



NATIONAL ENDOWMENT FOR THE

Humanities

OFFICE OF DIGITAL HUMANITIES

## **Narrative Section of a Successful Application**

The attached document contains the grant narrative and selected portions of a previously funded grant application. It is not intended to serve as a model, but to give you a sense of how a successful application may be crafted. Every successful application is different, and each applicant is urged to prepare a proposal that reflects its unique project and aspirations. Prospective applicants should consult the Office of Digital Humanities application guidelines at <http://www.neh.gov/grants/guidelines/IATDH.html> for instructions. Applicants are also strongly encouraged to consult with the NEH Office of Digital Humanities staff well before a grant deadline.

Note: The attachment only contains the grant narrative and selected portions, not the entire funded application. In addition, certain portions may have been redacted to protect the privacy interests of an individual and/or to protect confidential commercial and financial information and/or to protect copyrighted materials.

**Project Title:** Institute for Enabling Geospatial Scholarship

**Institution:** University of Virginia

**Project Director:** Bethany Nowviskie

**Grant Program:** Institutes for Advanced Topics in the Digital Humanities

NEH IATDH PROPOSAL  
**Institute for Enabling Geospatial Scholarship**  
Scholars' Lab, University of Virginia Library  
Dr. Bethany Nowviskie, Principal Investigator

**Significance:** In the first two years of the University of Virginia Library's graduate fellowship program in Digital Humanities (described under *Institutional Profile*, below), more than half of our applicants and Fellows have expressed a need to incorporate significant geospatial data components in their research. These students come from fields as diverse as Literature, History, Anthropology, French, and Music. We take their interest in geographical information systems (or GIS) as indicative of a growing awareness across the disciplines of the applicability of geospatial tools and methods to humanities inquiry – particularly among the next generation of scholars, who operate in an intellectual landscape of ubiquitous GPS technology, entrepreneurial map and visualization providers, and location-based media.

Our Scholars' Lab Fellows build on rich local examples of the power of spatial approaches for meaning-making in digital archives and collections. At the Virginia Center for Digital History, these projects have ranged from the path-breaking *Valley of the Shadow* to later work on Lewis and Clark, the *Race & Place* project, and the *Geography of Slavery*. At the Institute for Advanced Technology in the Humanities, GIS has yielded critical insights into the social dynamics of accusation in the Salem witch trials, and has offered both a playing field for the digital reconstruction of ancient urban centers in Rome and Pompeii, and an organizing metaphor for new projects like *Mapping the Dalai Lamas*.

But interest in spatial methodologies for humanities research is not unique to the University of Virginia. The recent establishment by UCLA of an interdisciplinary undergraduate curriculum in "Digital Cultural Mapping" is just one sign of growing critical engagement with place-based humanities inquiry and geospatial technology. GIS is emerging as a core methodology in 2009 at gatherings like "Visualizing the Past" – an NEH-funded workshop at the University of Richmond – or "Geospatial Methods for e-Humanities Research," a workshop at Ireland's Digital Humanities Observatory. We see it in palimpsestic approaches to culture and history, like Todd Presner's *HyperBerlin* and *HyperCities* work, in "experimental geography" and the cartographic meditations of Trevor Paglen, and in widespread, interdisciplinary essays and monographs on cultural mapping or what historian Victoria Thompson has called "telling spatial stories." Of the 64 Digital Humanities Start-Up projects supported by the NEH since November 2006, more than 25% percent take what we have recently heard scholars refer to as the "methodological turn" toward GIS. And this percentage is growing. Seven out of the 21 Start-Up projects funded by the ODH in its most recent round (like "The Cartography of American Colonization" and "The Poetry of Place in Walt Whitman") position themselves as a contribution to geospatial scholarship. Perhaps even more compelling are traditional scholarly publications that enjoy a surprising afterlife through enabling geospatial technologies. At the University of Nebraska's Center for Digital Research in the Humanities, history professor Timothy R. Mahoney transformed an award-winning article from a print journal into an innovative website with an interactive, bird's-eye view of the city of Lincoln in 1889. Users of the *Gilded Age Plains City* site engage in exploration of "spatial narratives" of an historic murder case.

Robust humanities scholarship using geospatial methods and tools demands robust local support for GIS at researchers' home institutions. The Scholars' Lab at the University of Virginia Library, building on the 12-year heritage of its constituent Geospatial and Statistical Data Center, is particularly well positioned to design educational programs and lead an international community in grappling with the support implications of geospatial scholarship. Not only can we call on our experience in supporting faculty work with the guidance of two full-time GIS specialists and team of graduate student consultants, but we have also dedicated significant resources in the past 15 months (including the efforts of one full-time and one

part-time programmer) to the evaluation of tools and the creation of an exciting Web services infrastructure for geospatial data discovery and delivery.

This system, built on shared ISO standards and extending a set of open source geospatial tools originally developed by groups like the United Nations and the Open Geospatial Consortium, is the result of an internal UVA Library Innovation Grant, awarded to the Scholars' Lab in late 2007 in response to our proposal that we re-envision our GIS and geospatial data services. In November of 2008 (in conjunction with our annual International GIS Day open house and a presentation by noted map collector and digital innovator David Rumsey), the Scholars' Lab unveiled the first product of this work, a beta version of our new Geospatial Data Portal (see Appendix F). The GIS Portal allows worldwide users easy access to and manipulation of resources formerly only available to UVA Library patrons on physical media and through proprietary desktop software – and only findable with the help of a librarian.

We informed our design process for the GIS Portal by consulting with scholars producing geospatial data and using it in significant ways to advance their research (hosting both a semester-long “GIS in the Humanities” seminar for faculty and advanced graduate students and an ongoing, year-long speaker series on “Spatial and Temporal Issues in Digital Scholarship,” as well as undertaking development work on a gazetteer application for the *Tibetan and Himalayan Digital Library*). We networked with private developers of enterprise-scale, Web-based mapping and geospatial search applications at events like THATcamp and SearchCampDC. We began to explore collaborations with other libraries (some, like the Newberry, requesting that we host their valuable geospatial data in our Portal and others, like Stanford, recognizing complementary strengths as potential development partners), and we quickly came to realize that the Scholars' Lab had implemented a system unique among its peer libraries and digital humanities centers.

The Geospatial Data Portal is built on a Web services framework that allows easy discovery and mashup of GIS data from any provider using similar standards-based protocols. Not only have we begun the process of opening up our own GIS information to humanities researchers for easy discovery and manipulation using browser-based tools, but – as more libraries, museums, and governmental providers increase their capacity to house and share geospatial data via Web services – we have positioned the University of Virginia as a leader in modeling the integration of these resources across institutional and national boundaries in a way that makes sense for humanities scholars. We have been invited to present this approach as a hands-on workshop at the 2009 Code4Lib programmers' conference and to discuss its relevance to rare map librarianship (at the 2009 pre-conference workshop of the Rare Books and Manuscripts Section of the ACRL) and to historiography (on a “Digital Tools” panel of the 2010 Organization of American Historians conference). This indicates to us that *libraries and cultural heritage institutions* recognize a need to modernize their support for GIS infrastructure and training just as faculty and students (including, for the first time in a serious way, *humanities scholars*) place greater demand on these services. These are the two audiences our proposed Institute for Enabling Geospatial Scholarship would serve.

The Scholars' Lab proposes to host two rounds of an NEH Institute on the theme of Enabling Geospatial Scholarship. A first four-day event would be geared toward 20 library, museum, and digital humanities center professionals from across the United States, competitively selected from public service and collections stewardship areas as well as computer programming and cyberinfrastructure support fields, and would aim to shape policy and build the technical capacity of the institutions these people represent to support boundary-pushing geospatial scholarship. Their ongoing work in implementing standards-based, open source infrastructure for discovery, delivery, and manipulation of geospatial data would be supported through an online clearinghouse and open-access community to be maintained long-term by the Scholars' Lab. In the second year, the Institute would bring together 20 humanities faculty members and advanced graduate students, ideally affiliated with participating Round One institutions. These scholars

would train on and critique (with an eye toward immediate academic use and further technical development) the open source and standards-based GIS tools and geospatial approaches to humanities scholarship for which the local groundwork could now have been laid. More information on the selection of attendees, including our strategy for attracting applicants from under-represented and under-resourced disciplines and institutions, is found in the section on Participants.

The curriculum and outcome of both Institutes would be made available to a worldwide audience as part of the planned online clearinghouse. The purpose of this clearinghouse is not only to offer technical bootstrapping for libraries and museums new to sophisticated GIS support via Web services frameworks, but also to provide differing scholarly perspectives on GIS for the humanities, from within the coherent narrative of a multi-institutional effort (which we hope this grant will foster) to build modern infrastructure, support innovative digital projects, and open up dialogue about the causes and conditions of the digital humanities community's uncharacteristic inhibition toward GIS (Jessop 2008).

In June 2009, several months before the opening round of our proposed IATDH gathering, the seventh annual Scholarly Communication Institute, a Mellon-funded initiative also held at the University of Virginia (and for which the present Project Director, Bethany Nowviskie, serves as Program Associate), will convene around the subject of "spatial technologies and methodologies." SCI events are 3-day, by-invitation meetings of leaders in scholarship, academic publishing, library services, and related fields. SCI program staff later work with representatives of this group on identified collaborative opportunities and action items. The fruitful overlap in theme between our proposed Institute for Enabling Geospatial Scholarship and SCI 7 means that follow-up activities from SCI, centering at the UVA Library, are likely to be synergistic with our IATDH work and result in increased value for the digital humanities community. We will also be well positioned to evaluate and reshape our planned curriculum prior to the Institute based on the SCI 7 report.

The finding of SCI's steering committee, that spatial technologies and methodologies are among the most promising areas for action in the larger world of scholarly communication, reinforces our sense that the time is ripe for an NEH Institute – with broader reach to a more representative cross-section of American universities and cultural heritage institutions – geared toward Enabling Geospatial Scholarship.

**Institutional Profile:** The University of Virginia Library has long demonstrated its organizational readiness to undertake new initiatives and forge experimental models to meet the needs of humanities researchers within a rapidly changing technological scene. In 1999, a challenge grant from the National Endowment for the Humanities acknowledged the ground-breaking work of the Library's Electronic Text Center. E-Text, founded in 1992 along with IATH (the Institute for Advanced Technology in the Humanities, itself housed and nurtured by the Library), made the University of Virginia an early, international leader in digital scholarship through the provision of innovative computing resources and services.

Over the past seventeen years, the Library has aggressively pursued the creation of distributed and flexible technical systems that enhance access, manipulation, storage, distribution, and integration of information for research and pedagogy. In 2006, the Library's Electronic Text Center merged with its successful Geospatial and Statistical Data Center (in operation since 1996) and with a Research Computing Support Center belonging to our University-level IT division. These merged centers became the popular "Scholars' Lab," located in a renovated space in Alderman Library. Jointly staffed by the Library's Digital Research & Scholarship department and ITC's Research Computing Support group, the Scholar's Lab offers a welcoming place for faculty and students to explore tools and content, receive assistance with digital projects, collaborate on research, and participate in intellectual programming.

In 2007, the Scholar's Lab expanded its support to the next generation of scholars by establishing three new, year-long Graduate Fellowships in Digital Humanities, awarded annually to advanced graduate students from a variety of disciplines. The awards are supported by the Jeffrey C. Walker Library Fund for Technology in the Humanities, the Matthew & Nancy Walker Library Fund, and the original challenge grant from the NEH.

The Scholars' Lab will be the primary host for sessions of the proposed Institute for Enabling Geospatial Scholarship, some of which will be held in the nearby Mary and David Harrison Institute for American History and Culture (which recently offered a year-long exhibit of a major bequest of historical maps by Dr. Seymour I. Schwartz and maintains the new Schwartz Map Room) and in the Albert C. Small Special Collections Library, in which the Library's map digitization unit, Scholarly Resources Digitization Services, resides. Collaboration among these Library units around the IATDH project promises a well-rounded experience for our library, museum, center staff, and faculty attendees. Proximity and close collaboration with the Institute for Advanced Technology in the Humanities, whose early work on map-based humanities scholarship (as in UVA Professor Benjamin Ray's *Salem Witch Trials Archive*) and later emphasis on GIS and virtual environments (including the international *Rome Reborn* initiative) holds the possibility for attendees of a field trip to IATH Graphics on Charlottesville's Downtown Mall. Provision for housing will be made at local hotels and through University of Virginia Conference Services.

The University of Virginia itself is currently rated the #1 "best value" public university in the United States by the *Princeton Review* and #2 overall by *U.S. News and World Report*, and its University Library is the 2005 winner of the ACRL's "Excellence in Academic Libraries Award," the highest national service award given in the academic library profession. In 2008, an internal Commission on the Future of the University identified digital scholarship and computation-intensive research as key institutional priorities for UVA, and the University's Board of Visitors affirmed its support for these fields by seeding twinned, interdisciplinary initiatives with faculty leadership: *SHANTI*, the Social Sciences, Humanities, and Arts Network for Technological Innovation, and *UVACSE*, the University of Virginia Alliance for Computational Science and Engineering.

The University of Virginia Library, with the 2007 creation of the positions of Director of Digital Research & Scholarship and Director of Scholarly Resources, is once again reinventing itself in fostering faculty-led digital innovation. We are actively reconfiguring our own structures and resources in readiness to support next-generation research and to share our experiences with the larger academic library community. Digital initiatives and the forging of new models and methodologies for scholarly inquiry and communication are key to the Library's vision of itself a model 21<sup>st</sup>-century research institution. As such, they are among our top priorities for the Library's \$100 million Capital Campaign, which began publicly in the fall of 2006, and is now successfully nearing the halfway mark.

**Curriculum & Work Plan:** The Institute for Enabling Geospatial Scholarship will be held in two distinct rounds, some seven to nine months apart. Each session will take place over the course of four days in Charlottesville, Virginia at the University of Virginia Library. Work happening between the sessions and after the close of the Institute will be facilitated by an online informational clearinghouse and community, maintained by the Scholars' Lab.

Round 1 of the Institute will focus on institutional support for geospatial data and research and will be subdivided into two "tracks." The first track will be geared toward administrators, librarians, curators, and heads of centers that support humanities scholarship. This group will focus on policy development, public services issues, and collections decisions regarding geospatial data and spatial research output, and discussion will be facilitated by Julie Sweetkind-Singer, Stanford University Library's GIS and Map Librarian. Ms. Sweetkind-Singer will situate our conversation with reference to her experience as a

curator of historical maps and her work on the long-term preservation of geospatial information as part of a Library of Congress grant to create a National Geospatial Data Archive. Madelyn Wessel, Esq., UVA Library's in-house legal counsel, will participate in this track and make a presentation on intellectual property rights related to geospatial information creation and sharing. Prior experience of the participants in this track may include devising metadata standards, establishing best practices for digital projects, stewarding data collections, and educating users on digital tools for research and teaching.

The curriculum for public service-oriented participants will consider principles of geospatial data librarianship, including the curation of geospatial collections, metadata standards, and best practices for spatial data in scholarly communities. Presentations will focus on ways to incorporate spatial methodologies in faculty research and the classroom, as well as methods for integrating spatial data with larger humanities collections of texts, images, and other media.

In the second track, to be facilitated by Scholars' Lab staff experienced in building and maintaining our GIS infrastructure, information scientists and systems administrators will meet to learn the architecture, tools, and practices required to establish a technical foundation for robust GIS support. The technical track will take a comprehensive look at the strategy, skills, and techniques required to implement a geospatial infrastructure on an institutional level. Participants in the technical track should have a basic understanding of web development practices and Linux operating systems. Prior experience in Javascript and/or XSLT is helpful but not required.

Initial sessions for this group will center on the data, formats, and tools used to construct a geospatial data infrastructure. From basic features, participants will first construct simple applications of their own and then explore a complex, pre-fabricated application that exhibits some of the rich possibilities for constructing interpretive tools with geospatial technologies. Time will be set aside for "un-conference"-like presentations from attendees on projects and initiatives from their own institutions.

The final morning of Round 1 will bring both the geospatial data stewardship and technology tracks together for a joint discussion on concrete institutional goals for supporting spatial data, tools, and scholarship.

Seven to nine months later, teaching faculty and advanced graduate students (many hailing from the same institutions that participated in the first round of the Institute) will convene in Charlottesville for another four-day session to discuss scholarship and research methodologies built upon the infrastructure and institutional practices discussed in the first round. These participants' scholarship must employ studies of space and place in a significant way. A basic understanding of the field of GIS is expected (and readings will be provided prior to the Institute), but the session will begin with an overview of tools and methods. Prior experience with XML, TEI, or any programming language will facilitate an understanding of some standards and practices presented in this Institute, but is not necessary for full participation.

This round of the Institute will be structured around symposia on topics of interest based on a prepared set of readings and identified by the scholars themselves before the proceedings. The conversation will be facilitated by Anne Kelly Knowles, author of *Past Time, Past Place: GIS for History* and editor of *Placing History: How Maps, Spatial Data, and GIS Are Changing Historical Scholarship*. Dr. Knowles will contextualize our work in light of late-breaking scholarly products of the NSF-funded *Holocaust Geographies* project, for which she serves as PI.

Our opening discussions will identify central questions facing the application of spatial tools and data in the humanities, with Jessop's 2008 article serving as a guide. Participants will then learn everyday tools of the trade for GIS and apply them to both simple applications and complex questions involving the

representation of ambiguous spaces and mapping over time. The use of historical maps and geospatial metadata markup will also be given significant attention. Our work will conclude with an open discussion (to be distilled in a report and published in the Institute's clearinghouse) of the possibilities for mapping space, place, and time in the digital humanities. Participants also will devise concrete goals for current projects that leverage the tools and methodologies explored in the session.

After the Institute, participants in both rounds will log their activity in the clearinghouse, discuss findings and approaches with their peers in an online forum, and make results (raw data, policies, code, and scholarly projects) available through their own institutional structures, through the clearinghouse, and in open source repositories as appropriate.

Materials, readings and greater detail on the curriculum, as well as a concrete schedule of discussion topics and activities for the Institute, are included in Appendices B and G.

**Participants:** Because a major goal of our program is to build the technical capacity and sharpen the resolve of institutional players to support innovative uses of geospatial information in humanities scholarship, preference will be given to participants who apply as part of an institutional team that commits to representation in both rounds of the Institute. An ideal institutional team would consist of two Round One (Fall 2009) attendees – one to participate in the data stewardship and policy track and another to receive training in the GIS infrastructure track – and two Round Two (Spring 2010) attendees: a humanities scholar with current or planned projects using geospatial tools or methods, and an advanced graduate student affiliated either with the scholar's project or with other institutional efforts at humanities GIS. The variety of organizational approaches to GIS and digital humanities will undoubtedly require adjustments to this ideal, but primary selection criteria will remain the seriousness of the institution about GIS support, its need for a watershed experience like the Institute to move forward, and the interest of its scholars in shaping GIS support (which most schools gear to Architecture and Environmental Sciences) toward humanities research needs.

The practice of dividing the Institute into three effective "tracks" will ensure that its curriculum and discussion is tailored to the interests, strengths, and levels of readiness of each participant group. Round One tracks will prepare participants to return home and enhance or renew their institutions' ability to support scholarly GIS. By holding the faculty/grad student seven to nine months later, we hope to foster scholarly discussion based on institutional realities and allow attending humanists to return home to a supportive environment, enriched with ideas that have a real chance of bearing fruit.

The Scholars' Lab will solicit applications to the Institute beginning in late June 2009, via messages to HUMANIST, HASTAC, Code4Lib, GIS4Lib, EDUCAUSE, Bamboo, and other relevant communities as well as flyers at the *Digital Humanities 2009* conference. Applications will consist of expressions of interest and rationale for representation, brief vitae for individual attendees or members of proposed teams, and a letter of institutional commitment from appropriate center, museum, or library administrators. The requested NEH funding will allow us to support travel, meals, and accommodations for 40 outside participants: 20 in the first round, primarily hailing from libraries, museums, and humanities centers, and 20 faculty and graduate student attendees in the second round. Among the applicants for the Institute, we expect to see some leaders in geospatial technologies and spatially-interested digital scholarship. The judicious addition of a few of these scholars, administrators, and developers would enrich our discussions and help other Institute attendees network with new communities. In selecting attendees, we will endeavor to create a healthy balance of skill levels, areas or disciplines of concentration, and need for specialized training not available elsewhere. We will also select participants with an eye toward growing the field of GIS-based humanities scholarship. The selection committee will consist of Bethany Nowviskie (University of Virginia), Anne Knowles (Middlebury

College), Diana Sinton (University of Redlands), and Julie Sweetkind-Singer (Stanford University), with assistance by Joseph Gilbert and his staff in the Scholars' Lab.

With some preference given to institutional teams, we expect to welcome representatives of 12 – 20 universities and institutions in all. Of these, we propose to give special consideration to only one institutional team – that from Stanford University. Stanford is currently engaged in a partnership with UVA Library around the creation and implementation of a Fedora-based digital repository system married to Project Blacklight, a Scholars' Lab-created interface to library catalog information and digital collections. Because we hope to integrate this successful collaborative project more closely with our work on GIS infrastructure (and have already begun implementation of spatial search in Blacklight and consideration of the repository implications of spatial data), and because of Stanford University Library's recognized expertise in geospatial data collections and policies, we would like to jump-start post-Institute activities by reserving a place for Stanford.

A second measure by which we hope to promote collaborative work under the rubric of the NEH Institute would be by tying \$40,000 of University of Virginia Library funding already earmarked for short-term scholar- or developer-in-residence fellowships to the theme of Enabling Geospatial Scholarship. The Scholars' Lab would host and administer these fellowships, which would be awarded competitively over the course of the two years following the first gathering, to Institute attendees and their collaborators who propose concrete projects or initiatives that build on their Institute training, and that could be documented in the online clearinghouse.

**Impact & Evaluation:** The concepts and practices involved in our approach to geospatial information are echoed in broader cultural trends toward open source, open data, ubiquitous GPS technology and spatial awareness, Web services, mashup culture, and social networking. That more digital humanists are not making use of GIS is a comment on the readiness of their academic support structures rather than on the conceptual utility of spatial tools and methods. We therefore see the proposed Institute for Enabling Geospatial Scholarship as a strategic intervention into an area of digital humanities research that is poised for expansion and in need of more sophisticated and coordinated support by libraries, centers, and cultural heritage institutions. The two-round, three-track approach of the Institute is designed in its first iteration to lay the technical and policy-level groundwork for improved support of geospatial research at our participating institutions, in preparation for the increased intellectual and scholarly engagement we expect will result from the second round of the Institute. The ultimate goal of the program is to deepen the impact of promising new spatial tools and methodologies on arguments embodied by scholars in digital humanities projects, and on the larger fields for meaning-making that research institutions provide to them.

In order to support these desired outcomes and expand the reach of the Institute to a global (and deliberately heterogeneous) audience of librarians, scholars, and technologists, we plan to create and maintain an open-access information clearinghouse similar to that called for by Martyn Jessop in his LLC article, "The Inhibition of Geographical Information in Digital Humanities Scholarship" (Jessop 2008). This online forum will facilitate continued, archived discussion, information sharing, and collaborative planning, and will provide an easy platform for showcasing successful geospatial projects and scholarly methodologies. The exact technical requirements for the clearinghouse will emerge in discussion with Institute participants, and we hope to identify community leaders who can emerge from each track as stewards for the online community. In addition, we are requesting 2-year funding for a part-time graduate student employee who can work to build the clearinghouse, coordinate the efforts of its volunteer contributors, and ensure that it gets off to a good start as a lively place, populated with useful and up-to-date information.



It is also crucial to the goals of the Institute that its own findings and the possibilities it opens up be entered into the scholarly record. We will therefore invite Institute participants in both rounds to collaborate with the Scholars' Lab on proposing panel discussions for upcoming international scholarly gatherings in our field: *Digital Humanities 2010* (to be held at King's College, London) and *2011* (to be held in North America), and to revise those presentations for publication in venues like *Digital Humanities Quarterly* and *Literary and Linguistic Computing*.

Finally, we will work with our library's Management Information Services department to design surveys and other qualitative measures to evaluate the success of the Institute. The University of Virginia has a strong reputation among its peers in the Association of College and Research Libraries (ACRL) as an assessment- and data-driven organization, and Management Information Services has a great deal of experience in the design of instruments that elicit useful information from library and faculty/student audiences.

We plan to employ a mixed methods evaluation process to assess the Institute's efficacy. We will use pre- and post test quantitative surveys to assess change due to participation in each session. The pre-test evaluation will be given one week prior to arrival at the University of Virginia and will consist of 25 questions designed to evaluate the level of the knowledge the participant has regarding GIS, web technologies, and scholarly applications for spatial tools. These questions will be answered using a five-point Likert scale ranging from "I know nothing about this topic" to "I am very knowledgeable about this topic." The same survey will be given within one week after participation. Survey data will be analyzed using a paired sample T-test analysis with SPSS software.

We will also ask the participants to complete a more detailed essay-style survey to assess qualitative changes related to participation in our program. Data derived from these surveys will be coded and analyzed using NVivo Qualitative Research Software. Results will be analyzed with respect to major themes inherent in our content matter. This data will be processed after each iteration of the Institute and reports will be prepared and made public by Dr. Nancy Kechner, a full-time, expert consultant in qualitative and quantitative analysis in the Scholars' Lab.

**Staff, Faculty, & Consultants:** The Institute for Enabling Geospatial Scholarship will be convened by *Bethany Nowvickie, MA Ed., Ph.D.*, Director of Digital Research & Scholarship for the University of Virginia Library, and coordinated with the assistance of *Joseph Gilbert, MA*, Head of UVA Library's Scholars' Lab.

*Julie Sweetkind-Singer, MLIS*, Head Librarian and GIS & Map Librarian at Stanford University's Branner Earth Sciences Library & Map Collection, will serve as facilitator for the Administration and Data Stewardship track of Round 1, with the assistance of *Dr. Bethany Nowvickie* and Scholars' Lab GIS Specialist *Kelly Johnston, MS GIS*. Guest speakers include: *Madelyn Wessel, Esq.*, Special Advisor to the University Librarian and Liaison to the Office of the General Counsel, UVA, *Dr. Joshua Greenberg*, Director of Digital Strategy at the New York Public Library, and *Dr. Diana Sinton*, Director of Spatial Curriculum and Research, University of Redlands.

The Technology track of Round 1 will be coordinated by *Joseph Gilbert*, with instruction by Scholars' Lab staff, including: GIS Specialist *Christopher Gist, MS*; User Support Programmer *Adam Soroka* (leader of a pre-conference workshop on the Scholars' Lab approach to GIS infrastructure at the 2009 Code4Lib conference in Providence, RI); Scholars' Lab Digital Humanities Specialist *Wayne Graham, MA*; and UVA Library Chief Systems Architect *Elizabeth (Bess) Sadler, MLIS*. Guest speakers include: *Shekhar Krishnan*, of MIT and *Mumbai Free Map* project; *Schuyler Erle* of OpenLayers, author of the O'Reilly books *Map Hacks* and *Google Maps Hacks*; *Andrew Turner* of Mapufacture, author of *An*

*Introduction to Neogeography* and *Where 2.0: The State of the Geospatial Web*, and Sean Gillies of the *Pleiades Project* at the Institute for the Study of the Ancient World, NYU.

Anne Kelly Knowles, M.Sc., Ph.D., of Middlebury College, author of numerous books, articles, and textbooks on GIS applications for humanities scholarship, will facilitate Round 2 together with Dr. Bethany Nowviskie. Guest speakers include: Dr. Todd Presner of UCLA and the *HyperCities* project; Dr. David Germano of the Tibetan and Himalayan Digital Library (UVA), Dr. Benjamin Ray of the Salem Witch Trials Archive (UVA), and Martyn Jessop of the Centre for Computing in the Humanities, King's College, London.

Logistical support for the Institute will be provided by Becca Peters, Assistant to the Director of Digital Research & Scholarship. Evaluation will be the responsibility of Nancy Kechner, Ph.D., Research Computing Support Specialist in the Scholars' Lab, in consultation with Management Information Services at the University of Virginia Library.

Institute faculty and staff are listed in **Appendix A**, and brief curriculum vitae for 10 outside faculty and 10 core UVA faculty and teaching or consulting staff are included in **Appendix C**. In addition, the following 10 experts in humanities cyberinfrastructure, geospatial technology, or digital scholarship with significant spatial components have agreed to review and comment on our syllabi for the Institute: Jennifer Green, GIS Librarian at the University of Michigan; Dr. Dan Cohen, Director of the Center for History and New Media, George Mason University; Dr. Tom Elliott of the Pleiades Project at the Institute for the Study of the Ancient World, NYU; Dr. Worthy Martin, Associate Director of the Institute for Advanced Technology in the Humanities, UVA; James Boxall, Director of the GIS Centre at Dalhousie University, Nova Scotia; Dr. Scot French of the Virginia Center for Digital History; Dr. Neil Fraistat, Director of the Maryland Institute for Technology in the Humanities; Dr. John Krygier, Ohio Wesleyan, author of *Making Maps: A Visual Guide to Map Design for GIS*; Martha Sites, Associate University Librarian for Production and Technology at the University of Virginia, and Dr. Abby Smith, Senior Advisor to the Scholarly Communication Institute. Letters of interest, support, and commitment to the proposed Institute are found in **Appendix D**.

#### **Budget Notes:**

**Personnel costs:** Faculty and classified staff cost share is calculated on actual salaries in the first year, with a 3% increase in the second year. The University of Virginia standard federal percentage for fringe benefits is 26.9% for faculty, 38.6% for classified staff, and 6.3% for hourly wage employees.

**Service costs:** In order to set up and maintain a website for this project, we calculate the following costs: a portal programmer (80 hours at \$30/hour), a web designer (30 hours at \$100/hour), and web hosting by UVa Library (\$250 per year).

**Participant support costs:** Includes honoraria of \$1,500 each for 2 facilitators and honoraria of \$500 each for 10 presenters not affiliated with the Scholars' Lab. In the second year, we will offer stipends of \$500 (\$125 per day x 4 days) each for 10 graduate student participants.

**Travel costs:** At the first Institute, travel, lodging, meals and per diem will be provided for 26 attendees, including the facilitator and presenters. At the second Institute, travel, lodging, meals and per diem will be provided for 24 attendees, plus two additional local presenters who will only receive meals and per diem. We have calculated the average cost of travel to and from Charlottesville at \$800. Lodging is calculated at the State allowed rate of \$100 per night for 4 nights at each institute. The state allowed rate for meals is \$41 per day for 4 days, plus \$3 per diem for 4 days.

**Conference costs:** We estimate that 35 individuals will attend each Institute, including the 20 invited attendees, plus facilitators, presenters, and Scholars' Lab staff. For each Institute, we calculate catering expenses at \$25 per person per day (35 x 4 x \$25), plus \$25 per person for a banquet to conclude the event (\$25 x 35), plus \$200 for fees, linens, etc. We calculate \$2,000 will be needed per year for materials and office supplies, and have added \$600 per institute for photocopying costs. Room rental for each 4-day conference in the Harrison-Small complex includes \$200 per day for the Harrison-Small Auditorium (\$200 x 4), plus the Byrd/Morris rooms at \$150 per day (\$150 x 4).

Indirect costs have been figured at the University's Federal rate of 51.5%, and are calculated omitting the \$5,000 for graduate student stipends in the second year.

The total cost of this proposed project is \$238,997, with \$162,457 (68%) requested from NEH, and \$76,520 (32%) as UVA's cost share.

As universities and cultural heritage institutions enter straightened economic times, we anticipate that lack of support for travel will be the primary obstacle to collaboration in digital humanities learning opportunities. NEH funds will therefore primarily support travel, lodging, meals, and materials for Institute participants.

As a further contribution to the program's success (but not calculated as part of the IATDH budget), UVA Library will devote \$40,000 earmarked for visiting scholars to fund 5 or more ongoing developer- and scholar-in-residence fellowships in GIS at the Scholars' Lab over the course of the two-year grant. Institute attendees and clearinghouse members will be eligible for these fellowships, which will require a tangible "give-back" to the larger, online community. They are designed as strategic incentives to deepen the collaborative efforts the IATDH grant will foster and to ensure the ongoing commitment of the University of Virginia Library to leadership in GIS for the digital humanities.

*Appendix B: Course Outlines:*

**Round 1: October 2009**

Unless otherwise noted, all sessions will be held in the Byrd and Morris rooms of the Harrison-Small Library. Continental breakfasts will be served in the Scholars' Lab, and participants will pick up boxed lunches in the Scholars' Lab conference room. Optional outings will include a field trip to IATH Graphics on Charlottesville's historic Downtown Mall, and expeditions using GPS devices on loan from the Scholars' Lab, to map the Grounds of the University of Virginia for inclusion in OpenStreetMap: <http://tinyurl.com/osm-uva>.

Day 1

<b>Time</b>	<b>Data Stewardship Track</b> Byrd Room	<b>Technology Track</b> Morris Room
8:30 a.m. – 9:00 a.m.	Continental Breakfast	
9:00 a.m. – noon	Introductions. Overview of GIS in the Humanities (with presentations by Julie Sweetkind-Singer, Bethany Nowviskie, and Diana Sinton)	Introductions. Tools of the Trade: Geospatial Databases, Data Formats, Web Services, Mapping Applications (welcome by Joseph Gilbert, presentations by Scholars' Lab staff)
Noon – 1:00 p.m.	Box Lunches	
1:00 p.m. – 4:00 p.m.	Geospatial Data Librarianship (facilitated by Julie Sweetkind-Singer)	Establishing an Open Source GIS Infrastructure (Scholars' Lab staff and Sean Gillies)
Evening (weather permitting)	Optional outing to map the Grounds of the University of Virginia for inclusion in OpenStreetMap.	

Day 2

<b>Time</b>	<b>Data Stewardship Track</b> Byrd Room	<b>Technology Track</b> Morris Room
8:30 a.m. – 9:00 a.m.	Continental Breakfast	

9:00 a.m. – noon	Geospatial Data and Tools in Humanities Research (with a presentation by Christopher Gist and Kelly Johnston)	Example Applications: Jefferson’s Monticello (Joseph Gilbert and Adam Soroka) and the NYPL Map Rectifier (Schuyler Erle and Shekhar Krishnan)
Noon – 1:00 p.m.	Box Lunches	
1:00 p.m. – 4:00 p.m.	Support for Spatial Thinking in the Humanities Curriculum (Diana Sinton and Julie Sweetkind-Singer, presentation by Shekhar Krishnan)	Customizing Schemas, Styles, and Services (Andrew Turner, Schuyler Erle, and Scholars’ Lab staff)
Day 3		
<b>Time</b>	<b>Data Stewardship Track</b> Byrd Room	<b>Technology Track</b> Morris Room
8:30 a.m. – 9:00 a.m.	Continental Breakfast	
9:00 a.m. – noon	Policies for Libraries and Cultural Heritage Institutions (Julie Sweetkind-Singer, with a presentation by Madelyn Wessel on intellectual property issues)	Example Application: H.P. Lovecraft’s Providence (Adam Soroka and Bess Sadler)
Noon – 1:00 p.m.	Box Lunches	
1:00 p.m. – 4:00 p.m.	A Holistic Approach to Digital Collections: Texts, Images, and Spatial Data (Bethany Nowviskie, Joshua Greenberg, Shekhar Krishnan, and Bess Sadler)	Discussion: Building Spatially-enabled Scholarly Content: a Mashup Approach (facilitated by Joseph Gilbert, with presentations by Sean Gillies and Andrew Turner)
7:00 p.m.	Banquet (Harrison-Small Auditorium)	
Day 4		

<b>Time</b>	<b>Data Stewardship Track</b> Byrd Room	<b>Technology Track</b> Morris Room
8:30 a.m. – 9:00 a.m.	Continental Breakfast	
9:00 a.m. – noon	Closing Discussion and Information Sharing: Support for Scholarship of Space and Place (held in the Scholars' Lab, facilitated by Julie Sweetkind-Singer & Bethany Nowviskie, with opening comments by Shekhar Krishnan and Diana Sinton)	
Noon – 1:00 p.m.	Lunch Buffet in the Scholars' Lab and farewell	

The curriculum for **policy and data stewardship-oriented participants** will begin by focusing on central concepts of using GIS data, like projections and symbology, specific issues in an academic setting, and principles of geospatial data librarianship. Texts for this session will include a series of articles and book chapters detailing the core challenges of finding, supporting, and using geospatial data in humanities scholarship. The first day's afternoon session will consider methods of finding and acquiring geospatial data, defining reference services for GIS, curating geospatial collections, and investigating metadata standards.

Discussions on the second day will concern best practices for providing geospatial data reference services, educating teaching faculty and graduate students on the possibilities for spatially enabled scholarship, and ways to incorporate spatial tools in pedagogy.

Based on discussions and presentations from the previous day, participants will spend the third day collaborating on future policies and best practices for spatial data in scholarly communities. A series of papers by the National Geospatial Data Center (NGDC) will frame the discussion, which will also be informed by a presentation and Q&A session on intellectual property issues related to geospatial data sharing and use, by UVA Library's legal counsel, Madelyn Wessel, Esq. In the afternoon, participants will look beyond the idea of a geospatial data 'silo' to methods for integrating spatial data with larger collections of text, image, and other media. A close look at UVA's Project Blacklight, open source library catalog software, and at digital initiatives at the New York Public Library, will frame a discussion about approaches to integrating geospatial search and discovery within broad, diverse collections of materials.

Initial sessions for **technology and infrastructure-oriented participants** will center on introductions to core concepts in geospatial data applications, including data formats and standards, geospatial databases, web services, geospatial search, and interactive mapping interfaces.

Participants will learn how to install and configure a suite of open-source database, web service providers, metadata managers, search providers, and interface tools that make up a modern,

enterprise-scale GIS infrastructure for academic use. Core pieces of software include PostGIS (<http://postgis.refractory.net/>), Geoserver (<http://geoserver.org/>), GeoNetwork (<http://geonetwork-opensource.org/>), and OpenLayers (<http://www.openlayers.org>). Participants will then investigate the salient features of each application as they pertain to humanities computing.

After establishing a bare-bones framework for delivering geospatial content over the Web, participants will examine a simple example application created by the Scholars' Lab and construct new ones of their own, exploring the employment of these tools in scholarly applications. The framework established at UVA allows for significant customization at every level of the infrastructure, and significant time will be dedicated to discussions of custom data models, map styles, and output formats possible with the tools used.

After mastering the basic aspects of the tools used, technologists will explore a complex, pre-fabricated application that exhibits some of the rich possibilities for constructing interpretive tools with geospatial technologies, connecting to the greater library collection to GIS-specific capabilities. This application, which ties Encoded Archival Description data from the H.P. Lovecraft collection at Brown University to an interactive map of Providence, RI and a SIMILE timeline, provides a model for the integration of special collections materials with rich GIS data in an interpretive field that makes sense to scholars. Finally, in the tradition of the "un-conference," participants will have the chance to display and discuss their own efforts from the past few days, work with other programmers, and compare notes.

The final morning of the Institute's first round will bring both public service and technology tracks together for a joint discussion on concrete institutional goals for supporting spatial data, tools, and scholarship.

## **Round 2: June 2010**

All events take place in the Byrd room, Harrison-Small Library, unless otherwise noted.

### Day 1

8:30 a.m. – 9:00 a.m.	Continental Breakfast
9:00 a.m. – noon	Welcome, Introductions, and Opening Discussion: Studies of Space and Place in a Digital Age (facilitated by Anne Knowles and Bethany Nowvskie, with introductory presentations by Martyn Jessop and Todd Presner)
Noon – 1:00 p.m.	Box lunches
1:00 p.m. – 4:00 p.m.	Introduction to GIS, Virtual Maps and Globes, Web Mashups (Chris Gist, Kelly Johnston, Joseph Gilbert)
Evening (weather permitting)	Optional outing to map the Grounds of the University of Virginia for inclusion in OpenStreetMap.

## Day 2

8:30 a.m. – 9:00 a.m.	Continental Breakfast
9:00 a.m. – noon	Spatial Approaches and Standards in Digital Projects and the Representation of Historic Maps (presentations by David Germano and Benjamin Ray, hands-on exercise by Scholars' Lab staff)
Noon – 1:00 p.m.	Box Lunches
1:00 p.m. – 4:00 p.m.	Ambiguous, Liminal, Subjective, and Imaginary Spaces (Anne Knowles and Todd Presner, with a presentation by Bess Sadler and hands-on exercise by Bethany Nowviskie)
Evening	Optional outing to visit IATH Graphics, Charlottesville Downtown Mall

## Day 3

8:30 a.m. – 9:00 a.m.	Continental Breakfast
9:00 a.m. – noon	Linking Time and Space, Marking Up a Chronological Space (Joseph Gilbert and Martyn Jessop, discussion facilitated by Anne Knowles)
Noon – 1:00 p.m.	Box lunches
1:00 p.m. – 4:00 p.m.	Mapping a Literary and Historical Space (hands-on exercise led by Adam Soroka and Scholars' Lab staff)
7:00 p.m.	Banquet (Harrison-Small Auditorium)

## Day 4

8:30 a.m. – 9:00 a.m.	Continental Breakfast
9:00 a.m. – noon	Closing Discussion: Mapping the Future of the Digital Humanities (opening comments by Todd Presner and Martyn Jessop, discussion facilitated by Anne Knowles)
Noon – 1:00 p.m.	Buffet Lunch and farewell

Anne Knowles will serve as primary facilitator for the second round of the Institute, geared toward **humanities faculty and graduate student participants**. An opening discussion will identify central questions facing the studies of space and place in the digital humanities. Martyn Jessop's 2007 article on inhibiting factors in humanities GIS will serve as a guide, and Jessop will present his work. The first afternoon session will allow scholars to become familiar with the



everyday tools of the trade for spatial scholarship. Core GIS concepts, interactive maps and globes, and principles of web mashup applications—including web services and open data—will be covered in depth by Scholars' Lab staff to provide participants with the underlying technical understanding required to formulate and manage complex scholarly projects incorporating these tools.

Those general technological principles will be brought to bear on humanities studies during the second day as scholars examine digital projects, historical map content, and metadata standards that make innovative inquiries using spatial tools in humanities disciplines possible. Tools such as Benjamin Ray's temporal map of Salem witch trial accusations (which Ray will present to the group), the New York Public Library's Map Rectifier, IATH's *Virtual Rome* exhibit, Todd Presner's *HyperCities* project, and content collections such as David Rumsey's online map library, with its Google Earth and Second Life integration, will serve as examples.

After the hands-on experience of the morning session, we will invite scholars to engage critically with places that are difficult if not impossible to map with precision. Ambiguous or conflicting place names, liminal spaces, subjective or politically-inflected views of space, and imaginary places are often encountered in humanities studies and present a unique challenge to the science-based approaches of online spatial tools. HyperBerlin (presented by Todd Presner), the Open Street Map Project and the Tibetan-Himalayan Places Dictionary (presented earlier in the day by David Germano, but now described technically by Bess Sadler) will offer guidance. Scholars will attempt to go further in the session with a hands-on exercise (led by Bethany Nowviskie and inspired by the work of Jerome McGann and Johanna Drucker) to map the seemingly unmappable.

Studies of place are tied intimately to considerations of time and history. On Day 3, Martyn Jessop and Joseph Gilbert will examine solutions for visualizing maps and spatial information over time with tools such as SIMILE's Timeline and the TimeMap project. In the afternoon, participants will dissect a complex example application involving space and time in the stories, letters, and life of a 20<sup>th</sup> century author. The Scholars' Lab has created an application that allows users to examine the ways H.P. Lovecraft's longtime home of Providence, RI influenced his writing. Users can see the changing face of Providence through the years and how Lovecraft's stories and correspondence interpret that spatial field. Scholars will leave the session with the ability to alter this application to represent an author and place of their choosing.

The second session of the Institute concludes with a reflection on possibilities for deeper, formal engagement with space, place, and time in the digital humanities. Participants will devise concrete goals for current projects that leverage the tools and methodologies explored in the Institute.

Over the following year, **participants in all three Institute tracks**, with the support of a graduate student employee in the Scholars' Lab, will log their activity in an online clearinghouse, discuss findings and approaches with their peers in an open forum, and make results (raw data, policies, code, and scholarly projects) available through an open source and open data portal.

**Appendix G: bibliography and suggested Institute readings**

(Note that in some cases, the texts and resources below will be excerpted for Institute attendees.)

**Policy and Data Stewardship track**

Buckland, et al. "Access to Heritage Resources Using What, Where, When, and Who." 2007.  
<http://www.archimuse.com/mw2007/papers/buckland/buckland.html>

Hoebelheinrich, N. and Banning, J. "An Investigation into Archiving Geospatial Data Formats." 2008. [http://www.ngda.org/reports/InvestigateGeoDataFinal\\_v2.pdf](http://www.ngda.org/reports/InvestigateGeoDataFinal_v2.pdf)

Beorn, et al. "Holocaust Geographies." 2007. <http://holocaust-geographies.blogspot.com/>

Janée G, Frew J, Hill LL. Issues in georeferenced digital libraries. D-Lib Magazine(2004 10(5)).  
<http://www.dlib.org/dlib/may04/janee/05janee.html>.

Jessop, M. "The Inhibition of Geographical Information in Digital Humanities Scholarship." *Literary and Linguistic Computing*. 2007. <http://llc.oxfordjournals.org/cgi/reprint/fqm041v1>

Johnson, J. *Geographic Information: How to Find It, How to Use It*. 2003.

Knowles, A. and Hillier, A., eds. *Placing History: How Maps, Spatial Data, and GIS Are Changing Historical Scholarship*. 2008.

Lo, C.P and Yeung, Albert K.W., *Concepts and Techniques of Geographic Information Systems*. 2002.

Lund, J. "GIS and spatial thinking in the arts, humanities, and languages." *Understanding Place: GIS and Mapping across the Curriculum*. Lund, J. and Sinton, D., eds. 2006.

Monmonier, M. *Mapping It Out: Expository Cartography for the Humanities and Social Sciences*. Chicago: University of Chicago Press, 2003.

National Geospatial Digital Archive (NGDA). <http://ngda.org/>

Okabe, A., ed. *GIS-based Studies in the Humanities and Social Sciences*. CRC Press, 2005.

Open Geospatial Consortium, Inc. Open Geospatial Consortium Standards for WMS, WCS, WFS.

<http://www.opengeospatial.org/standards/wms>

<http://www.opengeospatial.org/standards/wcs>

<http://www.opengeospatial.org/standards/wfs>

Parry, R. and Perkins, C. *The Map Library in the New Millennium*. 2001.

Scharl, A. and Tochtermann, eds. *How Geobrowsers, Social Software and the Web 2.0 are Shaping the Network Society*. 2007.

Turner, Andrew. "Introduction to Neogeography." O'Reilly Short Cuts, 2006.  
<http://oreilly.com/catalog/9780596529956/>

## **GIS Technology and Infrastructure track**

Hoebelheinrich, N. and Banning, J. "An Investigation into Archiving Geospatial Data Formats." 2008. [http://www.ngda.org/reports/InvestigateGeoDataFinal\\_v2.pdf](http://www.ngda.org/reports/InvestigateGeoDataFinal_v2.pdf)

Jessop, M. "The Application of a Geographical Information System to the Creation of a Cultural Heritage Digital Resource." *Literary & Linguistic Computing* 20.1: 71-90.

Jessop, M. "The Inhibition of Geographical Information in Digital Humanities Scholarship." *Literary and Linguistic Computing*. 2007. (<http://llc.oxfordjournals.org/cgi/reprint/fqm041v1>)

Lo, C.P and Yeung, Albert K.W., *Concepts and Techniques of Geographic Information Systems*. 2002.

Monmonier, M. *Mapping It Out: Expository Cartography for the Humanities and Social Sciences*. Chicago: University of Chicago Press, 2003.

National Geospatial Digital Archive (NGDA). <http://ngda.org/>

Okabe, A., ed. *GIS-based Studies in the Humanities and Social Sciences*. CRC Press, 2005.

Open Geospatial Consortium, Inc. Open Geospatial Consortium Standards for WMS, WCS, WFS.

<http://www.opengeospatial.org/standards/wms>

<http://www.opengeospatial.org/standards/wcs>

<http://www.opengeospatial.org/standards/wfs>

Open Source Geospatial Foundation. OpenLayers Examples

<http://www.openlayers.org/dev/examples/> and OpenLayers API.

<http://dev.openlayers.org/releases/OpenLayers-2.7/doc/apidocs/files/OpenLayers-js.html>

Open Source Geospatial Foundation. GeoNetwork How-to's

<http://geonetwork-opensource.org/documentation/how-to>

OpenGeo. Geoserver Introduction. <http://geoserver.org/display/GEOSDOC/0.1+Introduction>

OpenGeo. GeoServer Developer's Guide.

<http://geoserver.org/display/GEOSDOC/Developers+Guide>

Turner, Andrew. "Introduction to Neogeography." O'Reilly Short Cuts, 2006.  
<http://oreilly.com/catalog/9780596529956/>

Turner, Andrew. "Trends and Technologies in Where 2.0" webcast.  
<http://www.oreillynet.com/pub/e/1156>

### **Geospatial Scholarship track**

Buckland, et al. "Access to Heritage Resources Using What, Where, When, and Who." 2007.  
<http://www.archimuse.com/mw2007/papers/buckland/buckland.html>

Del Casino, V. and Hanna, S. "Beyond the 'Binaries': A Methodological Intervention for Interrogating Maps as Representational Practices." *ACME: An International E-Journal for Critical Geographies*: 4 (1). 2006.

Gregory, I. "Using geographical information systems to explore space and time in the humanities." *The Virtual Representation of the Past*. Greengrass, M. ed. 2008.

Harley, J. "Deconstructing the Map." *The Spaces of Postmodernity: Readings in Human Geography*. Dear, M. and Flusty, S., eds. 2002.

Jessop, M. "The Inhibition of Geographical Information in Digital Humanities Scholarship." *Literary and Linguistic Computing*. 2007. (<http://llc.oxfordjournals.org/cgi/reprint/fqm041v1>)

Jessop, M. "Dynamic Maps in Humanities Computing." *HUMAN IT* 8.3(2006): 68–82

Jessop, M. "The Visualization of Spatial Data in the Humanities." *Literary and Linguistic Computing*. 2004. (<http://llc.oxfordjournals.org/cgi/reprint/19/3/335>)

Knowles, A. and Hillier, A., eds. *Placing History: How Maps, Spatial Data, and GIS Are Changing Historical Scholarship*. 2008.

Knowles, A. *Past Time, Past Place: GIS for History*. ESRI Press, 2002.

Lo, C.P and Yeung, Albert K.W., *Concepts and Techniques of Geographic Information Systems*. 2002.

Lund, J. "GIS and spatial thinking in the arts, humanities, and languages." *Understanding Place: GIS and Mapping Across the Curriculum*. Lund, J. and Sinton, D., eds. 2006.

Monmonier, M. *Mapping It Out: Expository Cartography for the Humanities and Social Sciences*. Chicago: University of Chicago Press, 2003.

Okabe, A., ed. *GIS-based Studies in the Humanities and Social Sciences*. CRC Press, 2005.

Paglen, T. "Unmarked Planes and Hidden Geographies." *Vectors* 2:2 Winter 2007.

Presner, T. "Hypermedia Berlin: Cultural History in the Age of New Media, or 'Is There a Text in this Class?'" *Vectors* 1:2 Spring 2006.

Scharl, A. and Tochtermann, eds. *How Geobrowsers, Social Software and the Web 2.0 are Shaping the Network Society*. 2007.

Thompson, V. "Telling Spatial Stories: Urban Space and Bourgeois Identity in Early Nineteenth-Century Paris." *Journal of Modern History*, Summer 2003.

Turner, Andrew. "Introduction to Neogeography." O'Reilly Short Cuts, 2006.  
<http://oreilly.com/catalog/9780596529956/>