative examples of approaches that exploit time in historical GIS, this time to explore complex temporal patterns in point data, are provided by D. A. Fyfe, D. W. Holdsworth, and C. Weaver, "Historical GIS and Visualization: Insights from Three Hotel Registers in Central Pennsylvania, 1888–1897," *Social Science Computer*

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*Review* 27 (2009): 348–62; and C. Weaver, D. Fyfe, A. Robinson, D. Holdsworth, D. J. Peuquet, and A. M. MacEachren, "Visual Analysis of Historic Hotel Visitation Patterns," *Information Visualization* 6 (2007): 89–103.

It is important to remember that interest in exploring and analyzing data over space and time simultaneously predates GIS and has been of interest to researchers working outside the GIS community. One of the best discussions of the importance of doing this is D. B. Massey, *For Space* (London: Sage, 2005) and its predecessor, "Space-Time, 'Science' and the Relationship between Physical Geography and Human Geography," *Transactions of the Institute of British Geographers* 24 (1999): 261–76. Earlier papers exploring this theme from very different perspectives include J. Langton, "Systems Approach to Change in Human Geography," *Progress in Geography* 4 (1972): 123–78; and R. D. Sack, "Chronology and Spatial Analysis," *Annals of the Association of American Geographers* 64 (1974): 439–52.

#### HGIS DATABASES

Although many of the earlier papers in the field include a discussion of the databases that were created as part of a project or an analysis, few present a frank discussion of the issues and problems that building such a database can cause. Two notable exceptions to this are L. Siebert, "Using GIS to Document, Visualize, and Interpret Tokyo's Spatial History," *Social Science History* 24 (2000): 537–74; and C. Gordon, "Lost in Space, or Confessions of an Accidental Geographer," *International Journal of Humanities and Arts Computing* 5 (2011): 1–22, which include commendably honest accounts of building and using HGIS databases of Tokyo and St. Louis, respectively.

Much of the remaining literature is primarily concerned with databases that describe national historical GIS projects. These include M. De Moor and T. Wiedemann, "Reconstructing Territorial Units and Hierarchies: An Example from Belgium," *History and Computing* 13 (2001): 71–97; I. N. Gregory, C. Bennett, V. L. Gilham, and H. R. Southall, "The Great Britain Historical GIS: From Maps to Changing Human Geography," *Cartographic Journal* 39 (2002): 37–49; C. A. Fitch and S. Ruggles, "Building the National Historical Geographic Information System," *His-*

*torical Methods* 36 (2003): 41–51; and A. Kunz, "Fusing Time and Space: The Historical Information System *HGIS Germany*," *International Journal of Humanities and Arts Computing* 1 (2007): 111–22. These systems are primarily polygon based and designed to hold census and related data for the past two centuries or so. An alternative approach, based on over a millennium of Chinese data represented using point locations, is provided by M. L. Berman, "Boundaries or Networks in Historical GIS: Concepts of Measuring Space and Administrative Geography in Chinese History," *Historical Geography* 33 (2005): 118–33; and P. K. Bol, "Creating a GIS for the History of China," in Knowles, *Placing History*, 27–60. A. K. Knowles, ed., "Reports on National Historical GIS Projects," *Historical Geography* 33 (2005): 293–314 provides concise summaries of these and other systems. One issue that is usually not well handled in historical GIS databases that represent administrative boundaries is uncertainty in the locations of these boundaries. B. Plewe, "The Nature of Uncertainty in Historical Geographical Information," *Transactions in GIS* 6 (2002): 431–56 describes a solution to this.

It is becoming increasingly obvious that place-name gazetteers, basically database tables that provide coordinate locations for place-names, are an effective way of rapidly georeferencing large amounts of historical material. R. Mostern and I. Johnson, "From Named Place to Naming Event: Creating Gazetteers for History," *International Journal of Geographical Information Science* 22 (2008): 1091–1108; R. Mostern, "Historical Gazetteers: An Experiential Perspective, with Examples from Chinese History," *Historical Methods* 21 (2008): 39–46; and H. R. Southall, R. Mostern, and M. Berman, "On Historical Gazetteers," *International Journal of Humanities and Arts Computing* 5 (2011): 127–45 provide three accounts of this. These build on earlier perspectives when gazetteers were seen more as a way of adding metadata for digital libraries. See, for example, L. L. Hill, "Guest Editorial: Georeferencing in Digital Libraries," *D-Lib Magazine* 10, no. 5 (2004) and other essays in this issue (<http://www.dlib.org/dlib/mayo4/05contents.html>).

#### HISTORICAL GIS ON THE INTERNET

There are a wealth of sites that place historical GIS resources on the Internet (the Historical GIS Research Network, <http://www.hgis.org.uk/resources.htm>), provides links to many of them); however, here we are only concerned with the published literature that describes these resources. A. Wilson, "Sydney *TimeMap*: Integrating Historical Resources Using GIS," *History and Computing* 13 (2001): 45–69 describes a museum exhibit system for Sydney, while on a wider scale, H. R. Southall, "A Vision of Britain through Time: Making Sense of 200 Years of Census Reports," *Local Population Studies* 76 (2006): 76–84 describes how material from the Great Britain Historical GIS and elsewhere was put on the Internet. These two papers are primarily concerned with disseminating historical resources in a way that makes use of, and perhaps stresses, their spatial component. An alternative approach to putting historical GIS on the Internet is provided by B. C. Ray, "Teaching the Salem Witchcraft Trials," in Knowles, *Past Time, Past Place*, 19–33, which describes a system that includes not only primary sources but also secondary material and the results of some of Ray's own analyses on the Salem witchcraft trials. This is taken a stage further by W. G. Thomas and E. L. Ayres, "An Overview: The Differences Slavery Made: A Close Analysis of Two American Communities," *American Historical Review* 108 (2003): 1298–1307 (<http://www.historycooperative.org/ahr/elec-projects.html>), which is primarily an academic publication reporting on the results of an analysis but also uses the electronic environment to allow the reader to read the article in a nonlinear way and link back to a wealth of related materials that would not conventionally be included in a paper publication. Finally, R. G. Healey and J. Delve, "Integrating GIS and Data Warehousing in a Web Environment: A Case Study of the US 1880 Census," *International Journal of Geographical Information Science* 21 (2007): 575–612 present a paper that shows how data-warehousing techniques can be used to respond to complex queries that may be made by users over the Internet using examples of different ways of cross-tabulating and mapping results from individual-level data from the 1880 U.S. census.

#### FURTHER READING

#### URBAN HISTORICAL GIS

Urban studies is one of the areas in which historical GIS has made rapid progress. A number of reasons can be identified for this, including, from a database perspective, that cities are usually relatively small, making

the databases reasonably quick to construct, and, from an intellectual point of view, that many research topics associated with cities are inherently spatial. Several studies in North America have taken individual- or household-level records and used them to explore historical patterns of segregation. These include J. Gilliland and S. Olson, "Residential Segregation in the Industrializing City: A Closer Look," *Urban Geography* 31 (2010): 29–58, which studies Montreal based on the 1881 census; K. Schlichting, P. Tuckel, and R. Maisel, "Residential Segregation and the Beginning of the Great Migration of African Americans to Hartford, Connecticut: A GIS-Based Analysis," *Historical Methods* 41 (2008): 132–43; and P. Tuckel, K. Schlichting, and R. Maisel, "Social, Economic, and Residential Diversity within Hartford's African American Community at the Beginning of the Great Migration," *Journal of Black Studies* 37 (2007): 710–36, looking at Hartford, Connecticut. D. DeBats, "Tale of Two Cities: Using Tax Records to Develop GIS Files for Mapping and Understanding Nineteenth Century US Cities," *Historical Methods* 41 (2008): 17–38, and DeBats, "Using GIS and Individual-Level Data for Whole Communities: A Path toward the Reconciliation of Political and Social History," *Social Science Computer Review* 27 (2009): 313–30 compare Alexandria, Virginia, with Newport, Kentucky, in the mid-nineteenth century. A. E. Hillier, "Spatial Analysis of Historical Redlining: A Methodological Exploration," *Journal of Housing Research* 14, no. 1:137–67 and her chapter "Redlining in Philadelphia," in Knowles, *Past Time, Past Place*, 79–93 explores how mortgage redlining, the 1930s practice of declaring some areas as risky to make loans to – a practice often associated with race – affected loans in Philadelphia. E. Diamond and D. Bodenhamer, "Investigating White-Flight in Indianapolis: A GIS Approach," *History and Computing* 13 (2001): 25–44, and J. Stanger-Ross, "Neither Flight nor Flight: Urban Synagogues in Post-war Philadelphia," *Journal of Urban History* 32 (2006): 791–812 both investigate the relationship between religious change and broader urban changes. R. C. Allen, "Getting to Going to the Show," *New Review of Film and Television Studies* 8 (2010): 264–76 explores how GIS can be used to understand the role of cinema in U.S. cities in the early twentieth century, with race again being a major issue. Moving away from North America, Z. Frank, "Layers, Flows and Intersections: Jeronymo José de Mello and Artisan

Life in Rio de Janeiro, 1840s–1880s," *Journal of Social History* 41 (2007): 307–28 looks at the impact of economic change on artisans in the city; and L. Murray and E. Grahame, "Sydney's Past, History's Future: The Dictionary of Sydney," *Public History Review* 17 (2010): 89–111 describes a broad infrastructure for studying Sydney's past, focusing on a much wider range of sources than many of the studies above.

A very different approach to urban historical GIS is developed by K. Yano, T. Nakaya, Y. Isoda, Y. Takase, T. Kawasumi, K. Matsuoka, T. Seto, D. Kawahara, A. Tsukamoto, M. Inoue, and T. Kirimura, "Virtual Kyoto: 4D-GIS Comprising Spatial and Temporal Dimensions," *Journal of Geography* 117 (2008): 464–78, who focus on creating a three-dimensional model of historic Kyoto and how it has changed over time that will provide a platform for various subsequent analyses.

Three books have also been published in this area that move from answering specific research questions to broader spatial histories of urban areas. These are C. Gordon, *Mapping Decline: St. Louis and the Fate of the American City* (Philadelphia: University of Pennsylvania Press, 2008), which explores urban decline in St. Louis through the twentieth century; and J.-L. Pinol and M. Garden, *Atlas des Parisiens: De la révolution à nos jours* (Paris: Parigramme, 2009), which explores Paris over the past two centuries. These are both well-illustrated books that combine good use of maps and color with high-quality scholarship. J. Stanger-Ross, *Staying Italian: Urban Change and Ethnic Life in Postwar Toronto and Philadelphia* (Chicago: University of Chicago Press, 2010) presents a more conventional academic monograph, focusing on ethnic experiences within these two cities.

#### ENVIRONMENTAL AND AGRICULTURAL HISTORY

Environmental history is another area in which significant progress has been made in applying GIS techniques to historical research, in particular with two books that make significant revisions to established scholarship. G. Cunfer's *On the Great Plains: Agriculture and Environment* (College Station: Texas A&M University Press, 2005) uses GIS effectively to help challenge the orthodoxy that overplowing caused the Dust Bowl on the U.S. Great Plains in the 1930s; while B. Donahue's *The*

*Great Meadow: Farmers and the Land in Colonial Concord* (New Haven, Conn.: Yale University Press, 2004) examines conventional but untested beliefs about early agriculture in New England.

A very different paper on agricultural history is A. W. Pearson and P. Collier, "The Integration and Analysis of Historical and Environmental Data Using a Geographical Information System: Landownership and Agricultural Productivity in Pembrokeshire c. 1850," *Agricultural History Review* 46 (1998): 162–76, which provides an early, but still effective, description of what GIS is and what it has to offer to historical research, as well as providing a study of agricultural patterns in rural Wales in the mid-nineteenth century. Other work in this area includes W. Bigler, "Using GIS to Investigate Fine-Scale Spatial Patterns in Historical American Indian Agriculture," *Historical Geography* 33 (2005): 14–32; P. C. Brown, "Corporate Land Tenure in Nineteenth Century Japan: A GIS Assessment," *Historical Geography* 33 (2005): 99–117; R. Hunter, "Methodologies for Reconstructing a Pastoral Landscape: Land Grants in Sixteenth Century New Spain," *Historical Methods* 43 (2010): 1–13; G. Gong and J. Tiller, "Exploring Vegetation Patterns along an Undefined Boundary: Eastern Harrison County, Texas, Late Spring, 1838," *Social Science Computer Review* 27 (2009): 363–79; N. Levin, E. Elron, and A. Gasith, "Decline of Wetland Ecosystems in the Coastal Plain of Israel during the 20th Century: Implications for Wetland Conservation and Management," *Landscape and Urban Planning* 92 (2009): 220–32; and J. W. Wilson, "Historical and Computational Analysis of Long-Term Environmental Change: Forests in the Shenandoah Valley of Virginia," *Historical Geography* 33 (2005): 33–53.

#### DEMOGRAPHY

Demographic studies are another area in which historical GIS has made significant contributions to wider fields, perhaps reflecting GIS's origins in quantitative approaches. Some of these studies blur the distinction between the historical and the contemporary by exploring long-term change up to the present day. These include a range of British papers that explore long-term changes in mortality patterns, including D. Dorling, R. Mitchell, M. Shaw, S. Orford, and G. Davey Smith, "The Ghost of

Christmas Past: Health Effects of Poverty in London in 1896 and 1991," *British Medical Journal* 321 (2000): 1547–51, which compares London in the 1890s with the 1990s; I. N. Gregory, "Comparisons between the Geographies of Mortality and Deprivation from the 1900s to 2001: Spatial Analysis of Census and Mortality Statistics," *British Medical Journal* 339 (2009): 676–79, which does the same for all of England and Wales, comparing the 1900s with 2001; P. Norman, I. Gregory, D. Dorling, and A. Baker, "Geographical Trends in Infant Mortality in England and Wales, 1971–2006," *Health Statistics Quarterly* 40 (2008): 18–29 provides a more continuous comparison over the last thirty-five years; and P. Congdon, R. M. Campos, S. E. Curtis, H. R. Southall, I. N. Gregory, and I. R. Jones, "Quantifying and Explaining Changes in Geographical Inequality of Infant Mortality in England and Wales since the 1890s," *International Journal of Population Geography* 7 (2001): 35–51 looks at a longer time series using more widely spaced intervals.

Moving farther back in time, I. N. Gregory, "Different Places, Different Stories: Infant Mortality Decline in England & Wales, 1851–1911," *Annals of the Association of American Geographers* 98 (2008): 773–94 creates a continuous time series for these six decades that enables him to challenge the orthodoxy that infant mortality decline was driven by public health improvements.

Using HGIS to explore mortality and health is much less well developed in other countries, perhaps reflecting Britain's statistics on the subject. An exception to this is E. M. Carter, "Malaria, Landscape and Society in Northwest Argentina in the Early Twentieth Century," *Journal of Latin American Geography* 7 (2008): 7–38.

Moving to fertility, G. W. Skinner, M. Henderson, and Y. Jianhua, "China's Fertility Transition through Regional Space," *Social Science History* 24 (2000): 613–52 presents an effective analysis of fertility change in China since the 1960s using continuous time series data. This paper was one of the earliest applied analyses in historical GIS and still represents an extremely imaginative use of GIS to study long-term change.

Migration would also seem like an area with much potential for historical GIS work; however, to date this has been more limited than might be expected. P. A. Longley, R. Webber, and D. Lloyd, "The Quantitative Analysis of Family Names: Historic Migration and the Present Day

Neighbourhood Structure of Middlesbrough, United Kingdom," *Annals of the Association of American Geographers* 97 (2007): 31–48 uses surname distributions to map patterns of migration into a town in the northeast of England, a technique that could be applied much more widely. I. N. Gregory, J. Marti Henneberg, and F. J. Tapiador, "Modeling Long-Term Pan-European Population Change from 1870 to 2000 Using Geographical Information Systems," *Journal of the Royal Statistical Society Series A* 173 (2010): 31–50 looks at long-term population change in Europe but not at migration per se.

## TRANSPORT AND MOBILITY

Transport is another area that clearly has much potential for GIS-based analyses. The 2010 special issue of *Social Science History* contains three papers on the impact that the development of the rail network had on population in the nineteenth century in different places. J. Atack, F. Bateman, M. Haines, and R. A. Margo, "Did Railroads Induce or Follow Economic Growth? Urbanization and Population Growth in the American Midwest, 1850–1860," 171–97 looks at the United States; I. N. Gregory and J. Marti Henneberg, "The Railways, Urbanization, and Local Demography in England and Wales, 1825–1911," 199–228 looks at England and Wales; and R. M. Schwartz, "Rail Transport, Agrarian Crisis, and the Restructuring of Agriculture: France and Great Britain Confront Globalization, 1860–1900" 229–55 compares France and Britain. Moving back in time, M. E. O'Kelly's "The Impact of Accessibility Change on the Geography of Crop Production: A Re-examination of the Illinois and Michigan Canal Using GIS," *Annals of the Association of American Geographers* 97 (2007): 49–63 looks at the impact of the Erie Canal on agriculture; and G. R. Dobbs, "Backcountry Settlement Development and Indian Trails: A GIS Land-Grant Analysis," *Social Science Computer Review* 27 (2009): 331–47 looks at how the arrangement of indigenous trails influenced urban settlement patterns in eighteenth-century North Carolina.

Looking at mobility, D. A. Fyfe and D. W. Holdsworth, "Signatures of Commerce in Small-Town Hotel Guest Registers," *Social Science History* 33 (2009): 17–45; and D. A. Fyfe, D. W. Holdsworth, and C. Weaver

in *Social Science Computer Review* use signatures in hotel registers to explore how travelers moved around the northeastern United States in the early twentieth century.

## ECONOMIC AND SOCIAL HISTORY

Work in this broad area is more limited, but two papers in particular stand out. In both cases they make use of the ability of a GIS to integrate a wide variety of disparate sources to develop new insights into the topic under study. Thomas and Ayres, "An Overview: The Difference Slavery Made," *American Historical Review* 108 (2003): 1298–1307 presents a detailed analysis of two American counties, one on either side of the Mason-Dixon Line, to investigate a wide variety of factors associated with the local economy and society to investigate the extent to which slavery was a root cause of the Civil War. A. K. Knowles and R. G. Healey, "Geography, Timing, and Technology: A GIS-Based Analysis of Pennsylvania's Iron Industry, 1825–1875," *Journal of Economic History* 66 (2006): 608–34 brings together a wide variety of variables associated with the development of the iron industry over a long time period and, by stressing the importance of temporal and spatial differences, is able to challenge more general studies in this area. A third paper, R. G. Healey and T. R. Stamp, "Historical GIS as a Foundation for the Analysis of Regional Economic Growth: Theoretical, Methodological, and Practical Issues," *Social Science History* 24 (2000): 575–612 presents an earlier perspective on this type of work that stresses the database construction challenges and the opportunities that these open up in this field.

## ANCIENT AND MEDIEVAL HISTORY

The above discussion suggests that historical GIS research has largely concentrated on the nineteenth and twentieth centuries. This seems to fit with early criticisms that the technology works best in a data-rich environment. While there is some truth in this, the progress that has been made using GIS to study medieval and even earlier histories suggests that there is also much potential to apply it to periods when sources are very limited, fragmentary, and difficult to use. This is generally because

GIS allows the researcher to make better use of these sources. A leading example of this is the work of B. M. S. Campbell and colleagues, who use the early fourteenth-century *Inquisitiones Post Mortem* – effectively the wills of rich landowners – to explore medieval land use across England. K. Bartley and B. Campbell, “*Inquisitiones Post Mortem*, GIS, and the Creation of a Land-Use Map of Medieval England,” *Transactions in GIS* 2 (1997): 333–46 describes how the database underlying this research was created, while B. M. S. Campbell, *English Seigniorial Agriculture 1250–1450* (Cambridge: Cambridge University Press, 2000) and B. M. S. Campbell and K. Bartley, *England on the Eve of the Black Death: An Atlas of Lay Lordship, Land and Wealth, 1300–49* (Manchester: Manchester University Press, 2006) presents the research that developed from this resource.

GIS has also been used at a more local scale to explore medieval towns and settlements, as described by K. Lilley, C. Lloyd, and S. Trick, “Mapping Medieval Urban Landscapes: The Design and Planning of Edward I’s New Towns of England and Wales,” *Antiquity* 79, no. 303 (2005) (<http://www.antiquity.ac.uk>); and K. Lilley, C. Lloyd, S. Trick, and C. Graham, “Mapping and Analyzing Medieval Built Form Using GPS and GIS,” *Urban Morphology* 9 (2005): 5–15.

Finally, GIS has been used to explore medieval and ancient maps and what they reveal both about the map maker or makers and the areas that they were mapping. C. D. Lloyd and K. D. Lilley, “Cartographic Veracity in Medieval Mapping: Analyzing Geographical Variation in the Gough Map of Great Britain,” *Annals of the Association of American Geographers* 99 (2009): 27–48 explores a medieval map of Britain; and R. J. A. Talbert and T. Elliot, “New Windows on the Peutinger Map of the Roman World,” in Knowles, *Placing History*, 199–218 explores an even older map of the Roman world, the original of which is believed to date from around AD 300.

#### TOWARD HUMANITIES GIS AND SPATIAL HUMANITIES

In addition to the progress that GIS has made in history, there is also an increasing trend for it to be used in other disciplines within the humanities, leading to the development of humanities GIS and spatial history. D. J. Bodenhamer, “Creating a Landscape of Memory: The Potential of

Humanities GIS,” *International Journal of Humanities and Arts Computing* 1 (2007): 97–110 and the collection of essays in D. J. Bodenhamer, J. Corrigan, and T. M. Harris, eds., *The Spatial Humanities: GIS and the Future of Humanities Scholarship* (Bloomington: Indiana University Press, 2010) represent the first serious attempts to frame this field. The potential uses of geographical data have, however, been recognized for much longer than this, with the use of spatial data as metadata being seen as particularly important, as shown by D. M. Smith, G. Crane, and J. Rydberg-Cox, “The Perseus Project: A Digital Library for the Humanities,” *Literary and Linguistic Computing* 15 (2000): 15–25.

As the majority of sources used by humanities scholars are unstructured texts, the major challenges at present are first to work out how to convert these into a form suitable for GIS, which typically requires its attribute data to be in tabular form, and second, and more importantly, to explore what these texts have to offer to advance the disciplines that they are applied to such that, as with history, the research becomes of interest to people with no inherent interest in GIS or perhaps even in geography. At least three groups of researchers have taken on the challenge of how to convert texts to GIS format. These are C. Grover, R. Tobin, K. Byrne, M. Woollard, R. Reid, S. Dunn, and J. Ball, “Use of the Edinburgh Geoparser for Georeferencing Digitized Historical Collections,” *Philosophical Transactions of the Royal Society A* 368 (2010): 3875–89; I. N. Gregory and A. Hardie, “Visual GISting: Bringing Together Corpus Linguistics and Geographical Information Systems,” *Literary and Linguistic Computing* 26 (2011): 297–314; and M. Yuan, “Mapping Text,” in Bodenhamer, Corrigan, and Harris, *The Spatial Humanities*, 109–23.

At least two papers have explored the potential that mapping texts offers to develop new scholarship, albeit applied to very different topics. D. Cooper and I. N. Gregory, “Mapping the English Lake District: A Literary GIS,” *Transactions of the Institute of British Geographers* 36 (2011): 89–108 explore eighteenth-century literature associated with the English Lake District, while E. Barker, S. Bouzarovski, C. Pelling, and L. Isaksen, “Mapping an Ancient Historian in a Digital Age: The Herodotus Encoded Space-Text-Image Archive (HESTIA),” *Leeds International Classical Studies* 9 (2010): 1–36 explore the writing of a historian in the ancient world.

There is also the potential to use other types of sources within GIS. J. Hallam and L. Roberts (who also have a paper in this volume), "Mapping, Memory and the City: Archives, Databases and Film Historiography," *European Journal of Cultural Studies* 14 (2011): 355–72 explore how movies can be used within GIS to gain a better understanding of urban history using the example of Liverpool. J. Robinson, "Mapping the Place of Pantomime in a Victorian Town," in *Victorian Pantomime: A Collection of Critical Essays*, ed. J. Davis (Basingstoke: Palgrave Macmillan, 2010) explores how GIS can be used to explore theater history.

Thus it is clear that while the spatial humanities are in a relatively early stage, perhaps comparable with where historical GIS was around a decade ago, pioneering work in the development of databases is occurring, and rapid progress can be expected as this develops.