



Center for Spatially Integrated Social Science

# ANNUAL REPORT

**Year 3**

**1 July 2001 – 30 April 2002**

University of California, Santa Barbara

April 2002

CSISS is funded by the National Science Foundation (NSF BCS 9978058)  
to support the development of research infrastructure in the social and  
behavioral sciences





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Compiled by Donald G. Janelle

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(NSF BCS 9978058) TO SUPPORT THE DEVELOPMENT OF RESEARCH  
INFRASTRUCTURE IN THE SOCIAL AND BEHAVIORAL SCIENCES**

# CENTER FOR SPATIALLY INTEGRATED SOCIAL SCIENCE

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# CENTER FOR SPATIALLY INTEGRATED SOCIAL SCIENCE ANNUAL REPORT AND INCREMENT REQUEST, APRIL 2002

## Summary

The Center for Spatially Integrated Social Science (CSISS) is an infrastructure program funded by the National Science Foundation to facilitate communication and sharing of research ideas and methodologies among researchers in the social and behavioral sciences. The CSISS approach to integrating knowledge across disciplines and paradigms is to be achieved by broadening the user base of spatially integrated social science (SISS)—cartographic visualization, geographic information systems (GIS), pattern recognition, spatially sensitive statistical analysis, and place-based search methodologies. The Center's programs make use of Web technologies to promote accessibility to these tools and to related information, foster opportunities for scholars to learn about and master spatial methodologies, and provide intellectual foci for engaging a broad range of scholars in intensive discussion and program development.

Since its inception in October 1999, CSISS has sponsored seven weeklong workshops (Summers of 2000 and 2001) and three specialist meetings on spatial analytic themes of interest to the social science research community. It has established an important web resource for social scientists at [www.csiss.org](http://www.csiss.org) and has made significant progress in developing new software tools for research and teaching. A fourth specialist meeting (Spatial Analytic Software Tools) will take place in mid-May 2002 and four more workshops are now in preparation for summer 2002.

In total, by the end of the summer 2002 workshop period, more than 200 scholars will have participated in CSISS-sponsored weeklong workshops, more than 100 will have contributed to the success of specialist meetings, and another 100 will have benefited from CSISS support to ICPSR workshops on spatial analysis. Since June 2001, another 25 individuals participated in a CSISS co-sponsored 3-day workshop with the Wharton School at The University of Pennsylvania, and many more participated in CSISS-sponsored events at annual meetings of learned societies – including the American Sociological Association, The Social Science History Association, The Association of Pacific Coast Geographers, and the Association of American Geographers. For the coming year, plans are in place for workshop/sessions at the annual meeting of the American Anthropological Association, the North American Regional Science Association, the Southern Demography Association, and GIScience 2002.

Progress on two new books has been significant in the past year – both of which will appear in the CSISS Best Practice series in early 2003 – *Spatially Integrated Social Science* (Oxford University Press) and *Advanced Spatial Econometrics* (Springer-Verlag).

This report summarizes the progress made in each of the Center's programs since the last report was issued, in July 2001. CSISS acknowledges the support from NSF under BCS-9978058 and requests the second increment of funding for the project for the period 1 October 2002 through 30 September 2003.

## Table of Contents

Annual Report and Increment Request, April 2002, Summary	iii
Background	1
<b>CSISS Strategic Plan</b>	2
<b>Annual Plan Implementation</b>	2
Specialist Meetings	3
Workshops	4
Best Practices	5
Learning Resources	6
Spatial Analytic Tools	7
Place-Based Search	8
Virtual Community	9
<b>CSISS Programs</b>	10
<b>I Specialist Meetings</b>	10
Specialist Meeting on Location-Based Services	10
Specialist Meeting on New Tools for Spatial Data Analysis	11
Future Specialist Meetings	12
<b>II National Workshops</b>	12
Summer 2002 Workshops	12
Accessibility in Space and Time: A GIS Approach	12
Map Making and Visualization of Spatial Data in the Soc Sciences	12
Introduction to Spatial Pattern Analysis in a GIS Environment	13
Introduction to Spatial Data Analysis	13
Short Workshops and Conferences Supported by CSISS	13
Workshop Application and Participation Patterns	14
<b>III Best Examples</b>	19
<i>Spatially Integrated Social Science: Examples in Best Practice</i>	19
<i>CSISS Classics</i>	19
Advances in Spatial Econometric Modeling: Methodology, Tools and Applications	19
<b>IV Software Tools</b>	21
Objectives	21
Status	21
Personnel	21
Software Tools Clearinghouse	22
DynESDA2	23
The OpenSpace Initiative	24
Methodological Development	25
Dissemination	25
Work Plan	26
<b>V Learning Resources</b>	27
The CSISS Learning Resource Archive	27
Learning Resource Organization and Search Tools	28

Resources	29
CSISS Curriculum Development	29
ARGUS	29
Internal Resources Under Development	30
<b>VI Place-Based Search</b>	<b>31</b>
CSSAST: The CSISS Social Science Archive Search Tool	31
Limitations of the Search Tool	33
Efforts to Improve Data Description	34
<b>VII Virtual Community (<a href="http://www.csiss.org">www.csiss.org</a>)</b>	<b>34</b>
CSISS Website 2001-2002	35
National Workshops	35
Specialist Meetings	35
Learning Resources	35
Best Practices and <i>CSISS Classics</i>	36
Spatial Tools	36
CSISS Search Engines	36
Spatial Web Search	36
CSISS Site Search	37
CSSAST Meta Search Tool	38
Literature Search	39
Spatial Tools Clearinghouse	40
Integrated Search Directory	40
Website Look and Feel	41
Evaluation	41
<b>CSISS Work Plan – Summer 2002</b>	<b>42</b>
<b>Research Related Activities: CSISS Executive Committee</b>	<b>44</b>
<b>Appendices</b>	<b>61</b>
Appendix A. Report on the Third Meeting of the CSISS Advisory Board (2-3 October 2001)	61
Appendix B. Extracts from the CSISS Fastlane report to the National Science Foundation	71
Appendix C. Flyer – Summer Workshop Program and Participant Scholarships	79
Appendix D. CSISS Brochure	80

## CENTER FOR SPATIALLY INTEGRATED SOCIAL SCIENCE BACKGROUND

The Center for Spatially Integrated Social Science was established in 1999 with a grant from the National Science Foundation's Directorate for Social, Behavioral, and Economic Research (SBE). CSISS is one of six awards given in 1999 under SBE's initiative to build research infrastructure in the social and behavioral sciences.

CSISS recognizes the key role space plays in human society, and promotes research that advances understanding of spatial patterns and processes. The tools of spatially integrated social science (SISS)—cartographic visualization, geographic information systems (GIS), pattern recognition, spatially sensitive statistical analysis, and place-based search methodologies—are used to integrate knowledge across disciplines and paradigms. From research design to the interpretation of research findings, the use of SISS can advance understanding in nearly every domain of the social and behavioral sciences.

The management structure for CSISS includes a Science Advisory Board of prominent social science researchers and an Executive Committee consisting of Principal Investigators, Senior Researchers, and a Program Director. The Advisory Board has met three times, in May 2000, December 2000, and October 2001. It will convene again in October 2002. A Report on the October 2001 meeting is attached as Appendix A. The Science Advisory Board reviews all Center activities and plans, and reports to the Executive Committee and to the National Science Foundation. The Executive Committee convenes at least once a month to review the actual implementation of the various programs within its mandate.

- (1) sponsorship of **specialist meetings** on major themes in the social sciences;
- (2) **national summer workshops** in new methods, aimed at young scholars;
- (3) development of new **tools for spatial analysis** based on emerging software technologies;
- (4) preparation of Web-accessible **learning resources** covering all aspects of the spatial approach;
- (5) identification of **best-practice examples** of spatial analysis in the social sciences, converting these into publications and learning resources that demonstrate authoritative applications of spatial perspectives.
- (6) implementation of **place-based search** tools for identifying and delivering geographically referenced information on the WWW and in digital libraries; and
- (7) creation of a **virtual community** of Web-based services to the social sciences.

This report outlines progress towards fulfilling the objectives in the period from 1 July 2001 to 30 April 2002.<sup>1</sup>

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<sup>1</sup> The Government has certain rights in this material; and support by the NSF is gratefully acknowledged. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not reflect the views of NSF.



## **CSISS STRATEGIC PLAN**

In October 2001, CSISS presented its Strategic Plan to the Advisory Board. This plan draws from a mission statement, a set of program objectives, and tactics – available at [www.csis.org](http://www.csis.org), and outlined in last year's Annual Report. The detailed actions associated with this Plan are summarized in a set of tables, one for each of the seven CSISS Programs.

### **Annual Plan Implementation (October 2001 – September 2002)**

The following tables outline the short-term activities, anticipated outcomes, and measures of success associated with each of the seven CSISS programs. On an annual basis (in September), a new short-term plan is formulated for implementation over the next twelve months and the expected long-term outcomes are reassessed and modified, as needed. Annual CSISS reports document the outcomes and measures of outreach and infrastructure development associated with CSISS programs. The activities listed in the following tables reflect anticipated initiatives for the period through 30 September 2002.

## Specialist Meetings

Short-term Activities ( - Sept 02)	Inputs / Outcomes	Measures
<p><b>Active Planning / Hosting of Future SMs</b></p> <ul style="list-style-type: none"> <li>- Location-Based Services 12/01 (with UCGIS, involving academia, government and industry)</li> <li>- Spatial Tools Development 5/02 (to integrate efforts of academic, government and industry programmers)</li> </ul>	<p>Inputs</p> <p>Breadth of advertising to target experts and potential users of spatial analysis</p> <ul style="list-style-type: none"> <li>- Web-based meeting management for applications, sharing information, and disseminating agenda and logistics</li> </ul> <p>Partnering with other organizations in co-sponsorship of meetings</p>	<p>Outreach</p> <p>Magnitude &amp; Breadth of Exposure / Participation</p> <ul style="list-style-type: none"> <li>- Number of applicants to open calls</li> <li>- Participant distribution by discipline</li> <li>- Number of institutions represented</li> <li>- Web access to SM position statements</li> </ul>
<p><b>Active SM Topic Assessment (e.g.)</b></p> <ul style="list-style-type: none"> <li>- Agent-Based Spatial Modeling of Land Cover Change</li> <li>- Small-Area Analysis</li> <li>- Remote sensing for social sciences</li> <li>- Management of large spatial data sets</li> <li>- Borderlands research</li> <li>- Neighborhoods &amp; social capital</li> </ul>	<p>Move to model of self-funding for specialist meetings</p> <p>Outcomes</p> <p>Participation</p> <ul style="list-style-type: none"> <li>- Approx. 20 – 30 specialists/meeting</li> <li>- Diversity of discipline representation</li> </ul> <p>Identification of Resources:</p> <ul style="list-style-type: none"> <li>- Websites</li> <li>- Literature references</li> <li>- Best-practice examples</li> <li>- Candidates for CSISS Classics</li> <li>- Data sources</li> </ul> <p>Identification of Needs</p> <ul style="list-style-type: none"> <li>- Tools development</li> <li>- Data resources</li> <li>- Workshop training</li> <li>- Collaborative opportunities</li> </ul> <p>Publications to Inform and Illustrate</p> <ul style="list-style-type: none"> <li>- Position statements</li> <li>- Final Report (web and hardcopy)</li> <li>- Possible journal special issues / edited books</li> </ul> <p>Seek Funding from Selected Participants for follow-up activities</p>	<p><b>Assessment of Success</b></p> <ul style="list-style-type: none"> <li>- Extent to which innovative resources are identified and integrated on CSISS.org</li> <li>- Extent to which CSISS tools development and workshop offerings are altered to reflect the needs identified from SMs</li> </ul> <p>Infrastructure Development</p> <p>Response to follow-up surveys</p> <ul style="list-style-type: none"> <li>- Evidence of future collaboration among CSISS participants (no. of articles, proposals, grants)</li> <li>- Evidence of interdisciplinary co-operation (articles, grants, courses, programs)</li> </ul>
<p><b>Long-term Activities</b></p> <p>Moving from topic assessments to active planning and hosting of specialist meetings in 2003 and 2004, seeking external funding for sponsorship</p>		

## Workshops

Short-term Activities ( - Sept 02)	Inputs / Outcomes	Measures
Assess 2001 workshop results	Inputs	Outreach
- Review of entry & exit surveys	- Breadth of advertising – targeting young scholars who are potential users of spatial analysis	Magnitude & Breadth of Exposure / Participation:
Review candidates for CSISS workshops	- Web-based meeting management for applications, sharing information, disseminating agenda and logistics	- Number of applicants to open calls - Participant distribution by discipline - Number of institutions represented - Web access measures to the workshop video clips
- Topics - Instructional teams	- Planning for accommodations, instructional facilities and resources	Assessment of Success
Plan & implement 2002 National workshop program	- Funding and administration of participant scholarships	Review of entry & exit surveys for:
Target workshops to:	- Move towards a self-support funding model for workshops.	- Evidence of having learned from the experience - Strength of Recommendations to offer the workshop again
- Entry-level, Routine Applications, and High-level Exploratory Developments	Outcomes	Infrastructure Development
Consider alternative formats for workshops	Participation	Responses to follow-up surveys
- CSISS organized sessions at meetings of academic societies (e.g., Social Science History Assoc, 10/01)	- Approx. 20 per workshop - Diversity of discipline representation/integration - Breadth of institutional representation	- Evidence of future collaboration among CSISS participants (articles, proposals, grants)
- Half-day workshops at meetings (e.g., the Amer Sociological Assoc. Meeting (08/01), American Anthropological Association (11/02))	Instruction and practice in use of:	- Evidence of interdisciplinary co-operation (articles, academic meetings, grants, courses, programs)
- Two and three-day workshops (e.g., the ICPSR-CSISS workshop (05/01) and the Wharton-CSISS workshop (08/01))	- Spatial data - Spatial analytic software - Spatial methods and measures	- Participant expectation to include what they have learned in teaching and course design
Encourage participation in ICPSR spatial analysis workshops	Long-term Outcomes ( - Sept 04)	New tools and resources from High-level Exploratory Development workshops
Consider alternative delivery media	- To feature workshops on the full range of spatial analytic approaches for spatial social science - To seed expertise in spatial analysis in a broad range of social science disciplines and institutions	
- Filming workshops and creating video clips for web access (e.g., workshop on Map Making (7/01))	- To foster interdisciplinary communications and networks for spatial analysis among social science scholars	
Long-term Activities		
- Consider on-line workshops or discussions		

## Best Practices

### Short-term Activities

( - Sept 02)

#### Editing and Publication of

- Spatially Integrated Social Science, Oxford University Press 2002
- CSISS Classics in Learning Resources at [www.csis.org](http://www.csis.org)

### Long-term Activities

#### Under Consideration

- Sponsor International Conference on Spatial Social Science -- 2003
- Develop and host an on-line refereed publication on Spatially Integrated Social Science – 2004
- Publications (book / articles) from international conference - 2004
- Consider hardcopy publication of CSISS Classics – 2004

### Inputs / Outcomes

#### Inputs

- Solicitation of manuscripts and contributions for the web site
- Selected honoraria to encourage participation
- Web-based management of publication development
- International Conference self funding
- Selectivity over keynote speakers and special programs for international conference.

#### Outcomes

##### Participation

- Diversity of discipline representation
  - Breadth of institutional representation
- ##### Exemplary research uses of
- Spatial thinking
  - Spatial data
  - Spatial analytic software
  - Spatial measures

### Long-term Outcomes

Expanded range and quantity, and improved quality of resources for teaching and research

### Measures

#### Outreach

Magnitude & Breadth of Exposure / Participation

- Participant distribution by discipline
- Number of institutions represented in publications

#### Assessment of Success

- Measures of web access to CSISS Classics
- Sales and course usage of Spatially Integrated Social Science
- Numbers of applicants to participate in the international conference
- Citations of CSISS publications and references to CSISS programs

#### Infrastructure Development

- CSISS publications as a basis for research generation and teaching
- Increasing general production of spatial analytic teaching and research publications across the social science disciplines – monitored via literature surveys

## Learning Resources

### Short-term Activities ( - Sept 02)

Short-term Activities ( - Sept 02)	Inputs / Outcomes	Measures
<p><b>Expand Content from:</b></p> <ul style="list-style-type: none"> <li>• SAM</li> <li>• ARGUS</li> <li>• NCGIA, UCSB Geography, and other organizations (e.g., CASA)</li> </ul> <p><b>Add discipline Access:</b></p> <ul style="list-style-type: none"> <li>• Develop an archive of course syllabi on spatial analysis in different social science disciplines - to be gathered from leading scholars</li> <li>• Develop introductory modules related to spatial thinking and analytic approaches by discipline</li> </ul> <p><b>Implement a Search Engine to harvest existing learning resources from the World Wide Web</b></p> <p><b>Improve Presentation and User Search Capability for Content</b></p> <ul style="list-style-type: none"> <li>- Expand and refine metadata schema for learning resources</li> <li>- Catalog each learning resource to allow searching by author, format, keyword, discipline, and interest area.</li> <li>- Create a browse interface for retrieving all existing learning resources</li> <li>- Refine resource portal layout and presentation to make learning resources more accessible, and to highlight special resources, such as CSISS Classics</li> <li>- Implement a review process for evaluating new materials for the Learning Resource collection</li> </ul> <p><b>Advertise Learning Resources</b></p> <p>Design news releases, brochure</p> <ul style="list-style-type: none"> <li>- Announcing available resources to potential users</li> <li>- Soliciting contributions</li> </ul>	<p><b>Inputs</b></p> <ul style="list-style-type: none"> <li>- Selected Honoraria for authors of learning resources</li> <li>- Promotion / dissemination of information about CSISS Learning Resources</li> <li>- Solicitation and management of learning resource contributions by external authors and organizations</li> <li>- Extraction, preparation, and formatting of existing learning resources from local sources (NCGIA, UCSB Geography, etc.)</li> <li>- Web site organization and development of new interfaces for learning resource presentation</li> <li>- Surveys of users and potential users of CSISS Learning Resources</li> </ul> <p><b>Outcomes</b></p> <ul style="list-style-type: none"> <li>- Approximately 10 new large-scale learning resource contributions from external authors affiliated with SAM.</li> <li>- Improved Learning Resource web portal and subsequent community involvement</li> <li>- Use of CSISS Learning Resource Portal for class instruction and individual education</li> </ul> <p><b>Long-term Outcomes</b></p> <ul style="list-style-type: none"> <li>- Develop Model Curriculum for teaching "Spatially Integrated Social Science" based on CSISS Learning Resource Portal.</li> </ul>	<p><b>Outreach</b></p> <ul style="list-style-type: none"> <li>- Level of Involvement of external authors in Creating/contributing Learning Resources</li> <li>- Documentation on the size, institutional affiliations, and disciplinary origins of the user community for CSISS Learning Resources</li> <li>- Level of collaboration with other organizations in building learning resources</li> </ul> <p><b>Assessment of Success</b></p> <ul style="list-style-type: none"> <li>- Trends in the number of externally authored learning resource modules</li> <li>- Assessment of size of CSISS Learning Resource user community. Based on Web Trends measures and on surveys of educators.</li> </ul> <p><b>Infrastructure Development</b></p> <ul style="list-style-type: none"> <li>- Enhanced mechanisms for searching and retrieving learning materials from other similar and complementary archives, such as DLESE, ADEPT.</li> <li>- Learning Resources available at CSISS .org that are not found elsewhere.</li> <li>- Expanded CSISS Learning Resource Archive use by social science community.</li> <li>- Adoption of CSISS-based curriculum to aid in teaching topics addressed by the Learning Resource Portal</li> </ul>
<p><b>Long-term Activities</b></p> <ul style="list-style-type: none"> <li>- Implement metadata searching and learning resource object retrieval mechanisms with other collaborating organizations, such as DLESE, ADEPT, and ICPSR</li> </ul>		

## Spatial Analytic Tools

Short-term Activities ( - Sept 02)	Inputs / Outcomes	Measures
<ul style="list-style-type: none"> <li>- Implementation of CSISS Spatial Tools Clearinghouse and presentation at <a href="http://www.CSISS.org">www.CSISS.org</a></li> <li>- Preparation of database and cgi scripts for the clearinghouse</li> <li>- Establish management structure and process for maintaining and updating clearinghouse</li> <li>- Continued development of tools for spatial statistics within existing open source statistical software toolboxes (e.g., Xlispstat, Ox, R)</li> <li>- Complete documentation of XlispStat and Ox routines</li> <li>- Completion of tools for Dynamic Exploratory Spatial Data Analysis (ESDA) with GIS – beta release in fall 2001</li> <li>- Development of freestanding open-source spatial econometric software (the OpenSpace project)               <ul style="list-style-type: none"> <li>- Interface design by Dec 2001</li> <li>- Prototype by Summer 2002</li> </ul> </li> <li>- Develop tutorials               <ul style="list-style-type: none"> <li>- Dynamic ESDA</li> </ul> </li> <li>- Specialist Meeting on Software Tools Development (spring 2002)</li> </ul>	<p><b>Inputs</b></p> <ul style="list-style-type: none"> <li>- Finding and hiring for programming expertise</li> <li>- Programming new software</li> <li>- Documenting attributes of existing spatial tools</li> <li>- User feedback</li> </ul> <p><b>Outcomes</b></p> <ul style="list-style-type: none"> <li>- Prototype clearinghouse on web by October 2001 with links to software sites (e.g., SpaceStat, CrimeStat), portal sites (e.g., ai-geostats), and to collections of code for specific statistical toolboxes (e.g. S-Plus, R)</li> <li>- Template for spatial econometrics in xxx published on web</li> <li>- Open source collection of routines available on web</li> <li>- Collection of modules for ESDA with GIS</li> </ul> <p><b>Long-term Outcomes</b></p> <ul style="list-style-type: none"> <li>- An easy-to-use open source suite of software for spatial data analysis</li> <li>- Advances in the use of spatial econometric methods in social sciences</li> <li>- Improved accessibility to information about spatial analytic tools</li> </ul>	<p><b>Outreach</b></p> <ul style="list-style-type: none"> <li>- Dissemination of tools via <a href="http://www.csis.org">www.csis.org</a>, specialist meetings, workshops, best practice publications, and Learning Resources</li> </ul> <p><b>Assessment of Success</b></p> <ul style="list-style-type: none"> <li>- Number of users of new software tools developed through CSISS</li> <li>- Adoption of CSISS software tools in teaching laboratories</li> <li>- Demonstrated use of CSISS tools and resources in literature</li> </ul> <p><b>Infrastructure Development</b></p> <ul style="list-style-type: none"> <li>- New tools for spatial analysis</li> <li>- Clearinghouse that provides users with information about state-of-the-art spatial analytic tools</li> <li>- Via specialist meeting, new networks among spatial tools developers will help foster standard protocols and coordination of tools development efforts</li> </ul>

### Long-term Activities

- Implement strategy and infrastructure for Open Source Community Contributions to OpenSpace project
- Continual updating and refinement of spatial tools clearinghouse
- Expand tools clearinghouse to include demonstrations and tutorials
- Consider expansion of clearinghouse to include areas such as mapping and visualization, remote sensing, geo-statistics, etc.

## Place-Based Search

### Short-term Activities

( - Sept 02)

	Inputs / Outcomes	Measures
Develop services to search and deliver geo-referenced information via WWW and via digital libraries.	Inputs	Outreach
- Inventory of on-line social science data archives	- Collaborate with UCSB's Alexandria Digital Library and its ADEPT (Alexandria Digital Earth Prototype) initiatives	Document extent of collaboration with organizations to improve the spatial information about data resources
- Document geographical coverage, spatial resolution, etc	- Collaborate with ICPSR to enhance ICPSR's DDI metadata standards for geo-spatial applications	Assessment of Success
- Document / refine metadata standards	- Promote the ICPSR DDI	Document the use of the CSISS website for accessing, mapping, and analysing information on spatially referenced social science data
Allow place-name queries for geo-referenced information	- Collaboration on the Electronic Cultural Atlas Initiative (Berkeley)	
Explore role of gazetteers for social science research and information retrieval:	Outcomes	Infrastructure Development
- Transformations among geo-referencing systems	Enhanced Access to Resources:	- Document expansion of spatial referencing of social science data sources
- Dealing with vague spatial structures, diverse languages, historical name changes, and non-Roman alphabets	- Web linkages to place-based information	- Expanded range of tools for exploring information by user-defined spatial units
- Geoparsing of place names in text for representing information resources by geographical units	- Web links to data sources	
	- Allow for sharing data across archives	
	Evaluation	
	- Of spatial attributes of existing social science data	
	Enhanced web display and analysis of existing data resources	
	- Match data with spatial zones	
	- Create maps	
	- Rudimentary spatial analysis	
Develop a gazetteer interface for the CSISS Search Engine of websites that offer information of relevance to spatially integrated social science		

### Long-term Activities

Continue activities listed above in later stages,

- Demonstrate use of new resources
- Enhance best practices in spatially integrated social science
- Offer workshop(s), specialist meetings to illustrate practices and applications of tools for place-based search
- Consider developing a clearinghouse of GIS shape files accessed through place-based search routines.

**Virtual Community** [www.csiss.org](http://www.csiss.org)

**Short-term Activities**

( - Sept 02)

Short-term Activities	Inputs / Outcomes	Measures
<b>Website Look-and-Feel</b>	<b>Inputs</b>	<b>Outreach</b>
<ul style="list-style-type: none"> <li>- Add drop-down menus, animations, and more images</li> <li>- Widen to 600x800 pixels</li> <li>- Accommodate unsupported or obsolete browsers.</li> </ul>	<ul style="list-style-type: none"> <li>- Equipment updates consistent with objectives</li> <li>- Keeping up with latest developments to enhance web delivery and ease of user navigation</li> </ul>	<ul style="list-style-type: none"> <li>- Success in attracting applicants to open calls for CSISS events</li> <li>- Expansion of CSISS membership</li> </ul>
<b>Web support for CSISS events</b>		<b>Assessment of Success</b>
<ul style="list-style-type: none"> <li>- Host workshop / Specialist meetings</li> <li>- Supervise editing of video clips</li> <li>- Implement “streaming” capability for video clips.</li> </ul>	<ul style="list-style-type: none"> <li>- Update site content to reflect developments of spatial analysis in the social sciences</li> <li>- Promote/Publicize <a href="http://www.CSISS.org">www.CSISS.org</a>.</li> </ul>	<ul style="list-style-type: none"> <li>- Web Trends Site traffic analysis based on CSISS log files.</li> <li>- Incorporation of CSISS website content in university courses</li> </ul>
<b>Learning Resources</b>		
<ul style="list-style-type: none"> <li>- Add keyword search interface to LR metadata</li> <li>- Add web infrastructure for Glossary input, and for public input to CSISS Classics.</li> <li>- Implement review process on content</li> </ul>	<ul style="list-style-type: none"> <li>- User surveys to evaluate website use and content value</li> <li>- Consider focus-group review of CSISS web resources</li> </ul>	<ul style="list-style-type: none"> <li>- From Workshop and Meeting databases – the numbers of applicants per event over time.</li> </ul>
<b>Infrastructure</b>	<b>Outcomes</b>	<b>Infrastructure Development</b>
<ul style="list-style-type: none"> <li>- Update news &amp; events</li> <li>- Implement Search Kiosk.</li> <li>- Integrate event and membership applications with CSISS contacts database.</li> </ul>	<ul style="list-style-type: none"> <li>- An expanding content-rich website</li> <li>- Visual appeal to presentation</li> <li>- Ease of use and accessibility for CSISS clients</li> </ul>	<ul style="list-style-type: none"> <li>• Document innovation / provision of services not previously available (or not as easily available) in social sciences and spatial analysis</li> </ul>
<b>Spatial Tools Clearinghouse</b>	<b>Long-term Outcome</b>	
<ul style="list-style-type: none"> <li>- Add fields / pages</li> <li>- Build sites and portals infrastructure.</li> <li>- Implement Peer / public review process.</li> </ul>	<ul style="list-style-type: none"> <li>- <a href="http://www.CSISS.org">www.CSISS.org</a> seen as the primary port of call for anyone interested in spatial social science</li> </ul>	
<b>Long-term Activities</b>		
<ul style="list-style-type: none"> <li>- Accommodate code submissions and web-based analysis via spatial tools clearinghouse</li> <li>- Implement CSISS Social Science Archive Search Tool (CSSAST) – a clearinghouse of information on the spatial referencing of archival data</li> <li>- Implement Place-Based CSSAST</li> <li>- Reconstruct L. Anselin’s workshop for website.</li> <li>- Add Best Practices page</li> <li>- Integrate site resources through common search interface.</li> </ul>		



## **CSISS PROGRAMS 1 JULY 2001-30 APRIL 2002**

To fulfill its objectives, CSISS has formulated its strategic plan around the execution of seven interrelated programs. These programs focus on the methods, tools, techniques, software, data access, and other services needed to promote and facilitate a spatially integrated approach to the social sciences. Activities related to each of these programs over the period 1 July 2001 – 30 April 2002 are described in the following sections, along with plans for the year ahead. More detailed information on all of these activities is available through [www.CSISS.org](http://www.CSISS.org).

### **I. Specialist Meetings**

CSISS organizes meetings on core issues in the social sciences that cut across traditional disciplinary boundaries to focus on gaps in knowledge that can be addressed through a spatial perspective. Typically, these meetings address traditional domains of social science inquiry (e.g., equity, cultural analysis, externalities, and globalization), as well as new areas of investigation where spatial perspectives and technologies might add value (e.g., location-based services that exploit GPS and wireless technologies). These meetings identify scientific agendas and workshop needs for young scholars, propose learning resources essential to the diffusion of tools and concepts, suggest the creation of new spatial research tools, explore dissemination practices to reach potential users of spatial perspectives, foster collaborative networks among meeting participants, and develop best-practice publications of exemplary social science applications.

Since the last annual report, one specialist meeting was held in December 2001, and preparations are completed for a another meeting in mid-May 2002. These are summarized below.

#### **Location-Based Services December 14-15, 2001**

The Global Positioning System and cellular technologies are enabling a new generation of electronic devices that know where they are, and are capable of modifying the information they collect and present based on that knowledge. The Wireless Communication and Public Safety Act of 1999 permits operators of cellular networks to release the geographic locations of users in certain emergency situations, and a range of electronic services are now being developed and offered to assist users in finding nearby businesses and other facilities. A location-based service (LBS) can be defined as an information service that exploits the ability of information technology to know where it is, and to modify the information it presents accordingly. The Open GIS Consortium has begun a number of initiatives related to technical specifications for LBS.

CSISS and the University Consortium for Geographic Information Science organized a specialist meeting to explore these new services, and their implications and significance for the social sciences and for geographic information science. The meeting was held at the Upham Hotel in Santa Barbara on December 14-15, 2001. Specific issues addressed included:

- the use of LBS to support primary data capture in the social sciences, with emphasis on spatial and temporal components;
- requirements for new representations, and for analytic tools to visualize and investigate such data;
- privacy and related issues associated with LBS data;
- new forms of social behavior enabled by LBS;
- new technologies that extend current concepts of LBS;
- needs for learning materials, examples, and other resources that could help to facilitate social science research related to LBS; and
- the use of LBS-derived data for modeling in the social sciences.

A steering committee was named in mid-2001, selected participants were invited, and an open call for participation was issued. Some 30 applications were received, and 10 accepted. In total, the workshop included approximately 30 participants. Full details and position papers contributed by the participants can be found on the CSISS Web site, and a full report is anticipated to be complete in June.

#### **New Tools for Spatial Data Analysis (10-11 May 2002)**

An important part of the Tools Program effort during year 3 of the project was devoted to the organization of a Specialist Meeting on Software Tools, to be held in Santa Barbara, CA, May 10-11, 2002. In late spring 2001 a steering committee was established, co-chaired by Anselin and Rey and consisting of Richard Berk (UCLA), Di Cook (Iowa State), Mark Gahegan (Pennsylvania State), Geoffrey Jacquez (BioMedware) and Ayse Can Talen (Fannie Mae Foundation).

The objectives of the meeting are threefold. First, it is an opportunity to demonstrate, showcase and benchmark state of the art tools and to interact with other specialized developers. Second, it is to facilitate and promote a dialogue among the wide range of developers about priorities and guidelines for software design, data and model standards, inter-operability, and open environments. It is hoped that this will initiate a discussion of specific open source standards for spatial data analysis. Third, the meeting will also serve as a way to introduce CSISS' open source software development initiative, the "OpenSpace" project, and serve as a forum to obtain feedback and comments.

Participants for the meeting were solicited using a dual approach consisting of targeted invitations and an open call for participation. All respondents to the call were required to submit an abstract. A final list of participants was selected by the steering committee. Due to logistical and financial constraints, the number of participants was limited to 25. All participants submitted a full paper that is incorporated in edited Proceedings, made available on CD-ROM before the meeting. The CD-ROM will also be distributed by CSISS. The list of participants and abstracts is given at <http://www.csiss.org/events/meetings/spatial-tools/participants.htm>.

### **Future Specialist Meetings**

CSISS maintains active consideration of a large number of potential specialist meetings. Topics under active consideration include the Spatial Indexing of Globalization, the Environment-Human Interface, Small Area Social Data Analysis, among others. The Executive Committee reviews topics on a monthly basis and decide on sponsorship of meetings base on the greatest likely benefit to objectives as outlined in the CSISS Strategic Plan.

## **II. National Workshops**

CSISS sponsors intensive weeklong workshops and provides participant scholarships to introduce the latest and most authoritative approaches to the methods and tools of spatially integrated social science. The primary client group for workshops include PhD candidates, postdoctoral students, and untenured Assistant Professors. However, some senior scholars are included to provide a bridging across academic generations. Consistent with CSISS objectives, workshop invitees are selected from a broad mix of social science disciplines. Effort is made during the workshops to build collaborative networks among participants by stressing the commonality of the spatial perspective to problem identification and research approach.

**The following workshops have been organized for Summer 2002:**

### **Accessibility in Space and Time: A GIS Approach** *22-26 July 2002, Columbus OH*

**Topics Covered:** Measuring and analyzing accessibility in physical space, social space, and cyberspace; network approaches to connectivity and accessibility; graphical visualizations and computational approaches to the analysis of individual space-time behavior; statistical modeling of spatial interaction patterns; and spatial optimization techniques. Applications and exercises will feature a broad range of social science issues. No prior experience in GIS is required. For further details, see <http://csiss.org/events/workshops/access/index.htm>.

**Instructors:** Mei-Po Kwan (coordinator), Alan Murray, Morton O'Kelly, Michael Tiefelsdorf, (all of The Ohio State University).

### **Map Making and Visualization of Spatial Data in the Social Sciences** *22-26 July 2002, Santa Barbara CA*

**Topics covered:** Thematic mapping for the social sciences; principles of scientific visualization; graphical design and cartographic symbolization; geographic visualization; functions and types of maps; use of current graphical design and GIS software; mapping statistical data over space and time; and current developments in geographic visualization. No prior experience with visualization software is required. For further details, see <http://csiss.org/events/workshops/map/index.htm>

**Instructors:** Sara Fabrikant (coordinator), Keith Clarke, and Waldo Tobler (all of University of California Santa Barbara), Barbara P. Buttenfield (University of Colorado), Jeremy Crampton (Georgia State University) and Mark Gahegan (Pennsylvania State University).

**Introduction to Spatial Pattern Analysis in a GIS Environment**  
*29 July-2 August 2002, Santa Barbara CA*

**Topics covered:** Introduction to ArcInfo 8.1, pattern statistics and measures of spatial pattern, point-pattern software, introduction to geostatistics, research and developments in spatial pattern analysis, and exploratory data analysis, and examples of pattern analysis in the social sciences. No prior experience in spatial analysis is required. For further details, see <http://csiss.org/events/workshops/pattern/index.htm>

**Instructors:** Arthur Getis (coordinator), John R. Weeks, and Jared Aldstadt (all of San Diego State University) and Michael Goodchild (CSISS, University of California, Santa Barbara)

**Introduction to Spatial Data Analysis**  
*24-28 June 2002, Santa Barbara CA*

In collaboration with the Interuniversity Consortium on Political and Social Research (ICPSR), CSISS will host this workshop.

**Topics covered:** Spatial data visualization and exploration, analysis of clusters and point patterns, global and local indicators of spatial autocorrelation, variogram analysis, and introduction to spatial regression analysis, SpaceStat software. Prior familiarity with multivariate statistics and basic concepts of probability theory, and some knowledge of desktop GIS software, expected of participants. For further details, see <http://csiss.org/events/workshops/data/index.htm>.

**Instructor:** Luc Anselin, University of Illinois, Urbana-Champaign

**Short Workshops and Conferences Supported by CSISS since June 2001:**

**Wharton School Workshop**

CSISS's summer workshops are currently highly oversubscribed, and we have been exploring mechanisms for expanding access, and for reaching new audiences. An opportunity arose through collaboration with the Wharton GIS Lab, The Wharton School at the University of Pennsylvania, facilitated by CSISS Advisory Board member Susan Wachter, a Wharton faculty member. Luc Anselin and Mike Goodchild agreed to provide the instruction for the three-day workshop (August 29-31, 2001), which opened with a short course on ArcView offered by Wharton staff. The workshop was advertised widely, and attracted an interesting mixture of Wharton students, and participants from as far as Toronto. The focal areas of the Wharton School (real estate, regional science, and

economics) are not ones we normally reach well with our summer workshops, so this additional workshop satisfied both of our objectives. In addition we were able to share costs with the School, reducing the cost to CSISS. We plan to explore similar opportunities as they arise. For further details on the Wharton workshop, see <http://www.csis.org/events/workshops/2001/wharton/index.htm>

2001 ICPSR Workshops on **Introduction to Spatial Data Analysis** (hosted by CSISS at UCSB) and **Spatial Regression Analysis** (University of Michigan) were supported in summer 2001 with scholarships (up to \$500 for each participant).

CSISS participated as contributing sponsor to a very successful conference in Chicago (November 2001) on **Digital Communities 2001**. The Conference, which attracted nearly 150 participants from a broad range of disciplines from nearly two-dozen countries, was organized by the Department of Communications Studies at Northwestern University, e-Tropolis Evanston, and E-Space – The Electronic Space Project at Michigan State University. Six graduate students were supported with CSISS travel awards to present their research at the conference. Don Janelle, CSISS Program Director, was on the Advisory Board for the conference; both he and Helen Couclelis (CSISS Researcher) gave presentations.

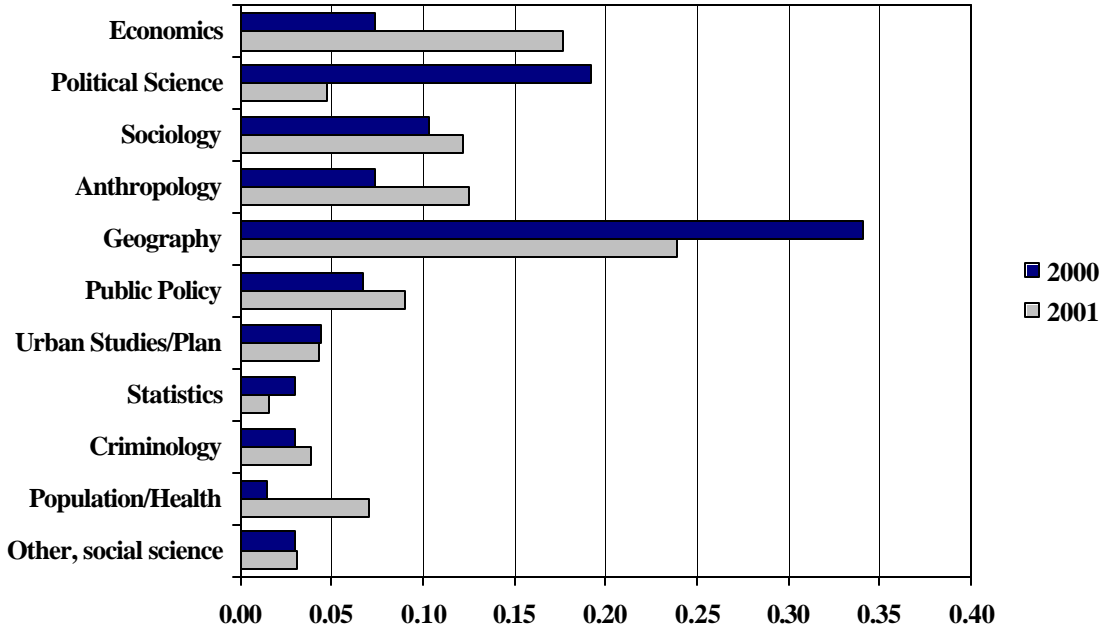
CSISS was invited to present a half-day workshop at the Annual Meeting of the **American Sociological Association** in Anaheim in August 2001. Presentations and demonstrations were given by CSISS Advisory Board member, John Logan, Deidre Okley (graduate student from the University at Albany), Michael Goodchild, Richard Appelbaum, Waldo Tobler, and Don Janelle. They covered issues in mapping social data, uses of GIS and spatial statistics, advances in cartographic representation, and CSISS programs. About 25 registered participants took part in the workshop – consisting of mostly professors of sociology and demography, and graduate students.

## **Workshop Application and Participation Patterns**

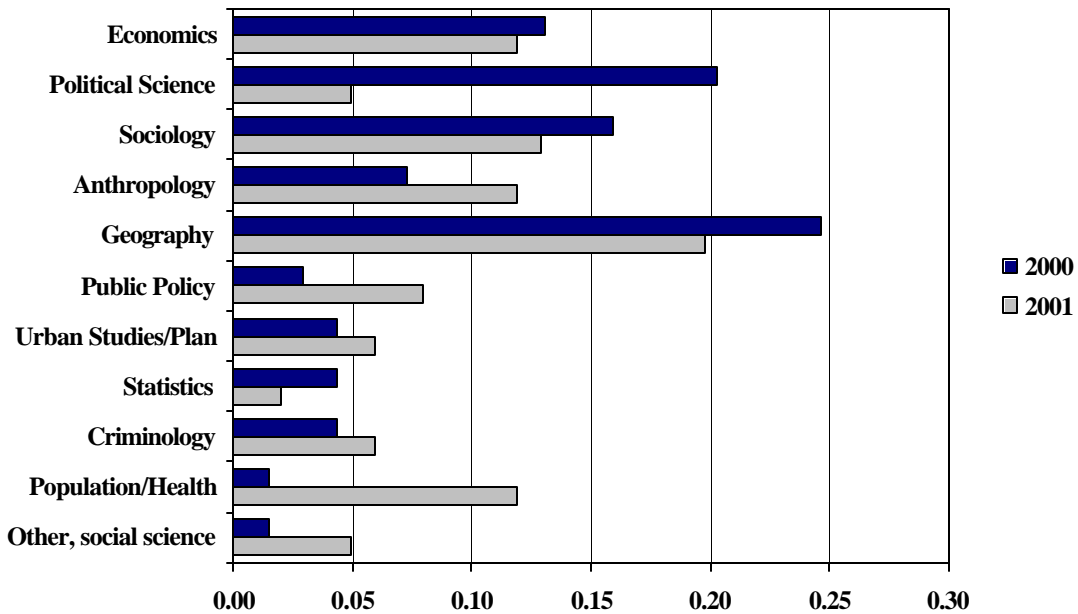
The number applicants for CSISS workshops and ICPSR scholarship support expanded from 152 for the Summer 2000 workshops to 262 for the Summer 2001 workshops. For the summer workshops in 2002, CSISS is not able to continue the scholarship support for the ICPSR workshop participants, so the number of applicants to our programs (225) is distributed only among the three CSISS workshops. If the ICPSR applicants were excluded from 2000 and 2001 then the trend in the number of applicants for CSISS workshops would be 136 in 2000, 235 in 2001, and 225 in 2002. This illustrates a general stabilization in interest that far exceeds the capacity of the workshops. CSISS was able to serve 49 percent of applicants in 2000, 43 percent in 2001, and an estimated 31 percent in 2002. The decline in the proportion of applicants serviced reflects slight declines in the admissions in the three CSISS workshops in 2002 to reflect lab capacity. However, these numbers do not consider the additional 22 participants in the ICPSR workshop for 2002, hosted by CSISS at UCSB.

The disciplinary mix of applicants and acceptances for all workshops is illustrated in Figures 1 and 2 for the 2000 and 2001. Tables 1 to 3, show the proportions of applicants and participants by discipline for the separate workshops in each of the first two years.

**Figure 1. Proportion of Applicants to CSISS Workshops by Disciplines for 2000 (152) and 2001 (262)**



**Figure 2. Proportion of Acceptances to CSISS Workshops by Disciplines for 2000 and 2001**



<b>Table 1. Number of participants by workshop and acceptance rates by discipline / area for year 2000</b>	<b>Total Applied</b>	<b>Total Accepted</b>	<b>Bayesian</b>	<b>Agent Modeling</b>	<b>Pattern Analysis</b>	<b>ICPSR.</b>	<b>Acceptance Rate</b>
<b>Anthropology</b>	10	5	0	1	4	0	<b>0.50</b>
<b>Criminology</b>	4	3	1	0	2	0	<b>0.75</b>
<b>Economics</b>	10	9	4	3	0	2	<b>0.90</b>
<b>Geography</b>	46	17	5	6	5	1	<b>0.37</b>
<b>Other, not social science</b>	17	3	0	1	1	1	<b>0.18</b>
<b>Other, social science</b>	4	1	1	0	0	0	<b>0.25</b>
<b>Political Science</b>	26	14	6	3	4	1	<b>0.54</b>
<b>Population/Health</b>	2	1	0	0	1	0	<b>0.50</b>
<b>Public Policy</b>	9	2	0	2	0	0	<b>0.22</b>
<b>Sociology</b>	14	11	4	2	3	2	<b>0.79</b>
<b>Statistics</b>	4	3	1	1	0	1	<b>0.75</b>
<b>Urban Studies/Planning</b>	6	3	1	2	0	0	<b>0.50</b>
	152	72	23	21	20	8	

<b>Table 2. Number of participants by workshop and acceptance rates by discipline / area for year 2001</b>	<b>Total Applied</b>	<b>Total Accepted</b>	<b>Accessibility</b>	<b>Map Making</b>	<b>Pattern Analysis</b>	<b>ICPSR.</b>	<b>Acceptance Rate</b>
<b>Anthropology</b>	32	12	2	8	2	0	<b>0.38</b>
<b>Criminology</b>	10	6	1	1	2	2	<b>0.60</b>
<b>Demography/Population</b>	18	12	3	1	3	5	<b>0.67</b>
<b>Economics</b>	45	12	5	0	2	5	<b>0.27</b>
<b>Geography</b>	61	20	9	3	4	4	<b>0.33</b>
<b>Other, not social science</b>	7	2	1	0	0	1	<b>0.29</b>
<b>Other, social science</b>	8	5	0	4	1	0	<b>0.63</b>
<b>Political Science</b>	12	5	0	3	2	0	<b>0.42</b>
<b>Public Policy &amp; Admin</b>	23	8	4	0	2	2	<b>0.35</b>
<b>Sociology</b>	31	13	1	2	3	7	<b>0.42</b>
<b>Statistics</b>	4	2	0	0	1	1	<b>0.50</b>
<b>Urban Studies/Planning</b>	11	6	2	2	2	0	<b>0.55</b>
	262	103	27	24	24	26	<b>0.39</b>

**Table 3. Proportion of Applicants / Acceptances by Discipline for CSISS Workshops in 2000 and in 2001**

	Applied		Accepted	
	2000	2001	2000	2001
<b>Anthropology</b>	0.07	0.13	0.07	0.12
<b>Criminology</b>	0.03	0.04	0.04	0.06
<b>Economics</b>	0.07	0.18	0.13	0.12
<b>Geography</b>	0.34	0.24	0.25	0.20
<b>Other, social science</b>	0.03	0.03	0.01	0.05
<b>Political Science</b>	0.19	0.05	0.20	0.05
<b>Population/Health</b>	0.01	0.07	0.01	0.12
<b>Public Policy &amp; Admin</b>	0.07	0.09	0.03	0.08
<b>Sociology</b>	0.10	0.12	0.16	0.13
<b>Statistics</b>	0.03	0.02	0.04	0.02
<b>Urban Studies/Plan</b>	0.04	0.04	0.04	0.06

The figures and tables above show a broad disciplinary representation. While geography is the most strongly represented, this declined in the second year of the program. The strong representation of Economics, Anthropology, Population/demography, and sociology is noteworthy. The strong showing for Political Science in year 2000 reflects that discipline's interest in Bayesian perspectives and the role of a political scientist (Michael Ward) in organizing the workshop.

Tables 4 and 5 for the **2002 workshop season** represents the data on applicants in the same format as in previous annual reports, however the data on acceptances and participants are not shown since we have not yet finalized the participant list for 2002. Women represent 47 percent of the applicant pool for 2002, similar to last year's 48 percent. The large number of universities with applicants reflects a strong general awareness CSISS programs and a continuing demand for resources and training in spatial analysis across the social sciences. Younger scholars at the PhD candidacy level, post doctorate scholars and untenured faculty are the primary client group, accounting for 71 percent of the applicants. The discipline mix for 2002 is consistent with previous years.

<b>Participant &amp; Applicant Status</b>	<b>Accessibility</b>	<b>Map Making</b>	<b>Pattern Analysis</b>	<b>Total Applications</b>
<b>PhD Candidate</b>	29	28	47	104
<b>Post Doc</b>	6	6	8	20
<b>Untenured Faculty</b>	12	6	17	35
<b>Tenured Faculty</b>	4	2	5	11
<b>Other</b>	21	17	16	54
<b>No. of Women</b>	35/72	25/59	45/93	105/224



Table 5. Distribution of CSISS Workshop Applications by Discipline and Institution, Summer 2002				
<b>Discipline/Area</b>	<b>Accessibility</b>	<b>Map Making</b>	<b>Pattern Analysis</b>	<b>Total Applications</b>
Anthropology	1	6	6	13
Archaeology	5	2	6	13
Communications		1		1
Criminology	1	2	2	5
Demography/Population Studies	5	2	6	13
Economics	7	3	11	21
Environmental Policy/Planning	1	5	3	9
Epidemiology/Health Studies	2	2	3	7
Ethnic Studies		1		1
Geography	17	10	18	45
GIS/Remote Sensing	6	4	11	21
History	1	1	1	3
Information Science	1	2	2	5
Natural Resources	3	3	5	11
Political Science	4	3	1	8
Psychology	4			4
Public Policy & Administration	4	2	2	8
Regional Science		1		1
Sociology	5	6	11	22
Urban Studies/Planning	5	3	5	13
Totals:	72	59	93	224
No. of Universities & Other Institutions	57	46	68	

Discipline / Area labels are based on the self-identification of applicants.

\* These totals are based on participants and applicants for all workshops, excluding the duplicates of universities represented across workshops.

### III. Best Examples

The editing of *Spatially Integrated Social Science: Examples in Best Practice*, by Michael Goodchild and Donald Janelle, is nearly complete and will be submitted in final form to Oxford University Press in June 2002. A complete list of authors and chapter titles was presented in the 2<sup>nd</sup>-year report to NSF. We have been successful in getting a 100% return of manuscripts from a set of outstanding scholars from across the social sciences. We will be turning attention to developing related web resources to supplement the chapters.

Another initiative, *CSISS Classics*, supplements the book series with a web presence. It is simultaneously part of the Learning Resources program. This short descriptive statement of intent appears on the website:

The foundations of spatial analysis span many disciplines over many generations of researchers and practitioners. *CSISS Classics* provides summaries and illustrations of major contributions to spatial thinking in the social sciences. Primary emphasis is given to research before 1980, with an attempt to capture and acknowledge the repository of spatial thinking in the social sciences for the last few centuries. The summaries, along with key references, are intended as guides for those interested in exploring intellectual inheritance from previous generations.

Currently, there are 24 items in the collection and six more are under development. Our goal is to expand the collection to 40 or more in year 3 and to feature broad representation from several disciplines. Some of the current list of authors and schools of thought include Torsten Hagerstrand / time geography, John Small / epidemiology, Robert Fogel / spatial econometrics and buffers, Ian McHarg (buffer maps), and Robert Park / urban social ecology).

A second CSISS Best Practice book is also underway and will also be ready for submission later in 2002 – edited by Raymond Florax (Free University Amsterdam), Sergio Rey (San Diego State University) and Luc Anselin (University of Illinois, Urbana Champaign) on **Advances in Spatial Econometric Modeling: Methodology, Tools and Applications**, to be published by Springer-Verlag. A tentative table of contents is listed below:

#### **Advances in Spatial Econometric Modeling:**

##### **Methodology, Tools and Applications**

*Luc Anselin, Raymond J.G.M. Florax, Sergio J. Rey, Editors*

1. Econometrics for spatial economic models: Recent advances  
**Luc Anselin, Raymond J.G.M. Florax and Sergio J. Rey**

##### **Part I Specification and Estimation in Spatial Econometric Modeling**

2. The performance of diagnostics for spatial dependence in regression models: A meta-analytical approach  
**Raymond J.G.M. Florax and Thomas de Graaff**
3. The influence of spatially correlated heteroskedasticity on tests for spatial correlation  
**Harry H. Kelejian and Dennis Robinson**

4. A taxonomy of spatial econometric models for simultaneous equations systems  
**Sergio J. Rey and Marlon G. Boarnet**
5. A methodology for estimating spatial probit models  
**Kurt Beron and Wim Vijverberg**
6. Techniques for estimating spatially dependent discrete choice models  
**Mark Fleming**
7. Simultaneous spatial and spline transformations of regression variables  
**R. Kelley Pace**
8. A Bayesian approach to geographically weighted regression  
**James P. LeSage**

**Part II Software Tools for the Exploration and Modeling of Spatial Data**

9. Spatial econometrics in practice revisited: A template for spatial regression Software tools  
**Luc Anselin**
10. Exploring spatial data analysis techniques using R: The case of observations with no neighbors  
**Roger Bivand and Boris A. Portnov**
11. Spatial econometrics in XlispStat  
**Luc Anselin, Patricio Aroca and Suhasil Nazara**

**Part III Modeling Competition and Externalities in Spatial Econometrics**

12. Does open trade result in a race to the bottom? Cross-country evidence  
**Paavo Eliste and Per G. Fredriksson**
13. Spatial evolution of U.S. cities  
**Yannis M. Ioannides**
14. Endogenous spatial externalities: Empirical evidence and implications for the evolution of exurban land use patterns  
**Elena G. Irwin and Nancy E. Bockstae l**
15. Externalities, public capital and costs of production  
**Rosina Moreno, Enrique LopezBazo, Esther Vaya and Manuel Artis**
16. Economic growth and spatial externalities  
**Esther Vaya Valcarel, Enrique Lopez-Bazo, Rosina Moreno and Jordi Surinach**
17. Economic growth and convergence: Insights from a spatial econometric perspective  
**Bernard Fingleton**

**Part IV Various Applications of Spatial Econometric Techniques**

18. Identifying the spatial structure of error terms in spatial econometric models  
**Shuming Bao**
19. Estimating the demand for urban air quality from intertemporal property value data  
**Kurt J. Beron, James C. Murdoch, and Mark A. Thayer**
20. White men take up a lot of space! An exploratory analysis of race and gender differences in aggregate transport demand.  
**Bettina H. Aten**
21. The spatial dynamics of urban violence and employment  
**John Engberg**
22. Bayesian pooling applications to space and time series forecasting  
**George Duncan, Wilpen Gorr and Janusz Szczypula**
23. Locally weighted probit and spatial patterns of density zoning in 1920's Chicago  
**Daniel P. McMillen and John F. McDonald**

## **IV. Software Tools**

Under the direction of Luc Anselin, CSISS researchers at the University of Illinois at Urbana-Champaign seek to develop and disseminate a powerful and easy-to-use suite of software for spatial data analysis, to advance methods of statistical analysis to account for spatial effects, and to integrate these developments with GIS capabilities.

### **Objectives**

The objectives of the software tools program of CSISS are to disseminate and develop software to enable the analysis of spatial data, to facilitate the incorporation of spatial effects such as spatial autocorrelation and spatial heterogeneity in empirical analysis and to promote state of the art methods for spatial econometric analysis in the social sciences. As such, the activities carried out under this program consist of software dissemination as well as software development and methodological development.

### **Status**

During the period of 1 July 2001 to 30 April 2002, the software tools program at UIUC moved to new quarters (together with the rest of the Regional Economics Applications Laboratory) and now occupies two rooms as part of the REAL suite of offices. In part following up on the feedback and comments provided during the meetings of the CSISS Advisory Board and various CSISS Specialist Meetings, there were two primary activities during the year: the completion and initial launch of the Software Tools Clearinghouse and the completion of a beta test version of DynESDA2, a free standing software package for exploratory spatial data analysis. In addition, the design of an open source, modular and cross-platform software package for spatial econometrics (OpenSpace) was initiated and an early prototype completed. Various other (smaller) software development efforts pertaining to the implementation of spatial data analysis in open source software toolboxes are in the process of consolidation and will be added to the CSISS Tools web site by the end of Spring 2002.

A second important aspect of the Tools Project was the organization of a Specialist Meeting on Software Tools, to be held in Santa Barbara, CA, May 10-12, 2002. This yielded an impressive collection of descriptions of the state of the art in spatial data analysis software tools, made available by CSISS as Proceedings on a CD-ROM. See section on Specialist Meetings for further details.

### **Personnel**

In addition to Anselin who directed the project and focused on overall design and methodological issues, the project team included Sergio Rey (San Diego State University), Oleg Smirnov (Senior Research Associate, UIUC), Ibnu Syabri (graduate student, UIUC), and Sotiris Karkalakos (graduate student, UIUC). Rey co-organized the CSISS Specialist Meeting on Spatial Software tools, and collaborated on the development of open source ESDA tools. Oleg Smirnov joined the project team in August 2001 as lead software engineer. He is primarily responsible for the implementation of the OpenSpace open source software tools. Syabri was on a 50% graduate assistantship and was the lead software engineer in the development of DynESDA2. Karkalakos was on a 50% graduate assistantship for one semester and assisted in the collection of specialized materials for

software tools clearing house. Rey, Smirnov and Syabri will continue to be involved with the project during year 4.

### **Software Tools Clearinghouse**

The software tools clearinghouse is intended to complement CSISS' own software development efforts with a comprehensive collection of links to software developed by others, in both the private and public sector (including academics).

The clearinghouse was launched in October 2001 as part of the CSISS web site and consists of three main entry points:

- a spatial tools search engine,  
<http://www.csiss.org/cgi-bin/teixis/webinator/clearsearch>
- a collection of links to portals  
<http://www.csiss.org/clearinghouse/links.php3>
- a collection of links to specific software sites (select tools)  
<http://www.csiss.org/clearinghouse/select-tools.php3>

In addition, a fourth entry point, dealing with CSISS' own software tools and benchmarks of open source toolboxes is under development and should be linked to the main CSISS site by the end of the summer of 2002.

The *Spatial Tools Search Engine* is a specialized search engine built on a data base of selected links and web sites dealing with a software tools and methods for spatial data analysis. The database has been custom designed to optimize the efficiency of the search engine with respect to the specialized materials of spatial data analysis. Therefore, the search engine is more effective with respect to these topics than a general-purpose Internet search engine. This specialized search engine complements the generic spatial analysis search engine on the CSISS site. It continues to be updated and refined in response to user feedback.

The *Links to Portals* are entry points to specialized portals dealing with spatial statistics in particular and spatial analysis in general. These are well-established portals developed by individuals, university departments and laboratories and professional societies. Rather than duplicating these portal efforts, a decision was made to build a collection of links to existing sites. The set of links continues to be updated and refined in response to user feedback.

The *Select Tools* are a collection of links to specialized sites that contain software for spatial data analysis. Some of these sites are commercial, but several are academic sites containing customized software tools (some freestanding, some as add-ons, scripts or extensions of commercial tools). All the sites contained in the list have been checked for appropriateness. As with the other links, the set continues to be updated and refined in response to user feedback.

The CSISS Tools link is under development and has (to date) not been connected to the main CSISS web page. It will contain downloadable software from CSISS own development efforts as well as benchmarks and sample data sets for a limited number of

(open source) software tools. Specifically, an agreement has been reached with Roger Bivand (University of Bergen, Norway) to host a collection of spatial data analysis software developed in the R package.<sup>2</sup>

### **DynESDA2**

During year 3, a major part of the software tools program dealt with refining the prototype software program for exploratory spatial data analysis with dynamically linked windows (DynESDA2) and moving it to a release version. This has been accomplished, and a beta version of DynESDA2 is to be released at the Specialist Meeting on Spatial Software Tools, May 10-12 in Santa Barbara, CA.

DynESDA2 is implemented in Visual C++ using ESRI's MapObjects Lite collection of components to implement mapping and simple GIS functionality. It is based on a design of dynamically linked windows in which each statistical graph and map is linked to all others. A detailed description of the design and functionality of DynESDA2 is given in Anselin, Syabri, Smirnov and Ren, "Visualizing Spatial Autocorrelation with Dynamically Linked Windows." (In *Computing Science and Statistics 33*, Proceedings of Interface 01, Orange County, CA, June 13-16, 2001, CD-ROM) and Anselin, Syabri and Smirnov, "Visualizing Multivariate Spatial Correlation with Dynamically Linked Windows" (In Anselin and Rey, Eds., *New Tools for Spatial Data Analysis, Proceedings of a Workshop*, Santa Barbara, CSISS, 2002, CD-ROM). The executable will be freely available from the CSISS Tools web site. It will be tested extensively during a number of workshops taught by Anselin, including the 2002 ICPSR/CSISS Introduction to Spatial Data Analysis workshop. A first official (non-beta) release is envisaged for the summer of 2002.

A limited set of supporting materials will be developed to facilitate the use of the software. However, CSISS resources are insufficient to provide full support and documentation. To implement this, a cooperative agreement is in the process of being worked out between the CSISS Tools Program and TerraSeer Inc, a spatial analysis software and consulting firm in Ann Arbor, MI.

During year 4, development of DynESDA2 will be continued in cooperation with the GeoVista project at Pennsylvania State University and BioMedware Inc. The National Cancer Institute has funded a joint five-year project with GeoVista on "Geovisualization and Spatial Analysis of Cancer Data". In part, it consists of a porting of DynESDA2 functionality to Java in order to complement the tools available in the GeoVista framework. The new tools will become part of the CSISS open source initiative (the OpenSpace Initiative). The collaboration with BioMedware consists of further methodological and algorithmic development of the use of local spatial statistics for space-time data exploration. A small subcontract from BioMedware's Space Time Information System project (funded by the National Cancer Institute) provides additional resources that leverage current CSISS funds.

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<sup>2</sup> Dr. Bivand currently serves as one of the main developers and coordinators in the R community in charge of spatial data analysis packages.

A second aspect of ESDA-GIS tools is the parallel development of a set of modules in Python/Tkinter under the direction of Sergio Rey. An initial version of STARS (Space Time Analysis of Regional Systems) is currently being tested. It implements dynamically linked windows and focuses on the study of the evolution of regional disparities. It contains a simple map, histograms, time series and Moran scatterplots. Its modular structure allows for easy extension with other techniques. STARS will be incorporated into the open sources spatial tools project in the near future.

### **The OpenSpace Initiative**

In late summer 2001, after Dr. Oleg Smirnov joined the CSISS Tools Team, an extensive review and evaluation was carried out of the ongoing software development efforts dealing with tools for spatial econometric analysis. A decision was made to streamline these efforts and to concentrate solely on open source development. This led to abandoning efforts to implement spatial econometric tools in commercial packages such as S-Plus, Ox or Stata, but to use open source equivalents where available.<sup>3</sup> The combined set of CSISS efforts in this regard are referred to as the *OpenSpace Initiative*.

The OpenSpace Initiative consists of a number of parallel efforts. Most important among these is the development of an open source, modular, extensible, object oriented and cross-platform software package for spatial econometric analysis. Given the developing long-term collaboration with the GeoVista project at Pennsylvania State University, a decision was made to recast the original Python-based efforts and move the development to an all-Java environment. While it is acknowledged that Java is not necessarily an ideal platform for numerical computing, it was decided to carry out initial development in Java and at a later date implement subsets of code in C where necessary for performance. This decision was also based with an eye on future integration with Java-based comprehensive open source statistical software development in the Omegahat project (<http://www.omegahat.org>).

The first step in the development of this spatial econometric software focused on designing a modular and extensible user interface and implementing maximum likelihood estimation techniques for the spatial lag and spatial error models. A prototype will be demonstrated at the May 10-12, 2002 CSISS Spatial Tools Workshop. The prototype will be enhanced and tested during the Summer 2002 ICPSR Workshop on Spatial Regression Analysis. It is envisaged that in early Fall 2002 the software will be made available as part of an open source CVS (Concurrent Versions System) web site (part of the CSISS Tools web site). At that point, development will be opened up to the community at large and managed as a truly open source effort. In addition to managing this enterprise, CSISS will continue to develop tools for specialized estimation and testing methods.

A second aspect of the OpenSpace Initiative is the development of functions (routines, modules, packages) for specific statistical tests and estimation methods in various open source software environments. Specifically, such routines are being developed in XlispStat and Python. In addition, CSISS is collaborating with Roger

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<sup>3</sup> Links to tools developed in commercial packages have been incorporated in the Clearinghouse.

Bivand (University of Bergen, Norway) and will host and contribute to the development of the current collection of R-based tools for spatial data analysis.

The XlispStat efforts started in year 2 were halted in favor of the other environments. The existing collection of functions has been tested and refined and is scheduled for release on the CSISS Tools site by late Spring 2002. These efforts are described in a chapter by Anselin, Aroca and Suahasil (“Spatial econometrics in XlispStat”) in the forthcoming edited volume by Anselin, Florax and Rey on “Advances in Spatial Econometrics”.

During year 3 of the project, a group of graduate students and visiting scholars has been working with Anselin on porting the XlispStat functions to Python. These routines deal with estimating models that include spatial heterogeneity (spatial regimes, spatial analysis of variance), diagnostics for spatial autocorrelation in regression residuals (Moran’s I, Lagrange Multiplier tests, Kelejian-Robinson tests, double length regression tests), maximum likelihood estimation of spatial error and spatial lag models and instrumental variables/generalized methods of moments estimation of spatial error and spatial lag models. Additional functionality for the estimation of spatial seemingly unrelated regression models (SUR) is being implemented as well. After further testing and benchmarking, the collection of routines will be made part of a CVS web site for further development, both by the team of volunteers at UIUC as well as by others in the community at large. The emphasis in these efforts is on incorporating new methods and demonstrating the software implementation of these methods, not on numerical performance.

The overall framework and design for this ongoing effort is outlined in a chapter by Anselin (“Spatial econometrics in practice revisited: a template for spatial regression software tools”) in the forthcoming edited volume by Anselin, Florax and Rey on “Advances in Spatial Econometrics”.

### **Methodological Development**

In addition to tools development, a number of methodological issues were considered as well, primarily dealing with the extension of the ESDA techniques to space-time and multivariate environments. Specific aspects considered were the visualization of space-time association by means of a generalized Moran scatterplot and the generalization of Local Indicators for Spatial Association to multivariate and space-time association. These were presented by Anselin at a number of conferences and documented in Anselin, Syabri and Smirnov, “Visualizing Multivariate Spatial Correlation with Dynamically Linked Windows” (In Anselin and Rey, Eds., *New Tools for Spatial Data Analysis, Proceedings of a Workshop*, Santa Barbara, CSISS, 2002, CD-ROM).

### **Dissemination**

The DynESDA2 beta release will be made available on the CSISS Tools web site in early May 2002. A final version is slated for release in the summer of 2002. The various tools developed as part of the OpenSpace Initiative will be made available during the summer and fall of 2002 in the form of a CVS web site. The Software Clearing House has been available on the CSISS site since October 2001.



In addition, Anselin made a number of presentations dealing with the design and methodological aspects of the DynESDA environment (BioMedware Space Time Information Systems Conference, Annual Meeting of the Association of American Geographers) as well as on the Software Tools Program in general (Annual Meeting of the American Agricultural Economics Association).

The technical issues related to the DynESDA framework are described in two conference proceedings articles by Anselin et al. al. that are in the process of being reworked for journal submission. Anselin, Florax and Rey describe the OpenSpace Initiative and the XlispStat tools in two chapters in the edited volume. That volume itself (*Advances in Spatial Econometrics*) has been incorporated in the CSISS Best Practice effort.

Finally, two Specialist Meetings have yielded publications. A selected number of papers from the 2001 Specialist Meeting on Spatial Externalities are forthcoming in a special issue of the *International Regional Science Review*. Also, a collection of descriptions of state of the art spatial data analysis software tools submitted by the participants to the Software Tools Specialist Meeting is contained in a Proceedings CD-ROM on “New Tools for Spatial Data Analysis”, edited by Anselin and Rey.

### **Work Plan**

The work plan for year 4 of the project will be carried out in three phases.

#### Summer 2002:

The focus of the summer activities will be two fold: fine tuning and updating the materials on the Software Tools Clearinghouse; linking the CSISS (UIUC) Tools Site to the main CSISS site. The latter will coincide with a release of the first version of the DynESDA2 software as well as the routines developed in XlispStat and Python. The collection of R-based tools will be streamlined, made available and benchmark test results posted on the CSISS Tools site. The incorporation of additional spatial econometrics in the R tools will be carried out at CSISS, in collaboration with Roger Bivand and other R developers.

Development of the OpenSpace spatial econometric tools will continue. Initial efforts will be made in extending DynESDA to deal with space-time and flow data structures.

#### Fall 2002:

By Fall 2002, the Java-based estimation routines for spatial econometric models will be released in a CVS web site and the open source development advertised and initialized. Development at CSISS will turn to methods for the estimation of spatial probit models. In parallel, new methods will be added to the collection of Python routines, also in collaboration with the community at large.

The development of ESDA tools will deal with the port of some of the DynESDA functionality to Java, for further integration with the GeoVista studio. In addition, this

will be added to earlier development of internet-based spatial analysis tools at UIUC. The functionality and performance of such tools will be evaluated.

Spring 2002:

During the spring, development will continue on the comprehensive spatial econometric software environment and the Python routines. The main objective is to have the Python routines combined in a “module” for easy use in a Python programming environment. In addition, the linkage of the Python routines to the R and OmegaHat environments will be explored. It is anticipated that by this time a number of the tools (in addition to DynESDA2) will be available for delivery in the form of executables as well (and not just source code, to be compiled by the user). A beta test version of the web-based spatial analysis tools is scheduled to be released.

## V. Learning Resources

CSISS aims to develop learning resources covering core spatial concepts and exemplary research approaches. These include lecture outlines, exercises, interactive learning modules, and demonstrations, and are made available through the CSISS website. **Matthew T. Rice** served as the Learning Resource Manager from September 2000 to December 2001. This report borrows heavily from his status report for 2001.

The CSISS Learning Resource Archive has a significant number of resources, available through the CSISS Learning Resources Portal at [http://www.csiss.org/learning\\_resources](http://www.csiss.org/learning_resources). This report identifies the current content of the Learning Resource Archive, documents the resource collection process, and notes tasks that are in progress. The primary objectives of the CSISS Learning Resource Archive are outlined in the original NSF grant proposal [http://www.csiss.org/aboutus/reports/csiss\\_descript.pdf](http://www.csiss.org/aboutus/reports/csiss_descript.pdf) and in the Annual Report for year 1, <http://www.csiss.org/aboutus/reports/ar2000.pdf>.

Identifying the audience for the CSISS Learning Resources has at times been difficult. Even though many individuals know about the learning resources effort via participation in CSISS workshops and expert meetings, there is not yet a community that can drive a strong learning resources effort. Getting the CSISS community to leave their own disciplinary domains and base their educational efforts around a CSISS Learning Resources framework may not be practical. Pursuant to the advice of the Advisory Board after the Fall 2001 meeting, it may be wise to make the CSISS learning resource efforts less generic and more suited to each of the individual domains, i.e., CSISS Learning Resources for Archaeology, CSISS Learning Resources for Economics, CSISS Learning Resources for Sociology, etc. This concept is currently being implemented through linkage to outstanding examples of syllabi on spatial analytic courses in a range of social science disciplines ([http://www.csiss.org/learning\\_resources/content/syllabi/](http://www.csiss.org/learning_resources/content/syllabi/)). This is seen as a first step to establishing a strong identity for the resource in the user community.

### **Learning Resource Organization and Search Tools**

The CSISS Learning Resources are comprised primarily of html-based resources, searchable via two principal tools: 1) a web browser, and 2) a PHP/MySQL-based search form that queries a local database of CSISS Learning Resource meta-data. This PHP/MySQL-based search form is fully functional and will eventually be the primary entry point for the Learning Resource Archive. The meta-data database that underlies the PHP/MySQL database is sufficiently populated to provide a good variety of resources, but most of the resources are from the domain of geography or more specifically geographic information science. When the metadata database contains a more substantial number of records from other disciplines, the search capability will be expanded in scope and will be given greater prominence on the learning resources page. Matt Rice and Ann Ricchiazzi completed a mock-up of this expanded search form; it includes selectable radio buttons for each of the CSISS disciplines and interest areas as well as image-mapped graphs and charts linked to meta-data records from specific disciplines and interest areas.

The format used for the CSISS Learning Resources metadata is the IMS Global Learning Consortium's Learning Resource Meta-data Information Model V1.1 (see <http://www.imsproject.org/metadata/mdinfov1p1.html>). This standard has also been adopted by other Learning Resource Archives including the Digital Library for Earth System Education (<http://www.dlese.org/>) and the Alexandria Digital Library at UCSB (<http://www.alexandria.ucsb.edu/>). A common meta-data format will eventually allow us to share content, search capability, catalog entries, and development tasks with these other groups. The DLESE and Alexandria meta-data catalogs are moving to XML format. Consequently, it may be useful for CSISS to explore migrating the current CSISS PHP/MySQL database to XML, which looks to be the future common format for databases of this type.

For internal development purposes, the CSISS learning resources metadata database is accessible in two ways. First, the web manager can access and modify the metadata database through the standard Linux command line interface. Second, anyone with the username and password can access the database through the CSISS internal website, allowing entry and updating of records through forms that use PHP. This method of input is easy and flexible, and can be done from any browser. To this point, only the web manager has had access to the database through Linux, because many of the important databases are kept in MySQL and it is difficult to have the web manager updating, loading, and manipulating databases while the learning resources manager is also editing them. The web-based interface for inputting meta-data lacks two functionalities, deleting records and modifying database fields. Because the web-input form allows for extensive revision of a record, it is possible to delete a record simply by changing all of its attributes, effectively deleting a record by replacing it with another. Modifying the fields of the database should be done by the web manager for two reasons. First, having the web manager do the major editing and manipulation will help avoid any problems with concurrent editing and over-writing. Second, if the Learning Resources manager doesn't have to learn PHP and MySQL (which the web manager should know anyway), he/she can focus on more important tasks at hand and leave the technical details of the database to the person who knows it better. The web-based interface for editing the meta-data

database is easy and should require no training, other than a reference sheet with the definitions of the metadata fields. Input can be done with text boxes, pull-down menus, or by copying a template record and editing its contents as appropriate. This last method, editing from a template record, is particularly useful as it helps to avoid manually entering large amounts of information that are redundant across several records.

The 29 fields used in our meta-data database are derived from the IMS Global Learning Consortium's Meta-data Information Model, Version 1.1. This Model is comprehensive and contains many fields that may be useful in the future but are not critical at this point. For this reason, we have chosen a subset of this IMS meta-data model, including such fields as author, origin, title, description, format, length, rights of use, subject domain, CSISS discipline, and CSISS interest area. Field definitions are available upon request.

### **Resources**

The contents of the Learning Resources Archive can be reached through browsing menus or by searching the metadata database. These resources are directed towards at least three main groups of users: individual learners (students), teachers, and authors. Each CSISS Learning Resource user may fall into more than one category depending on circumstance, and these categories might be better thought of as 'roles' that an individual may be in for a given space of time. Many of the Learning Resources in lecture outline format, such as Stuart Sweeney's "Introductory Lectures in Spatial Social Science" are appropriate for either a teacher or a student. Some resources, such as those listed on the Papers and Presentations section of the Learning Resources website, are good supplemental materials for study or as references for authors writing about spatial social science. Resources continue to be added to the meta-data base as they are collected and discovered. This part of the collection process will continue. As the distribution of resource types and source discipline areas expands, the browsable menus will change significantly. The underlying metadata database will remain the same.

### **CSISS Curriculum Development**

In order to provide a curriculum model for University-level courses in spatially integrated social science, Dr. Michael Goodchild and Dr. Donald Janelle developed a CSISS curriculum outline (available on request). A teacher or student of spatially integrated social science could organize his/her curricular study around this outline, which contains a comprehensive listing of key subject areas. An effort is underway to create some new resources in key curriculum areas, as well as linking existing resources from the NCGIA core curriculum and other internal sources. Eventually this entire curriculum outline will be complete with learning resource modules in each of the key areas.

### **ARGUS**

An excellent set of resources that are featured on the CSISS Learning Resources site is ARGUS, or Activities and Readings on the Geography of the United States. ARGUS was developed over many years by the Association of American Geographers as a tool for secondary education and individual learning. Many high school teachers were contacted and surveyed about their needs with respect to teaching Geography, and the ARGUS is a result. Although the materials may be too fundamental for most CSISS users, they do

provide useful reviews on background materials regarding elementary techniques (e.g., the construction of an isoclines plot from scattered spatial point data (See [http://www.csiss.org/learning\\_resources/content/argus/JXISOLIN.DIR](http://www.csiss.org/learning_resources/content/argus/JXISOLIN.DIR)). The ARGUS units are in Macromedia Director 4.0 format, and as such they can be viewed online without modification through the use of the Macromedia Director/Shockwave browser plug-in. Out of the many ARGUS units available, we chose to display 24 of them that were most relevant to the CSISS disciplines and interest areas. These 24 units are linked back to the other units through internal relative file references, which in some cases do not work. It is likely that our installation of the ARGUS units in a browser setting has some bearing on the way the relative path or file references are interpreted by the Macromedia plug-in, causing errors. This particular problem does not prohibit the use of the ARGUS materials and simply amounts to a minor distraction while navigating and exploring through the material. Special thanks are extended to the ARGUS editor-in-chief (Phil Gersmehl, Professor of Geography, University of Minnesota, and to the AAG's educational outreach coordinator (Osa Brand, Educational Affairs Director, Association of American Geographers).

### **Internal Resources Under Development**

The CSISS workshops that have been held to date were anticipated to be a rich source of learning resources. In some cases, materials have been presented to us for inclusion on the Learning Resources website, but in many other cases, the materials were not provided by the workshop leaders. Two workshops held in the summer of 2001 were video taped for possible inclusion on the CSISS website and possibly on the learning resources page. Videos of those workshops were edited and prepared by Nick Nagle and Nina Brown (CSISS summer 2001 researchers). The videos can be found at [http://www.csiss.org/streaming\\_video/](http://www.csiss.org/streaming_video/). Sara Fabrikant's workshop "Map Making and Visualization of Spatial Data in the Social Sciences" included several speakers-- UCSB emeritus professor Waldo Tobler, Keith Clarke, Danny Dorling, and Barbara Buttenfield. A workshop by Luc Anselin resulted in several PowerPoint presentations that could be included on the Learning Resources page if they were appropriately augmented with comments and context.

Matt Rice, the Learning Resources Manager through December 2001 gave presentations on "Learning Resources for Teaching and Self Study" at the Annual Meeting of the Association of Pacific Coast Geographers, Santa Barbara, California, in September 2001.

## **VI. Place-Based Search**

Our objective in this program is to enable social scientists to discover research resources for specified geographic locations, using advanced search tools and the WWW. To date such searches have been impeded by the lack of specialized search engines, since the conventional engines search only over text archives, not specialized social science data. In this program we are leveraging our connections with the Alexandria Digital Library at UCSB, and other efforts under way in the worldwide digital library community.

In summer 2002 we developed a first prototype of a tool for searching across distributed social science data archives. The prototype uses a map interface, allowing the user to specify an area of interest by pointing to the map, or by providing place names (at present limited to countries). Once an area and other requirements are specified, the prototype then searches any available WWW sites. We are using the DDI (Data Documentation Initiative) standard that is under development by an international consortium headed by ICPSR, and currently allowing users to search over three data archives that are DDI-compliant and remotely searchable.

From our experience with the prototype we have learned that the specification of geographic coverage is more complex for social science data sets than for maps or images with clear geographic footprints. Accordingly, we are collaborating with DDI, and specifically with its geography-working group, to refine the specification of geographic coverage. Mike Goodchild met with the group in Minneapolis in March, and with its chair in Washington in April, and has invited the group to hold its next meeting at CSISS. We will continue to give this issue high priority in the coming year. A more complete discussion about this project follows:

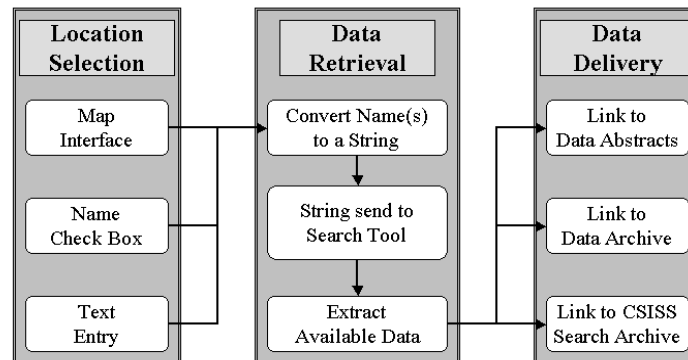
### **CSSAST: The CSISS Social Science Archive Search Tool A Place Based Search Tool for Social Science Data**

#### **Using the Search Tool**

**Scott J. Crosier** is the CSISS research assistant who developed this tool in cooperation with Eric White and the Ann Ricchiazzi. He authored most of this section of the report. One of the goals of the CSISS project is to develop a search tool that can examine the holdings of a social science data archive and search the archive based on geographic location of the study. The process involves three major steps – location selection, data retrieval, and data delivery.

## A Conceptual Model of CSSAST

Complete Web Interface of the Following Processes



### Location Selection

There are three different methods of selecting a location to be searched. These entail the use of a map interface, the selection of the name using an on-line checkbox format, or by entering the name or names into a text field. The map interface for the tool has been developed using ESRI's ArcIMS geographic information system. This tool offers the user many of the same functions that typical GIS software would offer, including zoom features together with a reference window, selection tools including point and bounding box selection, clear functions and so on. Once a location or locations is (are) selected the names of those locations are provided in text format at the bottom of the map interface. Further steps invoke the data retrieval process.

Beyond the use of map interface, a location can also be selected using a standard check box form that is provided independent of the map interface. This interface has been developed using a standard HTML form layout that includes check boxes and buttons. A list of all countries is provided with the option to select the country by clicking the corresponding check box. Once a selection of country or countries has been made, the "search" button invokes the data retrieval process. A "clear selection" button is also available to de-select the check boxes that have been previously checked.

The final method of location selection is through a text box entry. This allows the user to type the name or names of the location desired. This information is then entered directly into the data retrieval process.

### Data Retrieval

Once a location has been selected using one of the three location choice options, the information is processed and compared against the holdings of several leading data archives. This process entails three basic steps. Initially, the information is converted into a data string. This string of text is what is required in our search tool. Eric White using the Thunderstone document retrieval and management system developed the search tool. This Taxis/Webinator system takes the location names coded into the text string and compares it against the holdings of several leading social science data archives. Information about the holdings that pertain to the search is then extracted from the archives description. And the information is made available to user in a number of different formats.

#### Data Delivery

The final process in the search is the data delivery. Several options are available to the user in what type of information is to be extracted. The Webinator search tool also produces an abstract from the information accessed during the search. The user can see information about the content of the data set, including information about its production, the location of the study, and a description of the study. An alternative option is to link directly to the data archive. This would allow a user to make a more focused search of the individual holding or would allow the user to determine the accessibility to the actual data. Information that pertains to a specific location that is obtained from other CSISS search tools, including journal articles and web sites, could also be accessed.

#### Limitations of the Search Tool

The search tool currently has several limitations. These include limited access to the actual dataset, access to only a small group of data archives, a limited search resolution, and the absence of a keyword or topic search. Efforts are being made to enhance the tool and overcome each of these limiting factors.

#### Increasing Access to Holdings

Two limitations are faced in regards to the access and availability to the data archives. These include the limited access to data descriptions and the accessibility of the actual dataset. In order for the search tool to access the holdings of an archive, certain information must be available on line for our tool to interpret. This information is often in the form of metadata. The metadata documentation provides information about the dataset. Without access to the metadata documentation, an individual searching an archive's holding via the Internet cannot interpret the content of the information stored. Likewise, without access to this metadata information, the CSSAST search tool is unable to understand the content of the data.

Although some archives provide adequate metadata information, many times the actual content of the dataset is unavailable to the common user. This access is often limited to specific governmental or educational organizations. Other archives might limit the data access to subscribers to their services. The CSASST search tool is able to find data in some of these archives, however the access of the data to the individual user may vary according to organizational affiliation. As a global community working towards a common good, it is essential that information be freely distributed. As the goals of CSISS are becoming realized, and scientific research is crossing over into other disciplines social data will be one of the key tools in understanding the relationship between humankind and the environment. For this reason, the floodgates to social data must open. This begins with the free sharing of data through archives and the individual social scientists.

#### Focusing Search Options

As mentioned previously, metadata documentation is one of the key tools used in describing, and thus, searching for a specific dataset. Although metadata schemas have been developed for other types of data, a metadata schema for social science data has not yet been established. That is to say, that the social science community has not yet



accepted a uniform method of describing social science data. The Inter-Consortium for Political and Social Research (ICPSR) has made great efforts towards this end in the establishment of the Data Documentation Initiative (DDI.) The DDI, derived from the previously used codebook, is a computer readable format for describing social science datasets. Although a draft of the DDI has been established and is in use by several archives, the DDI is still under development. CSISS has been invited to participate in its future development. The CSISS goal in this endeavor is two-fold. First, we hope to establish a finer searchable resolution to the data description. Currently, the only spatial property in the DDI is the country name. Thus, the finest search resolution for CSSAST is by country. If the DDI contained a more specific location (in the form of state, province, or city name or bounding coordinates of the data collected) the CSSAST search tool could search at a finer resolution than country. With the use of ArcIMS and basic HTML forms in the development of the search tool, implementation of states, provinces and even cities could be introduced to the search tool with minimal effort.

The second goal of CSISS in the development of the DDI would be in a more rigid specification of the topic or key words in the description of the data. This would allow the CSSAST to search based not only on location, but also on specific topics.

#### **Efforts to Improve Data Description**

The efforts of CSISS to assist in the development of the DDI are being realized in three different formats. These are in workshops, publications and conference presentations. Contact has been established with many of the leading DDI researchers and a proposed workshop is being finalized that will focus on the establishment of location related issues in the DDI. CSISS will act as the host for the workshop. Several publications are underway that address the spatial issues of social science data. "Of Significance..." a non-refereed journal that caters to social science data users currently has in publication an article (Crosier, 2002) that addresses many of the spatial elements of social data. Future publications are projects as a result of future workshops and conferences. CSISS has also been invited to participate at a social science conference. At the October 2002 Social Science Historical Association (SSHA), representatives from CSISS will participate in several presentation and workshop sessions. In this we hope to invoke an understanding of the advantages of describing spatial elements of social science data and assist in the realization spatial elements in the DDI. These efforts will not solely permit increased functionality of the CSSAST search tool, but will also facilitate future cross-discipline research based on a geographical location.

### **VII. Virtual Community ([www.csiss.org](http://www.csiss.org) )**

CSISS is developing an open, virtual community to share spatial analytic software, foster discussion about spatial approaches in the social sciences, provide learning resources, and highlight information on workshops, conferences, and the latest innovations and applications of spatial analysis. The vehicle for these community-building and outreach efforts is <http://www.CSISS.org>. CSISS aims to position this website as the primary port-of-call for researchers and students of spatial analysis in the social sciences. To this end, it has developed specialized Internet search engines to identify relevant resources on the

World Wide Web and provides consolidated bibliographical resources derived from a broad range of on-line sources.

### **CSISS Website 2001-2002**

**Gamaiel Zavala** replaced Ann Ricchiazzi as CSISS Webmaster in late March 2002.

All of the core programs of CSISS are delivered or assisted through the website, <http://www.CSISS.org/>. Currently, this site is a host to more than 400 static html pages and several dozen dynamically created pages associated with our on-line databases. The website's role for each of the core programs is described below:

#### **National Workshops**

The web is the principal vehicle for advertising and for administering CSISS workshops. On-line procedures are used for receiving applications for positions in the workshop, and for the entire applicant review process, including follow-up surveys. Information for participants on travel and accommodations, venue, agendas, and workshop handouts are disseminated via the Web.

In the summer of 2001, we experimented with filming two workshops for purposes of creating streaming-video snippets of workshop content. The two workshops included Luc Anselin's ICPSR *Introduction to Spatial Data Analysis* and the CSISS *Map-Making and Visualization of Spatial Data in the Social Sciences*. UCSB Instructional Development Services assisted in the filming and summer research assistants who participated in the workshops selected and edited parts of the clips for web presentation. In general, we were not pleased with the results but believe that it will be worthwhile to continue this experiment for summer 2002 workshops, making improvements in the video capture of the instructor and of classroom displays

#### **Specialist Meetings**

The web is also a principal vehicle for disseminating on calls for participation in specialist meetings, for accepting on-line applications, and for adjudicating on the selection of participants. Details on the meeting's agenda, description, and venue are provided. In addition pre-meeting position statements or papers, and final reports are posted to the site. This procedure works exceptionally well and simplifies greatly the process of organizing and hosting these events.

#### **Learning Resources**

The CSISS website is the primary means for delivering learning resource in spatial social science. These resources include lecture outlines, exercises, learning modules, and demonstrations that pertain to spatial thinking and analysis. A metadata database for cataloging materials is described under Learning Resources in this report. A search interface for this database has been developed but will not be made available until a significant number of objects are catalogued – an objective for year 3 in the CSISS program. The search interface will allow searches by title, contributor, description, and keywords. Title, contributor, and description are displayed for all matching records, with links to additional metadata, and a link to the actual learning resource. As noted in the report on learning resources, we are exploring the migration of our current mySQL

database to Oracle or XML. This will permit greater coordination and exchange with other metadata collections.

### **Best Practices and *CSISS Classics***

Two edited CSISS best practices books, now in preparation, were described earlier in this report. The authors are encouraged to provide learning materials related to their chapters for the website. A related concept, *CSISS Classics*, is a lively and growing presence on the website. The objective of *CSISS Classics* is to provide summaries and illustrations of major contributions to spatial thinking in the social sciences, primarily before 1980. Classics are being compiled by summer graduate students, and submitted to a database by way of a form interface. The Classics are displayed by way of a Learning Resources menu option, which invokes the PHP scripts to access the Classics database.

### **Spatial Tools**

The principal effort here is towards the development of a Spatial Tools Clearinghouse. The Clearinghouse is intended to be a growing collection of spatial tools and techniques, initially populated through the efforts of a summer graduate student. The conceptual framework for this clearinghouse is in place, and the database and cgi scripts are in progress. The database has two tables – one for tools, and the second for techniques. CGI scripts, coupled with dynamically created web pages will perform the submission and retrieval functions of the clearinghouse. A peer review process will be established for evaluating the merit of submissions for the collection. A prototype version of the clearinghouse will be in place by the end of this summer.

### **CSISS Search Engines**

CSISS Search Engines (developed by Eric White) are now accessible throughout the website. These search engines look for the user's search string in CSISS-relevant urls, returning the matching urls. The Internet search is modeled after Eric's award-winning Anthro.net search engine. This report examines progress made on search engine and information retrieval software produced at CSISS since July 2001. All of the work in this area was performed using the Webinator platform and the Taxis scripting language.

### **Spatial Web Search**

The main Spatial Web search engine contains a broad array of Internet sites and resources related to spatially integrated approaches in the social sciences. Currently there are 37550 pages included in the search index. Included here are the contents of all other databases, described below. The only exception is the Literature Search database, which could not be included due to technical limitations. The following is an overview of the contents of a few subject areas included in the Spatial Web Search:

<u>Term</u>	<u># of Pages</u>
Agent-based Modeling	31
GIS	3645
Cartogram	24
Cost-benefit Analysis	155
Crime	623
Economic Geography	215

## CSISS Annual Report 2002

Electoral Map	479
Game Theory	60
Graph Theory	33
Human Ecology	161
Urban Ecology	28
Land Use	1778
Location-allocation	98
Network Analysis	107
Point-pattern Analysis	27
Regional Science	350
Remote Sensing	1009
Segregation	237
Sense of Place	77
Social Capital	143
Spatial Autocorrelation	130
Spatial Cognition	55
Spatial Decision Support System	71
Spatial Diffusion	4856
Spatial Statistics	8807
Spatial Regression	24
Thematic Mapping	60

During this period, routine maintenance was performed on the database. Dead, or outdated URLs were removed from the search index. Efforts to expand the contents of the database continue. Several thousand new pages were added to the index. Stylistic enhancements were made the search interface to make it match the look and feel of the overall site. In addition, a 'help kiosk' was developed to aid visitors in using the CSISS search tools.

### **CSISS Site Search**

The CSISS Site Search provides a mechanism for users to search across the collections maintained on the center's Web site. Stylistic enhancements to match the feel and look of the CSISS Web site were also added to the local site search. Also, routine maintenance and updating were performed on the database. Major work was conducted on segregating the contents of the CSISS Site Search database.

The original Site Search database contained all of the contents of the CSISS and NCGIA databases. It was felt that this would be potentially confusing to the site's visitors. Separate databases were created for CSISS and the NCGIA. In addition, individual databases were created for sections of the CSISS Web site. The goal of creating these is to give the user the option of either searching across the entire site or limiting their search to a specific section (such as Workshops, Learning Resources, Spatial Tools, etc). Ultimately, these databases will be included in the Integrated Search Directory (described below).

### **CSSAST Meta Search Tool**

The goal of this project was to produce a spatially enabled Meta search engine for DDI compliant archives. On the Web, Meta search engines (such as Meta Crawler) traditionally query several other search engines (such as Excite, Google, AltaVista etc.) and display their results in aggregate. The Meta search engine launches a series of user agents (or robots) that query the individual search engines and return their results in real time. Meta search engines typically unify the results of these by displaying the top ten results from each of the respective engines that they query and offer the user the opportunity to fetch more results from each engine.

Taxis, a scripting language produced by Thunderstone Inc. and used by CSISS, has the capacity to query remote databases and retrieve their results in real time. Taxis accomplishes this by sending out multiple user agents that pass a search query to a remote database and then returning the results in an aggregate format. In theory it is possible for Taxis to query any remote database server that is web accessible and return the results.

An alpha prototype of a DDI Meta search tool was constructed using the Taxis Meta search architecture (known as Timport). This script was tested against the search and retrieval systems of nine DDI compliant archives. It became apparent that many of the remote retrieval systems lacked the capacity necessary to interact with the Taxis system. Essentially, Taxis could query and retrieve results from those systems, but the time delay was significant. A two to three minute delay in returning search results was deemed unreasonable and this approach was abandoned.

A second prototype was constructed that bypassed the remote search and retrieval systems and directly read the databases. Instead of sending a query to the remote system, user agents were scripted to read the data files and return the results in real time. While all of the DDI archives use essentially the same document type definition, they are stored in different formats. The ICPSR archive, for example stores its documents in XML flat files, while the UK Data Archive uses Active Server Pages to present its files. Due to the variability in document storage and other factors unique user agents were designed to retrieve information from individual archives. A parser was then developed to interpret and rank the data returned by the user agents. Finally a reader and user interface was added to present the results.

While the second prototype offered a significant improvement in response time, this methodology also proved to be inadequate. Measures taken to protect the integrity of the remote host system were costly in terms of time. Also the speed of the procedure was entirely dependent on the capacity and connection of the remote system. This methodology also presented in maintaining consistency between the archives in the results returned to the user. Results produced by the user agents reading files from one archive in one file format looked very different from the results from another archive even though both shared the same DDI document type definition.

In order to optimize the performance of the Meta search tool a third prototype was constructed based on a different information retrieval methodology. Rather than query

remote search systems or directly reading data sets, this system is based on a locally stored and compiled index. This solution offers both significant enhancements in speed and in the consistency of results between the DDI archives.

User agents were customized to retrieve and index compressed versions of the data sets from each of the individual archives. The compression of the data sets involves the user agents translating them into an optimized machine-readable format. Parsers were designed to filter and rank the contents of the optimized index. Finally, a reader and user interface was created to serve the results to the user.

In brief, this is the sequence of events that occur when the Meta search application is launched. A text query is passed from the GIS user interface to the search engine. A user agent compares the modification dates and file sizes on the remote system with those on the local index. If there is a discrepancy between the remote database and the local index, the user agent assumes that a modification or addition has been made to the data archive and re-indexes the portions that have been changed since it last visited. Next, the parser searches the index for occurrences of the country name and uses data from the index to build a matrix of similarity. Pages are then ranked according to the placement and density of the place name. Documents that have the country name listed in the title and have greater frequencies of use are ranked higher than those where the country name is used less prominently or frequently.

### **Literature Search**

A literature search engine was built on the Taxis platform using a XML enabled structured query language format. The goal of this portion of the CSISS literature project was to develop an intelligent information retrieval and management system for a database containing over 7,000 bibliographical references that feature applications of Spatial Analysis techniques in the Social Sciences. The Spatial Analysis literature database has been developed for two goals: 1) to provide online users a selected database of citations in spatial analysis in the social sciences, searchable by keywords and social science discipline. 2) Quantitative assessment and reports on the impact of various spatial analytic methods and perspectives in the various social science disciplines. The database can yield summaries by a number of categories, by discipline, and by year. It has been updated to March 2002. Currently, Jorge Sifuentes and David Fearon are coding about 1500 new literature entries and are preparing for the statistical assessment of spatial analytic literature. The Taxis platform was chosen for this project both for its high quality user interface and speed and also for of its powerful features. The internal structure of the program supports text search operators that have an English language vocabulary of 250,000 word and phrase concept associations for natural language queries. It also provides excellent proximity control, fuzzy searches, true regular expression matching, and written numerical value searches.

To port the literature database to the Taxis environment significant modifications had to be made to the database and to the programming environment. The original literature database was produced and stored in a Filemaker Pro database for the Macintosh. The first step in preparing the data for the web application was to transform it into a suitable

format. This database was exported into a standardized html format for the purposes of creating a machine-readable index.

Abstracts and citation data were converted into a standardized html format. The titles of the articles were stored in the html title tag. Other elements (e.g. author, publisher, date, keywords, source etc.) were stored in specialized Meta tags. A search engine and user interface was developed to make special use of the data stored in the Meta tags. The search engine ranks documents based on a keyword density matrix. The occurrences of query words are counted in all sections of the html document. Additional weight is given to the article in the ranking of the results if the query term is found in either the html title or the html Meta tags. Ranking is also based on a description drawn from the article's abstract, which for reasons of copyright are not visible to the user.

After the user submits a query, the search engine returns the results in ranked order with best matches first. The occurrences of the search query are highlighted in the results. The user is presented with the titles, dates, authors and publishers of the articles in the initial screen of results. The user is also given the options of 'Get Citation', 'View Record' and 'Find Similar' in the search results. The 'Get Citation' option allows the user to view the citation record in a format that can be copied and pasted into Endnote or other bibliographic citation archiving programs. The View Record option allows the user to see the full accounting of the record in table format. This view presents not only the basic citation information but also the source database, academic discipline and keywords of the record. The Find Similar option builds a list of similar documents based upon a coefficient of relatedness frequency and distribution of terms and phrases found in the article compared to those found in the entire database. These are ranked from most to least similar.

### **Spatial Tools Clearinghouse**

A search engine was developed for software tools related to spatially integrated approaches in the social sciences. The search indexes a list of URLs and software archives compiled by Luc Anselin. To create the search database, a user-agent indexed remote URLs from individual pages to a depth of one. The search results therefore contain not only the review of the product found in the archive, but also links directly to the software. It also contains white papers, technical reports, and case studies on software in the database. Currently, the Spatial Tools Clearinghouse references over 700 individual software titles.

### **Integrated Search Directory**

Construction of an Integrated Search Directory designed to unify all of the information retrieval tools is currently under-construction at CSISS. 'Information overload' is currently a hot topic in the field of Knowledge Management. The CSISS Web site contains a large collection of search resources available to its users. Currently, the user must decide which database contains the most appropriate content for the subject that they are researching. The idea behind the Integrated Search Directory is to aid the user in finding the correct search database. This powerful interface uses Artificial Intelligence to guide the user to the most appropriate database. For example, if the user is searching for 'Human Ecology' in the Spatial Tools Clearinghouse database, the interface will alert

them that similar resources are found in the Spatial Web Resources database. In addition, the interface allows the user to select from multiple databases in one location or to meta search across all CSISS databases simultaneously.

**Website Look and Feel**

Web authoring software, *Macromedia Dreamweaver*, was used to create a template to give the site consistency and to allow for global edits, and rapid updates. An objective for 2001 was to introduce a variety of templates and to implement drop-down menus.

**Evaluation**

*Web Trends Log Analyzer* was installed in the previous year to analyze website traffic and site usage. We are currently analyzing trends in web traffic.



## **CSISS WORK PLAN – SUMMER 2002**

This work plan is intended to continue on-going efforts to implement and refine the core programs of CSISS. The UCSB CSISS Summer 2002 team for research and program development is not finalized, appointees may be added, and the tasks noted below are tentative. The work period will be 15 June to 15 September 2002

### **Samantha Ying (geography / NSF REU)**

GIS 'cookbook' project for CSISS Learning Resources  
Lab assistance in CSISS Workshop on Spatial Pattern Analysis in a GIS Environment  
Updates and refinements to the Spatial Tools Clearinghouse database  
NSF REU UCSB Seminar series

### **Ethan Sundilson (geography / NSF REU)**

GIS 'cookbook' project for CSISS Learning Resources  
Lab assistance in CSISS Workshop on Spatial Pattern Analysis in a GIS Environment  
Updates and refinements to the Spatial Tools Clearinghouse database  
NSF REU UCSB Seminar series

### **Carlin Wong (geography / NSF REU)**

GIS 'cookbook' project for CSISS Learning Resources  
Lab assistance in CSISS Workshop on Spatial Pattern Analysis in a GIS Environment  
Updates and refinements to the Spatial Tools Clearinghouse database  
NSF REU UCSB Seminar series

### **Jorge Sifuentes (geography)**

Literature database search and update  
Analysis of trends in Spatial Analysis in the social sciences / index measures  
Benchmarking of CSISS and spatial analysis in the social sciences  
Lead author for an article on spatial analysis in the social sciences  
Development team for graphic visualization of CSISS search engine output

### **David Fearon (sociology)**

Learning Resources Metadata project  
CSISS Classics development  
Course Syllabi identification  
Consultant on the Literature search and analysis project

### **Eric White (anthropology)**

CSISS search engine refinements for multi-data base searches and related directories  
FAQ narrative / help kiosk  
Integration of search engine with gazetteer-based spatial search capabilities (with web master and with liaison in the Alexandria Digital Library / ADEPT project  
Work on a graphic visualization interface for search engine output

### **John Corbett (geography)**

Project Director for the GIS Cookbook involving NSF REUs

## CSISS Annual Report 2002

Glossary of Spatial Analysis  
*CSISS Classics* page development  
Course Syllabi identification

Information on the CSISS 2002 summer research at the University of Illinois, Urbana-Champaign is contained in this report under section IV, Software Tools (Personnel / Work Plan).

## RESEARCH-RELATED ACTIVITIES CSISS EXECUTIVE COMMITTEE

Members of the CSISS Executive Committee have prepared narrative statements and listings of publications and presentations covering their scholarly activities over the period 1 July 2001–30 April 2002. In many cases, these reflect activities outside the direct context of CSISS. However, given the important role of outreach to the fulfillment of CSISS infrastructure objectives, these activities are useful indicators of CSISS contact with the various research communities within the social sciences.

### **Michael F. Goodchild, Principal Investigator**

As before, my efforts in the past year have been directed at organizing CSISS programs, overseeing the organization, managing our relationships with the Advisory Board, and promoting CSISS among new audiences. In the area of *national workshops*, I participated as an instructor in our workshop on spatial analysis using GIS in August, leading four sessions, and will repeat that role this coming August. I attended the workshop on accessibility in Columbus in July, reviewed all aspects of the workshop, and made a short presentation on CSISS objectives and programs. I also participated in several shorter CSISS workshops for specialized audiences. These included a three-day workshop organized by CSISS in collaboration with the Wharton School at the University of Pennsylvania in August; a half-day workshop at the American Sociological Association meeting in Anaheim in August; and a special session on CSISS at the Social Science History Association in Chicago in November. I also participated in a special session on CSISS at the Association of American Geographers meeting in Los Angeles in March.

In the area of *best practices*, I worked with Don Janelle to review and edit the incoming manuscripts. The chapters are now out for revision, with delivery to Oxford University Press planned for late May. In the area of *learning resources*, I continued to provide liaison as a member of the Steering Committee of the Digital Library for Earth System Education, and as a co-PI of the Alexandria Digital Earth Prototype with links to the National SMETE Digital Library.

In the area of *place-based search*, CSISS has developed productive links with the Data Documentation Initiative, a worldwide effort to establish metadata standards for social science data. Led by several major archives, including ICPSR at the University of Michigan, DDI is now widely adopted. CSISS has developed a prototype search engine capable of searching over distributed DDI-compliant archives, and based on location as the primary search key. To date the prototype is able to search over four archives: ICPSR, the archive at the University of Essex, a Swedish archive, and an Australian archive that are the only fully compliant archives. We are working with the Geography working group of DDI to refine those elements of the standard that deal with geographic location, and have proposed to host the next meeting of the working group in Santa Barbara, probably in June.

In the area of *specialist meetings*, I organized a workshop in December on location-based services, sponsored jointly by CSISS and the University Consortium for

Geographic Information Science. Roughly 30 participants, including invitees and researchers who responded to an open call, attended the meeting, which was held at the Upham Hotel in Santa Barbara. The meeting was organized in response to the growing impact of information technologies that have the ability to know where they are, and to respond accordingly. This includes GPS-enabled laptops and cell phones. The meeting had two major objectives: to develop an agenda for social science research focused on LBS; and to explore the role of LBS as social science research infrastructure. The report of the meeting is expected to be available in June.

### **Conference and Other Presentations**

- "Augmenting Geographic Reality: Origins and Evolution of Geographic Information Systems". Los Alamos National Laboratory, April 2002.
- "Geospatial Data: The Bottom Line". Keynote, GeoTec Event, Toronto, April 2002.
- "Why Space? Six General Principles". Association of American Geographers, Annual Meeting, Los Angeles, March 2002.
- "Augmenting Geographic Reality". Gregory Lecture, University of Southampton, March 2002.
- "Placing Liberal Arts Learning in a Geographic Context: Examples from the Earth and Social Sciences". Carleton College, February 2002.
- "Augmenting Geographic Reality". Environmental Systems Research Institute, Redlands, February 2002.
- "Augmenting Geographic Reality". Department of Geography, Syracuse University, November 2001.
- "What Is Spatially Integrated Social Science, and What Might It Contribute to Social Science History?" Social Science History Association, Chicago, November 2001.
- "Towards Spatially Integrated Social Science". George Mason University, November 2001.
- "Geospatial Computation in Social Science: Basic Research, Applications, and Instructional Challenges". Department of Computer Science, University of Nebraska, November 2001.
- "GIS: Time for a Change". Keynote Address, Urban and Regional Information Systems Association, Long Beach, October 2001.
- "The Digital City: Inventory and Prospect". Keynote Address, International Conference on Urban Geoinformatics, Wuhan, October 2001.
- "Current Research Issues in GIS". UN Development Program Conference on Application of GIS Technologies to Local Level Planning, New Delhi, October 2001.
- "Application of GIS Technologies to Local Level Planning". Inaugural Address, UN Development Program Conference, New Delhi, October 2001
- "A Geographer Looks at Spatial Information Theory". Keynote Address, International Conference on Spatial Information Theory (COSIT), Morro Bay, September 2001.
- "The Future of Education in GIScience". 21<sup>st</sup> ESRI International User Conference, San Diego, July 2001.
- "Geography Network and Gazetteers: Place Name Access to Spatial Locations". 21<sup>st</sup> ESRI International User Conference, San Diego, July 2001.

"Geodatabase: The ArcGIS Transportation Data Model (UNETRANS)". 21<sup>st</sup> ESRI International User Conference, San Diego, July 2001.

## **Publications**

### **I. Articles in Refereed Journals**

- A.M. Shortridge and M.F. Goodchild (2002) Geometric probability and GIS: some applications for the statistics of intersections. *International Journal of Geographical Information Science* 16(3): 227–243.
- M.J. Ungerer and M.F. Goodchild (2002) Integrating spatial data analysis and GIS: a new implementation using the Component Object Model (COM). *International Journal of Geographical Information Science* 16(1): 41-54.
- M.F. Goodchild (2001) Metrics of scale in remote sensing and GIS. *International Journal of Applied Earth Observation and Geoinformation* 3(2): 114–120.
- D.Z. Sui and M.F. Goodchild (2001) Guest Editorial: GIS as media? *International Journal of Geographical Information Science* 15(5): 387–389.

### **II. Books**

- J.X. Zhang and M.F. Goodchild (2002) *Uncertainty in Geographical Information*. New York: Taylor and Francis.

### **III. Articles in Books**

- M.F. Goodchild and K.C. Clarke (2002) Data quality in massive data sets. In J. Abello, P.M. Pardalos, and M.G.C. Resende, editors, *Handbook of Massive Data Sets*. Dordrecht: Kluwer, pp. 643–660.
- M.F. Goodchild (2001) Geographic information system. In A. Goudie, editor, *Encyclopedia of Global Change*. New York: Oxford University Press.
- M.F. Goodchild (2002) Spatial analysis and modeling. In J.D. Bossler, J.R. Jensen, R.B. McMaster, and C. Rizos, editors, *Manual of Geospatial Science and Technology*. London: Taylor and Francis, pp. 482–499.
- M.F. Goodchild (2001) Models of scale and scales of modelling. In N.J. Tate and P.M. Atkinson, editors, *Modelling Scale in Geographical Information Science*. Chichester, UK: Wiley, pp. 3–10.
- M.F. Goodchild (2001) A geographer looks at spatial information theory. In D.R. Montello, editor, *Spatial Information Theory: Foundations for Geographic Information Science: Proceedings of the International Conference COSIT 2001, Morro Bay, CA, September*. Lecture Notes in Computer Science 2205. Berlin: Springer, pp. 1–13.
- M.F. Goodchild (2001) Foreword. In R. Krzanowski and J. Raper, *Spatial Evolutionary Modeling*. New York: Oxford University Press, pp. vii–ix.

### **IV. Articles in refereed Conference Proceedings**

### **V. Other Publications**

- M.F. Goodchild (2002) MapFusion for GIS interoperability. *Geospatial Solutions* 12(4): 48–51.
- M.F. Goodchild (2001) The digital city: inventory and prospect. In *Urban Geoinformatics: 2001 International Conference Proceedings, School of Urban*

*Studies, Wuhan University*. Wuhan: Publishing House of Surveying and Mapping, pp. 248–257.

### **Donald G. Janelle, Program Director**

I continue to work closely with Michael Goodchild to oversee CSISS programs. Since the last report to NSF, outreach activities have included formal presentations and sessions on spatially integrated social science for the following groups: American Sociological Association (Anaheim, August 2001), Association of Pacific Coast Geographers, September 2001), Social Science History Association (Chicago, Nov 2001), Association of American Geographers (Los Angeles, March 2002), and GISRUK – GIS Research United Kingdom (Sheffield, April 2002). Currently, we are planning a half-day workshop for the American Anthropological Association (New Orleans, Nov 2002), and arranging for CSISS participation with the Social Science History Association meeting in St Louis, in November.

In the past year, my efforts have concentrated on offerings for the summer 2001 and 2002 national workshops – arranging for course coordinators and getting the infrastructure in place, especially for the three workshops hosted at UCSB. I also assisted with implementation of CSISS Specialist Meetings (Location Based Services, December 2001; Spatial Tools Software Development, May 2002). The editing of manuscripts for *Spatially Integrated Social Science* is now nearly completed, and we hope to deliver the book manuscript to Oxford University Press in the next month.

Other principal duties have involved supervising the CSISS research and development teams (graduate students) in the production and dissemination of resources for the CSISS website, working closely with the CSISS Webmaster to make resources easily accessible to site users. In March of this year we interviewed several candidates for the Webmaster's position, and appointed Gamaiel Zavala. This followed Ann Ricchiazzi's departure to assume the role of Webmaster for UCSB.

I am responsible for structuring the agenda for meetings of the Scientific Advisory Board (met last in October 2001) and monthly meetings of the CSISS Executive Committee. In the summer of 2001, significant effort was required in producing the first annual CSISS Strategic Plan (available at [www.csiss.org/aboutus/reports/strategic-plan.pdf](http://www.csiss.org/aboutus/reports/strategic-plan.pdf)). It will be updated on an annual basis.

In December 2001 I took on the role as North American leader for a focus group on ICT, Innovation and the Transport System for STELLA (Sustainable Transport in Europe and Links and Liaisons with America). Along with my European counterpart (Andrew Gillespie / University of Newcastle), we organized the first focus group workshop on ICT, Innovation and the Transport System, hosted by the National Science Foundation in Arlington, Virginia in January 2002. The STELLA network is sponsored by the European Commission and will function through 2004.

Current research interests focus on space-time analyses of individual behavior, the time-geography of cities, the temporal-spatial ordering of social systems, and the role of space-adjusting technologies in structuring new patterns of social and economic

organization. The interdisciplinary context of this work provides a base for representing the interests of CSISS to a broad community of social and behavioural scientists.

I continue my responsibilities as co-chair of the Centennial Planning Committee for the Association of American Geographers. The Centennial Meeting takes place in March 2004 in Philadelphia. I am also involved as co-editor of one of the centennial commemorative publications.

### **Presentations**

Resources for Spatial Thinking and Analysis, American Anthropological Association, New Orleans, 20-24 November 2002.

Issues in Space-Time Accessibility, CSISS Workshop on Accessibility in Space and Time, The Ohio State University, Columbus, Ohio, 22 July 2002.

The Center for Spatially Integrated Social Science – an Overview of Objectives and Programmes, GIS Research UK 2002, Sheffield, United Kingdom, 4 April 2002.

Collaborations in Spatial Social Science, Department of Geography, The University of Sheffield, Sheffield, UK, 2 April 2002.

Web-based Infrastructure for Spatially Integrated Social Science, Association of American Geographers, Los Angeles CA, 22 March 2002.

Comments on B.J.L. Berry's 'The Geography of the United States in the Year 2000', Association of American Geographers, Los Angeles CA, 21 March 2002.

Space-Time Adjustments to Transportation, Communication, and Information Technologies – Social Consequences and Policy Issues, ICE Research Seminar, The Institute for Civic Enterprise, University of Southern California, Los Angeles CA, 4 March 2002.

with A Gillespie, Research Issues on IC, Innovation and Transportation, STELLA Genesis Meeting, Amsterdam, 8-9 February 2002.

with A Gillespie, Social Science Perspectives on Transportation, Information, and Communication Technologies, STELLA Transatlantic Thematic Network Focus Group Workshop on ICT, Innovation and the Transport System, National Science Foundation, Arlington VA, 15-17 January 2002.

Building National Infrastructure for Enhancing Spatial Analysis in the Social Sciences, Social Science History Association, Chicago IL 15-17 November 2001.

Human-Regional Systems and the Transformational Consequences of a Digital World, Conference on Digital Communities 2001, Chicago IL, 4-7 November 2001.

Time-Space Convergence and Changing Accessibility Patterns for Cities and Regions, Department of Geography Colloquium, University of California, Santa Barbara, Santa Barbara, 25 October 2002.

Building Infrastructure for Spatial Social Science, Association of Pacific Geographers, Santa Barbara CA, 15 September 2002.

Center for Spatially Integrated Social Science – Programs, American Sociological Association, Anaheim CA, 20 August 2002.

### **Refereed Journal Articles and Book Chapters (in press)**

A Gillespie and DG Janelle "ICT, Innovation and Transport" *Annals of Regional Science*, in press 2003.

DG Janelle, From 'The Geography of the United States in the Year 2000' to the

- Geography of the United States in 2030' *Progress in Human Geography*, in press 2003.
- DG Janelle, Impact of Information Technologies, in S Hanson and G Giuliano, eds, *The Geography of Urban Transportation, 3<sup>rd</sup> Edition* (NY: Guilford Press, in press 2003).
- DG Janelle, Transportation, in B Feintuch and D Watters, eds, *Encyclopedia of New England Culture* (New Haven: Yale University Press, in press, 2002).
- DG Janelle, Time-space, in Geography, in NJ Smelser and P Baltes, eds, *International Encyclopedia of the Social and Behavioral Sciences* (Amsterdam: Pergamon - Elsevier Science, in press, 2001) 2 pages.
- DG Janelle and M Beuthe Globalization and Transportation: Contradictions and Challenges, in W. Black and P. Nijkamp, eds., *Social Change and Sustainable Transport*, (Bloomington IN: Indiana University Press, in press 2002).
- DG Janelle Transport Culture and the Economy of Speed: Speed Limits and Changing Patterns of Accessibility in the United States, in W. Black and P. Nijkamp, eds., *Social Change and Sustainable Transport*, (Bloomington IN: Indiana University Press, in press 2002).

### **Richard Appelbaum, co-PI**

My research examines global commodity chains, focusing in particular on the locational determinants of labor-intensive low-wage production, and its impacts on industrial upgrading as well as economic inequality. One key aspect of this work is the spatial distribution of production sites, the formation of industrial districts. I am especially concerned with the global regulation and enforcement of labor standards, particularly with regard to apparel production. Another aspect concerns the ways in which national economies “move up” the commodity chain into higher value-added activities, and the extent to which such movement can translate into economic development. The article “Governance and Flexibility: The East Asian Garment Industry” examines this questions with reference to the role of apparel production in economic development in the region.

In this regard I continue to serve on the Advisory Council of the Worker Rights Consortium, a national organization comprised of 96 universities, labor unions, student groups, and NGOs concerned with implementing university codes of conduct that regulate trademark licensing. I also served as a member of the University of California’s System-wide Committee on Trademark Licensing, in the Office of the President. I proposed adopting a code of conduct to govern all apparel purchases by the country of Santa Barbara (a project that involved students from a Global Studies class honors section), which the Board of Supervisors unanimously adopted. I have twice testified before the City of Santa Barbara concerning adopting a living wage ordinance to cover all city contract and temp workers, and serve as a research advisor to the Santa Barbara Living Wage Coalition. During the past year I have given numerous presentations on the issue of low-wage production, and the monitoring systems that have been established to enforce codes of conduct.

My co-authored book *Behind the Label: Inequality in the Los Angeles Apparel Industry* (with Edna Bonacich, University of California Press, 2000) was selected by the *Los Angeles Times* as one of the best non-fiction books of 2000, was a currently a finalist



for the annual C. Wright Mills Award of the Society for the Study of Social Problems in 2001, and won the ASA Marxist Section book award in that year. The book was the subject of a Presidential Session of the Pacific Sociological Association and the American Sociological Association in 2001.

My work is situated within the world-systems framework, which seeks to understand cycles of economic growth and decline within the global economic system. (I am current president of the American Sociological Association's Political Economy of the World-System section.) Much of my work examines low-wage labor in the global apparel industry, examining labor standards and their enforcement. *Behind the Label* analyzed the significant increase in apparel industry factory work in Los Angeles, and the importance of low-wage labor in a vibrant industrial district in that growth. The downtown fashion district is a vital industrial center, with thousands of small contracting factories, buying offices that provide services for the country's principal retailers, fashion schools, fabric providers, and numerous other providers of apparel-related goods and services, enabling the industry to provide extremely quick turnaround of small batch production, giving it a vital edge over other regions (and other countries) in the production of fashionable items. The spatial contiguity of numerous actors in the fashion industry acquires special symbolic significance in Los Angeles, where image is all-important: Los Angeles is a center of fashion design thanks in large part to the entertainment industry (movies, television, and music) and the image of the California lifestyle it connotes. Nonetheless, the industry is beginning to move to Mexico, driven by stricter enforcement standards in Los Angeles and the ease of movement under NAFTA. Understanding such respatialization of production represents a significant challenge.

A related aspect of my work concerns the development of legal regimes to regulate increasingly global businesses. *Rules and Networks: The Legal Culture of Global Business Transactions*, a co-authored edited volume that grew out of a conference held at the Oñati International Institute for the Sociology of Law (published 2001 by Hart Publishers in Oxford) reflects this concern. The book reflects the premise that international business transactions are heavily influenced by culture, practice and rule. The construction and fate of business relationships within a nation-state may encounter differences in the generation of norms and the processing of disputes, but these conflicts are magnified many times over in cross-border transactions where nation-state control and support is weak or absent. The book seeks different explanations of the ways in which business people and their legal advisers try to minimize the effect of these magnified difficulties. Since most explanations are dominated by North American and European legal scholarship and practice, a second concern of the book is to open up the discussion to competing explanatory frameworks. Specifically, the book advances the idea that global legal convergence may not be the immediate, inevitable result of increased global economic interaction. Rather, less formal mechanisms for achieving normative understanding and predictability in business dealings may also flourish. These include four possible sources through which the international business community might be considered to have supplemented nation-state conflict prevention and dispute resolution institutions – an international legal order, the development of a private normative order based on common business practices (denominated the *lex mercatoria*),

through the efforts and work product of internationalized law firms, and by means of extensive, thick personal relationships often referred to by their Chinese term *guanxi*).

### **Presentations**

- “Globalization and the Individual” (with Ming-Chang Tsai), International Sociological Association, Brisbane, Australia (July 13, 2002)
- Institute for Research on World Systems (IROWS) conference, discussant for panel on “Labor, Hegemony, and Globalization,” UC Riverside (May 4, 2002)
- “Testimony on the Proposed Santa Barbara Living Wage Ordinance,” testimony before Santa Barbara City Council (March 19, 2002)
- “The Economic Impacts of September 11,” presentation to UCSB Foundation annual meeting (February 9, 2002)
- “The Problem of Sweatshops and the Role of Consumer Action,” Progressive Jewish Alliance, Los Angeles (December 6, 2001)
- “The Economic Impacts of September 11,” economic panel in “Beyond the Catastrophe” Series, Interdisciplinary Humanities Center, UCSB (November 6, 2001)
- “Spatial Analysis in the Social Sciences,” Didactic Workshop, American Sociological Association Annual Meetings, Anaheim, CA (August 20, 2001)
- “Author Meets Critic” (*Behind the Label*), American Sociological Association Annual Meetings, Anaheim, CA (August 19, 2001)
- Organizer and Presider, Political Economy of the World System (PEWS) session on Globalization and Labor, American Sociological Association Annual Meetings, Anaheim, CA (August 18, 2001)

### **Publications**

- Richard P. Appelbaum, William L.F. Felstiner and Volkmar Gessner, eds. *Rules and Networks: The Legal Culture of Global Business Transactions*. Oxford, England: Hart, 2001
- Volkmar Gessner, Richard P. Appelbaum, and William L.F. Felstiner, “Introduction: The Legal Culture of Global Business Transactions,” pp. 1-36 in Richard P. Appelbaum, William L.F. Felstiner and Volkmar Gessner (eds.), *Rules and Networks: The Legal Culture of Global Business Transactions*. Oxford, England: Hart, 2001
- Richard P. Appelbaum and David Smith, “Governance and Flexibility: The East Asian Garment Industry,” in Frederick C. Deyo, Richard F. Doner, and Eric Hirshberg (eds.), *Economic Governance and the Challenge of Flexibility in East Asia*. Lanham, MD: Rowman & Littlefield, 2001.

### **Luc Anselin, P.I. for CSISS Tools Development**

During the period of July 2001 till May 2002, my CSISS-related efforts have continued to be primarily related to the management of the software tools development unit at UIUC. This involves activities ranging from personnel management to software design, implementation and testing. Related to this, I have made a number of presentations to various audiences about the CSISS software tools program as well as on specific methodological and software design issues pertaining to the use of dynamically linked windows for exploratory spatial data analysis (two papers related to this have appeared in conference proceedings). In addition, considerable effort has gone into the initial design

of an open source, cross-platform, modular software environment for spatial econometric analysis. Jointly with Oleg Smirnov, such a design has been developed and a software prototype is nearing completion.

In the area of software design and development for spatial data analysis, I have started collaborations with the GeoVista Group at the Pennsylvania State University (Alan MacEachren and Mark Gahegan) and BioMedware Inc. of Ann Arbor, Michigan (Geoffrey Jacques). Both these collaborations have resulted in additional resources for the CSISS software tools effort. The focus of these activities is on extending the current scope of EDSA techniques to exploration of space-time and multivariate spatial associations, leveraging the CSISS resources to reach new audiences and adding functionality to the current tools collection.

In addition to the software tools program, I have been involved in other CSISS activities as well. Jointly with Sergio Rey (San Diego State University), I organized the CSISS Specialist Meeting on Spatial Tools (May 10-12, 2002) and edited a *Proceedings* devoted to this workshop. I continue to teach two workshops that are part of the ICPSR Summer Program on Quantitative Methods and co-sponsored by CSISS (Introduction to Spatial Data Analysis and Spatial Regression Analysis) and have contributed several materials to the Learning Materials program. In August 2001, I co-taught a workshop on "Introduction to Spatial Analysis", jointly sponsored by CSISS and the Wharton School at the University of Pennsylvania. With Steve Messner (SUNY Albany), I authored a chapter on "Spatial analyses of homicide with areal data" forthcoming in the Best Practice volume edited by Mike Goodchild and Don Janelle. Another activity falling under the Best Practice program is a volume, jointly edited with Raymond Florax (Free University Amsterdam) and Sergio Rey (San Diego State University) on *Advances in Spatial Econometrics*, which will be published by Springer-Verlag in Fall 2002.

Substantively, I continue to work with a number of collaborators at various universities on issues related to the incorporation of spatial interaction and spatial effects in social science models. This includes work on the spatial patterning of homicides with Steve Messner and Glenn Deane at SUNY Albany and Rob Baller at the University of Iowa (funded by the National Consortium on Violence Research), some of which has appeared in *Criminology* and is forthcoming in an article in *Homicide Studies*. I also continued the analysis of the role of spatial effects in ecological inference with Wendy Cho at UIUC (two forthcoming articles in *Political Analysis*), and the study of the sensitivity of impact measures of air quality to the type of space-time methodology that is employed (funded by NSF/EPA) jointly with James Murdoch (UT Dallas) and Mark Thayer (San Diego State University).

I continue to co-edit the *International Regional Science Review* and am editing two special issues for this journal, one on "Spatial Analyses of Tropical Deforestation", and one "Spatial Externalities". The latter is an outgrowth of the CSISS Specialist Meeting on this topic held in January 2001.

**Presentations (July 1, 2001-May 1, 2002)**

- Annual Meeting of the American Agricultural Economics Association, Chicago, IL, Aug 4, 2001: “*Introduction to Spatial Econometrics*” (Pre-Conference Workshop on Spatial Analysis)
- ICPSR Summer Program in Quantitative Methods, Ann Arbor, MI, Aug. 6-10, 2001: Workshop on “*Spatial Regression Analysis*”
- The Wharton School, University of Pennsylvania, Philadelphia, PA, Aug 29–31, 2001: Short Course on “*Introduction to Spatial Analysis.*”
- Colloquium Series, Department of Agricultural Economics, Purdue University, West Lafayette, IN, Oct. 11, 2001: “*Topics in Spatial Econometrics.*”
- Specialist Meeting on Location Based Services, Center for Spatially Integrated Social Science, Santa Barbara, CA, Dec. 14-15, 2001: “*Spatial Data Analysis Tools in a Wireless Internet Environment.*”
- Space-Time Information Systems Conference, BioMedware, Ann Arbor, MI, Jan. 11-12, 2002: “*DynESDA and Exploratory Space-Time Analysis.*”
- USDA ERS Panel on Food Stamp Fraud, Washington, DC, Feb. 6, 2002: “*Spatial Analysis, Approaches and Considerations.*”
- 98<sup>th</sup> Annual Meeting of the Association of American Geographers, Los Angeles, CA, March 19-23, 2002: “*New Tools for Spatial Analysis in Social Science*”
- 2002 Joseph Havlicek Jr. Memorial Lecture in Spatial Econometrics, Dept. of Agricultural, Environmental and Development Economics, The Ohio State University, Columbus, OH, April 25, 2002: “*Spatial Externalities, Spatial Multipliers and Spatial Econometrics*”
- Workshop on GIS Research and Applications at the Department of Housing and Urban Development (HUD), National Research Council, Washington, DC, April 27, 2002: “*Beyond Crime Mapping, Spatial Analytical Approaches*”

**Publications**

- L. Anselin, R. Florax and S. Rey (eds.), *Advances in Spatial Econometrics*. Berlin: Springer-Verlag, (forthcoming).
- L. Anselin and S. Rey (eds.), *New Tools for Spatial Data Analysis: Proceedings of a Workshop*. Santa Barbara: CSISS (CD-ROM).
- L. Anselin, “Spatial Externalities, Spatial Multipliers and Spatial Econometrics,” *International Regional Science Review* (forthcoming).
- L. Anselin and W. Tam Cho, “Spatial Effects and Ecological Inference,” *Political Analysis* (forthcoming).
- L. Anselin and W. Tam Cho, “Conceptualizing Space,” *Political Analysis* (forthcoming).
- R. Baller, S. Messner, L. Anselin and G. Deane, “The Interchangeability of Homicide Data Sources: A Spatial Analytical Perspective,” *Homicide Studies* (forthcoming).
- C-W Kim, T. Phipps, L. Anselin, “Measuring the Benefits of Air Quality Improvement: A Spatial Hedonic Approach,” *Journal of Environmental Economics and Management* (forthcoming).
- Z. Acs, L. Anselin, A. Varga, “Patents and Innovation Counts as Measures of Regional Production of New Knowledge,” *Research Policy* (in press).
- S. Messner and L. Anselin, “Spatial Analyses of Homicide with Areal Data,” in M. Goodchild and D. Janelle (Eds.), *Spatially Integrated Social Science*, New York, Oxford University Press (forthcoming).
- L. Anselin, “Spatial Effects in Econometric Practice in Environmental and Resource Economics,” *American Journal of Agricultural Economics* 83 (3), 2001: 705-710.

- L. Anselin, "Rao's Score Test in Spatial Econometrics," *Journal of Statistical Planning and Inference* 97 (1), 2001: 113-139.
- R. Baller, L. Anselin, S. Messner, G. Deane, D. Hawkins, "Structural Covariates of U.S. County Homicide Rates, Incorporating Spatial Effects," *Criminology* 39 (3), 2001: 201-232.
- L. Anselin, I. Syabri and O. Smirnov, "Visualizing Multivariate Spatial Correlation with Dynamically Linked Windows," in L. Anselin and S. Rey (Eds.), *New Tools for Spatial Data Analysis, Proceedings of a Workshop*. Santa Barbara, CSISS (CD-ROM), 2002.
- L. Anselin, I. Syabri, O. Smirnov, Y. Ren, "Visualizing Spatial Autocorrelation with Dynamically Linked Windows." In *Computing Science and Statistics 33*, Proceedings of Interface 01, Orange County, CA, June 13-16, 2001 (CD-ROM).

### **Helen Couclelis**

My research efforts have again been divided between my two major ongoing interests: the integration of urban and environmental modeling, and the geography of the information society. My interests within the first theme involve primarily issues of predictability in connection with integrated models, and the development of a common conceptual format for social science and environmental-science sub-models, for the purpose of logically consistent integration. Both these issues relate to the use of integrated models in planning support systems and policy analysis. Regarding the second theme, the geography of the information society, I continued the exploration of my 'fragmentation of activity' hypothesis as it may apply to particular domains of social and economic life such as e-commerce. I am interested in how the possibility offered by ICTs to fragment and spread the activity of shopping across time and space may affect the retail structure of cities and regions. Similar questions may be raised regarding several other socio-economic activities (work, education, etc.) In both these research areas I have focused my efforts since the last report on preparing for publication a number of original papers I had presented at conferences and other venues the year before. Several of these manuscripts are due to appear within the next few months, as noted below.

In Winter quarter of 2002 I offered a new graduate seminar on agent-based simulation in spatial modeling. This well-attended and well-received seminar built on materials from the NAS Arthur M. Sackler Colloquium on "Adaptive agents, intelligence, and emergent human organization" and the follow-up workshop on "Agent-Based Models of Land Use and Land Cover Change" co-sponsored by CSISS (Beckman Center, Irvine, CA, October 4-8 2001). More information on these meetings is to be found elsewhere in this report.

#### **Presentations**

- "Why I no longer work with agents". Workshop on Agent-Based Models of Land Use and Land Cover Change, Beckman Center, Irvine, CA, October 4-8 2001.
- "Information technologies, the fragmentation of activity, and urban change: the case of e-commerce". Conference on Digital Communities: Cities in the Information Age. Allerton Plaza Hotel, Chicago, IL. November 4-6, 2001.

- “Integrated models of urban and environmental processes: some theoretical and methodological challenges”. Colloquium presentation, Geography Dept., University of Southern California, Los Angeles, CA, November 30, 2001.
- “The social construction of the digital city”. Association of American Geographers Annual Meeting, Los Angeles, CA, March 19-22, 2002.
- “CSISS specialist meetings and the diffusion of spatial thinking in the social sciences”. CSISS panel presentation, Association of American Geographers Annual Meeting, Los Angeles, CA, March 19-22, 2002.

### **Refereed Publications**

- Couclelis, H. (2001) Modeling frameworks, paradigms, and approaches. In K.C. Clarke, B.O. Parks and M.P. Crane (Eds.) *Geographic Information Systems and Environmental Modeling*. New Jersey: Prentice Hall, pp.36-50
- Couclelis, H. (forthcoming). The third domain: the spread and use of GIS within social science. *Cartographica*, special issue on “Reconstructing GIS: Technical Solutions to Social Problems”.
- Couclelis, H. (forthcoming). Pizza over the Internet: e-commerce, the fragmentation of activity, and the tyranny of the region”. *Entrepreneurship and Regional Development*.
- Couclelis, H. (forthcoming ). The social construction of the digital city. *Environment and Planning B: Planning and Design*, special issue on the Digital City.

### **Other Publications**

- Couclelis, H. (2000) Trasporti e telecomunicazioni: verso un' accessibilita sostenibile. *Sistema Terra*. IX (1-3), December, pp. 120-130. (Translation of Couclelis, 2000. From sustainable transportation to sustainable accessibility: can we avoid a new tragedy of the commons? In *Information, Place, and Cyberspace: Issues in Accessibility*. Eds. Donald Janelle, and David Hodge, 342-56. Berlin: Springer-Verlag.)
- Couclelis, H. (forthcoming) Living with uncertainty: GIS and the limits of geographic knowledge. Invited keynote paper, *Accuracy 2002, Proceedings of the 5<sup>th</sup> International Symposium on Spatial Accuracy Assessment in Natural Resources and Environmental Sciences*, Melbourne, Australia, July 2002.

### **Barbara Herr-Harthorn**

Barbara Herr Harthorn is Assistant Research Anthropologist and Associate Director of in the Institute for Social, Behavioral, and Economic Research at UC Santa Barbara as well as Co-Director of ISBER's Center for Global Studies and Director of Social Science Research Development for the UC Santa Barbara campus. Her current research projects center on examination of the social production of health inequality, looking particularly at immigrant health in California, present and past, and issues of Anglo and Latino community health at the interface of urban and rural agricultural sectors. Current projects look at issues of maternal health, reproduction, and living and working conditions among Santa Barbara County farm workers. A particular focus is on farm worker perceptions of risks related to exposure to agricultural chemicals, with grants from the UCSB Center for

Chicano Studies, and the UC MEXUS program. A second project, also funded by the UC MEXUS program, is an historical analysis of biomedical discourse about immigrants and infectious disease (particularly tuberculosis) in the first 3 decades of this century in California. The study explores the participation of biomedicine in the racialization of Latino immigrants. A third study, collaborative with Professors Susan Stonich (Anthropology and Environmental Studies), Michael Goodchild (Geography) and Oliver Chadwick (Geography) and funded by the UCSB Research across Disciplines (RAD) program, looks at the possible roles of PPGIS in mediating community conflict over pesticide drift in the northern Santa Barbara Co. community of Lompoc.

### **Presentations**

- 2002 "Powerful GIS Tools to Advance Spatial and Temporal Analysis in Anthropological Research" Herr-Harthorn, B., organizer, E. Moran, chair, session at American Anthropological Association meetings, New Orleans, Nov. 20-24.
- 2002 "Workshop on Spatial Analysis in Anthropology," Herr-Harthorn, B., organizer (for Center for Spatially Integrated Social Science, at UC Santa Barbara), AAA-sponsored workshop, American Anthropological Association meetings, New Orleans, Nov. 20-24.
- 2002 "Ethnography and Oral History," "Women's Studies: Disciplinarity and Interdisciplinarity: Conversations for Change" workshop, May 17.
- 2002 "Choosing Unsafe Work: California Farmworkers' Living and Working Conditions and Perceptions of Health Risk," Society for Applied Anthropology (SfAA), March 6-10, 2002, Atlanta.

### **Publications:**

- B. Herr Harthorn and L. Oaks, editors. *Risk, Culture, and Health Inequality: Shifting Perceptions of Danger and Blame*. New York: Greenwood. Forthcoming
- "Safe exposure? Perceptions of risks from agricultural chemicals among California farmworkers," B. Herr Harthorn, chapter in *Risk, Culture, and Health Inequality: Shifting Perceptions of Danger and Blame*, B. Herr Harthorn and L. Oaks, eds. New York: Greenwood. Forthcoming
- L. Oaks and B. Herr Harthorn "The Social and Cultural Production of Risk", chapter in *Risk, Culture, and Health Inequality: Shifting Perceptions of Danger and Blame*, B. Herr Harthorn and L. Oaks, editors. New York: Greenwood. Forthcoming
- S. Guendelman, C. Malin, B. Herr-Harthorn, P. Vargas 2001 "Orientations to motherhood among pregnant Mexican and Mexican-origin Women: A bi-national study", *Social Science and Medicine* 52:1805-1813.

### **Peter J. Kuhn**

As a U.S. labor economist, my interests and work are unusual in their heavy emphasis on international, interregional and other spatial comparisons. In the area of cross-national work, during the 2001/2 academic year I completed work on an edited volume entitled *Losing Work, Moving On: International Perspectives on Worker Displacement*.<sup>4</sup> This will appear in print in the summer of 2002. The goal of this twenty-two-author volume is to

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<sup>4</sup> In addition to securing the funding, co-ordinating the research and acting as editor, I was sole author of one of six chapters and co-author on a second.

compare the frequency and consequences of worker displacement, and to estimate the impact of widely varying labor market institutions on these phenomena, across ten different developed economies. In all cases the research is based on large national data sets, which offer the only way to obtain truly representative, quantitative measures of these effects.

Also in the cross-national vein, during the same period I co-directed (with Gustavo Marquez) a study of the economic effects of labor unions in Latin America, funded by the Inter-American Development Bank. Aside from descriptive research on the history of labor unions in various countries, very little is currently known about labor unions in this region, especially concerning their effects on wages, working conditions, firm productivity, profitability, investment, and a range of other outcomes. Like the displaced-worker study, a distinguishing feature of the research is the use of large national data sets (in this case of firms as well as workers) to develop truly representative, quantitative measures of effects. The volume consists of seven country studies, written by authors from throughout the region, a statistical overview chapter written by a Canadian specialist in union affiliation trends, plus a summary of results written by Marquez and myself. Two papers from this volume were presented at the Latin American Meetings of the Econometric Society in Buenos Aires in July 2001, where I acted as discussant for both.

My third cross-national project combines a regional with an international perspective, and is co-authored with Chris Riddell at the University of Toronto. "The Long-Term Effects of Unemployment Insurance: A Study of New Brunswick and Maine, 1940-1991" is a work in progress that studies the effects of Unemployment Insurance on a particular type of economy: a largely seasonal, extractive economy. While the geographic proximity of these two regions makes their industrial bases very similar, the fact that they belong to different countries makes their public policies (especially unemployment insurance) very different. This disjuncture between the relatively continuous effects of space on the underlying economy and the very discrete changes in legislation across national boundaries provides a very useful environment from which to learn how government policies affect workers. This paper has been accepted for presentation at the Canadian Economic Association meetings in Calgary, in May 2002.

Finally, during the past year I continued to serve as co-editor of Labour Economics: An International Journal. This relatively new journal is the only labor economics journal with an explicit international focus, and is gaining rapidly in stature vis-à-vis the more traditional outlets in labor economics.

On the regional level I was involved in three projects during the past year. One consists of collaborative work with a UCSB graduate student, Christiana Stoddard, tentatively titled "Teacher Unions, Education Reform, and Teachers' Work Hours: A Two-Decade Analysis". This project studies the effects of inter-state variation in teacher union strength, as well as in the legislation affecting teachers, on the number of hours worked by teachers. Using 20 years of microdata on reported usual weekly hours of work, we find that teachers' unions had a strong negative effect on weekly hours worked in the early part of this period, but not in the later part. This suggests either a weakening



of teacher union power or a change in the general thrust of union policy over this period-- a question that certainly warrants further investigation. We also document a dramatic narrowing of the gender and race gaps in teacher hours -- facts that were completely unknown until we produced these statistics--, and examine the effects of state education reform programs on teacher hours. Perhaps surprisingly, to date we have not been able to detect such an effect. Another fascinating feature of this study is the large and persistent difference in usual weekly work hours across U.S. states that we document. As it is not obviously connected to other measurable aspects of state economies, we speculate that this may be due to differences in the typical spatial configurations of work and residence across states; a subject we hope to explore in future work.

Also on the regional level I have been engaged in research on the interstate diffusion of a new set of job search methods --those based on the internet--, and the effects of this diffusion on both individual job search outcomes and states' economies. (The latter aspect of the research is still in the planning stages; I have submitted a proposal to NSF's ITR program to fund it.) Also in the planning stages is an extensive and innovative field experiment on job search methods used by graduating seniors to be conducted in collaboration with Counseling and Career Services here at UCSB. Most of my research on Internet job search is joint with Mikal Skuterud of McMaster University.

Finally, in the past year I completed a study of the labor market outcomes of North American Indians (co-authored with Arthur Sweetman). A key aspect of this research is disentangling the effects of pure physical remoteness on these outcomes from other factors such as school quality, discrimination, and assimilation. Interestingly, while we find that physical remoteness "matters", it matters less than cultural remoteness in the area of labor market success. This research is scheduled for publication in the February issue of the *Journal of Population Economics*.

My remaining research during the past year consists of four projects:

1. Collaborative work with Gary Charness, a junior faculty member in our department, on "Pay Compression, Pay Secrecy and Productivity: an Experimental Investigation.
2. Collaborative work with Catherine Weinberger, a visiting researcher at UCSB, on our \$498,000. NSF grant: "Entry, Earnings Growth, and Retention in IT careers: An Economic Study".
3. Collaborative work with a graduate student, Fernando Lozano, on "Explaining the Increase in Long Work Hours Among American Men, 1979-1999"
4. Collaborative research with Olivier Deschenes, a junior faculty member in our department, on "Testing for Sample Selection in the Absence of Exclusion Restrictions".

#### **Conference and Other Presentations (July 2001-April 2002)**

"Does Internet Job Search Reduce Unemployed Workers' Jobless Durations?" Western Economic Association meetings, San Francisco (July 2001).

Discussant of "Unions and the Economic Performance of Brazilian Establishments" and "The Economic Effects of Unions in Latin America: Their Impact on Wages and the

- Economic Performance of Firms in Uruguay”, Latin American meetings of the Econometric Society, Buenos Aires (July 2001).
- “So Why Don’t You Just Talk to People?” Human Resources Development Canada Methodology conference, Ottawa Canada (November 2001).
- “Leadership Skills and Wages”, University of British Columbia, April 2002.
- “The Living Wage Controversy: Understanding the Research and its Implications for Santa Barbara”. UCSB Symposium, presented at the Karpeles Manuscript Library Museum, downtown Santa Barbara. April 2002.
- “Leadership Skills and Wages”, Quantitative Methods in Social Sciences workshop, UCSB, April 2002.

**Publications (appeared in print July 2001-April 2002)**

- "Self-Employment Dynamics and Self-Employment Trends: A Study of Canadian Men and Women, 1983-1998" *Canadian Journal of Economics* 34(3) (August 2001): 760-784 (with Herbert Schuetze).
- “The Brain Drain: A View from Below”. *Choices* 7(6) (November 2001): 30-36 (ISSN 0711-0677). Reprinted as “The Brain Drain: A View from Stateside” *Policy Options* 22(9) (November 2001) 69-73. Also translated into French and reprinted in *La Presse*, Montreal.
- "Aboriginals as Unwilling Immigrants: Contact, Assimilation and Labour Market Outcomes”, *Journal of Population Economics*, February 2002. (with Arthur Sweetman).

**Stuart Sweeney**

The activities I engaged in over the past year were broadly related to the goals of CSISS. I continued work on an NSF research grant focusing on business clustering while also intensifying efforts on other research related to demographic forecasting. The business clustering research resulted in three articles that are forthcoming in peer-review journals. The forecasting work resulted in one article in a peer review journal with another still under review. I also received a new research grant from the Southern California Association of Governments to produce long-term population forecasts for the region’s 190 cities and subdivisions. As part of that grant I have also been serving as an expert panelists review various aspects of the overall long-term forecasting project.

I have also engaged in local outreach and service by helping the local newspaper with demographic analysis and mapping of the 2000 census data. Some of this analysis was related to ethnic compositions of neighborhoods and schools. That work also led to a intramural research grant to develop improved school enrollment forecasting models and investigate racial/ethnic equity issues in local educational resources.

Work has also continued on the teaching materials for an introductory spatial social sciences course. The new material will eventually supersede the current material on the CSISS website.

My ongoing term as the vice-chair of the Spatial Analysis and Modeling group of the Association of American Geographers has provided a nice platform to promote the activities and programs of CSISS.

**Presentations**

- “Population forecasting with non-stationary multiregional growth matrices,” *Pacific Conference of the Regional Science Association International*. 2001
- “Business location and spatial externalities: Tying concepts to measures,” *Pacific Conference of the Regional Science Association International*. 2001
- “Population forecasting with non-stationary multiregional growth matrices,” *Western Regional Science Association*. 2001
- “Data sources: Availability and limitations.” (Panel moderator and speaker) *The Next Generation of Community Statistical Systems* 2002
- “The geography of the national ES-202 file: prospects for small area policy analysis.” *The Next Generation of Community Statistical Systems* 2002
- “CSISS Workshops, Diffusing spatial concepts and methods” Association of American Geographers, 2002
- “On spatialization and migration models” Association of American Geographers, 2002

**Publications**

**Peer Review Articles**

- Sweeney, S. and K. Konty (forthcoming) “Population forecasting with non-stationary multiregional growth matrices” *Geographical Analysis*.
- Edward Feser and Stuart Sweeney (forthcoming) “The geography of U.S. economic distress: Implications for development priorities.” *International Regional Science Review*
- Edward Feser, Kyonjun Koo, Henry Renski, and Stuart Sweeney. (forthcoming) “Incorporating spatial analysis in applied industry cluster studies.” *Economic Development Quarterly*
- Edward Feser, Stuart Sweeney, and Henry Renski (forthcoming) “A descriptive analysis of discrete U.S. industrial complexes.” *Journal of Regional Science*

**Appendix A**

**REPORT ON THE THIRD CSISS ADVISORY BOARD MEETING  
(2-3 OCTOBER 2001)**

Santa Barbara CA. **Board Members:** R. Berk, J Dangermond, A. Glasmeier, P. Morrison, R. Sampson, B.L. Turner, (S. Wachter had to leave just prior to this session). **CSISS Executive:** L. Anselin, R. Appelbaum, H. Couclelis, M. Goodchild, B. H-Harthorn, and D. Janelle, S. Sweeney. **CSISS Research and Technical Staff:** D. Fearon, A. Ricchiazzi, M. Rice, E. White, and J. Sifuentes. Others in attendance during parts of the two-day meeting: J. Frew, L. Hill, L. Lucius, S. Rey, M. Ungerer, and F. Cordova.

Present from the **Board:** Brian Berry (Chair), Richard Berk, Bennett Bertenthal, Myron Guttmann, John Logan, Nancy LaVigne, Emilio Moran, Peter Morrison, Billy Lee Turner II. Present via telephone conference connection – Susan Wachter for morning sessions on 2 October and all sessions on 3 October, and Amy Glasmeier for sessions on 3 October.

**CSISS Personnel:** Michael Goodchild (PI), Luc Anselin (tools development PI), Richard Appelbaum (co-PI), Don Janelle (Program Director), Helen Couclelis, Barbara Herr-Harthorn, Peter Kuhn, and Stuart Sweeney. Ann Ricchiazzi (CSISS Webmaster), LaNell Lucius (CSISS Administrator), and Sum Huynh (CSISS Systems Administrator). For selected parts of the meeting, the following CSISS research assistants participated: Nina Brown, John Corbett, David Fearon, Nick Nagle, Matt Rice, Jorge Sifuentes, and Eric White.

**Invited Visitors** included Arthur Getis (UCGIS President Elect), and from the National Science Foundation Program Directors -- Richard Aspinall and Cheryl Eavey

**2 October 22, 2001**

Following Introductions, the Board met in executive session, and then received an **overview of year 2** of CSISS by D Janelle

**Workshops** - M Goodchild and D Janelle summarized experience with different workshop formats for 2001 – full-week, 2- and 3-day, and 4-hour (at an association annual meeting).

**Discussion:**

- J Logan – described how his students, who have attended CSISS workshops, give presentations to the rest of the graduate student group at Albany. They brought back software/ set up displays on web sites – enhancing the dissemination effort.
- N LaVigne– Since it would be difficult to clone M Goodchild and L Anselin, should CSISS concentrate on training people to conduct workshops, possibly a workshop to train trainers?
- B Bertenthal – has thought been given to focusing workshops on given disciplines – tailored to their needs? M Goodchild – we have not encouraged discipline identification. The intent is to influence disciplines through young scholars.
- C Eavey– saw association meetings as useful settings for workshops and dissemination of spatial social science.

- E Moran stressed that it might be useful to identify clusters of existing experts (centers and Universities) in the disciplines to be agents of diffusion
- M Guttmann noted how the NIGCD supported demography centers seek to find things that cannot be done effectively at other levels.

### **Spatial Tools Development and Spatial Tools Clearinghouse**

**Clearinghouse** – L Anselin described the first phase of the Spatial Tools Clearinghouse as an Inventory of Links – portal sites, individual software developers, and commercial vendors. The task is to establish the links, make them searchable via key words, and to consider a means of soliciting user feedback about tools. A prototype is currently being developed at UCSB. This project could be extended to include software demonstrations and benchmarking. He expressed a preference for depth as opposed to breadth of software entries in the clearinghouse.

**Tools Development** – Oleg Smirnov is now on staff at Illinois as a full-time programmer to assist L Anselin in adding spatial econometric methods to existing software. Anselin described work on an Open Source Project of spatial data analysis modules, and on Dynamic ESDA (with Sergio Rey). Plans for year 3 include the development of the clearinghouse, testing and releasing the ESDA, and prototype completion of the Open Source Project. This will be highlighted by a CSISS Specialist meeting on tools and open source standards – about 40 participants / May 2002 / Santa Barbara.

### **Place – Based Search (Mike Goodchild)**

- Using Location as the primary search key, CSISS seeks to leverage the Alexandria Digital Library for finding and retrieving data resources and literature. Interfaces for doing this allow for specifying geographic location as admin units, use of place-name gazetteer, point to a map, and geographical coordinates. CSISS is working with the Digital Library Community and with ECAI (Electronic Cultural Atlas Initiative) – a grass-roots worldwide effort in the humanities to use location within GIS. CSISS is also seeking to link the DDI standard developed by ICPSR for text-based archives with a CSISS prototype engine - currently working with 3 archives with demos at the country level. Need to improve the DDI metadata standard to access spatially referenced work

### **Gazetteers and Geo-referencing (Linda Hill)**

Building digital gazetteers since 1994, developing a translation tool between place names and geographical footprints. Currently, there are 4.4 million places and 5 million names. ADL sources include harvested web pages, GIS datasets, oral histories, articles, search engines. Metadata make digital libraries work – used to mine the various sources. Geoparsing Services are used to turn out geospatial indexing. Query expansion services (footprints for place names) make use of controlled vocabularies. Cataloging services / footprint creation tools also facilitate multi-lingual names for places and historic place name changes. Developments are also focused on a named time-period gazetteer and a gazetteer of geospatially-placed events (e.g., hurricanes). See [www.alexandria.ucsb.edu/gazetteer](http://www.alexandria.ucsb.edu/gazetteer)

### **Visit to UCSB Descartes Lab**

In the afternoon, the meeting moved to the UCSB campus for demonstrations and discussions of web resources related to different CSISS programs. The Board was welcomed by Keith Clarke (Chair of the Department of Geography). Ann Ricchiazzi chaired the session, featuring a demonstration of the Dynamic ESDA (L Anselin) and demonstrations by CSISS summer research assistants. Significant discussion followed each presentation.

### **ISBER Reception**

The Institute for Social, Behavioral, and Economic Research (R Appelbaum, Director) hosted a reception for the Board in South Hall. Chancellor Henry Yang and Vice Chancellor France Cardova participated and welcomed the Board to the UCSB campus.

## **3 October 2001**

### **Best Practices Program**

Don reviewed the publication plan of *Spatially Integrated Social Science* (Oxford University Press)– the authors, the author selection process and the time frame. The publisher prefers to drop “Best Practices in ...” from the title.

#### **Discussion:**

- P Morrison – supports the idea of "evolving practice" instead of best practice, seeing the book as a hardcopy portal to generate discussion.
- B Turner – suggested structuring chapters around critical social themes, seeing this as more enticing than one around method.
- M Goodchild sees scale (as proposed) as a neutral concept that allows embedding other ideas. Much will depend on the actual submissions, the introduction, and the sub-section organization.
- E Moran sees the book as an opportunity to move toward improved practices, suggesting engagement of the community in dialog via the CSISS website.

### **UCGIS / CSISS**

Arthur Getis reviewed the UCGIS objectives/missions – consortium of 65 universities, citing current cooperation with CSISS on the Location based services meeting as a possible basis for further specialist meetings and workshops. He noted the UCGIS effort to build a model GIScience curriculum (headed by Duane Marble) as an area of potential interest to CSISS. He suggested possibilities for cooperative meetings of joint advisory boards to review collaborative activities.

#### **Discussion:**

- What does CSISS see as role of collaboration with UCGIS?
- M Goodchild – UCGIS is a mechanism for reaching a wide audience. There is overlap in learning resources. Could UCGIS be a point of maintenance/dissemination for CSISS resources?

## The Strategic Plan Review

M Goodchild introduced the Plan, based on the GOST model – goals, objectives, strategies, and tactics (1 year-activities and year-6 follow-up). This more formal planning process is consistent with NSF's move for project management reports/plans.

### Looking Beyond year 5

MG saw extension via NSF as a weak possibility, aside from a short-term performance-based continuation. It is important for CSISS to explore new dimensions – a proposal that is explicitly different.

- One possibility would be an applied focus – linking the academy with the private sector. Tools and methods are of interest and are common across sectors. The difference is that knowledge in academic sector is disseminated, but not in private sector. There is need to build more interaction with industries that use social science – e.g., insurance, real estate, etc.
- Another possibility is to focus on spatial integration in biological and geological sciences – the same arguments for CSISS exist in the sciences.
- A Coupling of social processes and biological processes (nature-human interactions) is related to the LTER (Long-term Ecological Research) initiative to link study sites with social perspectives. Agent-based modeling may have wide application in this area to address epistemological issues – (e.g., what does one learn from coupled models? Why do we want to build models (to make science clear to policy makers)? There are also ontological issues – differences in representations, scales, and software environments that cut cross processes and disciplines.

### Discussion

B Bertenthal / C Eavey (NSF) – CSISS holds a grant, with no built-in renewal from NSF. Performance-based reviews occur at the program level, but CSISS was created at the Division level.

- R. Berk –the biological and geological sciences are already doing sophisticated spatial analysis. Instead, CSISS might consider link with human/environment interface – where coupling approaches are needed. Could CSISS partner with groups now doing this?
- J Logan – should we maintain CSISS or leave CSISS behind? Are there programs that need to be maintained? What would be the institutional basis to continue CSISS projects?
- MG – coupling needs to give attention to space and time in analytic frameworks. Workshops / Learning Resources would still be needed, but might develop in somewhat different directions.
- R Berk – sees coupled systems requiring research teams and less in the way of workshops/learning resources. MG sees an opportunity to engage people in the research through workshops, etc.
- B Turner – sees need to have an applied focus in any continuation of CSISS.

### General Discussion

- To B Berry's question about what are the objective achievements for measuring progress, MG responded that all 7 programs contribute and that there is the intent to have synthesis across the programs.

- A Glasmeier expressed concern about the order of objectives, fearing that technologies may be overriding "spatial thinking". She asked: "Where is the theory that leads to knowledge? Why are there not measurable outcomes for all of the specific CSISS activities? MG noted that the order of objectives does not privilege one over another, and that "CSISS as infrastructure" is not about building theory.
- R Berk observed that there are too many simultaneous activities in CSISS to disentangle the results as measurable outcomes.
- B Bertenthal asked "how does one move beyond the technologies to see real progress in the disciplines and what would be the supporting infrastructure to bring this about?"
- A Glasmeier – There is need for a model of penetration that identifies which activities are most effective and points to measures of their differential effects over time.
- R Berk – does not see precise measures as part of the process / partitioning out effects is too difficult.
- MG observed that the CSISS approach is to use its development of a literature database as a baseline for analysis of change across disciplines, recognizing that it may not be possible to single out the influence of CSISS.
- B Turner – has CSISS thought about focusing on only a few of the social sciences? MG noted that CSISS organizational dimensions range from the most empirical (e.g., criminology/anthropology) to the most theoretical (economics), and regards it essential that CSISS span this spectrum.
- B Turner – there have been many changes in the academy and nation since the proposal – The academy has moved towards integrated science / and federal agencies have moved towards a place-based framework. Has CSISS captured any of this dynamic?
- M Guttman – what would CSISS like from the Board? He is satisfied with the Strategic Plan, even though measures might be refined in certain areas.
- MG – CSISS needs help in identifying broad-based measures (beyond the literature). CSISS is using significant resources – if it is necessary to scale back its budget, which programs/activities would the Board cut?

### **Discussion about Specific Programs**

B Berry prefers that the Board not meet in executive session (as in the agenda). He recommended that **the Board and the CSISS Executive meet together** to go systematically through the 7 programs, as presented in the Strategic Plan. After some discussion, this structure for continued review of the plan was adopted.

- A Glasmeier – what are the **budget commitments** of CSISS?
- MG - Investment in Webmaster / administrative support is spread across programs. Tools development – approximately 200K/year is at Illinois. Workshops cost about 20+K each, including 10 K for participant scholarships. Specialist meetings cost about 25-30K each. A less costly approach to infrastructure is the development of search engines – something that CSISS is expanding upon on several fronts – spatial data, spatial tools, Internet and site search, and literature search.
- The search engines –J Logan would not use literature / data searches – the results are too broad based. He sees value in knowing how to do searches from the raw resources.



- A Glasmeier recommended separating the Annual plans and discussing them separately – focused on a evaluation of outcomes.
- P Morrison suggested that the group attempt to **sort CSISS programs** by
- Thumbs up, Phase Down, Thumbs down, Too ambiguous for a judgment

## Workshops

- J Logan – workshops are evolving nicely. He would like to see more evaluation.
- P Morrison -- put more into workshops. Training the next generation is a key to dissemination success. Considerable mileage is derived from the expenditure of about 20K for a one-week intensive workshop for 20 to 25 young scholars. He advocates experiments with a variety of formats, and supports the scholarship program as a form of cost sharing with students. Even the first-year failure of a couple workshops had some positive outcomes for participants.
- B Bertenthal – should workshops be replaced with longer summer institutes to train trainers? Would a month-long workshop of 40 or 60 people e a better model? Would senior people come for a long period? This might require changing focus somewhat to sharing ideas and presenting opportunities. L Anselin – length of workshops -- he did a 4-week workshop, it was not practical. Most people and instructors cannot give up 4 weeks – the opportunity cost is too high. H Couclelis suggested that instructors could cycle through for parts of a longer workshop and stay in touch with follow-up remote contact.
- E Moran supported the notion of serving more the needs of the senior scholars who might be seeking understanding, who are leaders in their fields, and who are potentially very influential in disseminating new ideas. L Anselin observed that the CSISS-ICPSR sponsored workshop in Ann Arbor was directed to leading scholars.
- B Berry – was mapmaking a suitable investment? MG -- yes, we pulled together very good participants and linked them with exceptional instructors. P Morrison – yes, this workshop was an outstanding example of matching CSISS objectives, building on the core competencies of UCSB/CSISS. He sees the workshops as the outstanding CSISS product.
- R Appelbaum proposed greater consideration to distance learning – possibly combining face-to-face with streaming video to extend the reach of workshops. Generally, Board members felt that remote delivery over the Web is not an effective primary model for workshops, but could serve as a supplement.
- J Logan noted the Vassar College model -- providing professional training and access to resources, plus a course reduction, for instructors to implement GIS in their teaching. Several universities are investing in retooling and CSISS might tap into this as potential market.
- P Morrison sees this idea of training university faculties as a basis for CSISS self sufficiency after year 5 – delivering a product on self-supporting basis – creating a profit center, possibly involving the GIS private sector in offering training programs oriented to academic needs.
- B Berry -- could the student scholarships for workshops be based on need? J Logan hopes CSISS will continue scholarships and non-fee workshops. Fees for ICPSR workshops represent a big commitment (\$900 / 1900 tuition), plus expenses.

## **Specialist Meetings**

- J Logan argued that the success of edited books and specialist meeting is hard to measure, but these mechanisms bring communities together and have real value for dissemination.
- In contrast, R Berk sees specialist meetings as expensive relative to the payoff – he would lower their priority among CSISS programs. If offered, they should generate their own funding?
- J Logan thought some topics could be seen as good investments, while others should be self-funding? There is need for clear links to other program outcomes.
- B Turner sees expert meetings as key to success in build communities of interest. They can help to push the CSISS agenda, especially if they focus ‘on galvanizing the work within the community.’ However, he was not certain that such meetings would have much to contribute in the way of workshops and related to tools development. MG noted that the meeting held in Ann Arbor was very successful in this regard.
- E Moran observed that expert meetings were significant to progress in the remote sensing community.
- R. Berk thinks it is hard to get things moving through single specialist meetings. He advises that it is useful to partner with other organizations, to keep the focus sufficiently narrow, and to build it on the basis of a carefully thought through statement of problems and objectives.
- S Wachter – sees expert meetings as "high risk / high reward" – possibly the best way to get the word out and to encourage changes towards the goal of interdisciplinary spatial social science.
- P Morrison believes that the concept of Specialist meeting can be refined and raises possibility of commercialization of these meetings. For example, get people at the Location Based Services meeting to provide follow-up funding.
- B Turner – do not drop Specialist Meetings, but reduce the level of support to participants.

## **Spatial Tools**

- L Anselin: Spatial analytical tools program has spent only at the 40% level of its budget, but this will change with the hiring of a full-time programmer. As a result, the program will progress more rapidly. Although there is uncertainty associated with building software, CSISS is not starting from scratch – more than 10 years experience.
- Logan views the software development as extremely valuable. The clearinghouse on software is potentially useful. L Anselin does not see a clearinghouse of only links as sufficient. He noted that it is not ease to guide users to the right tools and techniques.
- R Berk observed that he has shifted his center from human to electronic consultancy – routinized / automated. A sophisticated FAQ is essential.
- J Logan asked if a list server would work. L Anselin sees list serves as uncertain.
- Luc sees by the end of year 5 an open source collection of tools that will permit expected progress in spatial social science.
- P Morrison and M Guttmann stressed that the quality standards for inclusion of items in the open source facility and in the clearinghouse should be made explicit and adhered to.

## **Learning Resources**

### **General quality and content focus:**

- M Guttman – LRs is a mixed bag and lacks a linear path. Either set standards or scale back the content. He sees the search engine as most innovative.
- B Berry – what do we want on every student's reading list?
- S Wachter – have panels of teachers give feedback on resources
- A Glasmeier – CSISS needs a model of learning expectations. Maybe the most likely market for CSISS is the instructor, not student self-learning.

### **Discipline versus inter-discipline approaches:**

- N LaVigne sees potential value in establishing a catalog of spatial analysis syllabi for separate disciplines, including references, exercises, data sets.
- J Logan agrees to the discipline focus. There is nothing of value for urban sociology.
- It will be hard for CSISS to create this without assistance for the disciplines. A clear strategy is needed to find material for people to use by discipline. Building from geography materials is not a satisfactory solution. What parts of geography are common to other disciplines?
- E Moran – sees need for focusing on materials from outside geography. Can disciplines tell us what is missing for building a course? Will researchers / instructors share their modules?
- B Herr-Harthorn – CSISS needs for the Board to provide guidance on which disciplines to cover if we developed discipline-specific resources.
- D Janelle CSISS is trying to assemble modules through collaboration (e.g., the Statistical Analysis and Modeling group of Assoc Amer Geog). How can we establish similar collaborations in other disciplines?
- P Morrison – phase down LR program. Concentrate on those things that allow researchers and teachers to deal with problems. Solicit these directly from academic societies.
- MG – CSISS would like for LR to be the bookshelf that people draw upon for course development. There is a lack of textbooks in the area, and CSISS can help address the shortage. The current resources and those to be added need good tools to access the collection by different organizing principles – by level of sophistication, a browse tree, and metadata, A Boolean search engine will provide the means for users to custom organize the materials to fit their needs, by discipline or otherwise. However, he does not see discipline as the primary dimension. What dimensions span the disciplines?
- B Berry does not relate to discussion of learning resources. Learning resources seem thin. The goal should be to diffuse learning tools to others, stressing analytic approaches that transcend discipline boundaries. CSISS should not pander to discipline differences. It should emphasize the core generic ideas.

### **Clearinghouse Search Engine Approach**

- B Bertenthal – The CSISS search engine approach may be the key to automated updating of resources (e.g., URLs) via automated process to maintain these resources.
- S Wachter – consider a survey of disciplines to find out what things would be used. Concentrate on mining what is out there, providing links to this stuff. That approach, used elsewhere by CSISS, has not yet been built into the Learning Resources.
- P Morrison – sees less value in building new materials and more benefit from establishing a clearinghouse to existing resources on the web. Maybe the workshop

exit surveys could include questions about resources and exercises that are available on the web.

- E Moran - Introduce harvesting techniques – contact leading spatial scholars to see if they will include materials on CSISS. B Bertenthal – would this approach yield the critical information? It may be necessary to develop connective materials that give sufficient continuity to presenting concepts and methods.

### **CSISS Classics**

- B Berry – *CSISS Classics* – Is this a good investment? Should graduate students be doing this? E Moran did not find classics compelling; graduate students should use their time differently. M Guttmann also ambivalent on their value.
- B Bertenthal endorses the idea of *Classics* to help raise understanding and broad consciousness. He encourages more effort on these. For example, the NSF "nuggets" by researchers has been significant in influencing understanding of researchers and the general public. The National Academy of Science series “beyond discovery” are beautifully done and informative – but very expensive to produce. Scientists need to spend more time in public communication. *Classics* could help to broaden awareness of spatial approaches.
- B Turner – *CSISS classics* is no match for Susan Hanson's 10 great geographic ideas. What are the 30 great ideas (in spatial thinking and analysis) to come out of the social sciences? He thinks that they must address real-world problem solving -- e.g., John Snow and I. Wallerstein (world-systems analysis) start with real-world problems.
- E Moran – would prefer fewer well-done *Classics* to a large number poorly done.
- J Logan -- This is one of the few areas of Learning Resources that might (with development) be of value to sociologists. Do the *Classics* belong with learning resources? Could they be given a more prominent location on the website?
- B Berry believes that the research that they describe should be superb examples of spatial analysis.

### **Summary:**

- Harvest rather than invent – move to a clearinghouse model
- Allow for discipline identity but keep this within an integrative framework
- Continue but improve on Classics
- B Turner – LR should not be as high a priority for CSISS.

### **Place-based Search:**

- E Moran – What is the CSISS investment relative to ADL? MG - Currently all funding is by ADL.
- B Berry – sees PBS as low CSISS priority. It is important in the long run but should not absorb CSISS funding / ADL pays Scott Crosier’s research assistantship, and covers Linda Hill.
- B Turner – likes the place-based search for data, and web links. Thinks that this could open up uses of spatial approaches to many scholars. MG – access methods are poorly developed and CSISS/ADL can make substantive contributions, allowing for a clearer location based approach to analysis of social processes.
- J Logan – be cautious about showing the data clearinghouse until there is sufficient there to yield success for users. D Janelle– we need to emphasize on the site the prototype nature of the project, but its availability to users even in prototype form is essential to persuading archives to buy into the DDI extensions for spatial search.

### **Virtual community**

- MG – building the community is the problem. Providing the service is not sufficient.
- N LaVigne – navigation needs careful attention, as does the uneven quality of posted material.
- What is the quality standard for inclusion on the site? Peer assessment may be important (e.g., *CSISS Classics*). There is need for a feedback mechanism from users.
- MG - It is difficult to structure all aspects of overview of the web material. LRs needs content, but we can begin building the search/retrieval structures and processes, exploiting the talents of Ann and Eric.

### **Best Examples**

Book on *Spatially Integrated Social Science*. D Janelle noted that CSISS invested to find exceptional authors; they were offered a modest financial incentive to participate. CSISS will engage in the editorial work and will follow through with authors to generate other additional resources (e.g., learning modules, classics).

- J Logan – the book will be fine, but why do we want an **international conference** – what is so special here?
- B Turner – NSF sees great value in such conferences as an indicator of scholarly interest. If you hold one and they come, does this mean it's good?
- M G – although the conference would be dependent on submitted papers, CSISS would have control over keynote speakers, special programs, etc., and this would allow CSISS to have a potential impact on the field.
- Consensus of Board: CSISS should sponsor such a meeting, but it should be self-financed and moneymaking.

### **The Bottom Line from the Board**

- **Specialist Meetings** are a luxury
- **Tools and Workshops** – essential
- **Learning Resources** – under development, need structure, refinement, and more attention to clearinghouse role, but should continue
- **Best Practices** – ok if done well
- **Place-based search** – innovative and worth developing
- **Virtual community** – absolutely essential

## Appendix B

### Extracts from the CSISS Fastlane report to the National Science Foundation

[Project Reporting] ANNUAL REPORT FOR AWARD # 9978058

Michael F Goodchild; U of Cal Santa Barbara  
Center for Spatially Integrated Social Science  
Submitted 7 May 2002

#### **Participant Individuals:**

Co-Principal Investigator(s): Richard P Appelbaum  
Senior personnel(s): Donald G Janelle; Luc Anselin; Helen Couclelis; Barbara Herr-Harthorn; Terence R Smith; Stuart Sweeney; Karen K Kemp  
Graduate student(s): Jorge Sifuentes  
Other -- specify(s): LaNell Lucius  
Technician, programmer(s): Abby Caschetta; Sum Huynh  
Other -- specify(s): Christian Brown  
Graduate student(s): Eric White; David Fearon  
Senior personnel(s): Linda Hill  
Graduate student(s): Matt Ungerer  
Undergraduate student(s): Scott Crozier  
Technician, programmer(s): Ann Ricchiazzi  
Senior personnel(s): Sergio Rey  
Technician, programmer(s): Yongwook Kim  
Graduate student(s): Ibnu Syabri; Yanqui Ren; Widodo Baroka; Andre Mbassa; Nina Brown; John Corbett; Nicholas Nagle; Kevin Konty  
Technician, programmer(s): Zavala Gamaiel  
Other -- specify(s): Oleg Smirnov  
Graduate student(s): Sortis Karkalagos

#### **Partner Organizations:**

University of Illinois at Urbana-Champaign: In-kind Support;

#### **Facilities; Collaborative Research**

UIUC is host to the CSISS program to develop tools for spatial analysis. Luc Anselin is the PI on this CSISS subcontract. The software tools program at UIUC occupies two rooms as part of UIUC's Regional Economics Applications Laboratory.

**University of California-Santa Barbara:** Financial Support; In-kind Support; Facilities; Collaborative Research; Personnel Exchanges Three organizations at UCSB are involved directly in the initiatives of CSISS:

1. **Institute for Social, Behavioral, and Economic Research.** ISBER is home to the co-PI Richard Applebaum and to Barbara Herr-Harthorn (Senior Personnel), and, as such, is a primary contributor to the Intellectual framework and outreach of CSISS. ISBER also oversees the administration of personnel and finances for CSISS, and provides facilities and technical support for CSISS programs.
2. **National Center for Geographic Information and Analysis.** NCGIA provides the space requirements for housing CSISS personnel and offers collaborative expertise in the social science applications of Geographic Information Science. NCGIA is affiliated with UCSB's Department of Geography, which provides laboratory space and classrooms for CSISS workshops.

## CSISS Annual Report 2002

3. **Map and Imagery Library.** MIL is home to the Alexandria Digital Library and its NSF-supported initiative on the Alexandria Digital Earth Prototype (ADEPT). Through Terence Smith (PI for ADEPT) and Linda Hill, MIL is contributing to the social science orientation of Place-based Search tools to be made available through [www.CSISS.org](http://www.CSISS.org).

### **Other collaborators:**

CSISS has an extensive set of valued collaborators:

(1) **The Interuniversity Consortium for Political and Social Research (ICPSR);** CSISS has hosted ICPSR workshops in 2001 and 2002, sponsored scholarships of participants in ICPSR workshops in 2000 and 2001, and co-sponsored an Advanced Workshop on Spatial Analysis in Social Research (May 2001). Currently, CSISS and ICPSR are cooperating on introducing spatial components to the ICPSR International DDI metadata standard.

(2) The University of Washington's **Center for Statistics and the Social Sciences (CSSS)**, in summer 2000, in co-sponsoring a CSISS workshop on Perspectives on Spatial Analysis in the Social Sciences;

(3) UCLA's **Center for Computational Social Science and Social Informatics (CCSSSI)**, in summer 2000, in co-sponsoring a CSISS workshop on Agent-based Spatial Modeling;

(4) The **Environmental Systems Research Institute (ESRI)** is reviewing with CSISS opportunities to add spatial analytic capabilities to GIS; ESRI has provided free access to the ESRI Virtual Campus for participants in CSISS sponsored workshops;

(5) **The Ohio State University**, in 2001 and 2002, in co-sponsoring CSISS workshops on Accessibility in Space and Time;

(6) **University Consortium on Geographic Information Science (UCGIS)**, co-sponsoring a specialist meeting on Location-Based Services in December 2001;

(7) **Association of American Geographers**, in making available learning resources for dissemination through [www.csiss.org](http://www.csiss.org)

(8) **Centre for Advanced Spatial Analysis (CASA)**, University of London -- cross referencing resources on on agent-based modeling.

(9) **The Wharton School** (University of Pennsylvania) sponsored a CSISS workshop on Introduction to Spatial Data Analysis in the Social Sciences, in August 2001.

(10) **Digital Library for Earth System Education (DLESE)** In the area of learning resources, Mike Goodchild has developed several modules, participated in the development of the overall design, and acted as initial liaison to the DLESE.

(11) **CIPEC (Center for the Study of Institutions, Population, and Environmental Change.** Indiana University) -- arranged with CSISS a jointly sponsored workshop on applications of agent-based modeling in landuse and landcover change in Oct 2001.

(12) **Graduate School of Geography and George Perkins Marsh Institute** (Clark University)-- worked with CSISS and CIPEC to sponsor the workshop on applications of agent-based modeling in landuse and land cover change.

(13) **Department of Geography (The Pennsylvania State University)** -- Exploratory Spatial Data Analysis software development with Luc Anselin.

(14) **BioMedware Inc.** (Ann Arbor MI) -- Exploratory Spatial Data Analysis software development with Luc Anselin.

## CSISS Annual Report 2002

(15) NHGIS (**The National Historic GIS** project), based at the University of Minnesota -- exploring with CSISS joint initiatives regarding metadata standards for spatial data archives, and the development of learning resources on longitudinal studies using GIS and census data.

Details on each of these collaborations follow:

**The Interuniversity Consortium for Political and Social Research (ICPSR)** offers two summer courses on spatial analysis, both organized and taught by Luc Anselin. These include Introduction to Spatial Data Analysis (May 2000) at the University of Illinois at Urbana-Champaign / (July 2001) at UCSB; and Spatial Regression Analysis (August 2000/2001) at the University of Michigan. In addition, ICPSR and CSISS organized a 3-day joint Advanced Workshop on Spatial Analysis in Social Research in Ann Arbor in May 2001. This was directed by Luc Anselin (CSISS) and Hank Heitowit (ICPSR) and involved Michael Goodchild.

CSISS provided scholarships to PhD Candidates from the social sciences who participated in ICPSR work workshops (\$500 each) in 2000 and 2001 to help defray expenses. Since participants come from a broad range of disciplines, it is a useful way of contributing to the infrastructure goal of spreading the expertise of spatial analysis to the social sciences.

Under the organizational leadership of Dr. Michael Ward (Political Science), the **University of Washington's Center for Statistics and the Social Sciences (CSSS)** hosted a CSISS workshop in June 2000 on Perspectives on Spatial Analysis in the Social Sciences. The principal instructors included Julian Besag (Statistics) and Martina Morris (Statistics and Sociology). CSSS supplemented financial support from CSISS with funding for participant lodging and meals, and for workshop administration.

Under the coordination of Nicholas Gessler, **UCLA's Center for Computational Social Science and Social Informatics** hosted the CSISS-sponsored workshop on Multiagent Spatial Modeling (24-28 July 2000). Gessler was the principal instructor, but experts from around the country were featured speakers during the workshop. UCLA provided facilities for the workshop.

**The Environmental Systems Research Institute (ESRI)**. We collaborate on several fronts with our industrial partner, ESRI. Jack Dangermond, the President of ESRI, is a member of the CSISS Advisory Board. In November 2001, Mike Goodchild attended a small meeting at ESRI to examine and assess alternative development directions in the area of spatial analytic tools, and that discussion will continue at our Tools specialist meeting in May 2002. ESRI is working with CSISS to incorporate tools for spatial statistical analysis as part of GIS functionality, and to integrate spatial statistics within the visualization capabilities of GIS. ESRI Press recently published an excellent overview of the applications of GIS in historical research, edited by Anne Knowles. ESRI has also provided free access to its popular Virtual Campus for CSISS workshop participants. This valuable contribution helps in the dissemination of GIS tools more broadly among mostly young scholars in the social sciences.

**The Department of Geography at The Ohio State University** hosted a workshop on Accessibility in Space and Time: A GIS Approach on 16-20 July 2001 and will repeat this in summer 2002. Professor Meipo Kwan is the director. Additional instructors include Alan Murray, Morton O'Kelly, and Michael Tiefelsdorf.

**UCGIS** and CSISS organized and co-sponsored a Specialist Meeting on Location Based Services in Santa Barbara in December 2001. Mike Goodchild (CSISS) and Gerard Rushton (UCGIS) were the coordinators. In addition, the current UCGIS President (Arthur Getis) has helped to organize CSISS summer workshops (2000, 2001, and 2002), has attended a CSISS Executive Meeting, and participated in the CSISS Strategic Planning Retreat.

**The Association of American Geographers** has given CSISS the right to make selected instructional modules from the ARGUS (Advanced Readings in Geography of the United States) and ARGWorld



## CSISS Annual Report 2002

(Advance Readings in Geography of the World), available through the CSISS Learning Resources web page. These provide superb entry-level materials on analytic techniques and basic spatial models.

**The Centre for Advanced Spatial Analysis, University of London**, is a leader in the application of agent-based modeling to understanding issues of urban development. A program to make available their instructional materials is under development.

**The Wharton School** hosted a three-day CSISS Workshop in August 2001. This attracted social scientist from universities in northeastern United States and Canada. Luc Anselin and Mike Goodchild were the primary instructors, and worked closely with Susan Wachter (member of the CSISS Advisory Board) and Ayse Can Talen.

Collaboration with **DLESE** focuses on protocols and standards for managing large archives of learning resources. Many of the ideas developed by DLESE are directly transferable to the provision of access tools for Learning Resources on the CSISS website.

**CIPEC (Center for the study of Institutions, Population, and Environmental Change, Indiana University)**. CSISS has had a longstanding interest in spatially explicit agent-based modeling, in part because it illustrates many of the principles of spatial integration that are integral to CSISS, and in part because it represents an exciting area of cutting-edge research in the social sciences, with the potential for integration with the physical sciences. Accordingly, CSISS joined forces with CIPEC (funded under NSF's program of support for research on the human dimensions of global change, and the recipient of a recent NSF award for coupled natural and human agent-based modeling under the Biocomplexity initiative). We organized a special workshop on spatially explicit modeling in conjunction with a Sackler Symposium on agent-based modeling held under the auspices of the National Academy of Sciences at the Beckman Center in Irvine, CA in September 2001. The symposium was attended by approximately 150 participants, of whom some 25 attended the special 1.5-day workshop. A report is ready to be published jointly by CIPEC and CSISS. CSISS is maintaining a Web site and list-serve to foster continued interaction among the participants, and will fund the cover for the report.

**The Graduate School of Geography and George Perkins Marsh Institute (Clark University)** participated as a co-sponsor with CSISS and CIPEC in the agent-based modeling of landuse and landcover change workshop in Irvine CA in October 2001.

**The Pennsylvania State University**. Luc Anselin is collaborating with Alan MacEachren and Mark Gahegan at the Geography Department of Pennsylvania State University on the integration of tools for the visualization of spatial and space-time association within the GeoVista Studio framework. This leverages the current CSISS software tools development efforts in the area of dynamically linked windows and ESDA. The collaboration has resulted in a five-year joint project on 'Geovisualization and spatial analysis of cancer data,' funded by the National Cancer Institute. ESDA software, developed as part of this project, will become part of the CSISS open source initiative.

**BioMedware Inc.** Luc Anselin is collaborating with Geoffrey Jacquez of BioMedware Inc., a small software and research and development company focusing on spatial analysis, based in Ann Arbor, Michigan. This collaboration has resulted in additional sources of funding for the CSISS ESDA software development efforts as a subcontract of BioMedware's Space-Time Information Systems project with the National Cancer Institute.

**NHGIS (The National Historic GIS project)** is a sister to CSISS, funded under the same NSF program of support for research infrastructure in the social and behavioral sciences. We offered a pair of consecutive sessions on the two projects at the annual meetings of the Association of American Geographers in Los Angeles in February. Mike Goodchild is a member of the NHGIS advisory board, and attended the first board meeting in Minneapolis in March. We recognize several opportunities for intensive collaboration with NHGIS. First, NHGIS is a suitable archive for inclusion in our program of place-based search, and intends to adopt the DDI metadata standard. Second, NHGIS is a suitable source of data to illustrate

## CSISS Annual Report 2002

longitudinal GIS analysis, and we intend to develop a series of learning resources in conjunction with them. We will explore these and other opportunities in the coming year.

### **Activities and findings:**

#### **Findings:**

As an infrastructure program, CSISS does not yield research findings in the traditional sense.

CSISS development of software tools, web-based search engines, literature databases, and learning resources constitute infrastructure to advance spatial social science -- they do not constitute findings in the scientific sense, though we hope they are instrumental in the support of findings through the substantive research of social scientists. These programs are described in the Activities section of the report.

#### **Training and Development:**

CSISS is employing graduate research assistants to work on the development of CSISS programs. From October 1999 to April 2002 at UCSB, seven PhD candidates and four MA/MSc students have contributed original work to CSISS projects. They are engaged in building data bases, developing innovative web search engines for accessing research, tools and social science data resources, authoring web pages on spatial perspectives in the social sciences, developing programming code for managing our Website, and establishing monitoring systems for determining the status of spatial analysis in the social sciences.

Some of these projects have resulted conference presentations and publications, a pattern that we expect to see increasing over the next half of CSISS funding. Descriptions of researcher workplans are provided in the two previous annual reports to NSF. Included in this report is a listing of research and development activities associated with each member of the current research team at Santa Barbara, provided in the Activities section of this report under 'Work Plan - Summer 2002'.

Seven individuals, including five graduate students, have been employed at the University of Illinois, working on the spatial analysis software development project with Luc Anselin. Three of these individuals will take part in the Spatial Tools Development Specialist meeting in May 2002, and three of them have co-authored scientific papers with Anselin.

Over the past two summer workshop periods, an additional 12 graduate students were hired under CSISS funding (at University of Washington, UCLA, and UCSB in summer 2000; at UCSB and Ohio State University in Summer 2001) to work as teaching assistants in CSISS workshops, gaining valuable technical and teaching skills.

Finally, CSISS regards Workshop scholarship awardees as having 'worked' on the project'. It is our anticipation that they will return to their home institutions and act as agents for the diffusion of spatial methodologies through their research and teaching. The CSISS National Workshop program for summer 2000 and 2001 provided nearly 225 scholars from more than a dozen different social science disciplines and from more than 100 different universities with opportunities to acquire specific research skills that will potentially enhance both their research and teaching. The participation listings for the Year 2002 Summer Workshops will add an additional 90 to 100 scholars who will benefit from intensive training in spatial analysis and who will hopefully aid in our dissemination efforts.

#### **Outreach Activities:**

CSISS is conceived of as an outreach project, but the orientation is to social science researchers rather than to the general public. Our outreach to increasing public understanding has been limited to interviews with the local press and with university in-house publications. We envision, however, that the broad dissemination of spatial perspectives will result eventually in a stronger focus on skills for spatial thinking within the K-12 educational environment. PI Michael Goodchild has recently prepared and submitted a program funding proposal that would accomplish this objective.

The CSISS one-page advertising brochure is circulated widely, but mostly within the scientific community. The advertising of summer workshops has attracted applications and participation from social and

## CSISS Annual Report 2002

economic planners from Native American reservations, and from police departments and health agencies across the country. Although they may not represent the target group for CSISS programs, their inclusion in some of our workshops and meetings helps to strengthen the quality of the workshop or meeting experience for all participants.

Of more direct importance to broad public outreach, the Website [www.CSSIS.org](http://www.CSSIS.org) represents an open resource that is available to anyone with computer access. Many of the resources we are developing are prepared in language accessible to the educated public. Our collaboration with the Association of American Geographers in making some of their high-school oriented teaching materials (ARGUS and ARGWorld) available through [www.CSISS.org](http://www.CSISS.org) is one example, available through [www.csiss.or](http://www.csiss.or) since August 2001.

CSISS Classics' provide summaries and illustrations of major contributions to spatial thinking in the social sciences. Primary emphasis is given to research before 1980, with an attempt to capture and acknowledge the repository of spatial thinking in the social sciences for the last few centuries. The summaries, along with key references and Web linkages are intended as guides for those interested in exploring the intellectual inheritance from previous generations. They are written to be accessible to a broad audience. Currently (April 2002), there are two-dozen classics appearing at [www.csiss.org](http://www.csiss.org).

### **Journal Publications:**

#### **Other Specific Products:**

##### **CD Rom of Meeting Proceedings**

"New Tools for Spatial Data Analysis: Proceedings of the Specialist Meeting" Editors: Luc Anselin and Serge Rey. Contents: Twenty original research papers on software advances in spatial analysis for the social sciences. Published by CSISS, University of California, Santa Barbara, May 2002.

This is being distributed to all meeting participants and CSISS researchers, and will be made available at cost to the research community from the CSISS website

#### **Data or databases**

**CSISS Web Search Engines** and related databases. These include

- (1) The CSISS Social Science Archive Search Tool: A Place Based Search Tool for Social Science Data (CSSAST) -- this is an on-line system for searching for geo-referenced data through selected world-wide social science data archives -- it is based on the CSISS concept of 'place-based search' allowing access by place names, bounding boxes on a map, and point-to-map and click
- (2) **CSISS Literature database** derived from diverse bibliographic sources, keyed to spatial analysis in the social sciences (about 10,000 entries, updated twice a year)
- (3) the **CSISS Spatial Tools Clearinghouse** -- a database updated weekly for retrieving website pages that feature spatial analytic tools and measures.

All of these database products are described in greater detail in the Activities section of this report

These search engine databases are all web accessible at [www.csiss.org](http://www.csiss.org)

#### **Software (or netware)**

**Dynamic Exploratory Spatial Data Analysis** software (beta test version DynESDA2) is now available for testing. This is a freestanding software package for exploratory spatial data analysis, developed by CSISS Tools PI, Luc Anselin, in cooperation with the GeoVista project at Pennsylvania State University and BioMedware Inc. In addition, the design of an open source, modular and cross-platform software package for spatial econometrics (OpenSpace) was initiated and an early prototype has been completed. More complete information is found in the Activities section of this report.

CSISS software developments will be made available through its website and through BioBedware, Inc. (Ann Arbor).

#### **Internet Dissemination:**

<http://www.CSISS.org> <http://www.ncgic.ucsb.edu/CSISS>

## CSISS Annual Report 2002

CSISS is developing an open, virtual community to share spatial analytic software, foster discussion about spatial approaches in the social sciences, provide learning resources, and highlight information on workshops, conferences, and the latest innovations and applications of spatial analysis. The delivery vehicle is the CSISS Website, [www.CSISS.org](http://www.CSISS.org), launched officially on 21 June 2000. Prior to this, details on CSISS activities were found at [www.ncgia.ucsb.edu/CSISS/](http://www.ncgia.ucsb.edu/CSISS/).

Some of the highlights of the Website include the latest information about all of the core programs of CSISS--such as workshops and specialist meetings, bulletin boards on key topical areas, and private sites for communication among members of the CSISS Executive Committee and Science Advisory Board. Possibilities to host online expert-mediated discussions on specific topics are under consideration.

In early 2001 CSISS introduced its own Internet Search Engine, built on weekly scans of the Internet to update material of relevance to spatial analysis in the social sciences. Currently, there are nearly 40,000 sites in the basic database, searchable by any user-defined keywords and by directories that focus on the specialized interests of spatial social science. CSISS also maintains an extensive web resource for literature search in the social sciences -- used to monitor the progression of spatial perspectives by disciplines and research areas.

In January 2002, CSISS launched another search engine to serve as a clearinghouse for information on spatial analytic tools. This supplements yet another search engine developed in the past year that searches social science data archives for geo-referenced data.

An important use of the website is in serving the administrative needs of CSISS to develop and advertise workshops, specialist meetings, and other activities. This has also assisted in basic editorial review of materials (e.g., learning resources) before they are posted to the site. CSISS' integrated databases are derived through user interfaces similar to those of NSF's FastLane. The Activities section of this report gives more complete information on CSISS Internet dissemination.

### **Contributions:**

#### **Contributions within Discipline:**

CSISS serves the collective social and behavioral sciences through the common theme of spatial analysis. Hence, contributions are relevant to a broad range of disciplines. The development of tools for spatial analysis and for place-based search, the provision of Learning Resources, and the development of web resources (for example, CSISS Internet Search Engines for data, tools, and literature) provide new research techniques and information resources that are of value to anyone interested in spatial analysis in the social sciences.

CSISS organized specialist meetings draw expert participants from a range of disciplines on topics of broad interest to spatial analysis ('Social Inequality and Equity' in November 2000; 'Spatial Externalities' in January 2001; 'Location-Based Services' in December 2001; and, 'Spatial Tools Development' in May 2002. Reports from these meetings offer concrete suggestions for the kinds of training and research resources that would best serve students, instructors, and researchers in the social sciences.

CSISS workshop programs for 2000 (75 participants from 12 disciplines) and 2001 (approximately 150 participants from about two dozen disciplines) help spread understanding of spatial analytic methods to a cross section of young scholars. These are described in the Activities section of the report.

CSISS also provides modest assistance to other multi-discipline organizations that feature uses of spatial perspectives in their work. This support is usually in the form of travel awards for graduate student participation. With Florida International University (Center for Transnational and Comparative Studies) CSISS co-sponsored a Workshop on Political Processes and Spatial Analysis, which met in Miami, Florida, 5-6 March 2001. In March 2000, similar support was made available to this group for a meeting at the University of Colorado. In November 2001, support for graduate students was provided for participation in the Digital Communities 2001 conference in Chicago. We are currently funding the cost of a cover for a book that is based on work presented by researchers at the CSISS co-sponsored workshop in Irvine CA (Oct 2002) on Agent-Based Modeling and Land Use Land Cover Change. In addition, CSISS will provide

## CSISS Annual Report 2002

awards for 8 graduate students to participate in a Short course on the Economics of Urban Sprawl and Land Use Change, to be held at UCSB on 22 June 2002, organized by Antonio Bento in conjunction with the World Congress of Environmental and Resource Economics that meets in Monterrey 24-26 June 2002.

### **Contributions to Other Disciplines:**

Given its mission of 'integrated social science,' CSISS has chosen to view the Social Sciences as a single body. Hence, we have described the contribution of findings, techniques, and products to the section on 'Contributions Within Discipline'.

### **Contributions to Education and Human Resources:**

The National Workshop program brings together scholars from a mix of disciplines from across the country to explore the theory and applications of spatial analysis in the social sciences in intensive one-week programs. The concept behind these CSISS workshops is that the participants will return to their own institutions and help to disseminate further what they have learned in the workshop settings.

In the previous two years, these workshops have attracted scholars from dozens of universities, mostly PhD candidates, post-doctoral scholars, and untenured assistant professors. More than 45 percent were women.

We are currently in the process of selecting about 70 participants from among 225 applicants for three CSISS workshops in summer 2002. In addition we are hosting 20 participants in an ICPSR workshop on 'Introduction to Spatial Data Analysis'.

CSISS has also provided hands-on experience for about nearly two-dozen student researchers (graduates and undergraduates), described elsewhere in the report.

### **Contributions to Resources for Science and Technology:**

The contribution of resources for research and education is one of the primary missions of CSISS, the other being to disseminate these contributions as broadly as possible among the social sciences. These are treated in the Activities section under Learning Resources and in the section on Internet dissemination regarding the CSISS Virtual Community.

### **Contributions Beyond Science and Engineering:**

The CSISS tools development program is likely to have spillover benefits beyond academic and scientific research. The December 2001 Specialist Meeting on Location-Based Services brought together commercial, academic, and government innovators to explore common issues in an area of rapid technical change and broad social implications. A report on this workshop will be available on the CSISS Website in June 2002.

A May 2002 Specialist workshop for spatial analytic tools software developers will convene a group of academic and commercial spatial-analytic software developers to review the status of ongoing work and to recommend protocols that will facilitate interoperability of software products and the establishment of a clearinghouse for open-source software. This project is reported on in greater detail in the Activities section of the report.

CSISS participation with the ADEPT project (Alexandria Digital Earth Prototype) is also likely to expand the technical range of information access in ways that will be of interest to commercial developers. This initiative could also benefit research and practice of digital governance.

### **Special Requirements for Annual Project Report:**

Unobligated funds: less than 20 percent of current funds

### **Categories for which nothing is reported:**

Research and Education Activities  
Special Reporting Requirements  
Animal, Human Subjects, Biohazards