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SCHOLARLY COMMUNICATION INSTITUTE 7: Spatial Technologies and the Humanities

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We provide here a summary of the major points of discussion from the 7th annual Scholarly Communication Institute.[1] Discussions focused on the nature and implications of spatial tools and methods for scholarly communication. This meant exploring the conceptual as well as technical challenges of using spatial technologies; the impact of using them on established scholarly practices; the organizational models best suited to support and nurture spatial research; and how the infrastructure of scholarly communication, from IT and libraries to publishing, should adapt to the "spatial turn" in scholarship. For all the talk about transformation—even revolution—in scholarship brought on by the digital, discussions at SCI were informed by a sense of realism, even pragmatism, focusing on what these changes mean for university-based practices in terms of strategic opportunities and tactical adaptation. For additional contributions to the discussion, see SCI 7 participant responses to a pre-meeting questionnaire.[2] Direct quotation from conversation with SCI participants are noted with quotation marks but not attributed.

SPATIAL METHODS IN THE HUMANITIES

What is the spatial turn?

Discussions at SCI began by exploring the nature of the "spatial turn"—an exploration of space and place in time, supported by technologies that represent spatial and temporal dimensions and permit scholars to discover, analyze, represent, and argue various interpretations of spatial data. The origin of the interest coincides with and is probably related to the proliferation of personal computing devices that are location-aware (utilizing GPS, for example); as well as two- and three-dimensional mapping services on the Web. Most frequently cited was Google Earth, which allows visualization of heterogeneous phenomena in three-dimensional space and effectively acts as an armature for the presentation of information. It has become the gateway for researchers of all ages and abilities to discover and display spatial information, creating users curious and primed for further exploration. Perhaps most significant is that these technologies—here called "vernacular," because they are not designed for

[1] http://www.uvasci.org/
[2] http://www.uvasci.org/for-participants/questionnaire-responses/

expert use exclusively—are so easy to use that a vast amount of contemporary knowledge production is spatially inflected, embedded with spatial data of one form or another.

There are fields—geography, archaeology, the classics, linguistics, landscape and architectural history, environmental history—which for decades have used the variety of sophisticated spatial analytical programs known collectively as geographic information systems (GIS). These disciplines study both natural and man-made spatial phenomena, such as landscapes, geophysical and political boundaries, transportation systems, urban development, agricultural regimes, and other historical phenomena that exist in the context of physical spatial systems, social spatial systems, and the interpenetrations of the two. Literary and cultural studies, including visual and religious studies, also seek to incorporate spatial representation and analytics in their work, but until recently have been more focused on artificial and imaginary spaces than on natural spatial phenomena.

In the context of SCI, the terms “spatial” and “geospatial” resisted precise definitions. Participants at times spoke of significantly different concepts under these terms, differences that usually reflected their disciplinary points of view and degree of familiarity with spatial technologies and spatial thinking skills. Most participants could agree that the term "geospatial" refers to something that exists in Earth space—that is, can be mapped onto a representation of the globe or the universe. They used “spatial” in a broad sense to encompass spaces that may not have a correlate on the planet or in the universe. And all concurred that “spatial” is shorthand for spatial *and* temporal; we need to avoid thinking of these as dualities.

What is its potential for the humanities?

Participants shared a particular interest in cultural and historical constructions of space and their representations. Because so many questions in the humanities address the diachronic, not just the synchronic, the ability to represent change over time is crucial. Change happens in time and space simultaneously. The diffusion of ideas, people, cultural artifacts, flora and fauna, is core to the work of geographers, historians, archaeologists, linguists, and musicologists, among others. To some participants, this means that the ability to represent and manipulate relative space has greater value than that of absolute space. But so, too, is the representation of historical and nonwestern cosmologies, sacred as well as secular spaces, artificial as well as natural places and events. The study of archaeological sites exemplifies the challenge of representing multiple layers of time and place in the same latitude and longitude. Not insignificantly, archaeologists often need to compensate for the fact that landscapes, soils, botanical specimens, and stratigraphic layers shift their longitude and latitude over time. Above all, humanists require that their tools be able to represent uncertainty, preserve various strands of historiographical interpretation, and account for the subjectivity of agency. Participants did not agree on whether one ontology or many are needed to represent all desired fields and attributes specific to categories of space, time, agency, and other features important to their discipline. Some scholars pressed

for a new suite of tools, other than GIS, that were not as difficult to learn or inflected with what they perceived as a scientific or quantitative bias. Others were pleased with the precision of GIS tools, pointing out that quantitative tools enable a great range of computational tasks that can run on massive data sets otherwise unintelligible to "the expert reader." Such tools, when used to interrogate narrative sources well-known to those expert readers, illuminate both and lead scholars to view their sources with greater depth perception.

However technologies and ontologies may differ among disciplines, all SCI 7 participants agreed that there is an unexplored universe of spatial information implicit in existing sources, both digital and analog. When "liberated" from a static analog medium and made legible to geospatial technologies, a whole new reservoir of information will be available to nourish new fields of inquiry. Historians and literary scholars of the 19th century, for example, can be daunted by the plethora of sources rich in locational and spatial information. The novels of James Fenimore Cooper, rail road freight tables, species observations, sound recordings, documentary images, and, of course, the massive print legacy of cartography—itself a result of information technology innovations such the production of cheap pulp paper and chromolithography—these are incredibly deep repositories of information that cannot tell us all they know until we make them machine-readable and interpretable. This is an enormous task.

Scholars want to have these resources digitized and georeferenced in order to visualize them, for, as architectural historians and geographers insist, it is the visualization which generates questions, not vice versa. "Visualization is not illustration." Scholars studying historical environments, both built and natural, are also looking for spatializations which they can animate to understand interactions among people and their natural environments. Archaeologists and architectural historians have been especially frustrated when confined to representing historical environments in static two-dimensional depictions. They now have the ability to model three-dimensional spaces and animate them with people and objects moving through space. They can add sound and create temporal progressions that provoke a range of questions not previously possible to ask.

The ability to incorporate sensorial experience and response within a temporospatial representation would add a uniquely important dimension to environmental modeling. A rich example described by an architectural historian at SCI was the case of modeling, in virtual reality, a Roman site about which there is extensive material evidence, as well as textual sources that, for example, recount the moment in a speech when the orator broke off because of the smell of cooking. With the exception perhaps of elevation—an elusive coordinate—virtual modeling is sophisticated enough to visualize landscape and incorporate avatars to model pedestrians flows, "viewscapes" (what is visible to an individual at a given moment in a given place), "soundscapes" (what one hears), and "smellscapes" (what one smells). It is in the act of modeling that questions are formulated, hypotheses proposed and tested, and knowledge is produced.

Disciplinary distinctions emerged most notably at SCI 7 when identifying desired tool functionalities, because disciplines distinguish themselves in large part not just by subject matter but by methodological approach. These distinctions strongly informed comparative evaluations of various technologies. In the instance of history, for example, scholars in the vibrant field of environmental history, which has many convergences with environmental science, want to have more and more spatial data digitized so that it can be processed and manipulated. Literary, visual, and religious studies scholars articulated greater priority for combining real space/time with imaginary space/time, depicting qualitative attributes of various dimensions, and representing nonwestern temporal and spatial regimes. As a rule, those humanities disciplines most influenced by the linguistic and visual turns in scholarship over the past few decades have not given priority to critical spatial reasoning.

Geographers represent a special case at SCI 7, in that they have long experience in spatial thinking and their field embraces both human and physical spatial systems. (It is, however, also true that the divide between those who do one or the other can be strong, somewhat analogous to the division among anthropologists between the physical and cultural.) That said, geographers have theorized spatial methodologies and reasoning in ways that may be of great interest to humanists who are grappling, perhaps the first time, both with issues of spatial reasoning and of spatial representation. Moreover, geographers are at an inflection point in their own discipline, re-examining cartographic conventions and seeking ways to represent uncertainty and ambiguity, subjectivity and agency, and qualitative attributes as well as quantitative. Geographers fluent in GIS were just as quick as others to note the inadequacies of existing GIS applications to the questions are emerging in their own field. This convergence of interest in the subjective and qualitative suggests a collaboration between geographers and scholars in a range of humanities disciplines may prove fruitful to both.

Spatial reasoning and representation

Reasoning

What is spatial reasoning? For one thing, it is consideration of both time *and* space, of diffusion and flow, change over time, and relative as well as absolute distance. Scholars who deal with spatial relationships—geographers and architectural historians, for example—argued strongly that we must disabuse people of the notion that spatial thinking is “intuitive,” that one picks it up as a child, and need not be taught; anymore than “intuitive” language acquisition by children obviates the need to teach reading, writing, and rhetorical skills. “Spatial intelligence is a skill gained over time.” Several participants have developed curricula focused on teaching critical spatial thinking and shared their insights and core concepts.[3] A concise formulation of spatial thinking identifies “the ability to visualize and interpret location, distance, direction, relationships, movement, and change over space and time" that draws on a core

[3] www.teachspatial.org; links to power points forthcoming

set of cognitive skills that can be honed: “pattern recognition, recognizing, deducing, making decisions, and predicting.” No doubt the widespread availability of vernacular technologies provides an opportunity to expand spatial reasoning skills. And the boon of “neo-geo” or the “new geography”—the notion that anyone can do geography, aided by commercial and open source tools, data, and platforms—spurs unprecedented levels of community engagement in doing what is, in effect, community or “volunteer” geography.

Representation

The reading and interpretation of maps, including historical maps, is a learned skill, critical to creating and using maps. School children in the 19th century were taught how to make maps in geography classes (themselves a result of the mapmaking boom of the time, caused in part by new information technologies). But it is a rare modern humanities scholar who acquires skill in either reading or making maps. The cartographic languages of abstraction differ from those familiar to discourse-based disciplines that now predominate in the humanities. One SCI participant suggested that we “go back to school” to study how maps and spatializations encode information. Certainly, before we can start using spatial representations both as evidence and as rhetoric of argument we must understand precisely how these forms do their work.

“Spatialization” is a useful way to describe taking things that are not inherently spatial and creating a mechanism to display them. This would include a large set of visualizations depicting spatial and temporal dimensions of a given phenomenon or object, such as network visualizations, kinship mapping, cultural diffusion routes, perceptual space, and subjective, agent-oriented views of place. While some suggested that spatialization would prove most useful to humanists to the extent that it shifts “from the actual to the representational and subjective,” others rejoined that basic cartographic literacy tells us that *no* map is literal, or accurate, or undistorted. Everything depends on the scale used, what information is included and what excluded, which conventions and symbologies are chosen to encode information and, of course, in which projection the landscape is depicted. Even maps that have no correlation to Earth space cannot be immune from the biases of spatial representation as such. Each map “has an attitude,” and no matter the mode of representation, each map must be used with appropriate critical skills, just as one approaches any other form of knowledge representation, from a narrative to a statistical table or a documentary film.

So what are maps good for? Maps function as navigational tools: to find one’s way from one place to another; to represent the world or cosmos in one integrated space as macrocosm; to frame a smaller view of the world, a microcosm, in order to home in on a set of details for analysis and problem solving; and to place representational objects in a shared space—a context—to better understand their relationship one to another, as seen in maps depicting kinships, concepts, vectors of communication, and so forth. As cultural artifacts, maps become interpretive objects that themselves play roles in events, decision-making, propaganda and persuasion, and inspiration and appreciation, among other things.

Finally, by way of analogy to the field of visual studies emerging from film and media studies, one SCI participant proposed "spatial studies" as a discipline emerging in the not-too-distant future. In fact, at the University of California, Santa Barbara, there is a spatial studies program, sited in the Center for Spatial Studies, that will offer an undergraduate minor and form part of an interdisciplinary PhD.[4] This program reaches broadly across a range of humanities and social science disciplines and has brought in participation from religious studies and area studies scholars. The impetus for this comes from UCSB's geography department. But on different campuses, such impetus will come from any group that coalesces around spatially-enabled humanities. Down the road, at the University of California, Los Angeles, there is a new undergraduate program, Digital Cultural Mapping, led by scholars from the fields of architectural history, archaeology, literary studies, and history.[5] The University of Redlands also hosts an interdisciplinary program, LENS, to support spatial studies.[6]

Spatial tools and concepts should be applicable to the description and analysis of both the natural and the social worlds. But the social world is tougher. How much harder is it to map a home than a house? A house can be represented by the image of a roof or a simple polygon on a map. But a home suggests inhabitants and activities, emotional linkages, social bonds, and other artifacts and behaviors that are harder to represent in stasis or concretely. When leaders of the UCLA Digital Cultural Mapping program presented a view of their work at SCI 7, they used the word "scape" in compound forms repeatedly—not just landscape, but also viewscape, soundscape, even smellscape, meaning that which one could see, hear, or smell within the perceptual circumference of a person or an agent. These are all terms that imply a subjective point of view. Perhaps when we are able to develop methods to enable representations of the kinds of subjective experiences represented in these compound "scape" words, the promise of spatial studies for the social and cultural worlds—spatial humanities, as it were—will be closer to realization.

TECHNOLOGY AND ITS DISCONTENTS

This topic, more than any other at SCI 7, brought out the inherent tension between the needs of scholars pursuing careers within the academy and the promises of technology to democratize scholarship, research, and citizenship. Sounding like an ostinato through the discussions was a call for "simpler and easier," quickly followed by a daunting list of sophisticated functions that researchers require to do their work. On the one hand, people want technologies that are easy to use but able to support ambiguity, uncertainty, and subjectivity; on the other hand, there is dissatisfaction with the way that certain powerful and easy-to-use applications, such as Google Earth, are too often inaccurate or imprecise, with base layers changing without notice and

[4] http://www.spatial.ucsb.edu/
[5] http://keckdcmp.ucla.edu/
[6] http://www.spatial.redlands.edu/lens/

some locations in the wrong place. To some extent, the problems of functionality relate to the appropriateness of scale to task: some vernacular applications serve global-scale phenomena well, but prove wholly inadequate for display and analysis of highly articulated spaces requiring precision of measurement, either absolute or relational. Some technically complex tools are simply too laborious to use for a quick-and-dirty operation or visualization.

There is no either/or here. We need a continuum of tools, from the relatively simple yet powerful, such as Google Earth, to more sophisticated and resource-intensive such as desktop GIS or Web-service-based geospatial delivery spheres. We also need a continuum of training to expose scholars at all stages of their career to these tools. A third need is to have a suite of tools and methods that address not different skill levels, but different time frames. There should be some applications and methodologies that are good for semester-long undergraduate courses, some that are geared to the time-frames of graduate students, and some that are optimized for the decades-long research projects that scholars undertake over the course of their careers.

Reliability, accuracy, and authority are major concerns, and this is where vernacular technologies are perceived to fall down. Applications easily built onto lightweight Web mapping services can be irreparably damaged by routine events like a new release of a browser. Simple, free, or commercial mapping services often do not handle toponyms well. And librarians at SCI 7 expressed concern about the amount of effort it will take to convert and geo-reference historical sources for use in GIS applications. They point to crowd-sourcing as a possible response to the scale issue in, say, the georeferencing of historic maps. While conceptually strong, the idea was met with skepticism by some scholars because questions of accuracy and above all authority in the vetting process become important for scholarship.

In discussions about the need for better ontologies, some librarians at SCI likewise proposed using folksonomic frameworks for crowd-sourced data. This might achieve scale, but that also met with skepticism with respect to accuracy and credibility within the academy. This may not matter in everyday use, or in the classroom. But faculty want more, in part because of their own research needs, and in part in recognition of the fact that scholarship based on folksonomies and crowd-sourcing will not be viewed as authoritative within the academy.

This is an area that needs a great deal of work, both on how to make highly functional technologies more user-friendly, and in thinking through what levels of accuracy, authority, and reliability are necessary for which scholarly tasks. It is a conversation to be carried out within disciplines, but also across them, and with software developers. We certainly do not wish to lose sight of the fact that lightweight, mobile spatial technologies, simple as they may be, have become powerful tools for collaboration, participatory research, and teaching. "Expertise is overrated in this area," one expert cautioned, because amateurs are able to bring new perspectives into the mix without the limitations of existing paradigms.

Spatial data ethics

A salient feature of Web-based information is a level of imprecision about who is accessing data and for what purposes. Firewalls put in place to protect sensitive data are routinely breached. This is of particular import with respect to geospatial data because location information can be extremely sensitive. Though it is important to know what can and cannot be mapped for intellectual reasons, it is also critically important to know which *should not* be mapped for ethical reasons. This might include mapping the territories of species at risk of extinction or contamination, locating sensitive archaeological sites, and pinpointing spaces sacred to groups. Revealing location information can result in a violation of privacy or threat to personal security. In addition, there is always the need to reflect on whether a given spatialization is prone to manipulation or "digital malpractice," paying particular attention to the fact that online resources cannot be assured of security, appropriate and respectful use, or privacy. Each discipline, as it develops digital best practices, should make explicit what its ethical guidelines are with respect to data use and sharing. And it should do this with full awareness of the fact that most geospatial data are in the custody of governments or their agents, not all of whom believe in open access to information. People have been arrested in China and elsewhere for making maps with GPS devices.

SCHOLARLY PRACTICES AND MODES OF WORKING

The combined processes of research, analysis, presentation, vetting, publication, and teaching by which scholars advance knowledge and inquiry, have been disrupted by the introduction of digital technologies. Services that were successfully bundled in the print regime are now unbundled. Efforts to re-integrate these services in the digital realm require thoughtful deliberation, for simply translating analog practices into digital has been tried and proven largely unsuccessful. Besides, part of the excitement and promise of new technology is that it forces a root-and-branch re-engagement with fundamental aspects of long-standing scholarly practices. This rethinking extends from the process of converting analog content into digital form—a process that includes the development of ontologies, gazetteers, taxonomies, and other categorizations—to the very nature of making an argument and publishing that argument in a form that is readily reviewable by peers.

Three key issues emerged in discussion: the changing nature of knowledge production; the integration of new practices into existing structures of the academy; and the impacts of these new practices on communication and dissemination.

The changing nature of knowledge production

SCI 7 participants agreed that the use of spatial methods and technologies changes the nature of knowledge creation, and that this change produces serious challenges to existing processes for validating and credentialing scholarship. The latter was described as "not a barrier, but a wall—full stop." Interestingly, scholars who reported difficulties in communicating to their peers

how knowledge production is changing and why that matters reported dramatically different experiences in their classroom. Pedagogy has been reinvigorated in the process of using spatial technologies with students. The draw for students is the process of learning, not the tools themselves. Many scholars reported that "the best teaching" they do is in the laboratory or design studio, the spaces that they have configured for students to work collaboratively to build and to learn. And this is what is marks the new knowledge production: collaboration and iterative discovery.

Some argued that scholars should master all of their tools before they use them. But others saw collaboration as a way to engender an efficient division of labor, keep up with the rapid pace of technology change, and obviate some of the "life-is-too-short" rationale for avoiding new techniques. All could agree on the importance of learning as much about tools and technology as necessary to understand potentials and pitfalls, to be able to articulate a clear vision to their technology and design partners in the project, and to learn from them. The real work happens in the dialogue among members of a collaboration that involves doing, learning, and incorporating that knowledge into the next phase. Design, build, test, and begin again. Not only does this process generate questions; knowledge itself is generated through the interactions among people with complementary expertise. This iterative process—develop a project, build models or visualizations, and critique them—is the standard model of investigation and discovery in architecture and design. As one SCI participant put it: "Model building is a discovery process." Devising the abstractions necessary for meaningful visualization, like the categorization demanded by the creation of ontologies, is understood as a deeply scholarly activity. Making progress in these areas constitutes an advancement of scholarship. And perceiving that it is the process that generates knowledge, scholars increasingly wish to capture the process of knowledge production in scholarly communication. Current models of reviewing and publishing are not set up to do this. What would need to change? To answer this question, participants began to unpack the nature of argument and evidence in spatial scholarship.

Argument and presentation

Scholarly communication both begins and ends with the argument and presentation of evidence. The most vexing questions center around the formulation of questions and creation of arguments in spatially enabled humanities. Archaeology and architectural history have long been self-consciously engaging with critical spatial reasoning. These disciplines used both mapmaking and modelmaking as integral parts of knowledge formation well before the advent of digital technologies. For SCI participants from those fields, discussions of how spatialization and visualization can generate questions and mount arguments were unproblematic. While they were quick to point out all the things that they wanted to do but were not yet able to with technology, there was agreement that mapmaking and modelmaking are the processes by which questions are formulated, answers proposed and tested, and knowledge created. As a planning and design scholar noted, "it is the visualization that generates the questions, not vice versa." In many ways, the digital liberates scholars from focusing on fixing knowledge into static form to

produce a recognizable output—traditionally the monograph or article. For historians the answer to this question was less clear. It may turn out to be that the monograph continues to be the preferred form for a long argument, and articles will be used for presenting the results of more discrete investigations. But the presentation of evidence should not and will not remain the same, if only because the nature of spatial evidence cannot always be presented in print-on-paper forms.

A common model for presentation emerged during discussion, with each discipline able to articulate the specific forms in which the elements relate to each other within their own domain. Roughly speaking, scholars proposed the production of an "edition" that might be a working paper, an article, a monograph, a video, or some form which presents the core of an argument. Behind that would stand a database to contain models, archival materials, multimedia elements, whatever constitutes the evidence and documentation of the ways that the scholars use the evidence to produce their results. If adopted, this model of the "edition plus database" would have ramifications throughout all of scholarly communication.

Validation and credentialing

Questions of validating and credentialing scholarship are fundamentally about impact. As one administrator phrased it, "What a provost wants to know is whether his faculty are the ones that are being recognized as field leaders. Are my faculty making a difference? Are they changing the conversation?" Each discipline has its own metric for assessing impact, but the important thing is that an authoritative community of peers has made that assessment. The challenge for spatially enabled humanities is the nature of that authoritative community: "What is needed for credentialing is credibility. We lack such an authoritative community with respect to spatial scholarship." Discussion quickly turned to how we could build such an authoritative community by identifying leaders in the field of spatial scholarship across a range of disciplines and bring them together as a group to model peer review. As a member of the SCI steering committee noted two years ago at SCI 5, when we focused on visual technologies, a group of leading scholars in visual studies emerged and committed themselves to modeling and testing ways of validating, credentialing, and publishing new-model scholarship in visual studies.[7] Spatial studies in the humanities is in a far more primitive state than visual studies was two years ago. So the real question is: how are we going to stimulate growth in this area?

One solution would be to assemble a group qualified to assess spatial digital scholarship, regardless of discipline. A first step might be to bring together scholars from those disciplinary societies who have made significant progress in this area, such as the Society of Architectural Historians, with others—environmental historians were mentioned as one possibility—to develop case studies and present models of high-impact scholarship using spatial technologies. These case studies would serve as exemplars to other disciplines.

[7] http://www.uvasci.org/archive/visual-studies-2007/

There are other models of peer review, such as that developed by NINES[8] for online literature of the 19th century; both its development process efforts to promote adoption of it by the community it serves is highly instructive.

The power of this idea—developing and aggregating case studies of high-impact spatial scholarship—lies in sharing models across disciplinary and institutional boundaries. While the primary authoritative community is constituted by peers within a single discipline, they are embedded in turn in a web of relationships and dependencies. Everybody needs to be exposed to this work, from senior faculty unfamiliar or unsympathetic to it, to professional societies, department chairs, publishers, and senior administrators, because each plays a role in deciding what kinds of scholarship and which scholars are recognized and promoted. Humanities centers are uniquely situated to host such activities that bring these groups together.

Modeling case studies of high-impact spatial scholarship would allow the community to deliberate the more difficult issues in this area, such as the need to develop mechanisms for granular crediting of authorship and ensure access and persistence over time. Both issues are particularly difficult if collaborators come from multiple institutions. It would also provide an opportunity to bring evaluators and readers together with the producers of scholarship, so that both sides of the review process could develop shared understandings about the nature of the content under review, the nature of individuals' contributions to it, and the nature of the compromises that scholars and reviewers need to confront and resolve in order to produce scholarship accessible to the community it addresses.

Precise modes of peer-review and publication vary from field to field. In the case of geography, for example, two models coexist: single-author articles are the standard for social geographers, and multi-author works for natural geographers. But ethical issues crop up across all disciplines and need to be addressed within any collaboration, such as a commonly-observed gender bias and a devaluation of design and technical contributions, biases that are often conflated in practice. As one experienced collaborator drily noted, "evaluators tend to assume that the intellectual part, the 'hard part,' is done by men and the 'pretty part,' the design, by women."

Socializing results

Faculty: As we develop models of spatial scholarship across disciplines, we need to socialize the epistemologies and practices that enable them. Given the current economic downturn, combined with long-term trends that put great pressure on the tenure system—60 percent of full-time faculty hires are off the tenure track nowadays—SCI participants expressed dismay that we are creating an increasingly conservative generation of young scholars. Students, like others in the academy, are highly attuned to existing power structures. Being at the bottom rung of the academic ladder and trying to climb it means that they are of necessity more risk-averse than those who have made it to the top. Advice

[8] http://www.nines.org/

from on high, urging pre-tenure scholars to forge the new path of digital scholarship, founders on the shoals of pragmatism. The surest way to widen the path for innovative young scholars and to integrate new modes of working and knowledge production into existing structures of the academy is to engage leaders, beginning (but not ending) with faculty. The ULCA Digital Cultural Mapping program, for example, has a module for faculty education that precedes that for students. It addresses the epistemological foundations of spatial scholarship, so that faculty and students will be less likely to look at visualizations as "mere illustrations" to a text. When introducing the unfamiliar, the right labels can open peoples' ears. Several scholars reported that they never use terms such as "digital humanities" or "geospatial data" when they can name the concepts they are driving to, such as movement and migration, change over time, and location in space and place.

Administration: An important point of leverage in scholarly communication is campus administration, from department chairs to provosts and presidents. Some SCI 7 participants cited departments as the least flexible social unit in the landscape, and shared strategies to elide them, including but not limited to going around the department directly to the provost. On some campuses, such as the University of Southern California, scholars doing innovative work that crosses department boundaries have crafted formal guidelines for interdisciplinary reviews. Interdisciplinary work has become an explicitly-stated goal for tenure. This could be a model for collaborative work review and for reviews of spatial scholarship as well.

Learned societies: Many societies are facing a crisis in membership, in part due to the collapse of a business model dependent on subscriptions to print journals and attendance at annual meetings. One way to re-energize membership in professional organizations and draw attendees at all stages of their career is to offer workshops on various digital technologies, especially spatial tools and methods. This instruction could be given at discounts to members of the society, and geared to several levels of interest, from information-only to highly detailed hands-on sessions. In addition, some societies—the Society of Architectural Historians and the Modern Language Association are two—have adopted statements about consideration of digital production for tenure and promotion.

<u>Impacts on publishing and dissemination</u>

While the steps that constitute scholarly publishing remain fundamentally the same—peer review, editing, distribution, and preservation of scholarly output—scholars at SCI argued for shifts in content and substance. They particularly advocated focusing on capturing and preserving parts of the discourse itself, not merely its fixed outcome. The exigencies of the print-on-paper regime have been cited for years as reasons for scholars to compress arguments and edit out evidence—too expensive to publish it all, they are told. But digital creation and delivery have obviated the financial need for such compression and editorial discretion in our daily lives. Scholars are wondering why their professional communication should be any different. The real arguments today for tightly edited presentation of scholarship rest in respect for pressures on the time of

our peers, whom we expect to do the reviewing. Time and attention are the scarcest resources in any information ecology. That said, one of the most valued affordances of the digital is interoperability of data and of discourse itself. Scholars are wanting—expecting—more and better and faster everything, including more data, better searching, faster time to publication, all resulting in broader reach. The ramping-up of expectations as a result of digital technology is by now a familiar story, but neither publishers nor libraries have the increased resources to meet those inflated expectations.

Editors and publishing houses continue to be immensely important for the publication and dissemination of scholarship. No scholar at SCI 7 advocated for removal of the roles of publisher or editor in favor of some other way of "going to press." As one publisher pointed out, presses are also pushed by the same technology as scholars to revisit fundamentals of publishing—redefining the role of the editor, designer, distributor, and above all, the business model (now often referred to somewhat euphemistically as a "sustainability model"). Presses want to work closely with scholars in order to rethink and remodel their publication processes. This begins with the back-end platform, because existing production processes break down in the digital. Design, distribution, and marketing have to change. But they remain vitally necessary to scholarly communication. Publishers know that they need new business models, yet there is no blueprint for this transition. It is not clear to anyone which player in scholarly communication is responsible for which task. And who, in the end, is responsible for long-term stewardship of scholarly discourse? Scholarship that does not persist does not "count" as scholarship.

As one SCI participant with a book in press said, publishers are not as scared of the demise of the monograph as scholars may assume. But they do need help in figuring out new modes of editing and publishing, and this they cannot do without scholars' guidance. One model that we might consider in the near term is the prototype for digital media publishing in visual culture studies being developed by the Network for Visual Culture, which emerged from SCI 5.[9] This group of scholars has worked intensively for two years to forge partnerships within their own community and with a set of archives and publishers, each of which has compelling incentives to work with each other to explore new models. The archives want users, the users want access to archives and to publishers, and the publishers want to publish the work of scholars. This group is focused on iterating one or more models in the near-term as a crucial first step. Ultimately, publishers and scholars should decide how to present the progress of scholarly work over time, so that scholars can be engaged in long-term research projects and publish during the process. This is likely to require a re-examination of the ecology of libraries, scholars, and publishers.

This ecological rebalancing and reconfiguration will require scholars, professional societies, presses, and libraries to work hand-in-glove to sort out which parts of a scholar's output should be published and preserved in which forms. Scanning the horizon for examples, an architectural historian who uses virtual reality pointed to the scientific model of publishing, whereby scholars

[9] http://www.uvasci.org/archive/visual-studies-2007/

routinely post working papers to the field to inform others of their research findings, solicit (pre-print) peer comments, and make data available as appropriate. In order for this model to work in the humanities, scholars would need to agree on what such a working paper or an edition would look like. These practices, too, could be modeled in a workshop setting.

Finally, a publisher at SCI suggested, as a logical next step, that a group of scholars, working through a consortium of professional societies, put out an RFP for publishers to provoke response and indentify potential partners.

Audiences old and new

Discussions of validation and credentialing raise the question of audiences and reflect the abiding friction between the predominant vector of communication in the academy—vertical—and the vector of communication intrinsic to the digital—horizontal. Validation can occur in all the ways impact can be measured: successful grant applications, non-academic publications with public or policy impact, keynote speeches, articles in major newspapers, and media interviews. Some fields are conscious of the need to have influence not only within the academy, but beyond it—to influence public policy, federal research directions, and otherwise set the terms of public and government debates. The barriers to adoption of and adaptation to new information technologies appear to be highest in those fields that do not value impact outside of a relatively closed circle of discourse participants.

The fundamental challenge posed by the Web to any closed circle of communication is the porousness of online discourse. Particularly with respect to spatial technologies, the openness of the Web has given birth to a burgeoning and enthusiastic world of neo-geography, born of the notion that anyone can do geography using the tools now available online. Geographers at SCI 7 are exploring the impact of “neo-geo.” They take the phenomenon as an indicator of the growing importance of spatial thinking in our society, something which they, as professionals, are committed to promoting. By encouraging such developments, and actively working with groups of students and the general population, they can advance spatial literacy at the same time they begin to obviate the "so what?” question by getting more people involved. They asked if there were a similar phenomenon in the world of humanities—neo-humanities, as it were. Are there people doing community-based humanities, intensively engaged with the subjects and methods of humanistic inquiry? If not, why not? One project, Imagining America, sees readily accessible digital data and tools as an opportunity to cultivate in our students and the general public interest in humanistic inquiry.[10]

In another case, a leading member of the Society of Architectural Historians reported that her community is reflecting on its new audiences and how best to reach them. To some degree, SAH’s engagement with the public has been core to its mission for decades. But by looking beyond its own membership and fellow academics, SAH is seeking to engage more people in its activities. New

[10] http://www.imaginingamerica.org/

audiences can and should be part of an emerging sustainability strategy for the 21st century. These audiences will be recruited and loyalties retained primarily through mobile technologies. And if SAH collections and services are not available on mobile devices, those of some other entity, probably commercial, will be. This is an opportunity we seize or ignore at our own peril.

ORGANIZATIONAL MODELS AND INFRASTRUCTURE

ORGANIZATIONAL MODELS

Collaborative scholarship demands new organizational models. In imagining an ideal organization that would bring scholars, technologists, librarians, and information resources together, SCI participants said the appropriate environment would look like a laboratory or design studio, in which space is configured to encourage collaboration, easy interaction with tools and technologies, and display of research results for critique and learning.

Where and how one situates such as space will depend largely on the specific culture of each campus. At some institutions, a "nondenominational" centralized administration of enterprise-wide GIS software is deployed across the whole campus. At the University of Virginia, for instance, these services are provided by the Library-based Scholars' Lab. On others, laboratory space is sited within disciplinary departments. Especially in schools with strong geoscience, forestry, or environmental science programs, such as UCSB, there is sophisticated GIS software is provided in multiple discipline-specific settings. At Stanford, the domain-specific grant-funded Spatial History Project supports a small number of investigators in history and is housed outside of the history department.[11] At the Centre for Computing in the Humanities at Kings College London, geospatial scholarship is diffused throughout the center, which is itself an academic department.[12] If anything, the multiple answers to the question "where and how" show how important spatial technologies are in many different disciplines. Achieving the right balance between provision of services at scale and the customizing of services to meet domain-specific demands involves attention to cyberinfrastructure development on each campus and to achieve real scale—among campuses.

INFRASTRUCTURE

Our Cultural Commonwealth, the ACLS report on cyberinfrastructure for the humanities and social sciences noted that humanists have lost rapport with their own infrastructure.[13] Further, it suggested that the introduction of new information technologies provides an opportunity for scholars to re-engage with their partners in scholarly communication—librarians, archives, museum curators, and technologists. A recently-funded round of NEH workshops at the University of Virginia's Scholars' Lab, the Institute for Enabling Geospatial

[11] http://www.stanford.edu/group/spatialhistory/cgi-bin/site/index.php
[12] http://www.kcl.ac.uk/schools/humanities/depts/cch
[13] http://www.acls.org/programs/Default.aspx?id=644

Scholarship, is designed to bridge that gap by offering training to librarians, information technologists, faculty, and graduate students. [14]

Universities at the highest levels are part of the problem. Information technology is too often looked at as a utility, not a strategic tool to enable research and learning. Scholars talk with enthusiasm about the affordances of the digital—interoperability, better searching, access to greater amounts of data—but none of this is easy without alignments among key actors in the information landscape, including strategic alliances among different departments, schools, and universities. One of the promising signs of the recently formed HATHI Trust text repository is that negotiations for this multi-university initiative took place among CIOs, ensuring that it will be integrated into the core technical infrastructure of each participating campus.[15]

This need is especially acute with respect to spatial data and infrastructure, because of the scale of the data, the complexity of file formats, and the proliferation of proprietary software and information. Spatial data require new models of cooperation among libraries and data repositories to provide networked storage and delivery, guided by clear policies about access and ethical use. Meeting these challenges has been immensely complicated by the series of recent cutbacks in all areas of libraries as a result of falling university budgets. As more and more researchers use geospatial data and programs, their expectations grow. They go quickly from discovery to wanting instant functionality: to be able to comment, annotate, visualize, and mash up. Map librarians at SCI reported that their users do not want to learn to use software, they want easy means of discovery and visualization.

What about the use of Web-based services such as Google Maps and Google Earth as platforms that integrate digital objects and are good for search and discovery? They provide very simple tools with highly desirable affordances. For example, Google Maps can link to sound files and there are services to geolocate free-form text. In this way users can take existing, implicit “geoknowledge” and make it explicit and visual. One scholar noted that he and his colleagues are really becoming "hooked” on these applications. But they are also concerned that are they are becoming dependent upon a commercial entity. Why, they wonder, can't universities step in and provide similar services? That way stewardship and persistence would be in the hands of our own community. One participant noted that, on his campus, there is a project that writes directly to Amazon S3. As a precaution, the project creators have written an interpretation layer that lets them plug in something other than S3 in case that commercial service goes away.

Most of what people want to do lies somewhere in the middle space between vernacular and expert technologies. How do we move from one to the other? A software entrepreneur at SCI 7 remarked that vernacular tools have had to come back to geographic theory to advance, just as complex tools have had to evolve simpler, better interfaces. He suggested that geographers could be

[14] http://www2.lib.virginia.edu/scholarslab/geospatial/
[15] http://www.hathitrust.org/

important in working out solutions that act as transitions between the simple and the sophisticated.

Bundling services on top of repositories may begin to get at part of the scaling issue that is intrinsic to geospatial data use and management. SCI participants pointed to several types of repositories with high functionality, such as ICPSR and Harvard Dataverse in the social sciences [16,17]. The Society of Architectural Historians is building SAHARA for architectural images; they plan to connect this system to their journal so that there is seamless linking between the journal and image data.[18] Architectural historians note that a number of 3D models exist in data silos, inaccessible to parallel projects. Would it be possible to develop something similar to a JSTOR service for architectural models? A funder present at SCI reported that publishers have repeatedly expressed their interest in and willingness to house data which supplement print volumes. This should be an item included in whatever RFP scholars or scholarly societies put out to publishers.

Wherever data reside, it is important for their depositors to have explicit agreements about what will happen to the data over time. Best practice would involve a contract between the data owner and a repository. Such agreements are important to address concerns about persistence that come in to play in the evaluation of scholarship. As long as "the digital" is assumed to be ephemeral, it will not be counted as "real scholarship."

Agreement upon and mandatory use of standards is key to building shared repositories and curatorial services. One way to promote the use of standards is for funding agencies to require their use in grant-funded work.

NEXT STEPS

Scholars should now begin to seek strategic partnerships with other agents and organizations in scholarly communication to move ahead on several fronts. These include working with:

- *developers and technologists* on tools and technologies;
- *professional societies* that help to form and promote standards of scholarship within a field, not least by individual scholarly validation, publishing outstanding scholarship, and setting ethical guidelines for the profession;
- *publishers and librarians* can collaborate with scholars to model new forms of scholarly communication, dissemination, and persistence; and
- *administrators and CIOs,* to begin mapping a strategy for building a shared geospatial cyberinfrastructure to support the data management and services necessary for spatial scholarship.

Above all, advancing scholarly communication in this area means that those engaged in spatial humanities across multiple disciplines should come together

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[16] http://www.icpsr.umich.edu/icpsrweb/ICPSR/
[17] http://thedata.org/
[18] http://www.sah.org/index.php?src=gendocs&ref=HOME&category=Sahara%20HOME

to form the "authoritative community" able to develop methods to: validate spatial scholarship; promote awareness of the power of spatial scholarship by engaging senior scholars and disciplinary leaders, through professional societies and at campuses humanities centers; and seek partnerships with willing publishers to publish work using spatial visualizations and methodologies. Spatial technologies in the humanities have the potential to deepen our understanding of change over time, to provide flexible platforms for research and discovery, and to bring the riches of humanities scholarship within reach of an ever more mobile population.