



Center for Spatially Integrated Social Science

# **ANNUAL REPORT**

**Year 1**

**(1 October 1999 – 30 June 2000)**

University of California, Santa Barbara

July 2000

**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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**CSISS IS FUNDED BY THE NATIONAL SCIENCE FOUNDATION  
(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, JULY 2000**

### **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.

CSISS began its operations in October 1999 and has spent the last nine months laying the foundation for its programs; it is currently sponsoring its first series of workshops in spatial analysis; it has initiated its presence on the Web (CSISS.org); and is in the process of implementing its strategy for monitoring the success of its various programs. This report summarizes the progress made in establishing the Center since October 1999 and documents its plans for the coming year.

CSISS acknowledges the support from NSF under BCS-9978058 and requests the second increment of funding for the project for the period 1 October 2000 through 30 September 2001.

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# 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 our 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 met for the first time in May 2000, and will convene once again in December 2000. Reports on its first meeting are attached as Appendices A-B. 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.

In fulfilling its mandate, CSISS operates seven programs, including:

- (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 of these programs over the first nine months of NSF support, from 1 October 1999 to 30 June 2000.<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 PROGRAMS

## I. Specialist Meetings

Specialist Meetings were not included in the original proposal to NSF. However, on advice from the Science Advisory Board and after deliberation on alternatives, the Executive Committee decided that Specialist Meetings would provide a useful basis for structuring several of its other programs of outreach and service to the social science community. It is intended that these meetings should focus on themes that cut across traditional disciplinary boundaries (e.g., equity, cultural analysis, externalities, globalization) and focus on identifying the gaps in knowledge that can be addressed with spatial perspectives. The objective of each meeting is to identify a scientific agenda 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, and develop publications of exemplary social science applications.

The first two Specialist Meetings will take place in Santa Barbara, the first on equity in November 2000 and the second on spatial externalities in January 2001.

### *Equity, 12-14 November 2000*

The relationship between space and inequality will be explored in a CSISS expert meeting of approximately 15-20 sociologists, economists, demographers, political scientists, criminologists, geographers, and epidemiologists who study such diverse topics as neighborhood transition and segregation, environmental change and risk, crime and criminal justice, social stratification, income inequality, racial and ethnic inequality, and health and illness. All of these topics implicitly or explicitly have spatial dimensions and involve spatial effects, and to various degrees may benefit from the use of spatial analysis models and techniques. The purpose of the meeting is to strengthen and integrate research on inequality/equity issues through the spatial perspective, identifying the ways in which CSISS can support the development and dissemination of spatial theories and concepts, tools and techniques (such as geographic information systems), and formal analytic methods in support of research on this topic.

The steering committee for organizing the meeting is co-chaired by Richard Appelbaum (CSISS, UCSB) and John Logan (SUNY-Albany), and includes Helen Couclelis (CSISS, UCSB) and John Sprague (Washington University, St. Louis).

The **specific goals** of this meeting include the identification and prioritization of:

- ♦ research questions related to inequality and equity, where consideration of the spatial dimensions of the issues has led to, or is most likely to lead to new insights;
- ♦ emerging issues in research on inequality and equity requiring new developments in spatial theory, methodology or technology, with an eye to developing future CSISS workshops (this would include identifying topics, target audiences, and potential workshop instructors);

- materials that could be collected, developed, and disseminated by CSISS, to support research and instruction on the spatial aspects of inequality and equity;
- software tools, including methods, platforms, and implementations, that CSISS could refine or further develop to support research and instruction on inequality and equity; and
- materials related to the study of inequality and equity that could be collected as part of the CSISS' virtual community.

### ***Externalities, 11-13 January 2001***

The concept of “externalities” in general and “spatial externalities” in particular is a theme that has gained considerable recent attention in economics. Both from a theoretical perspective as well as empirically, the explicit modeling of interacting agents (e.g., strategic interaction) rather than isolated agents has come to the fore in a range of sub-fields in economics (economic geography, labor economics, public, urban, and real estate economics, environmental and natural resource economics, etc.). In addition, new paradigms that emphasize increasing returns, path dependence, and imperfect competition have led to a renewed interest in agglomeration economies and spatial externalities. Complementing this theoretical focus, the explosion in the availability of geo-coded economic information collected at a range of spatial scales has strengthened the need to explicitly take into account spatial effects in econometric methodology (spatial econometrics).

The specialist meeting on “externalities” is primarily targeted at an audience of economists (both theoretical as well as empirical and policy-oriented). It is intended to achieve two outcomes: (1) provide an overview and stimulating discussion of the range of viewpoints with respect to “spatial” approaches towards research questions (both theoretical and empirical); and (2) translate these conceptual frameworks into specific demands and priorities for the various CSISS infrastructure components. Participants will be expected to prepare a short position statement related to the first of the goals above.

The steering committee for this meeting includes Luc Anselin (CSISS, UIUC), Chair, Jan Brueckner (UIUC), Robert Deacon (UCSB), and Edward Glaeser (Harvard University). Invitations will be sent out in early July 2000 to a group of 15 to 20 scholars, to be drawn from the range of sub-fields in economics and to represent the various perspectives on “spatial thinking” with respect to the concept of externalities, both theoretically as well as methodologically.

The **specific goals** of the meeting include:

- identification of research questions related to externalities where a “spatial perspective” shows the highest promise of providing new insights (and best practice examples);
- designation of specific workshop topics that address emerging issues related to externalities in terms of spatial theory, methodology or technology (including the identification of target audiences and potential instructors);
- identification and prioritization of specific learning resources that could be collected or developed to support research and instruction on externalities;

- identification and prioritization of specific software tools (methods, platforms, implementations) that could be refined or developed to support research and instruction on externalities; and
- identification and prioritization of specific materials related to externalities that could be collected as part of the CSISS virtual community portal.

***Biophysical–Human Interface, spring 2001 (tentative)***

On the suggestion of the Science Advisory Board, CSISS is developing a meeting on the interfaces between biophysical and human domains. We plan to develop this topic based on research in the human dimensions of global change, and related topics. Advisory Board members Emilio Moran and Billie Lee Turner II were advocates of this topic, and we will ask them to be involved in planning the meeting. It is likely that the specialist meeting will occur in the spring of 2001.

## **II. National Workshops**

CSISS sponsors intensive weeklong workshops to introduce the latest and most authoritative approaches to the methods and tools of spatially integrated social science. Scholarships are provided for participants to help offset some of the costs associated with travel and accommodation. Workshops offer an interactive learning environment that is hard to duplicate in the ordinary routine of university life. Since we seek to draw the participant base from a variety of disciplines and universities, workshops are also an important catalyst for establishing collaborations across disciplinary and regional boundaries. In addition, we hope that they provide the incentive for participants to develop new course offerings at their institutions, and to apply what they have learned in their research and teaching, and in proposals for research funding.

Through agreement with workshop instructors, the lectures and exercises are being incorporated as CSISS Learning Resources that will be accessible through CSISS.org.

***Summer 2000 Workshops***

The CSISS National Workshop program for Summer 2000 included the following:

- **Perspectives on Spatial Analysis in the Social Sciences** (Instructors: Michael Ward, Julian Besag, and Martina Morris); Host institution — The Center for Statistics and the Social Sciences, University of Washington, 19–23 June 2000.
- **Multiagent Spatial Modeling** (Instructor: Nicholas Gessler); Host institution — Center for Computational Social Science and Social Informatics, University of California, Los Angeles, 24–28 July 2000.
- **Introduction to Spatial Pattern Analysis in a GIS Environment** (Instructors: Arthur Getis, Michael Goodchild, John Weeks and Lauren Scott); Host institution — CSISS at UCSB, 14–18 August 2000.

In addition, CSISS provided scholarship support to help Ph.D. candidates defray some of

the expenses associated with two workshops offered by the **Interuniversity Consortium for Political and Social Research (ICPSR)** as part of their regular summer workshop program—**Introduction to Spatial Data Analysis** and **Spatial Regression**, both taught by Luc Anselin.

**Advertising**

In implementing the summer 2000 workshop program, considerable effort was required to build a database of social science departments in American universities for distributing fliers on the workshop program (see Appendix C). Nearly two-dozen social science list servers were used, along with an advertisement that appeared in *The Chronicle of Higher Education*. Discipline newsletters and Web sites were also targeted for wide distribution on information about the workshops. The results of this campaign are reflected in the broad base of applications from the full range of social science disciplines and from researchers and students from a large number of universities from across the country. The results are summarized in Tables 1 and 2.

**Participants and Applicants by Academic Status, Gender, and Discipline**

<b>Table 1 CSISS Workshop Participants and Applicants, Summer 2000</b>					
	<b>Perspectives on Spatial Analysis</b>	<b>Multi- Agent</b>	<b>Pattern Analysis</b>	<b>ICPSR</b>	<b>Totals Acceptances/ Applications</b>
<b>Participant and Applicant Status</b>					
• <b>PhD Candi- date</b>	<b>13 2</b>	<b>11 2</b>	<b>11 1</b>	<b>8</b>	<b>43/88 5/15</b>
• <b>Post Doc</b>					
• <b>Untenured Faculty</b>	<b>4</b>	<b>2</b>	<b>4</b>		<b>10/17</b>
• <b>Tenured Fac- ulty</b>	<b>2 2</b>	<b>4 2</b>	<b>3 1</b>		<b>9/12 5/17</b>
• <b>Other</b>					
<b>No. of Women</b>	<b>3</b>	<b>9</b>	<b>10</b>	<b>3</b>	<b>25/54</b>

**Table 2.**  
**Distribution of CSISS Workshop Acceptances and Applications by Discipline**  
**and for Number of Universities. Summer Program 2000**

<b>Discipline/Area</b>	<b>Perspectives in Spatial Analysis</b>	<b>Multi-agent</b>	<b>Pattern Analysis</b>	<b>ICPSR</b>	<b>Totals Acceptances/Applications</b>
<b>Agricult/Agric Engin</b>					<b>0/6</b>
<b>Anthropology</b>			<b>3</b>		<b>3/5</b>
<b>Archaeology</b>		<b>1</b>	<b>1</b>		<b>2/5</b>
<b>City/Regional Plan</b>					<b>0/2</b>
<b>Civil/Environ Engin</b>				<b>1</b>	<b>1/2</b>
<b>Criminology</b>	<b>1</b>		<b>2</b>		<b>3/4</b>
<b>Earth &amp; Mineral Sci</b>		<b>1</b>			<b>1/1</b>
<b>Economics</b>	<b>4</b>	<b>3</b>		<b>2</b>	<b>9/10</b>
<b>Education</b>					<b>0/1</b>
<b>Environ Policy/plan</b>		<b>1</b>			<b>1/7</b>
<b>Epidemiology</b>					<b>0/1</b>
<b>Forestry</b>					<b>0/2</b>
<b>Geography</b>	<b>4</b>	<b>3</b>	<b>5</b>	<b>1</b>	<b>13/31</b>
<b>GIS/Remote Sensing</b>	<b>1</b>	<b>2</b>			<b>3/10</b>
<b>Information Science</b>			<b>1</b>		<b>1/3</b>
<b>International Exten</b>					<b>0/1</b>
<b>Landscape Architect</b>	<b>1</b>				<b>1/1</b>
<b>Linguistics</b>					<b>0/2</b>
<b>Natural Resource</b>					<b>0/1</b>
<b>Not Known</b>					<b>0/1</b>
<b>Political Science</b>	<b>6</b>	<b>3</b>	<b>4</b>	<b>1</b>	<b>14/26</b>
<b>Population/Health</b>			<b>1</b>		<b>1/1</b>
<b>Public Policy</b>		<b>1</b>			<b>1/2</b>
<b>Social Psychology</b>					<b>0/1</b>
<b>Sociology</b>	<b>4</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>11/13</b>
<b>Spatial Analysis</b>		<b>1</b>			<b>1/5</b>
<b>Statistics</b>	<b>1</b>	<b>1</b>		<b>1</b>	<b>3/4</b>
<b>Urban Studies/Plan</b>	<b>1</b>	<b>2</b>			<b>3/4</b>
<b>Totals:</b>	<b>23</b>	<b>22</b>	<b>20</b>	<b>8</b>	<b>73/149</b>
<b>No. of Universities &amp; Other Institutions</b>	<b>18/26</b>	<b>19/37</b>	<b>18/46</b>	<b>6/13</b>	<b>-- 48/71</b>

In general, we are pleased that the workshop participants represent a diversity of disciplines and universities, and that the gender mix is consistent with expectations. Nonetheless, CSISS will attempt in 2001 to broaden even further the range and coverage of its advertisements.

### ***Future Plans***

Plans for the summer 2001 program of workshops will be formulated in January 2001. We will advertise widely across several disciplines for proposals for joint sponsorship of workshops. Some of the summer 2000 workshops may be repeated in subsequent years, but we do hope to broaden the range of spatial approaches treated in the workshop program. Among the topics under consideration are:

- Geolibraries and Social Science Research
- Time-Geography Methodologies in the Social Sciences
- Event History Analysis and Spatial Interaction
- Using Spatial Analysis to Investigate Internet Activity
- Accessing Spatial Data and Understanding Data Base Models
- Analysis of Flow Data in the Social Sciences
- Analysis of Point Data

In addition, we will explore the possibility of sponsoring workshops over the Web in future years (Virtual Workshops) and in holding some workshops in conjunction with the annual meetings of social science organizations. The CSISS Science Advisory Board has offered to assist in the identification of suitable topics and in the evaluation of proposals. Currently, CSISS allocates \$10,000 per workshop for participant scholarships and \$10,000 for workshop administration, materials, and instructor stipends.

### ***Evaluation***

As part of the evaluation process for workshop topics and sponsorship, we incorporated both entry and exit surveys of participants, and will follow these up with a post-workshop survey 6 months later. The survey results will be documented in the annual report for 2001. Examples of these survey instruments are attached as Appendix D. They will be evaluated for possible modification in subsequent years.

## **III. Best Examples**

CSISS seeks to identify outstanding uses of spatial analytic approaches that advance theoretical understanding and empirical testing in social science. Such exemplary research will be featured in CSISS publications and used for creating learning resources to be made available at CSISS.org.

This program is intended to create a number of documented examples of spatially integrated social science, in which investigators produce significant results through the use of

some combination of spatial theory, perspectives, tools, and analysis. We had originally proposed this program as a small number of grants, and the final budget negotiated in August 1999 showed three such grants in each of Years 2, 3, and 4. The procedures for making the awards were to have been discussed with the Science Advisory Board and approved by them and NSF.

At its May 2000 meeting the Science Advisory Board took the view that the amounts available under the program were unlikely to be sufficient to initiate truly novel research, and recommended instead that the program be restructured as a mechanism for adding value to existing projects. CSISS resources could be used to identify such projects, rework them for publication in a CSISS compendium and on its Web site, and adapt them as CSISS learning resources. Accordingly, we will be working this coming summer to identify a number of candidate projects. We will use various information resources, including searchable archives of NSF and NIH awards, the contents of major social science journals, and individual contact networks. The Executive Committee will review the candidates, and negotiations will be undertaken with selected investigators. To adapt the selected materials CSISS may award funds directly to investigators, or may use its own staff. We anticipate that several prototype projects will have been identified in time for the next Science Advisory Board meeting in December 2000.

#### **IV. Software Tools**

Under the direction of Dr. 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**

In year 1 of the project, most of the focus of activity has been on preliminary work, dealing with design and computer architecture issues as well as the scope of the methods that would be provided. During the period of 1 July 1999 to 30 June 2000, only limited activity was carried out, due to the complexities of implementing the subcontract between UCSB and UIUC. Formally, the project has been in place since early January 2000. No personnel other than Anselin were involved in this program before May 2000.

The emphasis in the software tools effort is on two sets of techniques. One is *exploratory spatial data analysis* (ESDA), which lends itself extremely well to integration with geographic information systems. The second is *spatial regression analysis* or spatial econometrics, which is the main analytical tool in empirical work in the social sciences. By design, no software development will be carried out for point pattern analysis or geostatistical analysis, since such software currently exists (e.g., the CrimeStat package available from NIJ and the Geostatistical Analyst under development by ESRI). Instead, links to pertinent Internet sites for such software will be included as part of the CSISS Virtual Community program.

As the result of consultation with a range of scholars and an assessment of the current state of the art, the implementation of the software tools development program will be pursued along three specific and distinct lines: (1) the porting of ESDA tools to the new ArcInfo8 environment; (2) the development of add-ons to existing commercial statistical and econometric software to facilitate spatial data analysis; and (3) the development of a collection of modules for spatial data analysis, in an open software environment. These activities and their current status will be detailed in turn below.

### ***ESDA Tools***

The first set of activities pertains to the ESDA tools. These will consist of a refinement and the addition of new functionality to the existing DynESDA extension for ArcView developed by Anselin and Smirnov (UTD). A preliminary version of this extension was made available freely on Anselin's SpaceStat Web site in February 2000. The new functionality will include methods to analyze and visualize clusters in space-time data and the application of local indicators of spatial association (LISA) to discrete variables. ESRI is CSISS's industrial partner in this venture.

The software will be ported to be compatible with the new object model of ESRI's ArcInfo8 software. An organizational visit was made to ESRI in September 1999 and subsequent interaction has been maintained by e-mail. Initial design issues have been resolved and the porting of C++ classes used in the DynESDA extension to a new framework that will take advantage of ESRI's ArcObjects technology has begun. The refinement of the methods to apply LISA to time-space data and discrete data was largely accomplished under a previously funded NSF grant to Anselin and is near completion.

It is anticipated that a prototype of the new Dynamic ESDA tool will be completed by the end of 2000, with an initial operational version ready by summer 2001. The refinement and completion of the final version will be carried out with the assistance of software engineers from ESRI. It is expected that a commercial-grade product will be available by early 2002, including manuals, demonstrations and tutorials.

Two graduate research assistants are assigned to assist Anselin in this activity: Yanqui Ren, a master's student in Consumer Economics at UIUC, joined the project as a C++ programmer in May 2000; Cao Liou, a doctoral student in Urban and Regional Planning at UIUC, will join the project as an ArcInfo programmer in August 2000. It is also antic-

pated that a postdoctoral research fellow will be attracted within the next six months to take a leading role in this activity.

Specific products of this activity during 1999–2000 consist of three conference presentations by Anselin, the release of the DynESDA extension, and a forthcoming article in the *Journal of Geographical Systems* by Anselin detailing the functionality of the DynESDA extension and other efforts to add ESDA capabilities to GIS.

### ***Spatial Add-on to Econometric and Statistical Software***

A second activity of the software tools program consists of facilitating spatial data analysis within the familiar user interface of existing econometric and statistical software. This will be approached by developing functionality to construct spatially lagged variables (interfacing to a range of existing GIS data formats) and write macros and scripts to carry out tests for spatial autocorrelation, diagnostics for spatial effects in regression analysis, and estimation of models that incorporate spatial dependence. In part this effort will also consist of cataloging existing software pieces and providing easy Internet access to these resources.

Initial discussions were held with a number of commercial vendors about facilitating this process. Current plans are to complete a cataloging effort by the end of 2000, focused on existing functions developed in S-Plus, Matlab and related mathematical toolboxes. Development of a prototype set of tools will start in year 2 of the project, with the goal of completing at least three sets (i.e., for three different software packages) by year 3.

Specific products of this activity during 1999–2000 consist of a special issue of the *Journal of Geographical Systems*, guest-edited by Anselin and devoted to the topic of “Computing Environments for Spatial Data Analysis”.

### ***Modules for Spatial Data Analysis in an Open Software Environment***

While the previous two activities are targeted at Microsoft-Windows-based platforms and commercial software environments, the third activity addresses the needs of “high end” users on Linux platforms, using the paradigm of open source software development. It is the objective of this activity to establish a virtual collaborative of interested programmers to develop a library of modules for the widest possible range of spatial data analyses. This would allow the incorporation of state of the art techniques as well as highly specialized methods that only appeal to a small subset of the community. By utilizing the programming efforts of many, it is anticipated that the hurdle for development of new techniques will be lowered.

The role of CSISS will be to develop initial prototypes and standards, ensure quality, organize and disseminate the modules in the library and provide a comprehensive set of documentation, help files and tutorials. To jump start the process, a small meeting of an initial core group will be organized in late 2000 and the initiative will be advertised at a number of special sessions of scholarly meetings. In addition, a listserv will be established to facilitate communication.

A set of prototype modules will be developed during year 2 for existing open source statistical toolboxes such as XlispStat and R. It is anticipated that this will be extended to a collection of free-standing code during years 3 and 4.

Dr. Sergio Rey (San Diego State University) will spend a month at UIUC as a visiting scholar in the summer of 2000 to collaborate in the initial design of the effort. It is anticipated that at least one research assistant and a series of visiting postdoctoral fellows will play a major role in this effort.

During the period covered by this report, work under this activity has been primarily conceptual, and no specific products are available yet.

## V. Learning Resources

CSISS aims to develop learning resources covering core concepts and exemplary research approaches, cataloged for easy access through its Website, CSISS.org. These include lecture outlines, exercises, interactive learning modules, and demonstrations.

During the first year of the CSISS funding, work in the Learning Resources (LR) program has focused on developing a conceptual and Web-based infrastructure for archiving a range of existing and readily adaptable learning materials. The outcomes of these deliberations are outlined in the following section. We feel that a solid foundation for future years' efforts is in place.

### *Objectives*

The target audience for the CSISS Learning Resources is sophisticated, advanced learners (e.g. graduate students and faculty) who can be encouraged to begin using spatial analytic perspectives and methods in their teaching and research.

The objectives for the Learning Resources Program are:

- Increase the use of spatial analysis and visual representation in the social science domains.
- Increase the quality and power of social science research through the use of spatial analysis.
- Improve geography through discovery of new contexts, applications, and methods in Social Science.
- Increase the potential for collaboration across disciplines and among institutions.
- Find ways to address old problems in new ways and discover new problems to be solved.
- Ensure feedback from learners to improve Learning Resources.
- Bring in new people.
- Achieve the maximum impact by directing resources at educating instructors and researchers.

While they will be in many different forms, Learning Resources will have several major areas of content:

- Applications and examples – “Show me the value added”
- Tools – “Show me how I can use them in social science”
- Methods and research design – “Show me how to use them in social science applications”
- The spatial (spatio-temporal) perspective – “What is it? What’s the minimum set of concepts? What does it mean to be spatially enabled? Who uses it, how much?”
- Spatial perspectives on the big themes in social science – “How can a spatial approach illuminate this area?”

### ***Learning Resources Portal***

The Learning Resources maintained under the CSISS banner will be a collection of many different types of learning “objects”. This searchable archive will include:

- Exercises with data (equivalent to a one-hour lab)
- Lecture notes for a 50-minute lecture (about 7 pages in outline format, complemented with discussion and exam questions, examples, and links to other resources)
- Case studies (exemplary projects from different disciplines)
- Case-method examples (e.g. variations on case-method learning, following the models from the Harvard Business School)
- Interactive learning modules (method oriented)
- Hands-on tutorials (tool oriented)
- Frequently asked questions database
- State-of-the-art articles (journal articles available on-line)
- Demonstrations

During the summer 2000 work term, a plan for evaluation of materials to be included in the LR archive will be put in place. This plan will include at least the following components:

- New materials for the LR archive will be kept in a private section of the Website for internal review and evaluation prior to making them publicly accessible.
- Once materials are public, comments will be solicited and reviewed on an ongoing basis by the LR team.
- Comment from this public evaluation will be compiled and reviewed at the monthly CSISS Executive Committee meetings.
- General oversight and review will be provided through the annual program review process.
- An update procedure will be put in place which will include a requirement that all contributors agree to provide ongoing oversight and update, if necessary, of their contributed materials during the life of the grant.

In order to locate appropriate resources within the archive, it is necessary to include structured metadata for each stored object. A number of existing metadata schemes for learning resources exist (e.g. the IMS Global Learning Consortium’s metadata specifica-

tion, ([www.imsproject.org/metadata/index.html](http://www.imsproject.org/metadata/index.html)), the Digital Library for Earth System Education ([www.dlese.org](http://www.dlese.org)), and components of the Alexandria Digital Earth Prototype ([www.alexandria.ucsb.edu](http://www.alexandria.ucsb.edu)). By the end of the first year of this project, a simple metadata structure appropriate for the CSISS archive, but linked to other Learning Resources systems, will be in place. This metadata structure will provide the framework for the initial LR archive search interface. This will allow users to locate appropriate learning objects within the archive according to various metadata categories. This searchable interface will be in place by the end of the first year.

In addition, the Learning Resources team will also develop a number of different structured “views” of the Learning Resources archive. Since the audience for the Learning Resources will be very diverse in interests, abilities, spatial analysis expertise and disciplinary foci, it is necessary to design an interface to the LR that will accommodate a wide range of users. Thus, the *Learning Resources Portal*, the Web-based access point to the LR, must provide many different entry points and “views” of the database of objects.

A structured view on the archive will provide a selection of appropriate objects organized in a sequence that is appropriate for the intended audience. While the set of views will evolve as the CSISS project progresses, initially the following will be developed:

- The Primer View—this view will organize entry-level materials for researchers unfamiliar with the terminology, methods and applications. This is intended to be a means of encouraging new users to delve into the CSISS materials and programs more deeply.
- Workshop Views—All of the summer workshops will produce a rich set of learning materials that can be posted on-line. Building on the structure of the workshops themselves, workshop views of the materials will mirror the workshop learning process.
- Knowledge Framework Views—As the archive grows, the CSISS team expects that one or more conceptual frameworks for the body of knowledge within the domain of spatially integrated social science will emerge. A proposed version of this is a “wheel view” of the LR content in which domain oriented applications in the social sciences and examples are on the outside of the wheel, with specialized skills and methods representing the spokes that connect to a hub comprised of the theoretical core.

### ***Work Plan***

Work prior to the summer of 2000 focused on developing the conceptual framework for the Learning Resources Portal. On June 2-3, the CSISS Executive Committee met in a retreat with Karen Kemp, acting as the Learning Resources Consultant, and Rick Johnson and Stan Nicholson of UCSB Instructional Consultation to discuss the founding principles and design for the Learning Resources.

During the 2000 summer work program, the team of Research Assistants at Santa Barbara will contribute in various ways to the Learning Resources while also completing tasks addressing other components of the CSISS program. Several tasks will be undertaken this summer:

- Development of a metadata scheme for the learning objects.
- Development of a preliminary Web-based learning resources portal with search capability and one or more archive views.
- Identification of appropriate resources and initial populating of the portal—several existing sources of appropriate materials will be reviewed, incorporated into the archive and, when necessary, revised. These include elements of the NCGIA Core Curriculum in GIScience, workshop materials, published articles, and best practice examples uncovered during the literature review.
- Development of an evaluation program that will formalize the process for determining what materials should be included in the archive.
- Initial conceptual organization of the materials to identify areas needing development in the next years of the project.

During the fall of 2000, the Executive Committee and the continuing members of the Learning Resources team (Karen Kemp will continue in an advisory role, and a graduate student from the summer team will be appointed as the Learning Resources Coordinator) will review the current LR archive and assess the breadth of coverage obtained. This will allow the team to identify content gaps and will provide direction for future materials development. At this time, opportunities for input from the social science community in general on the value and structure of the LR materials and portal will be identified.

In the second year of this project, efforts will focus on commissioning the development of needed materials, on enhancing the value of workshop materials and best practice cases, and on expanding the range of LR archive views.

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

In collaboration with UCSB's Alexandria Digital Library and its ADEPT initiative (Alexandria Digital Earth Prototype), CSISS is developing services to enable search and delivery of geographically referenced information on the World Wide Web and in digital libraries.

This CSISS program will promote greater access to digital data archives using geographic location as the primary key. Digital libraries that support search by geographic location have been termed *geolibraries*. Use of geographic location as the primary key allows the execution of queries such as "what demographic information is available about *there*?" Such location-based searches would be valuable to social scientists seeking to research issues in a particular geographic location, and to integrate data about that location across diverse sources and disciplines. A geolibrary is *distributed* if a search can be executed automatically across many sites and servers, without specific direction by the user. A National Research Council report, *Distributed Geolibraries: Spatial Information Resources*, appeared this year and was the culmination of a study chaired by Michael Goodchild, as

Chair of the NRC's Mapping Science Committee.

A two-pronged approach is being pursued in this program. First, CSISS is working with the Alexandria Digital Library (ADL), a major geolibrary located at UCSB, in order to enhance the relevance of its collections and services to social scientists. Efforts will be made through other CSISS programs, such as the Virtual Community, to draw attention to ADL and to encourage its use. Although only one of the 2000 workshops will devote attention to ADL (the workshop being offered at UCSB in August under the direction of Arthur Getis), we will consider offering a workshop in 2001 that is more focused on geolibraries and their potential.

Second, CSISS is assembling a directory to digital libraries and data archives that offer significant geolibrary services (location-based search) and substantial spatially disaggregated and georeferenced data. This directory will be built in the coming year, mounted on the CSISS Web site, and maintained with additions throughout the CSISS program. Work on the directory will begin this summer, and continue throughout the following academic year. We anticipate that the first prototype of the directory will be available by the end of 2000.

In addition, we will be exploring with ADL the possibility of search mechanisms that work transparently across distributed sites. This is a major research focus at this time in the geolibrary research community, and CSISS will exploit any major developments that appear to offer valuable services to social scientists.

## **VII. Virtual Community**

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, [cssis.org](http://cssis.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 within the CSISS Executive Committee and Science Advisory Board. A hotline will be in place by the end of 2000, and there are tentative plans to host online expert mediated discussions on specific topics. Portal linkages to Websites that provide access to spatial analytic tools and data, or to specialized information regarding spatial perspectives in the social sciences, are currently under development. All of the basic structural work on the Website is now in place. We are conducting exhaustive tests of its functionality and reliability for users, and will proceed over the coming year to populate this structure with learning resources, best examples, and useful and timely information of interest to the social science community.

Illustrative of the way in which CSISS seeks to cross the boundaries of disciplines is our attempt to identify the research interests of CSISS Virtual Community registrants. Although we do identify registrants by discipline, the primary intent is to establish discipline-neutral ways of defining their research interests. Thus, on the CSISS registration page, research interests are presented as fol-

lows:

**Research Interests** (Check all that apply. Under 'other' please add keywords that you believe should be included in this listing)

**Social Science and Spatial Analysis**

- Spatial Information Infrastructure
- Spatially Integrated Social Science
- Other \_\_\_\_\_

**Spatially Explicit Theory and Modeling**

- Economic Geography
- Regional Science
- Spatial Interaction
- Space-Time Accessibility
- Time Geography
- Other \_\_\_\_\_

**Social Science Issues with an Explicit Spatial Component**

- Border Politics and Conflicts
- Community Studies and Grassroots Organizations
- Criminal Justice and Law Enforcement
- Cultural Analysis
- Analysis of Internet Activity Patterns
- Governance and Spatial Knowledge
- Health and Disease
- Human Environments and Climate Change
- Social and Business Networks
- Social and Economic Inequality
- Spatial Information Infrastructure and Human Resources
- Urban and Regional Issues
- Other \_\_\_\_\_

**Spatial Analysis Methods**

- Cartographic Visualization
- Simulation (Agent-Based, Cellular-Automata, etc.)
- Statistical Analysis
  - Spatial Regression Analysis
  - Exploratory Spatial Data Analysis
  - Point Processes
  - Bayesian Approaches
  - Other \_\_\_\_\_
- Systems Analysis and Optimization

- Location-Allocation Analysis
- Spatial Statistics Software:
  - SpaceStat
  - S+
  - Other \_\_\_\_\_
- Statistical Programming Languages:
  - GAUSS
  - Lisp
  - S, R
  - SAS
  - Other \_\_\_\_\_
- GIS Software:
  - ArcInfo
  - ArcView
  - GRASS
  - Map/Info
  - Other \_\_\_\_\_

**Place-Based Search and Analysis**

- Geo-libraries and Digital Spatial Data Collections
- Geo-referenced Footprints
- Electronic Gazetteers
- Other \_\_\_\_\_

**Digital Earth**

- Digital Earth Modeling Systems
- Bibliographies and Discussions
- Other \_\_\_\_\_

## WORK PLAN – SUMMER 2000

The first summer of CSISS research will focus on benchmarking the position of spatial analysis in the social sciences, finding examples of best practices in spatial analysis, developing the framework for identifying, organizing, and displaying Learning Resources, and building the Web infrastructure to deliver CSISS services. Four Research Assistants (all Ph.D. Candidates) will be engaged in these projects over the period 1 July–30 September 2000—Matt Rice (Geography), Jorge Sifuentes (Geography), Amaury Cesar de Siqueira F. (Education and Information Technology), and David S. Fearon (Sociology).

### *General Objectives*

- Establish a system for documenting and tracking success in advancing the spatial analytic perspective in the social sciences
- Identify key researchers across the social sciences who are particularly prominent in making use of spatial analytic tools
- Find examples of exemplary research making use of spatial analysis—to use as part of our ‘best examples’ initiative
- Develop databases for easily advertising (email/post) of CSISS programs
- Determine those Web sites that we should link to CSISS.org (to be online in late June)—as collaborators and as sources of high-quality content of likely interest to CSISS clients
- Develop and implement a strategy for producing Learning Resources on spatial analysis in the social sciences
- Develop a Web platform for Learning Resources, best-practice primers and other CSISS products.

### *Documenting Spatial Analysis in the Social Sciences*

- A. Devise a work plan to produce a database, index measures, and replication procedures.
- B. Document the use of specific spatial analytic methods/perspectives by social science discipline and problem area
- C. Develop index measures to document the penetration of spatial perspectives in the social sciences
- D. Establish strategy for replication of procedures/measures and for updating the databases in successive years

Electronic search procedures will be used (keyword search on such terms as ‘spatial’ ‘spatial analysis’ ‘location-allocation’ ‘GIS’ ‘exploratory spatial data analysis (ESDA)’ ‘point-pattern analysis’ ‘geostatistics’ etc.). Information will be derived from such sources as:

- *Dissertation Abstracts* (Univ of Michigan) for recent years
- NSF Dissertation Awards in the social and behavioral sciences for recent years

- Key journals in each discipline (consult the *Social Science Citation Index*, *Arts and Humanities Citation Index*, *Behavioral Science Citation Index*, and *Science Citation Index* to document the leading journals in each discipline. This source can also be used for keyword searches, and citations to prominent authors—the leading practitioners of spatial analysis.
- Other indexing and abstracting services include *Sociological Abstracts*, *PsychInfo*, *EconLit*, *Anthropological Literature*, *Conference Papers Index*, *Current Contents*, *Geography Abstracts*, *Historical Abstracts*, *Web of Science*.

### ***Best Examples***

- Identify best examples from each social science discipline and for different problem areas. A key question/criterion is: Can these best-practice examples be converted into **primers** within selected domains of the social sciences? Are we able to add value to the selections to facilitate the broader dissemination of ideas about spatial analysis via CSISS.org?
- Develop a systematic search strategy that can be used in future years to find and screen potential best-practice examples that span the social science disciplines.
- For the final selection of the 5 to 10 best examples, outline a strategy of what might be done to convert them into part of a book on *Best Practices in Spatially Integrated Social Science*. In addition, how can they be used to generate user friendly, easily understood primer examples for CSISS.org?
- Contact the authors of the selected preliminary "best practice examples" to see if they are interested in working with CSISS to develop materials for the book and eventually for the Website

### ***Learning Resources***

Work will include:

- Establishing appropriate metadata standards that will permit easy identification and retrieval of Learning Resources via CSISS.org.
- Revising the existing GIScience core curriculum modules for use by social scientists.
- Searching/compiling inventories/sources of geographically referenced social science data and place-based data that should be linked via CSISS.org, and establishing a database of such .
- Documenting the social science content of the Alexandria Digital Library and working with ADEPT to insure compatibility with the needs of social scientists.
- Incorporating learning resources from the summer 2000 workshops within CSISS.org
- Incorporating material for Luc Anselin's ICPSR/SpaceStat workshops
- Determine the feasibility of delivering CSISS Learning Resources as dynamic models over the Web (e.g., Keith Clarke's urban growth model, Matt Ungerer's simulation of the von Thunen model, and streaming video from the summer workshops)

### ***Building Web Infrastructure / Organizing Knowledge / Portal Linkages***

Key questions/tasks include:

- How can Learning Resources, primer examples, and Web linkages be organized for easy access by users and for easy modification and updating by authors and CSISS staff?
- Which Web sites should CISSS link through its Portal function for purposes of providing access to Learning Resources developed elsewhere, to spatial data of value to social scientists (e.g., for geographically referenced census data), to bibliographies related to key spatial tools/concepts, etc.? Search for and document the contents/quality of Websites that CISSS should serve as a Portal to.
- Review the initial listing of Websites and evaluate their value to CISSS and CISSS users.
- Collect and catalog Learning Resource materials/Websites.
- Design conceptual framework, metadata schema, and Web infrastructure for Learning Resource materials.
- Populate the framework with materials, links, etc.
- Develop a content outline of Learning Resources and identify gaps in the knowledge base represented in the collection.
- Set up automated URL vitality checkers and update procedures for revised Learning Resources and new software versions.

## 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 1999–30 June 2000. 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, P.I. and Director**

Much of my time over the past year has been devoted to the establishment of CSISS, and presenting its programs to as wide an audience as possible. A complete list of presentations, many of which included descriptions or references to CSISS programs, is given below. Announcements of the establishment of CSISS were placed in various newsletters. In October 1999 I participated in a conference in Ottawa on Social Sciences for a Digital World. I was a member of the conference steering committee, and in that capacity participated in a planning meeting in Paris in May 1999 hosted by OECD. At the conference I gave a keynote on geographic information systems, expanding on many of the ideas in the CSISS proposal. A written version of the paper will appear in the conference proceedings, and a shortened version was published by the Canadian journal *ISUMA: Canadian Journal of Policy Research*.

The CSISS proposal was restructured into a journal article, which appeared in April in the *International Regional Science Review*. A presentation on CSISS and its programs was made to the Association of American Geographers in Pittsburgh in April, in a session organized in honor of Reginald Golledge. The proposal has also been accessible via the CSISS Web site, and has received substantial attention from PIs preparing proposals for the 2000 round of the SBE Directorate's infrastructure program.

More broadly, I have been engaged this year with the winding up of the Varenus project, which was the subject of a special issue of the *International Journal of Geographical Information Systems*, which I edited. I was first author on the lead article of the issue, which introduced the project, discussed its motivation and programs, and grounded the project in a formal theory of geographic information. Many Varenus seed grants are still active, but will be completed in time for the end of the project in February 2001. I have also been engaged with ADEPT, the Alexandria Digital Earth Prototype, which is funded under the second NSF Digital Library Initiative. The relationship between this project and CSISS is discussed in detail in the section of this report dealing with Place-Based Search.

I have also continued various activities intended to build bridges between the technically oriented GIS community and the critical and humanist traditions in social science. An interview with Nadine Shuurman was published in *Environment and Planning D: Society and Space*. It reviews the arguments on both sides, and the status of efforts to

achieve dialog and consensus.

### ***Presentations***

"The Digital Earth Project". EarthVIZ, University of California, Santa Cruz, May 2000.

"The Alexandria Digital Earth Prototype". Workshop on Gridded Population Databases, Columbia University, May 2000.

"Scales of Cybergeography". Brown Lecture, University of Minnesota, April 2000.

"Spatially Integrated Social Science: Building the Research Infrastructure". Association of American Geographers, Pittsburgh, April 2000.

"Spatial Analysis in a Communicating World". Invited Plenary Session, Mathematical Models and Quantitative Methods Specialty Group, Association of American Geographers, Pittsburgh, April 2000.

"Discrete Global Grids for Digital Earth". International Conference on Discrete Global Grids, Santa Barbara, March 2000.

"Scientific Information". Information Technology Workshop II, University Consortium for Atmospheric Research, Boulder, CO, January 2000.

"Towards a Geography of Geographic Information". University of California, Los Angeles, January 2000.

"Visions for the Digital Library". Pacific Neighborhood Consortium/Electronic Cultural Atlas Initiative, University of California, Berkeley, January 2000.

"Implementing Digital Earth: a research agenda". Keynote Presentation, International Symposium on Digital Earth, Beijing, November 1999.

"Spatial RDBMS: Opportunities and Challenges". Driven by Data, Los Angeles, November 1999.

"The Future of Geographic Information Science". University Hart Lecture, University of Sheffield, November 1999.

"Towards a Geography of Geographic Information". Ohio State University, October 1999; and University of Sheffield, November 1999.

"The Future of Gazetteers". Opening keynote, Digital Gazetteer Information Exchange, Washington, October 1999.

"New Horizons: Geographic Information Systems". OECD Conference on Social Sciences for a Digital World: Building Infrastructure for the Future, Ottawa, October 1999.

"Measurement-Based GIS". University at Buffalo, September 1999.

"Cartographic Futures for a Digital Earth". University of Cincinnati, September 1999.

"New Directions in Environmental Problem Solving". EPA Conference on Environmental Problem Solving with Geographic Information Systems, Cincinnati, September 1999.

"Cartographic Futures on a Digital Earth". Keynote Presentation, International Cartographic Association, Ottawa, August 1999.

"The Value of a Digital Library for Earth System Education". Opening Keynote, Geoscience Digital Library Workshop, Coolfont, WV, August 1999.

"Measurement-based GIS". Opening keynote, International Symposium on Spatial Data Quality, Hong Kong, July 1999.

### **Publications**

- M.F. Goodchild (2000) Communicating geographic information in a digital age. *Annals of the Association of American Geographers* 90(2): 344–355.
- M.F. Goodchild (2000) Introduction: special issue on 'Uncertainty in geographic information systems'. *Fuzzy Sets and Systems* 113: 3–5.
- M.F. Goodchild (2000) First Impressions: SMSS 3.0 software, manage your metadata. *Geo Info Systems* 10(5): 43–45
- M.F. Goodchild (2000) Perspective: Browsing metadata, where do we go from here? *Geo Info Systems* 10(5): 30–31
- M.F. Goodchild, L. Anselin, R.P. Appelbaum, and B.H. Harthorn (2000) Toward spatially integrated social science. *International Regional Science Review* 23(2): 139-159.
- M.F. Goodchild (2000) The current status of GIS and spatial analysis. *Journal of Geographical Systems* 2: 5–10.
- M.F. Goodchild (2000) New horizons for the social sciences: geographic information systems. *ISUMA: Canadian Journal of Policy Research* 1(1): 158–161.
- M.F. Goodchild (2000) Communicating the results of accuracy assessment: metadata, digital libraries, and assessing fitness for use. In H.T. Mowrer and R.G. Congalton, editors, *Quantifying Spatial Uncertainty in Natural Resources: Theory and Applications for GIS and Remote Sensing*. Chelsea, MI: Ann Arbor Press, pp. 3–16.
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- Land Information Uncertainty in Natural Resources*. Chelsea, Michigan: Ann Arbor Press, pp. 175–182.
- C. Funk, K. Curtin, M.F. Goodchild, D. Montello, and V.T. Noronha (1999) Formulation and test of a model of positional distortion fields. In K. Lowell and A. Jaton, editors, *Spatial Accuracy Assessment: Land Information Uncertainty in Natural Resources*. Chelsea, Michigan: Ann Arbor Press, pp. 131–138.
- M.F. Goodchild, A.M. Shortridge, and P. Fohl (1999) Encapsulating simulation models with geospatial data sets. In K. Lowell and A. Jaton, editors, *Spatial Accuracy Assessment: Land Information Uncertainty in Natural Resources*. Chelsea, Michigan: Ann Arbor Press, pp. 123–130.
- P.C. Kyriakidis, A.M. Shortridge, and M.F. Goodchild (1999) Geostatistics for conflation and accuracy assessment of digital elevation models. *International Journal of Geographical Information Science* 13(7): 677–708.
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- M.F. Goodchild (1999) Future directions in geographic information science. *Geographic Information Sciences* 5(1): 1–8.
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- A.M. Shortridge and M.F. Goodchild (1999) Communicating uncertainty for global data sets. In W. Shi, M.F. Goodchild, and P.F. Fisher, editors, *Proceedings, International Symposium on Spatial Data Quality, Hong Kong*. Hong Kong: Hong Kong Polytechnic University, pp. 59–65.
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- M.F. Goodchild (1999) GIS and Geography: elements of a debate. *Yearbook of the Association of Pacific Coast Geographers* 60: 150–157.
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### **Donald G. Janelle, Program Director**

I joined CSISS as Program Director in January 2000, but I was also involved with wrapping up my duties as Assistant Vice Provost for Faculty Affairs at the University of Western Ontario through mid April. Since arriving at UCSB in April, attention has been directed fully to implementing CSISS programs—organizing the first summer series of CSISS-sponsored workshops, helping in the launch of our Website (CSISS.org), preparing brochures to advertise the programs (see Appendix E), organizing the first meeting of the Science Advisory Board, discussing and formulating strategies for delivering CSISS Learning Resources, and assisting with the first round of planned Specialist Meetings. In general, my job is to help oversee the integration of CSISS programs toward the common goal of building social science infrastructure. This involves considerable outreach to the social and behavioral sciences, emphasizing the fundamental role that spatial perspectives can play in achieving cross-disciplinary communication and enhanced research.

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. A current project on "the culture of transport and the economy of speed" attempts to understand the social context of transportation development. In February 2000, I received the Edward L. Ullman Award from the Association of American Geographers for Outstanding Career Contributions to Transportation Geography.

#### ***Presentations***

“Issues in Accessibility in the Information Age”, Social Science E\*Space Forum on "Bits and Places: Investigating the Geography of the Information Age", East Lansing MI: Michigan State University, April 2000.

“The Internet Threat to Local Social Capital and Regional Development”, Association of American Geographers, Pittsburgh, PA, April 2000.

“The Internet Threat to Local and Regional Development”, E\*Space V Conference on Digital Development: Assessing the Promise of Information Technology, Cape Town, South Africa, July 1999.

#### ***Publications***

Book:

D.G. Janelle and D.C. Hodge, eds. (2000). *Information, Place, and Cyberspace. Issues in Accessibility* (Berlin and Heidelberg: Springer-Verlag 2000) 381 pages.

Refereed Journal Articles and Book Chapters:

D.G. Janelle and D. Hodge (2000). Information, Place, Cyberspace and Accessibility. In DG Janelle and D. Hodge (eds.). *Information, Place, and Cyberspace. Issues in Accessibility* (Berlin and Heidelberg: Springer-Verlag) 3-11.

D.G. Janelle, (2000). William Warntz, 1922-1988. In P.H. Armstrong and G.J. Martin, (eds.), *Geographers: Biobibliographical Studies*, Vol 19. Commission on the History of Geographical Thought of the International Geographical Union and the International Union of the History and Philosophy of Science (London and New York: Mansell) 102-118.

Non-Refereed Publications:

D.G. Janelle and D.C. Hodge, eds. (1999). *Measuring and Representing Accessibility in the Information Age*. NCGIA Varenius Report (Santa Barbara: National Center for Geographic Information and Analysis (March) 61 pages.

In Press:

D.G. Janelle and M. Beuthe Globalization and Transportation: Contradictions and Challenges. In W. Black and P. Nijkamp (eds.), *Social Change and Sustainable Transport*, (in press 2000).

D.G. 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*, (in press 2000).

D.G. Janelle, Time-space, in Geography. In N.J. Smelser and P. Baltes ( eds.). *International Encyclopedia of the Social and Behavioral Sciences* (Amsterdam: Pergamon - Elsevier Science, in press, 2001).

D.G. Janelle, Transportation. In B. Feintuch and D. Watters (eds.). *Encyclopedia of New England Culture* (New Haven: Yale University Press, in press, 2000).

### **Richard Appelbaum, co-P.I.**

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, and the formation of industrial districts.

This work has recently come to fruition with the publication of a book which reflects 10 years of research into the Los Angeles garment industry: *Behind the Label: Inequality in the Los Angeles Apparel Industry* (with Edna Bonacich, University of California Press), and "The Los Angeles Apparel Industry: A New Ethnic Flashpoint?." (One brief summary of this work is found in the chapter on Los Angeles I contributed to the *Catalogue* for the Smithsonian Institution exhibit *Between a Rock and a Hard Place*," which was on display at the Museum of Tolerance in Los Angeles between mid-November and mid-April 20. In addition to analyzing the sources of growing inequality in an industry that accounts for an estimated 10 percent of Los Angeles' economy, this research sought to explain why Los Angeles has seen a significant increase in apparel industry factory work. In an industry

that has lost hundreds of thousands of workers to offshore production in the last 20 years, Los Angeles remains a puzzling exception: there are now an estimated 120,000 garment workers laboring in as many as 6,000 small factories throughout Los Angeles county.

While there are many reasons for this (for example, the presence of a large, undocumented, low-wage immigrant workforce), one important reason is spatial in nature: the fact that the Los Angeles 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. This enables 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. Moreover, 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. The city's image projects glamour, creativity, innovation, and casual informality. These characteristics combine to create the "California look," casual, yet fashionable, moderately priced sportswear, especially for young women, but also for men as well. There is an important policy implication that follows from the intersection of culture and space in the Los Angeles apparel industry: manufacturers who specialize in fashionable items that require quick turnaround will likely thrive by continuing to produce clothing in Los Angeles, while those that produce high-batch, low-cost items will likely move their factories elsewhere (most likely Mexico). Policy-makers should take note: if they wish to strengthen this important industry, one way would be to provide support for upgrading into more specialized, higher-fashion production.

### ***Presentations***

"Jews and Sweatshops," talk at Santa Barbara Society for Jewish Secular Humanism (May 21, 2000)

"The Working Class at Century's End: Retrospect and Prospect," keynote address at UC Irvine conference on changes in labor at the turn of the Century (May 20, 2000)

"Jews and Sweatshops: The Los Angeles Jewish Commission on Sweatshops," guest sermon at UCSB Hillel Shabbat Services (May 19, 2000)

"Behind the Label," presentation and booksigning at Borders, Santa Barbara (May 18, 2000)

"The Impacts of Growth In Santa Barbara: A Restrospective Analysis," presentation to Santa Barbara League of Women Voters (April 19, 2000)

"The Global 'Race to the Bottom:' What can be Done?" presentation at teach-in on sweatshops, Cal Poly San Luis Obispo (November 30, 1999)

"The Global Apparel Industry: When Retailers Dominate, What Can be Done to Combat Sweatshops?" keynote presentation at The Living Wage Symposium: College Logo Apparel, International Labor Standards and the Living Wage Issue, Robert M. La Follette Institute of Public Affairs, University of Wisconsin-Madison (November 18-21, 1999)

- “Between a Rock and a Hard Place: reflections on the Smithsonian Institution Exhibition at the Museum of Tolerance,” on *Which Way L.A.* (public radio) (November 18, 1999)
- “Global Production, Local Initiative: Responsible Business Practices in an Era of Globalization,” Program on Diversity and Difference: Globalization Revisited, New Academy of Business, Bath, England (November 9, 1999)
- “California’s Future: A Look at the 21st Century,” Discovery Dialogue Symposium, UCSB Interdisciplinary Humanities Center in conjunction with UCSB General Affiliates and Office of Community Relations, Santa Barbara, CA, University Club (October 18, 1999)
- “Challenging Sweatshops,” National Religion-Labor Conference: Forging Partnerships for a New Millennium, National Interfaith Committee for Worker Justice (in conjunction with AFL-CIO national meeting), Los Angeles, CA (October 9, 1999)
- “Behind the Label: Sweatshops Come to Los Angeles in the Global Garment Industry,” Master of Arts in Liberal Studies Program, Dartmouth College Summer Graduate Symposium on “Globalization in the New Millennium” (Hanover, NH, July 21, 1999)
- “Can Workers Organize? Globalization, Flexible Production, and the Decline of Organized Labor,” 34<sup>th</sup> World Congress of the International Institute of Sociology, Tel Aviv, Israel (July 11–15, 1999)

### ***Publications***

- R.P. Appelbaum (forthcoming 2001). *The Normative Order of Global Business Transactions* (ed., with William J. Felstiner and Volkmar Gessner) Hanover, NH: Dartmouth University Press
- Edna Bonacich and Richard P. Appelbaum (2000). *Behind the Label: Inequality in the Los Angeles Garment Industry*. Berkeley, CA: University of California Press.
- R.P. Appelbaum (2000). Moving Up: Industrial Upgrading, Social Networks, and Buyer-driven Commodity Chains in East Asian Chinese Business Firms, *International Studies Review*, vol. 3, no. 1 (winter 2000)
- Goodchild, Michael F., Luc Anselin, Richard P. Appelbaum, and Barbara Herr Harthorn (2000). Toward Spatially Integrated Social Science, *International Regional Science Review* 23:2 (April):139-159.
- R.P. Appelbaum (1999-2000). The Los Angeles Apparel Industry: A New Ethnic Flashpoint?, *Catalogue: Between a Rock and a Hard Place*,” Smithsonian Institution exhibit at the Museum of Tolerance, Los Angeles (November 15, 1999–April 20, 2000)
- R.P. Appelbaum (1999). Report of the Los Angeles Jewish Commission on Sweatshops, Los Angeles, California: American Jewish Congress and LAJCS (January)
- R.P. Appelbaum (1999). Economic Governance and Industrial Location: Garment Production in East Asia (with David Smith). In Hyuk-Rae Kim, *Asian Industrial Governance: States, Societies and Cultures in Comparative-Historical Perspective*. Seoul, Korea: Asia Research Fund (March)
- R.P. Appelbaum (1999). Moving Up: Industrial Upgrading, Social Networks, and Buyer-driven Commodity Chains in East Asian Chinese Business Firms, pp. 15-31. In *Asian*

*Industrial Governance: Conference Report* (Seoul, Korea, Ewha Women's University, May 14)

Richard P. Appelbaum and Peter Dreier (1999). The Campus Anti-Sweatshop Movement, *The American Prospect* (September-October): 71-78

Richard P. Appelbaum and Leonard I. Beerman, (1999). California Has an Opportunity to End Sweatshop Conditions, *The San Francisco Chronicle* (July 13, 1999): editorial, p. A21

Richard P. Appelbaum and David Smith (forthcoming) Governance and Flexibility: The East Asian Garment Industry. In Frederic C. Deyo and Eric Hirshberg, *Economic Governance and Flexible Production in Asia*. Ithaca, NY: Cornell U Press

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

Luc Anselin's research and teaching pertain to the incorporation of spatial effects (spatial autocorrelation and spatial heterogeneity) in statistical and econometric methods and their dissemination in the form of software tools. These activities are closely intertwined with the three CSISS programs related to *software tools* (which Anselin directs), *advanced workshops* and *learning materials*. During the period covered by this annual report, this research has been applied to a number of substantive areas in social science, and led to several journal articles and book chapters, as well as a number of conference and other presentations, as listed in detail below. Specifically, this research has focused on four major substantive areas:

- *The spatial patterning of homicides* (in part supported by a grant from the National Consortium on Violence Research, NCOVR); joint research with sociologist Steve Messner and his co-workers (SUNY Albany). The application of exploratory spatial data analysis (ESDA) techniques to the assessment of clustering and diffusion of homicides led to an article in the *Journal of Quantitative Criminology*, a Web-based digital atlas and a number of working papers, currently under review.
- *Spatial externalities in university research and development*; joint research with economists Attila Varga (Economic University Vienna) and Zoltan Acs (University of Baltimore). This work focuses on the extension of spatial econometric techniques to deal with discrete data across space as well as over time. Initial work has applied standard econometric methods to this issue, yielding a paper forthcoming in *Growth and Change* and a number of working papers, currently under review.
- *Spatial econometric models of the interaction between demographic phenomena and deforestation* (in part supported by NASA); joint research with demographer Charles Wood (University of Florida) and geographer Bob Walker (Michigan State University). This research deals with the combination of ESDA and spatial econometrics to infer causal factors underlying Amazon deforestation and its interaction with demographic phenomena such as migration and changes in household size. This resulted in an article that appeared in *World Development*, as well as a number of conference presentations and manuscripts in progress.

- *The problem of ecological inference in political analysis*; joint research with political scientist Wendy Tam Cho (University of Illinois). This research focuses on the way in which spatial effects such as spatial autocorrelation and spatial heterogeneity affect recently suggested solutions to the ecological inference problem, with specific applications to political analysis. It has resulted in a book forum essay forthcoming in the *Annals, Association of American Geographers*, a working paper (currently under review) as well as a number of conference and colloquium presentations.

In addition to these specific research activities, Anselin has authored and co-authored as well as presented a number of general statements regarding the future of spatial analysis and its integration into the methodological apparatus of the social sciences. These have appeared in the *Journal of Geographical Systems*, the journal *Geographic Information Sciences* and the *International Regional Science Review*.

### ***Software Tools***

Software tools development involved further refinement of the SpaceStat software for spatial data analysis and in particular the DynESDA extension for ArcView, which implements dynamically linked windows for exploratory spatial data analysis. The extension has been made freely available from the SpaceStat Web site. In addition to specific software development, Anselin edited a special issue of the *Journal of Geographical Systems* devoted to “Computing Environments for Spatial Data Analysis” that includes several papers dealing with specific software contexts in which spatial data analytical methods are integrated with geographic information systems, ranging from proprietary software tools to open source software. The software tools activities also involved further research into algorithmic development, particularly with respect to the analysis of very large data sets. A new implementation of maximum likelihood estimation of spatial autoregressive models is forthcoming in the journal *Computational Statistics and Data Analysis* (Smirnov and Anselin). These new methods will be implemented in the software tools developed as part of the CSISS project.

### ***Workshops***

Anselin continues to teach a workshop on spatial data analysis that has been part of the Summer Program in Quantitative Methods of the Interuniversity Consortium for Political and Social Research (ICPSR) at the University of Michigan. As part of the CSISS workshop activities, the format was changed to two one-week workshops, one introductory (“Introduction to Spatial Data Analysis”) and one advanced (“Spatial Regression Analysis”). These workshops are held through ICPSR with co-sponsorship from CSISS. The introductory workshop was held May 22-26 at the University of Illinois, Urbana-Champaign. Twenty participants attended it from a range of academic disciplines as well as from the public and private research sector.

### ***Learning Materials***

As part of the reorganization of Anselin’s ICPSR workshops, a new set of learning materials was developed, consisting of lecture overheads in Powerpoint format, exercises and sample data sets. These materials are being made available over the Web and integrated within CSISS overall learning materials program.

### ***Presentations***

Approaching the millennium: new paradigms for social science research, 24<sup>th</sup> Biennial Meeting of the ICPSR Official Representatives, Ann Arbor, MI, Oct. 14–17, 1999: “*The Center for Spatially Integrated Social Science.*”

46<sup>th</sup> North American Meetings of the Regional Science Association International, Montreal, Canada, Nov. 11–14: “*Toward Spatially Integrated Social Science,*” “*Spatial Econometric Issues in the Analysis of Amazon Deforestation*” (with C. Wood, D. Skole and S. Perz), “*Space-Time Patterns in the Knowledge Production Function for High Technology*” (with A. Varga and Z. Acs).

Department of Agricultural and Consumer Economics, University of Illinois, Urbana-Champaign, Departmental Seminar, Dec. 3, 1999: “*Space-Time Patterns in the Knowledge Production Function for High Technology*”.

Quantitative Psychology Seminar Series, University of Illinois, Urbana-Champaign, Dec. 6, 1999: “*Exploratory Spatial Data Analysis*”.

Conference on New Methodologies for the Social Sciences: The Development and Application of Spatial Analysis for Political Methodology, Boulder, CO, March 10–12, 2000: “*Spatial Software for Spatial Data Analysis,*” “*Spatial Effects in Ecological Inference*” (with W. Tam Cho).

Quantitative Methods in the Social Sciences (QMSS) Colloquium, University of California, Santa Barbara, CA, May 4, 2000: “*Spatial Effects in Ecological Inference*”

### ***Publications***

Articles in Refereed Journals:

S. Messner, L. Anselin, R. Baller, D. Hawkins, G. Deane, S. Tolnay (1999). The Spatial Patterning of County Homicide Rates: An Application of Exploratory Spatial Data Analysis, *Journal of Quantitative Criminology* 15 (4): 423–450.

L. Anselin (1999). The Future of Spatial Analysis in the Social Sciences, *Geographic Information Sciences* 5 (2): 67–76.

M. Goodchild, L. Anselin, R. Appelbaum, B. Harthorn (2000). Towards Spatially Integrated Social Science, *International Regional Science Review* 23 (2): 139–159.

R. Walker, E. Moran, L. Anselin (2000). Deforestation and Cattle Ranching in the Brazilian Amazon: External Capital and Household Processes, *World Development* 28 (4): 683–699.

L. Anselin (2000). GIS, Spatial Econometrics and Social Science Research, *Journal of Geographical Systems* 2 (1): 11–15.

Accepted/forthcoming/in press 7/99–6/00:

L. Anselin (2000 in press). Computing Environments for Spatial Data Analysis, *Journal of Geographical Systems* 2 (3).

S. Bao, L. Anselin, D. Martin, D. Stralberg (2000 (in press)). Seamless Integration of Spatial Statistics and GIS: the S-Plus for ArcView and the S+Grassland Links, *Journal of Geographical Systems* 2 (3).

L. Anselin, Rao’s Score Test in Spatial Econometrics, *Journal of Statistical Planning and Inference*, (forthcoming).

- O. Smirnov and L. Anselin, Fast Maximum Likelihood Estimation of Very Large Spatial Autoregressive Models: A Characteristic Polynomial Approach, *Computational Statistics and Data Analysis* (forthcoming)
- L. Anselin, The Alchemy of Statistics, or Creating Data where No Data Exist, *Annals, Association of American Geographers* 90 (3), 2000 (forthcoming).
- L. Anselin, A. Varga, Z. Acs, Geographic Spillovers and University Research: A Spatial Econometric Approach, *Growth and Change* (forthcoming).
- Articles in Books:
- L. Anselin, J. Cohen, D. Cook, W. Gorr, G. Tita, Spatial Analyses of Crime, In David Duffee (ed.), *Criminal Justice 2000: Volume 4. Measurement and Analysis of Crime and Justice*. Washington, DC: National Institute of Justice (in press).
- L. Anselin, Spatial Econometrics, In B. Baltagi (ed.), *Companion to Econometrics*. Oxford: Basil Blackwell (forthcoming).
- Other Publication Outlets:
- S. Messner, L. Anselin, D. Hawkins, G. Deane, S. Tolnay, R. Baller (2000). *An Atlas of the Spatial Patterning of County-Level Homicide, 1960-1990*. Pittsburgh: NCOVR (<http://www.ncovr.heinz.cmu.edu/>).

### **Helen Couclelis**

An increasingly important part of my research deals with the geography of the information society. There is hardly a social science that has not been touched by the effects of the momentous reorganization of human activity and interaction brought about by modern information and communication technologies. The globalization of the economy and ongoing regional economic restructuring has been made possible through these technologies. Social networks, the meaning of community and place, the mechanisms of spatial segregation, institutional and political structures and processes, education, interpersonal communication, the definition of deprivation and advantage have all been affected to some degree by the increasing ability of key people and institutions to engage in particular activities (almost) ‘anywhere, any time’. Within this very broad social science research domain my own work has focused on how traditional notions of accessibility are being transformed in the information society. My contribution to that theme (originally part of the NCGIA/ Varenus project) has been the development of the notion of the fragmentation of activity, i.e. the observation that socioeconomic activities that used to be tied to particular places and times (e.g., work at the workplace 9–5 on weekdays), are now increasingly distributed across several places at several different times. Following the initial presentation of that work at an NSF/ESF-sponsored workshop last year I was invited to give three additional talks and a public lecture on that topic to audiences primarily outside geography. Current research plans along these lines include the investigation of e-commerce as an instance of the fragmentation of (shopping) activity, and its implications for retail job loss or gain in urban areas.

My second major research focus, supported by a different NSF grant, involves developing an integrated modeling environment for urban change research. Urban change is of course also a cross-disciplinary theme that involves several social sciences (economics, regional science, sociology, political science, etc) as well as several environmental sciences and engineering disciplines such as transportation and infrastructure planning. The purpose here is to develop concepts and tools that can facilitate such cross-disciplinary study of urban change, using the spatio-temporal angle as the integrative dimension for both scientific research and communication with policy makers.

### ***Presentations***

"Accessibility in the Information Age". Ida Beam 2000 Distinguished Lecture, University of Iowa, 5 May 2000.

"Accessibility in the Information Age". Geography Department Colloquium, UCLA, 19 May 2000.

### ***Publications***

H. Couclelis (2000). From Sustainable Transportation to Sustainable Accessibility: Can We Avoid a New Tragedy of the Commons? In D.G. Janelle and D.C. Hodge (eds.), *Information, Place, and Cyberspace. Issues in Accessibility* (Berlin, Heidelberg: Springer-Verlag), 341-356.

## **Barbara Herr Harthorn**

Dr. Barbara Herr Harthorn is involved as a co-principal investigator in a collaborative Public Participation GIS (PPGIS) project examining conflict at the urban-rural interface over environmental health (pesticide exposures) and the uses of PPGIS to inform the community and move toward equitable resolution of conflict. The project is sited in the agricultural area of north Santa Barbara County. Dr. Harthorn is the medical anthropologist on the project and is directing the accessing and analysis of ICD-9 diagnoses being used to assess the health status of the community, and serving as the primary contact with the public health department and regulators. The GIS being developed for public dissemination will include socio-demographic, meteorological, agricultural, air quality, and other data in addition to the health data, as they become available. Funding will be sought in the coming year to collect primary health and perception of risk data on the community and to expand the GIS and its dissemination.

Dr. Harthorn also in 1999–2000 organized and led a new UCSB faculty reading group on medical anthropology. The readings for the year focused on social and behavioral science analysis of risk and perception of risk, with a special interest in their spatial aspects.

### ***Presentations***

"Chemical exposures, pregnancy, and newborn health among Mexican-born farmworkers in rural California" Society for Applied Anthropology, panel on "Occupational Health Issues among Immigrant Workers" Tucson, AZ April 1999

"Reproductive health and temporalities: Stratified reproduction in the US" Discussant at American Anthropological Assoc. meetings, invited panel, "It's about time: Integrating a temporal perspective into reproductive research" Nov/99

"Community conflict at the agricultural-urban interface: Concerns over the health effects of agricultural pesticides."

Herr Harthorn, B. & S. Stonich Paper presented at the Society for Applied Anthropology, San Francisco, CA, March 21-25. Mar/00

### ***Publications***

B. Herr Harthorn (1999). Review of *The Anthropology of Infectious Disease*. Marcia Inhorn and Peter Brown, eds. (1997). *Journal of Political Ecology*, vol. 6, [http://www.library.arizona.edu/ej/jpe/volume\\_6/inhornvol6.htm](http://www.library.arizona.edu/ej/jpe/volume_6/inhornvol6.htm)

M. Goodchild, L. Anselin, R. Appelbaum, & B. Herr Harthorn (2000). Toward spatially integrated social science, *International Regional Science Review* 23(2):139-159.

S. Guendelman, C. Malin, B. Herr Harthorn, P. Vargas (under review) Orientations to motherhood among pregnant Mexican and Mexican-origin women: A bi-national study, *Social Science and Medicine*

## **Terence R. Smith**

Terrance R. Smith is Professor of Geography and Professor of Computer Science at UCSB. He directs the Alexandria Digital Library Project and is PI on a five-year award to develop the Alexandria Digital Earth Prototype (ADEPT) under NSF/NASA/ARPA's DLI-2 program.

Current research involves modeling fluvial phenomena; computational modeling systems; spatial database systems; and the design, development, and testing of digital libraries for scientific and geo-referenced information.

### ***Publications***

Hill, L.L., Dolin, R., Rae, M-A., Carver, L, Frew, J., Larsgaard, M., and Smith, T.R. (1999). Alexandria Digital Library: User evaluation studies and system design. *Journal of the America Society for Information Science*

Frew, J. Freeston, M. Freitas, N, Hill, L., Janee, G., Lovette, K., Nideffer, R., Smith, T.R., and Zheng, Q. (2000). The Alexandria Digital Library Architecture. *International Journal of Digital Libraries* (forthcoming).

Smith, T.R. Merchant, G.E., Birnir, B. (2000). Transient Attractors: Towards a Theory of the Graded Stream for Alluvial and Bedrock Channels. *Computers and Geoscience* (forthcoming).

## Stuart Sweeney

My research activities over the past year were broadly compatible with current priorities of CSISS. Continuing research efforts included work on state occupational employment forecasting, funded by the U.S. Department of Labor, and extending results of a U.S. Economic Development Administration project focusing on out-migration and depopulation in the Mountain West and Great Plains regions. Papers resulting from the research were presented at the Western Regional Science meetings in Poipu, Kauai, the Population Association of America meetings in Los Angeles, CA, the UCLA Geography Colloquium, and at a meeting of the Long-Term Projections Working Group from the U.S. Bureau of Labor Statistics. The research also carried over to the classroom as the primary focus of a graduate seminar on regional modeling. The spatial models employed in this work are categorical data models of interregional migration. Currently work is underway to extend these models to the space-time domain and to overcome incomplete data problems with the use of model schedules.

I was awarded a National Science Foundation grant from the Division of Geography and Regional Science in the Spring. The NSF research project, titled "The Clustering of U.S. Business Enterprises in the 1990s," is a collaborative effort with Ed Feser at the University of North Carolina at Chapel Hill and will run for two years. The research is using spatial point process models and confidential employment records housed in the U.S. Bureau of Labor Statistics in Washington, DC and at the Census Data Research Centers at UCLA and Duke.

I have also been active in the social science community at UCSB as the geography faculty affiliate/ student advisor for the new *Quantitative Methods for Social Sciences* graduate emphasis. In this capacity, I have been working with colleagues from sociology, economics, statistics, psychology, education, and political science to develop an interdisciplinary training program for quantitatively oriented social science graduate students.

Finally, I have participated in two CSISS-sponsored workshops. The first was the Spatial Methodologies for Political Science at the University of Colorado, Boulder and the second was the Perspectives on Spatial Analysis in the Social Sciences workshop at the University of Washington.

### ***Presentations***

- 1999 "Planning Decline: Lessons from Nation's Heartland." UCLA, Department of Geography, Colloquium
- 2000 "Planning Decline: Lessons from Nation's Heartland." Population Association of American, Annual Meeting, Los Angeles.
- 2000 "An account-based labor supply sub-model for regional occupational employment projections: enhancing the direct-requirements approach.." Western Regional Science Association Conference, Poipu, Kauai

***Publications***

Articles in Refereed Journals:

E. Feser and S. Sweeney (2000). A Test for Coincident Economic and Spatial Clustering Among Business Enterprises, *Journal of Geographical Systems* (forthcoming)

Technical Report -

H. Goldstein and S. Sweeney (1999). Alternative Demo-Economic Specifications for State Industry-Employment Projections, Technical Report to U.S. Bureau of Labor Statistics

## Appendix A

### Joint sessions of the Advisory Board and the CSISS Executive (May 5–6, 2000)

**Present from Science Advisory Board:** B. Berry, R. Berk, J. Dangermond, A. Glasmeier, C. Kohfield, N. LaVigne, A. Moran, B. Turner, M. Ward

**Present from CSISS:** L. Anselin, R. Appelbaum, M. Goodchild, B. Herr-Harthorn, D. Janelle, K. Kemp, T. Smith (6 May only), S. Sweeney, and A. Caschetta

#### The Agenda:

##### Friday, 5 May

Science Advisory Board in Executive Session

Science Advisory Board and CSISS meet jointly

- Welcome by M. Goodchild.
- Introduction to objectives, structure, and history of CSISS (Goodchild)
- Overviews of CSISS Programs
  - Workshops (Janelle)
  - Tools (Anselin)
  - Virtual Community (Goodchild and Caschetta)
  - Best Practices (Goodchild)
- Demonstrations at UCSB (National Center for Geographic Information and Analysis and the Alexandria Digital Library)
- Reception with Chancellor H. Yang

##### Saturday, 6 May

Science Advisory Board in Executive Session

Science Advisory Board and CSISS meet jointly

- Overviews of CSISS Programs
  - Learning Resources (Kemp)
  - Place-Based Search (Smith)

Science Advisory Board in Executive Session

Science Advisory Board Summary to the CSISS Executive Committee

#### Discussion on Introduction:

“The Question” from the Board: If after 5 years CSISS is judged a success, what problem will have been solved? Concern was expressed that social scientists have not accepted that variance across space really matters in what they do. Some may be hostile to the CSISS initiative, limiting its role to serving only the already committed. Other key questions relate to the potential tension between GIS (the technique) and “thinking spatially”, and in figuring out how to build new structures in the social sciences.

**Discussion on Workshops:**

Possible workshop topics were considered. These included workshops on spatial sampling and on spatial externalities. While economists are turning to space as a way of handling externalities, they are not always using the approaches of spatial analysis. It was also suggested that CSISS might wish to explore parallels in science that might be transferable to the social sciences. One example might be developments in protein/biochemical models.

**Discussion on Tools Development:**

Concern was expressed that a proposed survey of user needs might divert limited funds from tools development, and that it might be more useful to concentrate on adding space and time to current software, and on expanding econometric options, routines for panel data, probit models, and other innovations.

**Discussion on Best Practices:**

Concern for the use of the term 'best practices' was a focal point of discussion. Alternative terms were considered, one being "Documenting Good Spatial Science." The position of the Board was that CSISS might want to shift the emphasis of awards from implementing new research to finding existing exemplary research and leveraging it for the development of Learning Resources and special publications (case studies). It was also suggested that inviting scholars to participate might yield a higher return than soliciting proposals.

**Discussion on the Virtual Community:**

Concerns were raised about the desirability of including Hotlines that might quickly deplete the human resources of CSISS with little gain in the broad dissemination of spatial thinking in the social sciences. Similarly concerns were raised about managing extensive Bulletin Board structures. One important issue concerns how CSISS can identify those who do not use CSISS.org, but who might benefit from its offerings. Other questions related to the design of the Website, including the importance of Web links, capturing the good features of outstanding Websites (e.g., Nature), the desirability of imbedding terms that will be picked up by standard Web search engines, and putting special attractive things on the first page.

**Discussion on Space-Based Search**

Given that the Alexandria Digital Library and the ADEPT initiative have been oriented to the physical sciences and library sciences, the overriding issue for CSISS is to see that the needs of social scientists are also considered.

**Discussion on Learning Resources**

The concept of building an idealized course on spatial analysis in the social sciences was viewed with interest and it was thought that the content outline might be possible by the end of year 2000. This would add an element of structure and purpose to the enterprise. There was a question raised on whether or not workshops represented a

suitable vehicle for generating learning resources. Alternative types of learning resources were reviewed.

The addition of **Specialist Meetings** to the package of CSISS programs was introduced via a proposal from Trevor Harris and Karen Kemp for a specialist meeting to link scholars concerned with social and cultural resources with GIS and other analytic tools – moving the technology to serve the qualitative needs of the humanities. The idea of introducing specialist meetings was seen as an option that provides very good exposure for CSISS and direction for organizing workshops and learning resources. However, there was a debate regarding a specialist meeting focused on the humanities. Are the humanities operating totally outside the social science paradigm or is the boundary more permeable?

#### **Final discussion between the Board and the CSISS Executive:**

The “**Way Forward Template**” presented for the Board by Billy Lee Turner stressed the need to push the core concept of spatial ‘thinking’ in the social sciences. Their recommended model sees **Specialist Meetings** driving the process – based on key concepts instead of methods. Learning Resources and Best Practice examples, tools development are to be derived from these meetings. The process might culminate in year 5 with an **International Conference** that helps to codify the **New Spatial Social Science**. This might demonstrate the value of CSISS (supplemented with documented impact measures) and the rationale for its continuation for a renewed round of funding beyond the five years. Diffusion of spatial analysis in the social sciences is seen as the product. The conference might be used to **launch a new academic society and/or journal** to service the community. Proceedings from the conference might be featured in the Proceedings of the National Academy of Sciences (Brian), and the Committee on Geography may be able to offer assistance.

#### **Other recommendations from the Board:**

- Use the Web as a vehicle for outreach (news and information); its role as a delivery vehicle should be limited
- CSISS needs to establish greater interdisciplinary collaboration at the local UCSB level.
- The Executive should attend meetings of diverse organizations – listening to their problems and determining the leadership to draw upon. This is most important in the initial years of the Center.
- The Board should be drawn on to participate in outreach. They seek active involvement in the programs of CSISS.
- The establishment of an internal bulletin board on CSISS.org for the exclusive use of the Board of Advisors would be very helpful. CSISS is encouraged to post its plans for Specialist Meetings, Best Practices, and other initiatives on this bulletin board for Board discussion and reaction.
- For specialist meetings, include among participants some important scholars who are not yet users of spatial perspectives.

## Appendix B

### Minutes of Science Advisory Board (May 5-6, 2000)

Notes compiled by **Abby Caschetta** on behalf of the CSISS Advisory Board.

Present: B Berry, R Berk, J Dangermond, A Glasmeier, C Kohfield, N LaVigne, A Moran, B Turner, M Ward

Friday, May 5, 2000

1. CSISS is a dissemination effort with synergy or technology transfer?  
Focus at UCSB is narrow with a large investment in GIS. What needs to be done to broaden it?
2. What is the role of space in analysis? What are the key issues with integrating it?  
Focus must draw activity to meet those issues and break the paradigms. What new science can we do and what new tools can we develop?
3. No clear conceptions of the problem. Why don't social sciences use this technology? What is the entry barrier? (quantitative / transfer to GIS / perception of GIS).  
Need a mechanism to monitor and a design for evaluation.
4. Workshops – preset community will relate to the programs while many will overlook them. Need to select key people and topics.
5. Agree that the target audience should include graduate, post doc, untenured faculty
6. Workshops and Best Practice examples are important areas of programs. Should consider special issues publications illustrating / applying various techniques.  
Utilize key people as sparks for inspiration.
7. CSISS – four key processes
  - a. outreach
  - b. creating new knowledge
  - c. capitalizing and synthesizing the work
  - d. diffusion of knowledge

Saturday May 6, 2000 - Afternoon Session

1. Empirical vs. theoretical approaches and the blending of the two over time. Beyond tools and technology into the theoretical development to enable growth in social sciences.
2. Disconnect between the proposal description and presentation/behavior. What do you lead with? Need the breadth and nuances of the issues driving social sciences represented in the group for the appropriate engagement with the correct community
3. Success = how results change the core concepts in social science
4. What is the image of success in 5 years? Culmination with measurable results.

- a. final conference sponsored by CSISS (planned up front with focus on measures of success)
- b. spatial articles in conferences and journals
- c. publications on spatial topics in the social sciences
- d. books
- e. courses and materials with spatial domain
- f. new initiative for NSF
- g. new research community

5. Priorities of activities:

- a. Modestly enlarge the Advisory / Executive committee to cover the SS
- b. Advisory and Executive - Identification of 3-4 critical themes/year (key concepts / theory in SS)
- c. Web to hook, populate and create community
- d. Problem-oriented specialty meetings of critical players.  
Players must be people with access to dissemination devices.
- e. Informative training workshops. (centralized vs. distributed workshops / product production) Utilize ICPSR as a vehicle?
- f. Development of tools / software / methods based on insight from workshops
- g. Educational materials
- h. Web dissemination of resources

Steps d, e & f: Must have built in dissemination devices e.g. special issue journal.

Best Practice Examples

- proposal to split funds to hit more targets
- focus targets to works in progress or near completion
- competitive awards?

Illustrative Problems/ Themes (? = is there a recognized spatial component)

1. Externalities / Econ
2. Biogeophysical / human interface (e.g., water cycle / land change)
3. Risk theory / Vulnerability theory
4. ? International Conflict (e.g., diffusion)
5. ? Plot to pixel
6. ? “conceptual problem” – Census 2000
7. ? Electoral process / theory