

**North American  
Cartographic Information  
Society**

**NACIS**



W E L C O M E

Welcome to the 24<sup>th</sup> meeting of the North American Cartographic Information Society. It was a pleasure putting together this program because people from all reaches of NACIS volunteered to present papers, make posters, nudge along discussion-style sessions, and organize carto-entertainments. It was tough for me to set up concurrent sessions—I myself would like to be in two places at once each day of the conference—and you may feel the same as you look at this program. Luckily most every discussion overflows from the sessions into the casual moments of the conference. If you are new to NACIS, be assured, you will be swept into conversation about maps and mapping at the social events and in the hallways.

I hope you are reading this before Wednesday's opening session, when we will have the pleasure of Joseph S. Wood speaking on the New England Village. Joe is Provost and Vice President for Academic Affairs, University of Southern Maine. Yolanda Theunissen, Curator at the Osher Library, will talk Thursday about the library's map collection in anticipation of the evening's social event at the library. Friday night, Robert Nannay will send us off dazzled by his world-ranging slide show. I am deeply appreciative of the attention these busy local people are giving to NACIS.

It is a beautiful time to be in Portland, ME and Mike Hermann, local arrangements coordinator, has been working all year to make the Portland experience a good one in and out of the session rooms. Susan Peschel kept track of myriad details and made cheerful accommodation to registrants' special situations. Lou Cross, the Executive Director, handled the negotiations and commitment to the conference location and Jim Anderson prepared conference materials, including this printed program prepared in Florida the month of soon-to-be-legendary hurricanes. I appreciate help and collaboration in decision-making from John Krygier (President) and the rest of the NACIS board.

It is a challenge to our all-volunteer organization to plan Practical Cartography Day annually. Erik Steiner took the active lead in PCD over the summer months, and Glen Pawelski and Dan Van Dorn contributed important early PCD strategizing.

Fritz Kessler willingly reprised his role as poster-session organizer. The poster session in some years has been a bit of a free-for-all. If Fritz's calm organizing makes the poster submission process seem tame, the map gallery has room for your more impulsive map map sharing. Dennis McClendon provided that opportunity for all by getting the map gallery set up.

Enjoy the next few days in Portland. While you are freshly enthused by this conference, why not volunteer to help with next year's? We will have a spectacular 25<sup>th</sup> anniversary conference in Salt Lake City, Utah, October 5-8, 2005.

I so enjoy the intimate scale of the NACIS conference and look forward to talking with each of you over the next few days.

Trudy Suchan  
Program Chair and Vice President

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# S C H E D U L E

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## Wednesday, October 6

8:30—9:30 A.M., Practical Cartography Day Registration  
LOBBY

9:30 A.M.—4:30 P.M., Practical Cartography Day  
VERMONT

*Organizers: Erik Steiner and Glen Pawelski*

9:30 A.M.—Noon  
VERMONT

Exploring Natural Scene Designer 4.0 Pro  
*Tom Patterson, U.S. National Park Service*

Building an International Map: 2D and 3D Methodologies  
*Neil Allen, Allan Cartography, Inc.*

Map Series Management and a GIS–Graphics Communiqué  
*Shaun Faith, e-Education Institute, The Pennsylvania State University*

Photoshop's Inner Truths  
*Alex Tait, International Mapping Associates*

Noon—1:15 P.M., Lunch (provided)  
CASCO BAY HALL

1:15 —2:15 P.M.  
VERMONT

Workflow Management: Juggling Time, Data, and Special Interests  
*Erin Aigner and Laris Karklis, The Washington Post*

Processing and Exporting Elevation Data for Cartographers  
*Michael Hermann and Matt Cote, University of Maine; Jim Sloan, The Pennsylvania State University*

2:15—2:30 P.M., Break (on your own)

2:30 —4:30 P.M.  
VERMONT

Rapid-fire review and critique of attendee's maps  
*Moderator: Steve Spindler*

2:00—7:00 P.M., NACIS Conference Registration  
LOBBY

2:00—5:00 P.M., Poster set-up  
CASCO BAY HALL

*Coordinator: Fritz Kessler*

2:00—5:00 P.M., Map Gallery available for postings  
CASCO BAY HALL

*Coordinator: Dennis McClendon*

3:00—5:00 P.M., NACIS Board Meeting  
LINCOLN

7:30—9:00 P.M., NACIS Opening Session  
CASCO BAY HALL

Representing the New England Village—Places, Maps, and Minds  
*Joseph S. Wood, Provost and Vice President for Academic Affairs, University of Southern Maine*

9:00—11:00 P.M.  
CASCO BAY HALL

Opening Reception and Poster Session

After reception  
Poster presenters move their displays to York

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## Thursday, October 7

8:00 A.M.—5:00 P.M., NACIS Conference Registration  
LOBBY

8:30 A.M.—11:00 P.M.  
YORK

Posters on display  
Map Gallery available for postings

8:30—10:15 A.M.

**A. Representing U.S. Places New and Old**  
VERMONT

*Chair: Gordon Kennedy*

Mapping Suburbia: Tax Assessment Data Provides an Important Sense of Place  
*Mary L. Johnson, Remington & Vernick Engineers*

National Security Sprawl: Targeting the Homeland  
*Deborah Natsios, Natsios Young Architects*

Hawaiian Place Names: Mnemonic Symbols in a Hawaiian Cartography  
*Renee Pualani Louis, University of Hawaii at Manoa*

“The Shape of Ohio” as Seen in Quilts  
*Karen M. Trifonoff, Department of Geography and Geosciences, Bloomsburg University*

## **B. Cognition**

CONNECTICUT/RHODE ISLAND

*Chair: David Patton*

The Neural Basis of Map Comprehension and Spatial Abilities  
*Megan M. Lawrence, Department of Geography, University of Oregon*

Defining the Map Prototype  
*Roberta Williams, Jeffrey Patton (presenter), Elisabeth Nelson, and Rick Bunch, University of North Carolina-Greensboro*

User-Defined Benchmarks for Visualizing Object Movement in a Large Spatiotemporal Database  
*Benjamin C. Sheesley (presenter), Jeff Stone, and Bill Buckingham, Department of Geography, University of Wisconsin-Madison*

Seeing Clusters that Move Over Space and Time II: Comparing Small Multiples With Animation  
*Amy L. Griffin (presenter), University of New South Wales at ADFA; Alan M. MacEachren and Bonan Li, The Pennsylvania State University; and Frank Hardisty, University of South Carolina*

10:30 A.M.—Noon

## **C. Libraries and Information Technology**

VERMONT

*Chair: Jenny Marie Johnson*

Building a Digital Gazetteer for Connecticut  
*Patrick McGlamery (presenter), Information Technology Services; Robert Cromley, Department of Geography and Director, Center for Geographic Information and Analysis; Michael Paluzzi, Department of Geography; all University of Connecticut*

What is the Role of Maps in Web-Services? Geo-communication Under the Influence of an Infrastructural Environment  
*Lars Brodersen, Aalborg University, Denmark*

Cartographic Data on the Web: What's Out There and How to Find It  
*Joanne M. Perry, Maps Library and Cartographic Information Services, The Pennsylvania State University*

Librarian Roundtable (extended discussion)  
*Moderated by Trudy Suchan and Susan Peschel. Librarians founded NACIS 24 years ago. How can we refresh the NACIS experience for librarian members? How can we stir up library topics at the 25th anniversary meeting in October 2005?*

**D. Cartographic Design Old and New**

CONNECTICUT/RHODE ISLAND

*Chair: Patricia Gilmartin*

Representing Oregon's Endangered Salmon

*Ken Kato (presenter) and Erik Steiner, InfoGraphics Lab, Department of Geography, University of Oregon*

Recreational Symbol Design: Where Have We Been and Where Are We Going?

*David Gagner, Humboldt State University and U. S. National Park Service at Harper's Ferry*

Evaluating National Park Service 3D Trailhead Maps

*Tom Patterson, U. S. National Park Service*

The Influence of Classification Choice on Animated Choropleth Maps

*Kirk Goldsberry (presenter), Sara Irina Fabrikant, and Phaedon Kyriakidis, Department of Geography, University of California-Santa Barbara***Noon—1:30 P.M., Luncheon and Annual Business Meeting**

NEW HAMPSHIRE/MASSACHUSETTS

1:45—3:15 P.M.

**E. Map and Art**

VERMONT

*Chair: Denis Wood*

Mapping Desire: The Louisiana Purchase, Lewis &amp; Clark, and Karl Kirchwey's

*The Geographer's Line**Adele J. Haft, Classics at Hunter College: City University of New York*

Modern Map-Like Art, Images Interpreted Through a Perspective Learned from

J. M. Blaut

*Dalia Varanka, U. S. Geological Survey*

Glowlab.com Projects (extended presentation)

*kanarinka, Glowlab Collective***F. History: Today's View of Geographies Past**

CONNECTICUT/RHODE ISLAND

*Chair: Patrick Florance*

"Staid in School and Worked on My Map": 19th Century American Schoolgirl

Cartography

*Judith Tyner, Department of Geography, California State University-Long Beach*

Using GIS to Make Maps of Landscapes that No Longer Exist

*Charlie Frye, ESRI*

Remastering the 1748 Nolli Map of Rome

*James Tice, Department of Architecture, University of Oregon and Erik Steiner (presenter), InfoGraphics Lab, Department of Geography, University of Oregon*

Treasures in the Osher Map Library (extended presentation)

*Yolanda Theunissen, Curator*

3:30—5:00 P.M.

### **G. The NACIS Map-Off**

VERMONT

*Chair: Dennis McClendon*

A handful of cartographers were given a map assignment to be completed in the two weeks before the NACIS conference. A panel of experts and the audience will review and critique the results.

5:00—7:30 P.M., Dinner on Your Own

7:30—10:00 P.M., Osher Map Library Dessert Social

OSHER MAP LIBRARY TOP FLOOR SPECIAL-EVENTS ROOM

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## **Friday, October 8**

8:00—10:00 A.M., NACIS Conference Registration

LOBBY

8:30 A.M.—Noon

YORK

Posters on display  
Map Gallery available for posting

8:30—10:15 A.M.

### **H. GIS and the Cartographic End Result**

VERMONT

*Chair: Margaret Pearce*

Open Source Cartographic Software: Where Does the Ethical Meet the Practical?  
*Frank Hardisty, University of South Carolina*

Canadian Century Research Infrastructure Project: Using GIS for Historical Census Data  
Mapping and Analysis  
*Byron Moldofsky, Cartography Office, Department of Geography, University of Toronto*

Mapmaking for the *Census Atlas of the United States*  
*Alex Tait, International Mapping Associates*

From GIS to Graphics Software: When Do You Bail? (extended presentation)  
*Cynthia A. Brewer, Department of Geography, The Pennsylvania State University and  
Charlie Frye, ESRI, Inc. (co-presenters)*

**I. Plan Then Map**

CONNECTICUT/RHODE ISLAND

*Chair: Fritz Kessler*

Census Field Mapping on a Mobile Computing Device

*Andrew McIntire, Geography Division, U. S. Census Bureau*

Database and Application Design Considerations in Automated Map Production

*Miguel Garriga, Geographic Systems, LLC*

Cartographic Design and Production Issues of the 108th Congressional District Wall Map Series

*Linda Orsini, Geography Division, U. S. Census Bureau*

Toward Historical GISs: Issues in the Design and Implementation of a GIS for Nantucket, Massachusetts 1950–2000

*Alberto Giordano (presenter) and Alexis Buckley, Department of Geography, Texas State University*

10:30—Noon

**J. Exploiting Computing Resources for Cartography**

CONNECTICUT/RHODE ISLAND

*Chair: Frank Hardisty*

Visualizing Reliability and Veracity of Historical Townplans

*Elwin Koster, Department Humanities Computing, Groningen University, the Netherlands*

Cartography Supporting Computer Simulation for Analysis

*Jed Marti, ARTIS LLC*

Interpreting Spatial Statistics with Maps: The Case of Geographically Weighted Regression

*Jeremy Mennis, Department of Geography and Urban Studies, Temple University*

Cloudy Day Illumination of LIDAR Data

*Patrick J. Kennelly, Department of Earth and Environmental Sciences, CW Post Campus of Long Island University and James Stewart, School of Computing, Queen's University***K. Technical Roundtables**

VERMONT

*Chair: John Krygier*

Printer's Point of View (extended presentation)

*Mike Fredericks, Account Manager; Shawn Anderson, Prepress Technical Support; Tim Cochran, Paper/Stock specialist, J. S. McCarthy Printers*

Cartographic Software Roundtable (extended discussion)

Discuss, dissect, and delight in details of current software used by cartographers. Bring, among other things, questions that the print experts (above) can contribute to

Noon—1:30 P.M., Lunch—on your own

**Cartographic Perspectives** Editorial Board Meeting

MASSACHUSETTS

1:30—3:15 P.M.

### **L. Map Symbolization**

VERMONT

*Chair: Trudy Suchan*

Views of the Rivers, Representing Hydrologic Data of the Greater Yellowstone Ecosystem

*Eric Richard Strandhagen, Department of Geography, University of Oregon*

Maps with no Limits: Mapping Undefined Areas

*Dennis McClendon, Chicago Cartographics*

Revising the Subway Map of New York City (extended presentation)

*Eddie Jabbour, Kick Design*

### **M. Cartographic Guides**

CONNECTICUT/RHODE ISLAND

*Chair: R. Maxwell Baber*

Lessons Learned: Reflections on Coauthoring *Thematic Cartography and Geographic Visualization*

*Fritz Kessler, Frostburg State University*

Writing and Illustrating *Practical Cartographic Production*

*Malcom Hermann, Municipal Publications*

From Direct Actor to Engaged Guide: Developing a Manual of Mapping Conventions for a World Wide Conservation Organization

*Mark Denil, Center for Applied Biodiversity Science, Conservation International*

Mapping by Degrees: Enhancing Liberal Arts Education with Geographic Information Systems

*R. Maxwell Baber, Samford University*

3:30—5:00 P.M.

### **N. Modeling Cartographic Data in the ESRI Environment**

CONNECTICUT/RHODE ISLAND

*Chair: Ken Kato*

Resolution and Representing Physical and Topographic Features at Different Scales  
*Barbara Buttenfield, Department of Geography and Meridian Research Lab, University of Colorado*

Modeling GIS Data for Cartography Versus “Reality”

*Aileen Buckley, ESRI*

Cartographic Models in GIS for Naturally Fuzzy Features (Named Marine Water Bodies, Islands, and Landforms & Physiographic Regions)

*Charlie Frye, ESRI*

**O. Open Session on ICA**

VERMONT

*Overview and Q&A led by Cynthia Brewer*

The International Cartographic Association meets in 2005 in A Caruña, Spain, July 9-16. The U. S. National Committee to ICA encourages you to present your work on U. S. cartography or GIS in Spain next summer. Abstracts are due November 1, 2004 ([www.icc2005.org](http://www.icc2005.org)). Please also send a copy of your submitted abstract to Cindy Brewer ([cbrewer@psu.edu](mailto:cbrewer@psu.edu)), USNC Committee Chair ([www.usnc-ica.org](http://www.usnc-ica.org)). At this informational session at NACIS, Cindy will tell you about the meeting, discuss presentation ideas, and talk about travel funds.

*Followed by . . .*

Geo Skills Games

*Chair: Dale Sanderson*

3:30—6:00 P.M., NACIS Board Meeting

LINCOLN

6:30 P.M., Annual Banquet

VERMONT

Doctor Bob's Planet Earth Review

*Bob Nannay, Department of Technology, University of Southern Maine*

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**Saturday, October 9****Workshops**

9:00 A.M.—1:00 P.M., What's New for Cartography in ArcGIS 9.0

WORKSHOP IN HOTEL

*Cory Eicher, ESRI*

Learn about new features and functionality for cartography in ArcMap and ArcGIS 9.0. Topics covered will include: text labeling and annotation, Maplex for ArcGIS, variable depth masking, working with elements and the map layout, and map exporting and printing.

9:00 A.M.—4:30 P.M., Creating Interactive Maps with SVG

UNIVERSITY OF SOUTHERN MAINE, GORHAM CAMPUS

*Brandon Plewe, Brigham Young University, Department of Geography*

Scalable Vector Graphics (SVG) is a web standard for interactive vector graphics that is gaining popularity as a way to put high quality, interactive maps on the Internet. This day-long workshop will give participants a hands-on introduction to the standard and how to use it for cartography. Note: lunch is on your own.

**Field Trips**

9:00 A.M.—4:00 P.M., "Insider" Tour of DeLorme Mapping followed by Freeport shopping. Lunch on your own.

## Opening Session

### Representing the New England Village—Places, Maps, and Minds

Joseph S. Wood, Provost and Vice President for Academic Affairs, University of Southern Maine

Joe is a cultural geographer interested in how people make places and landscapes. He has taught at the University of Nebraska at Omaha and George Mason University in Northern Virginia, where he was also Vice Provost for Academic Affairs. He has been a visiting professor at South China Normal University in Guangzhou, China, and in 2001, he lectured on an educational tour in Cambodia and Vietnam. At the University of Southern Maine, he serves as Vice President for Academic Affairs and Provost, the chief academic officer of the University. Joe's presentation to NACIS comes from his research on New England village morphology and iconography and how understanding of the village became an invented scholarly tradition.

## Annual Banquet Address

### Doctor Bob's Planet Earth Review

Robert Nannay,  
Department of Technology,  
University of Southern Maine

Dr. Robert Nannay has been a professor at the University of Southern Maine for 31 years teaching in the School of Applied Sciences, Engineering and Technology. He has traveled extensively visiting over 90 countries and every U. S. state. Dr. Nannay has taken over 30,000 photos capturing the natural beauty and cultural aspects of each country. This incredible material has been sequenced to music in a manner that generates interest and amusement. Dr. Bob boasts "I never show a slide before its time."

## Poster Session

### **Integrated Precision Digital Mapping of Structural Geology in Muscongus Bay, Maine**

*Matthew Bampton and Dr. Mark Swanson, University of Southern Maine*

### **Improving Landscape Interpretation by Linking Panoramic Photography to a Self-Orienting, Visible Area Revealed Map**

*John Coveney*

### **Transforming the Earth**

*Mark Denil, Center for Applied Biodiversity Science, Conservation International*

### **Conservation Outcomes: Eastern Arc Mountains**

*Mark Denil and Kellee Koeing, Center for Applied Biodiversity Science, Conservation International*

### **Biodiversity Mapping in the Sierra de Manantlán Biosphere Reserve, Mexico**

*James R. Ferguson and Janet E. Mersey, University of Guelph*

### **Prisoners of the Census: Mapping How Prison Populations Change the Political Landscape**

*Rose Heyer and Peter Wagner, Prison Policy Initiative*

### **Outsider Maps: Some Examples of Cartographic Disobedience through Direct-Contact, Observation & Response**

*Steven R Holloway, toMake Press*

### **Innovative Physical Modeling Technology: The Dynamic Sand Table**

*Charlie Kershner, U.S. Army Topographic Engineering Center*

### **The Masters in GIS Program at the University of Redlands**

*Mark Kumler, University of Redlands*

### **Solving the Landscape Puzzle of the Kickapoo Valley: Investigating Land Tenure History with GIS**

*Keith Rice, University of Wisconsin-Stevens Point, Lynne Heasley, Western Michigan University, Raymond Guries, University of Wisconsin-Madison, and Hawthorne Beyer, University of Alberta*

### **Liberal Use of the FCC Database: The NPR® Map**

*Martin von Wyss, vW Maps, Inc.*

### **Collingswood, New Jersey Residential/Commercial Land Use Map**

*Kevin R. Zelinsky, Remington & Vernick Engineers*

## Abstracts Paper Sessions

*Listed alphabetically by author*

**R. Maxwell Baber, Department of  
Geography, Samford University,  
Birmingham, AL**

### **Mapping by Degrees: Enhancing Liberal Arts Education with Geographic Information Systems**

Learning modules using Geographic Information Systems (GIS) are being integrated into introductory courses across the Samford University Arts and Sciences curriculum. The Academic Excellence and Geographic Information Systems (AEGIS) project is teaching non-technical faculty how to use GIS and assisting them in the development of discipline-specific GIS modules suitable for use in their introductory level courses. The introduction of GIS experiences into a diverse array of Arts and Sciences courses enhances student research skills by providing students with opportunities to engage in spatial data acquisition and analysis. This project prepares undergraduate students from various disciplines for roles in an increasingly technological society by introducing spatial methodologies that have increasing application across a broad spectrum of professional and academic fields.

Participating faculty begin with a workshop covering basic GIS concepts and methods, and then develop GIS modules for integration into their lower division courses. The AEGIS project aims to increase awareness of GIS, generate growing undergraduate interest in GIS, and provide ongoing support for multidisciplinary GIS activities at Samford University.

**Cindy Brewer, The Pennsylvania State  
University, University Park, PA and  
Charlie Frye, ESRI, Inc., Redlands,  
CA**

### **From GIS to Graphics Software: When do you Bail?**

Remaining in the GIS environment during map production has many advantages but requires that an increasing range of cartographic effects and graphic design tools be embedded in the software. For example, cartographers want to position and curve type precisely; break lines for type over complex backgrounds; clarify precise overpass, underpass, and merge relationships in complex road interchanges; associate multiple labels with individual point features; and control the way dashes and multiple lines interact with shape, intersection, and overlay. We challenged a group of graduate students at Penn State with a series of compact design problems, with the goal of deciding "When do you bail?" The students received a project with data and styles prepared to the point where a cartographic problem needed to be solved. For example, the set of lines for a complex highway cloverleaf were symbolized but did not have correct merging or overpass/underpass relationships established. The students also received a .PDF showing the final result that could be accomplished in ArcGIS 9.0. Their challenge, with hints, was to accomplish that final result by staying in the GIS environment as long as they could. For this highway interchange problem the solution involves advanced symbol-level drawing using an added road-level attribute. We will reflect on the students' responses to learning about these advanced cartographic tools as we also highlight some new and hard to find cartographic options in the software.

**Lars Brodersen, Assoc. Prof, Dr.,  
Aalborg University, Denmark**

**What is the Role of Maps in Web-services? Geo-communication Under the Influence of an Infrastructural Environment**

The role of geoinformation and the distribution of geoinformation have changed dramatically since the introduction of web-services on the Internet. In the framework of web-services geo-information should be seen as an index to further information. In this context web-services perform the function as index-portals on the basis of geoinformation. The introduction of web-services as index-portals based on geoinformation has changed the conditions for both content and form of geocommunication. A high number of players and interactions (as well as a very high number of all kinds of information and combinations of these) characterize web-services, where maps are only a part of the whole. These new conditions demand new ways of modelling the geocommunication. One new aspect is the fact that the service providers have become a part of the geocommunication process with influence on the content. Another aspect is that there no longer is a given relation between producer and end user. A third aspect of the new way of modelling is the distinction between active and passive elements in the infrastructure. This paper is organized around a pair of illustrations that show all components and processes.

**Aileen R. Buckley, ESRI, Inc.,  
Redlands, CA**

**Modeling GIS Data for Cartography versus “Reality”**

At last year’s conference, we asked the NACIS community to consider the how cartographic requirements might inform the development of GIS data models. At this year’s conference, we will show the conceptual and practical work we have accomplished in this area. Automating the

mapping process in a GIS environment requires that the data are well modeled not only for typical GIS applications relating to data management and analysis but also for map compilation and production. To that end, the map product helps to drive the modeling as much as it does the production process. Data modeling for geographic inventory and analysis is being undertaken in large mapping agencies throughout the world. This modeling effort should not be undertaken without the input of cartographers since one of the primary functions of these agencies is to provide map products and data that can be used for mapping by users.

However, cartographers are often thought of and often think of themselves as peripheral players in the GIS arena. This need not and indeed should not be the case for without direction from cartographers, GIS databases will not be able to support map production requirements. In fact, the map products should drive the data modeling process — working backwards from the product to the data specification reduces unnecessary detail and assures an efficient database design. All too often, however, the map is only considered after the data are collected. This presentation demonstrates a map-based approach to GIS data modeling to support the automation of map production.

**Mark Denil, Director of Conservation  
Mapping / Chief Cartographer,  
Center for Applied Biodiversity  
Science, Conservation International,  
Washington, DC**

**From Direct Actor to Engaged Guide:  
Developing a Manual of Mapping  
Conventions for a World wide  
Conservation Organization**

It is one matter to direct map makers working in a single office or region; it is quite another kettle of fish when the organization has persons needing direction scattered around the world in over 30 countries. Procedures and tactics based on example, consultation, review

and critique that can function well in a setting of personal contact can quickly break down when issues of time and distance intervene, issues that cultural, social, language, and other factors can only exacerbate. An obvious first step in dealing with such a situation is to establish and promulgate some core principles for standard conventional mapping practice across the organization.

Mapping standards have traditionally been thought of as formulas, and in establishing standard conventions some formulaic aspects are perhaps inevitable. However, the very wide variety of map products (for the even more widely varying audiences) that are produced within an organization like Conservation International (CI) are not easily covered by rigid prescription; and a rigid rule, once broken, is easily discarded altogether.

The envisioned manual will have to be both particular and general: some aspects of a CI map need to be constant, while others, instead, require a consistent approach. All aspects need to be informed by the rhetorical model of cartographic design and practice.

Any conventions manual must be a work in progress, and it is hoped that this first version of CI's manual can benefit from examination and critique.

*Charlie Frye, ESRI, Inc., Redlands, CA*

### **Using GIS to Make Maps of Landscapes that No Longer Exist**

Making a modern map with modern tools like GIS to depict historical events is a challenge in many ways. Even when historical documentation and maps exist and are rich with information they do not easily translate into a digital analogy. This session will focus on using hand-drawn period maps to create a digital landscape of the Boston, Massachusetts area just before the Battle of Bunker Hill in June of 1775. The coastline and terrain of Boston and Charlestown have changed a great deal since that fateful day when one of the bloodiest battles in American history took

place. A young British officer, Lieutenant Thomas Hyde Page, executed three maps that were used to create Boston in a time when the Back Bay was a bay. In particular this session will cover how to create a terrain model that depicts natural and built shorelines for large scale maps.

*Charlie Frye, ESRI, Inc., Redlands, CA*

### **Cartographic Models in GIS for Naturally Fuzzy Features (Named Marine Water Bodies, Islands, and Landforms & Physiographic Regions)**

A quintessential feature of many topographic and reference maps are the place names, but not just that they're on the map, but how they have been draped, slung, splayed, or settled onto the map. The ability to get this information on the map separates the amateurs from the professionals and for now keeps GIS on the outside of some circles of cartographic excellence. This session will cover the data modeling necessities for building GIS data that fully describes these essential geographic features. In particular, the idea that a coordinate pair, as typically appears in geographic names indexes, does not begin to adequately describe how and where to put names on maps for these kinds of places.

*Miguel Garriga, Geographic Systems, LLC, Altamonte Springs, FL*

### **Database and Application Design Considerations in Automated Map Production**

This paper touches on issues and trade-offs in automated map production using GIS. The ultimate goal is to produce many high-quality maps quickly, with minimum manual effort. Automated map production places demands on the designs of both the Applications and the Databases they interact with.

A traditional approach to GIS map production uses dedicated datasets to support production of one single, specific map title. The map may be created using

coverages, shapefiles, or other datasets that “belong” to that one map title, and are not used in any other map. One drawback to this approach is the level of manual effort required. Map composition, including text placement, may be largely manual. Another drawback is that a real world change to a feature may require edits to each separate map dataset that feature appears in.

Emerging map production methods are more automated and database-driven. This requires sophisticated design of both database and mapping applications. One or more centralized mapping datasets contain all the features that may appear in any number of maps. Advanced mapping routines include the required features, generalize on the fly, symbolize and annotate the map as needed for the particular map type, scale, and distribution media (paper or internet). A centralized database approach may eliminate or greatly reduce the need to duplicate real world changes in disconnected datasets.

The quality of the final map is independent of the approach taken. The appropriate approach depends on the needs of the mapping organization and resources available.

***Alberto Giordano and Alexis Buckley,  
Department of Geography, Texas  
State University, San Marcos***

**Towards Historical GISs: Issues in the Design and Implementation of a GIS for Nantucket, Massachusetts 1950-2000**

The island of Nantucket, Massachusetts has a rich history that includes the prosperous days of its Quaker-dominated whaling industry in the 18<sup>th</sup> century. Since the decline of whaling and for 150 years, Nantucket remained a modest fishing community, frequented by a small but affluent summer tourist set. During the 1950s Walter Beinecke, Jr. (a wealthy summer resident) recognized the potential for economic revitalization through

strategically planned tourism development geared towards the rich. Beinecke and others purchased property, renovated buildings, preserved historic places, and promoted the conservation of natural habitats. It was the beginning of the transformation that propelled Nantucket into a burgeoning high-end resort. However, this transformation also led to the economic marginalization and often to the disappearance of much of the local working class, due particularly to the lack of affordable housing. The purpose of our project is to show the dynamics of this process through the creation of an historical GIS (Geographical Information System) specifically geared towards visualizing the evolution from the 1950s of the interrelationships between real estate market, historic preservation and natural conservation, and indices of housing affordability. In our presentation we will discuss the design of the GIS, introduce a prototype implementation, and discuss issues related to the use and integration of GIS and GPS for historical analysis.

***Kirk Goldsberry, Sara Irina Fabrikant,  
and Phaedon Kyriakidis,  
Department of Geography,  
University of California Santa  
Barbara***

**The Influence of Classification Choice on Animated Choropleth Maps**

Data classification has a considerable visual effect on choropleth maps. Different classing methods yield different class thresholds, thus directly influencing the geographic pattern emerging in the map. Effects of classification choice on static maps are well documented (Brewer, 2002; Jenks and Caspall, 1971; Monmonier, 1975). It is not quite clear, however, how different classing methods will affect the visibility of space-time patterns in animated maps.

In this paper we investigate the effects of four popular classification techniques (e.g., equal interval, quantile, nested means, and standard deviations) on animated

choropleth maps. In addition, we evaluate the applicability of an averaged Cumulative Distribution Function (CDF) to classify a time-series data set for animation. The five chosen classification methods result in five different sequences of map frames. We introduce a method to quantify the magnitude of change between map frames to evaluate the classification effects mentioned. We investigate the differences relating to empty classes, skewed data distributions, and the magnitude of change between adjacent key frames in the map animation. Empty classes occur when an animation frame does not include at least one geographic unit within every class on the legend. Skewed distributions can result in certain map frames containing an overwhelming majority of geographic units belonging to one or two classes. The broader impacts of this investigation include a better understanding of how classification and generalization affect a sequence of thematic maps.

**Amy L. Griffin, University of New South Wales at ADFA; Alan M. MacEachren and Bonan Li, The Pennsylvania State University, University Park; and Frank Hardisty, University of South Carolina, Columbia**

### **Seeing Clusters that Move Over Space and Time II: Comparing Small Multiples with Animation**

A long-standing question in both cartography and cognitive psychology is whether map animation (and animation more generally) facilitates learning. Morrison (2000) reviewed a large number of controlled experiments that tested the efficacy of animated graphics, and concluded that because of experimental design flaws, these studies did not provide any evidence to support a hypothesis that animated maps and graphics promote either faster or more complete learning. Notably, none of the studies Morrison reviewed involved animated maps or the types of complex knowledge construction

activities that animated maps may be most useful in supporting.

This paper reports on the results of an experiment that assessed the degree to which map readers are able to detect clusters of events that move through both space and time while viewing a set of static small multiple maps. The test instrument used sets of static small multiple maps that contained the same information as animated maps used in an earlier experiment (reported on at last year's NACIS conference). Participants also viewed the visual representations (animated or static) for the same length of time. Additionally, we compare map readers' performance with both animated maps and static small multiple maps under a range of experimental conditions (varying pace and pattern coherence).

Cited Literature: Morrison, J.B. (2000). Does animation facilitate learning? An evaluation of the congruence and equivalence hypotheses. Doctoral Dissertation, Department of Psychology, Stanford University. 161 pp.

**Adele J. Haft, Associate Professor of Classics at Hunter College of the City University of New York**

### **Mapping Desire: The Louisiana Purchase, Lewis & Clark, and Karl Kirchwey's *The Geographer's Line***

In *The Geographer's Line* (1990), American poet Karl Kirchwey recalls his childhood in London with his dysfunctional family. But Kirchwey's youthful alter-ego escapes his parents' despair by creating a map of his future. As the poem opens, the thirteen-year-old is tracing a map of "the continental United States in 1803." Imagining the year 1803 as a coming-of-age for the young republic, Kirchwey compares the boy's imminent growth with the westward expansion of the United States after the Louisiana Purchase. Drawn to the unknown, the boy embodies the excitement of discovery facing the young country.

Like William Clark and others who mapped the country's frontiers, the boy tries to "ornament...the unknown" and "get those boundaries right somehow." His desire for freedom, control, and adventure mirror the dreams of nineteenth-century Americans as they sought to find a northwest passage to the riches of Asia or, failing that, to create an social and economic Eden in the West. ("I say that mankind progresses east to west... We go westward as into the future, with a spirit of enterprise and adventure" — Thoreau, 1863.)

Told from the perspectives of an idealistic boy and the man / poet he has become, The Geographer's Line also hints at the darker side of maturity, nationally as well as individually. Inspired by the Lewis and Clark bicentennial, this critique ends by examining several maps that illuminate Kirchwey's brilliant poem. Together, these maps record "the gradual acquisitions, betrayals, [and] purchases" of nineteenth-century territorial expansion.

**Frank Hardisty, University of South Carolina, Columbus**

### **Open Source Cartographic Software: Where Does the Ethical Meet the Practical?**

Open Source Software (alternatively, Free Software) has ethical advantages over proprietary software, especially for software produced in the course of academic research. These advantages include contributing towards the public good in two ways, directly and indirectly. Releasing software under an Open Source license contributes to the public good directly in the form of useful software routines. It contributes indirectly by enabling better peer review of the research being conducted.

Both of these ethical advantages apply to software produced as part of cartographic research. Two examples of the direct benefits are the release of the projection routines in the "proj4" library, and the MapTools internet mapping applications.

Indirect benefits would include circumstances enabling better peer review, such as making a user-testing apparatus available, or such as an algorithm for producing cartograms. It is unfortunate, therefore, that the majority of cartographic research is done on cartographic software remains proprietary.

A main reason for the dearth of Open Source cartographic software is the practical one that most Open Source software depends on Open Source platforms, such as Linux. For example, the leading Open Source GIS, GRASS, does not run easily on Windows, and has not developed much cartographic sophistication. On the other hand, progress towards use of Open Source cartographic software is being constantly made, especially for mapping over the internet. A cultural change among cartographers to encourage the use of Open Source licenses would help the cartographic community better conduct its research, and would help those who benefit from our efforts.

**Malcolm Hermann, Owner, Municipal Publications, Home, PA**

### **Writing and Illustrating Practical Cartographic Production**

The need for a manual or manuals on cartography in the digital age is often remarked upon. Much is written about GIS but very little is published on the use of graphic arts software for cartography. This book approaches the job with a craftsman's attitude, with the goal of attractive, easy-to-read maps. The look of the book is also intended to be attractive and easy-to-read. The book is about 2/3rds written as of 5/25/04, and primarily covers the use of Adobe Illustrator and Photoshop. Various other software packages are also briefly shown including In Design, Olive, Acrobat, Macadam, Flash, Bryce and ColorBrewer. The longest chapter, 'Illustration Techniques', is completed, denoting the emphasis on vector line art. The overall tone is non-academic. For example the word 'symbolization' will not be used.

The pages are designed as fully illustrated spreads, and are intended to impart to beginners 'how-to' information without excessive verbosity. The Macintosh platform is used in all the examples, although most of the work can be easily followed in the Windows versions of the same software. The content focuses on print media but also briefly covers maps on the web.

The tentative table of contents and sample spreads from the book can be seen at: [www.microserve.net/~malcolmh/Practical\\_Cartography.html](http://www.microserve.net/~malcolmh/Practical_Cartography.html)

***Eddie Jabbour, Creative Director, Kick Design, New York***

**Revising the Subway Map of New York City**

Eddie is the designer of, and tireless advocate for, a new map design and communication solution for the world's most complex subway system. His firm offers brand design and product concepting for clients such as the Walt Disney Company, the Andy Warhol Foundation, and General Motors. See the latest map design at: [www.kickdesign.com/mapcomparison/](http://www.kickdesign.com/mapcomparison/)

***Mary L. Johnson, Technical Writer, Remington & Vernick Engineers, Haddonfield, NJ***

**Mapping Suburbia: Tax Assessment Data Provides an Important Sense of Place**

Collingswood is a small community in southern New Jersey that is perhaps best known as the boyhood home of late television actor / writer / director Michael Landon. Small storefront businesses thrive on its main street, and houses range from ornate Victorians to modest bungalows. The careful mix of residential and commercial properties, the intricate balance of development and preservation needs, and the ability to look to the future while remembering the past have kept this community vital and strong even during

harsh economic times. "Collingswood: It's where you want to be," proclaims their website, and the community continues to do everything possible to make people believe it.

Mapping has become an important tool for those at the helm of Collingswood and other older communities struggling with today's redevelopment needs.

For municipal mapping and GIS purposes, the local Tax Assessor's Office is the springboard to customized data layers suitable for land use, planning and related applications. Everything from street addresses to property classifications to zoning designations may be included. Since no two tax parcels ever consist of exactly the same identification number, GIS attribute tables based on this data can be seamlessly and accurately linked to their corresponding property locations on a digital map.

By examining the maps created for Collingswood using tax assessment data, it is not only possible to visualize the community as it is today, but also to understand how careful redevelopment guidelines will continue to make Collingswood a place people want to be in the future.

***kanarinka***

**Glowlab.com Projects**

There is an emerging field of new media artists who are borrowing concepts from cartography in order to create experimental, locative artworks. These practices are often collaborative, performative, and use public space as an artistic medium. These practices have antecedents (such as the psychogeographical practices of the Situationists of the 1960s) and influences (such as the fields of cartography, ethonography, and conceptual art), but also approach the realm of artistic, cartographic inquiry in entirely new and very diverse ways.

kanarinka will give an overview of several of these artists and groups, focusing

particularly on the glowlab collective (of which she is part). Glowlab ([www.glowlab.com](http://www.glowlab.com)), founded by artist Christina Ray, curates an annual festival called Psy.Geo.Conflux in which artists and theorists of this emerging area converge to experiment together for five days a year. glowlab is also engaged in an extensive project "One Block Radius" to map a single city block in New York City ([www.oneblockradius.org](http://www.oneblockradius.org)).

**Ken Kato and Erik Steiner,**  
*InfoGraphics Lab, Department of  
Geography, University of Oregon,  
Eugene*

#### **Representing Oregon's Endangered Salmon**

The north coast of Oregon is presently the focus of an important debate concerning fish listed under the Endangered Species Act. The Oregon Watershed Enhancement Board (OWEB), a key player in this debate, is currently engaged in a comprehensive assessment of the Oregon Plan for Salmon and Watersheds to determine its effectiveness in addressing the 1997 listing of Coho salmon as an endangered species. The Oregon Plan for Salmon and Watersheds is a statewide effort to restore the watersheds of Oregon and recover fish and wildlife populations to productive and sustainable levels. In particular, the Oregon Plan assessment entails collecting and analyzing mountains of data collected by state and federal agencies as well as local watershed councils. As cartographers we were recruited to work with OWEB in the presentation of this assessment.

To meet OWEB's need for an effective document, the InfoGraphics Lab at the University of Oregon is creating a map-driven publication that employs atlas design principles. Working alongside state fish biologists, we're creating a series of two-page layouts that display place-based accomplishments, investments, restoration issues and challenges. Detailed maps and data rich graphics are used to present the major factors affecting wild Coho: what actions have been taken, the presentation

and interpretation of relevant data, and a prioritization for future action. Our challenge is packing a tremendous amount of information into just a few precious square inches of paper – a challenge well suited for cartographic techniques. Our work on this project has demonstrated a strong role for cartographers and quality cartographic design in state government reporting.

**Patrick Kennelly, Assistant Professor,**  
*Department of Earth and  
Environmental Science, CW Post  
Campus / Long Island University,  
Brookville, NY and James Stewart,  
School of Computing, Queen's  
University, Kingston, Ontario,  
Canada*

#### **Cloudy Day Illumination of LIDAR Data**

Geographic information systems usually render terrain using a point source illumination model. If the sky surrounding the terrain is assumed to be a hemisphere at great distance from the terrain, this model assumes that light shines from one point on the hemisphere to the terrain.

Any pattern of light of the same or varying intensity, however, can be defined on the hemisphere and used to illuminate the terrain. Uniform diffuse illumination uses equal intensity of light from every portion of the hemisphere. Cloudy day illumination combines diffuse illumination from clouds and localized, brighter illumination from the obscured sun.

We apply cloudy day illumination to renderings of Light Detection and Ranging (LIDAR) data from an area with tall, closely spaced buildings. Generally, rendering such data has required a choice between including shadows and obscuring parts of the dataset, or excluding shadows and losing important visual clues to building heights. We use cloudy day illumination to display both simultaneously in a realistic-looking

manner. Localized illumination creates soft shadows that reveal detailed hillshading beneath. In shadowed and non-shadowed areas, uniform diffuse illumination modulates the brightness of hillshading with percentage of the sky visible from any given point. Surface elements with more of the sky obscured, such as streets, will be darker than those with less sky obscured, such as the tops of buildings.

**Fritz Kessler, Department of  
Geography, Frostburg State  
University, Frostburg, MD**

### **Lessons Learned: Reflections on Coauthoring *Thematic Cartography and Geographic Visualization***

Anyone who has authored a textbook for the first time has undoubtedly reflected upon the entire writing process and in so doing has perhaps wished for a smoother experience. Coauthoring *Thematic Cartography and Geographic Visualization* was a new experience for me, and I gained a considerable amount of insight into the authoring process and writing in general. The purpose of this presentation is to share my experiences as a first time coauthor hoping that others who are contemplating writing a cartography text will ponder the following issues and perhaps be better informed as to the labors involved. The first issue centers on the fact that the amount of time needed to complete each chapter was considerably greater than the original estimate. The second issue points out that my approach to how I write had to change since the textbook was geared toward students and not my peers. The third issue examines the production and cost considerations needed for preparing graphics and illustrations. The fourth issue looks into my role as a coauthor versus the role of a sole author. The fifth issue talks about the necessity of being critical of my own writing abilities and being able to blend my writing style with that of the other authors. While these are not the only issues that coauthors must face, they are the ones that I became most cognizant of during my writing

experience. Had I been aware of these issues, I would have been better prepared for the coauthoring process.

**Dr. Elwin Koster, Information  
Technologist / Urban Historian,  
Dept. Humanities Computing /  
Architectural History, Groningen  
University, the Netherlands**

### **Visualizing Reliability and Veracity of Historical Townplans**

More and more historians are using GIS and digital maps to present their work. While in many other cases historians aim for reliable sources they do not seem to care when they use maps. In the project "Paper and Virtual Cities" research is done on the reliability of historical, mainly 17th century maps. (<http://mani.let.rug.nl:8080/pvc/>) The ultimate goal of this project is to make explicit choices in the use of historical maps in virtual (re-) constructions for research and design. How can the root mean square error been used to better rectify historical sources? What rubbersheeting techniques can be used to make maps fit better, and how can the choice of ground control points be derived from historical sources on land surveying?

The paper will present the global approach of the project, but also on the design of a digital matrix (a GIS-like application) that visualizes the reliability and veracity of historical town plans and virtual (re-) constructions (separately or in combination) in relation to function and context. This matrix is a combination of GML and SVG in combination with a markup language that is able to describe the historical context.

**Megan M. Lawrence, Department of Geography, University of Oregon, Eugene**

### **The Neural Basis of Map Comprehension and Spatial Abilities**

Cartographic researchers have been investigating how people cognitively process and use cartographic representations for years. Significant gains have been made in understanding how a map design influences a user's ability to accurately interpret the presented information. Meanwhile, comparatively few gains have been made in understanding the broader question: how a user's fundamental spatial abilities influence their accurate interpretation of a map, regardless of its design. The exact relationship between spatial abilities and map comprehension is still largely unknown.

Previous research in spatial abilities has investigated spatial knowledge acquisition, map rotation abilities and the emergence and development of spatial abilities over time. A majority of the results from these research projects have relied on behavioral data, such as performance and response time – admittedly poor surrogates for complex cognitive processing such as map comprehension.

Using fMRI (functional magnetic resonance imaging), this ongoing research project investigates the neurological basis of two previously identified spatial abilities: spatial relations and spatial scanning. Using performance and response time information coupled with rich data on brain activation during task completion, we hope to more rigorously identify the importance of these abilities in map comprehension.

There are two distinct components to the experiment, one in which subjects are tested on abstract cognitive tasks (much like questions on an IQ exam), and a second where they are tested on related real-life map tasks. Results will be presented comparing images of brains performing the cognitive versus map

tasks, and comparing the patterns of the two so-called spatial abilities.

**Renee Pualani Louis, University of Hawaii at Manoa**

### **Hawaiian Place Names: Mnemonic Symbols in a Hawaiian Cartography**

Hawaiians used place names as mnemonic symbols to encode their knowledge of the environment. Place names performed in daily rituals (i.e., stories, chant, song, and dance) were a conscious act of re-implacing genealogical connections, re-creating cultural landscapes, and re-generating cultural mores. Those performing these traditional practices deliberately incorporated familiarity, awareness, expertise, and fluency of the spatial relationships of their environments thereby communicating cartographically.

This paper proposes to investigate Hawaiian 'performance cartography', a cartographic tradition cultivated in oral traditions still being practiced today despite the eroding presence of Hawaiian names and cartographic traditions on Western map products (i.e., U.S.G.S. topographic maps). In addition, it will also seek to understand the nature of Hawaiian cartography, its parallelism with Western cartography, its depiction, communication, display techniques.

The main goal of this research is to attain a better understanding of the development of Hawaiian cartography, its cognitive relationships with Hawaiian culture, livelihood, and the landscape, and offer a comparison of its scientific paradigms with those of Western cartography. The broader impacts of the results of this research is a cooperative effort with the U.S.G.S. to revive and preserve this important Hawaiian tradition by suggesting and replacing place names back to the Hawaiian tradition and adopt them into the GNIS, to educate mapping agencies as well as future Hawaiian generations the cognitive, cultural, spatial, cartographical implications of Hawaiian place names. Furthermore, it will raise

awareness of indigenous cartography among practitioners of Western cartography.

**Jed Marti, ARTIS LLC, Salt Lake City, UT**

### **Cartography Supporting Computer Simulation for Analysis**

Computer Simulations are used for analysis of diverse topics from military weapons and communications systems to patterns of human physical activity. Cartographic displays support both generation of scenarios and visualization of results.

Computer simulations of human activities, from exercise to warfare, are based on numeric representations of terrain; elevation, ground cover, and discrete features. Areas covered range from a few square kilometers usually with very high resolution, to thousands of kilometers with medium resolution. Using this data, the simulation programmer develops a generic tool that the analyst applies in different terrains. The analyst must first specify the terrain area and data quality - input typically derived from a graphical user interface tied to a cartographic display. The analyst may create a "scenario" describing movements and interactions on a specific piece of terrain using a map display as a basis. Results of analysis of many simulation runs might be displayed on a map background, perhaps a movie or some visualization tool relating data to its geographic location.

This paper presents problems we've solved using cartographic visualization tools coupled to computer simulations for various activities. We address terrain selection and database generation, terrain analysis activities, scenario generation, and visualization of results.

**Dennis McClendon, Chicago  
CartoGraphics**

### **Maps with No Limits: Mapping Undefined Areas**

The tidy-minded cartographer (and geographic database) expects areas shown on maps to be carefully defined polygons. But the world is not so tidy. Neighborhoods, wildlife ranges, geologic phenomena, and even some nations have edges that are vague or unknown. What design solutions have various mapmakers used to illustrate this concept?

**Patrick McGlamery, Information Technology Services Area Head, University of Connecticut Libraries; Robert Cromley, Geography Professor and Director, University of Connecticut Center for Geographic Information and Analysis, Michael Paluzzi, Geography PhD. student; all University of Connecticut**

### **Building a Digital Gazetteer for Connecticut**

This paper will present work done to at the University of Connecticut on a GeoLocator for 14,000 images of photographs, drawings and prints in the Connecticut History Online (CHO). The GeoLocator is an ArcIMS application which maps bibliographic records from the Libraries' catalog. CHO II presents an improved implementation with more digital images. This version integrates ArcIMS and the digital gazetteer of Connecticut as a geodatabase in ArcSDE. The data model of the geodatabase and methods for populating the database will be discussed.

**Andrew McIntire, Geography Division, U.S. Census Bureau, Suitland, MD**

### **Census Field Mapping on a Hand Held Computer**

Decennial Census field staff have traditionally used paper maps to

accomplish their tasks. As part of the effort to reduce the use of paper in the 2010 Census, the Census Bureau is testing the use of maps on hand-held computer by the field staff. For testing in the 2006 Census Test, the Census Bureau is developing a system (called LAMI - Listing And Mapping Instrument) designed to provide all the functionality of the previous paper maps and address lists. The requirements include: the ability to display a map; the ability to collect and display map updates; the ability to display and update an address list; the ability to acquire a GPS coordinate for a structure; and the ability to conduct Quality Control operations. All of the above requirements must be accomplished on a screen roughly the size of a credit card. This presents considerable challenges, not only for the cartographers, but also for the clients. The Census Test programs provide the Census Bureau with the opportunity to learn the limitations of both hardware and software, and the opportunity to find solutions to the design issues raised by working with such a small map area. Some of the issues revolve around the data structure (number of layers and complexity of features in some layers), some derive from operational requirements (areas to be mapped range from single blocks to multiple counties), while others relate to specific cartographic limitations of COTS software being used.

**Jeremy Mennis, Department of  
Geography and Urban Studies,  
Temple University, Philadelphia**

### **Interpreting Spatial Statistics with Maps: The Case of Geographically Weighted Regression**

Geographically weighted regression (GWR) is a statistical technique for exploring spatial nonstationarity – when the measurement of relationships among variables varies over space. Whereas conventional regression of spatial data generates a single equation to represent global relationships among variables, GWR calibrates the regression equation

differently for each observation according to a bandwidth-modified, Gaussian distance decay function away from the observation upon which the GWR is centered. The result is a separate parameter estimate, *t*-value, and goodness of fit statistic for each individual observation, allowing these values to be mapped. These maps reveal the form of spatial nonstationarity and may be used to drive hypotheses as to the spatial process being modeled.

Because GWR is a relatively new technique, the utility of different approaches for mapping the results of GWR has not yet been investigated. This research undertakes such an investigation by applying GWR to investigate spatial nonstationarity in the relationship between socioeconomic characteristics and median housing value using tract-level, U.S. Census 2000 data for the Philadelphia, Pennsylvania region. A variety of techniques for mapping parameter estimates are compared, including:

- Categorical thematic maps of tracts classified as having negatively, positively, and not significant parameter estimates
- Univariate choropleth maps of all tract parameter estimates
- Univariate choropleth maps of only significant tract parameter estimates
- Bivariate choropleth maps of parameter estimates and *t*-values
- Bivariate choropleth maps of only significant parameter estimates and *t*-values

**Byron Moldofsky, Manager,  
Cartography Office, Department of  
Geography, University of Toronto**

### **Canadian Century Research Infrastructure Project: Using GIS for Historical Census Data Mapping and Analysis**

The Canadian Century Research Infrastructure Project is a five-year multi-

institutional interdisciplinary project to create a microdata sample database of individual census records for the 1911 to 1951 censuses of Canada. Integral to the project is the construction of a geographic framework for the historical census data, using GIS technology. Census geography layers are being created at the census subdivision level, to enable location, selection, aggregation and analysis of sample data, as well as some mapping of generalized census data. This is being designed in a Geodatabase environment, which will allow researchers to link to the main database, and to ask questions which are much more geographically oriented than in past projects. Interactive mapping tools to make these geographic queries and analysis as user-friendly as possible will also be developed in the latter stages of the project.

***Deborah Natsios, Natsios Young  
Architects, New York***

#### **National Security Sprawl: Targeting the Homeland**

The digital mappings in this series examine the emergent national security geography called "homeland". They track the metamorphosis of America's civil landscapes into incipient battlespace - the virtual, multidimensional locus of information-rich databases serviced by networks of complex sensors and information devices that provide real-time intelligence frameworks for visualizing and prosecuting warfare.

The maps explore the security environment at the US homeland's epicenter: Washington DC and its greater metropolitan region, where in recent decades, a new national landscape of amorphous edge cities and chaotic exurban sprawl have been annexed to the emblematic Capital, displacing the idealism of L'Enfant's 1791 plan for the city.

In an earlier era of internal enemy threat, during the US Civil War, the Capital and its Monumental Core had been hardened

by a ring system of fortifications known as the Defenses of Washington. The network was supported by an extensive program of military mapping informed by ongoing intelligence and reconnaissance operations. Cartographic information systems are also circumscribing the 21st century militarization of homeland, supporting its regime of purported Total Information Awareness. The new defenses of Washington are expanding beyond the centralized apparatus of the nation state, targeting the constitutionally ambiguous terrain of suburban battlesprawl.

***Linda Orsini, Geography Division,  
U.S. Census Bureau, Suitland, MD***

#### **Cartographic Design and Production Issues of the 108<sup>th</sup> Congressional District Wall Map Series**

In 2003, the U.S. Census Bureau's Geography Division created a new series of 42" by 36" maps of each district of the U.S. House of Representatives. These maps, designed for attractive wall display as well as for distribution via the web and DVD-ROM, portray in detail selected political boundaries, physical features, and the congressional district boundaries in effect for the 108th Congress, the first to serve under the reapportionment and redistricting following Census 2000. To make 440 unique large-format maps of the highest cartographic quality within a 5 month production schedule, the Census Bureau created a system combining automated and interactive cartographic production techniques. This presentation will discuss the map requirements, the design issues, and the production system that was used to successfully complete this challenging project.

***Tom Patterson, U.S. National Park  
Service, Harpers Ferry, MD***

#### **Evaluating National Park Service 3D Trailhead Maps**

I will discuss the 3D trailhead map program at the U. S. National Park Service

(NPS) and preparations for a study to evaluate the effectiveness of 3D trailhead maps compared to their traditional 2D counterparts. The NPS is one of the largest publishers of outdoor maps in the world, many of which depict hiking trails in mountainous regions. The prevailing design philosophy for trailhead maps is one of clarity and simplicity, because hikers must carry all information obtained from the maps in their heads—assuming that they are not using other maps on the trail—for a hike that might last several hours. The goal of these maps is twofold: to provide basic orientation information about the hike such as distance, trail difficulty, and safety concerns; and, to encourage more people to hike by informing them about points of interest along the trail.

To better achieve these goals, the NPS increasingly uses 3D depiction to map trails in parks with high relative relief. Based on the 57,100 hits yielded by a Google search using the keywords “3D trail maps,” the NPS is not alone in this trend. However, the basis for the decision by the NPS to use 3D maps is entirely design intuition. The NPS design and cartography staff believes that compared to 2D maps, 3D maps increase trailhead readership (both the number of readers and the time spent reading), are more easily understood, and are retained longer as mental maps. To test the validity of these assumptions, and to justify the additional time and expense needed to produce 3D maps, I plan to conduct a comparative user study in a national park.

The target study population is general park visitors setting out on a day hike of several hours duration. On alternate days either a 2D or 3D map of comparable complexity and design quality will be on display at a popular trailhead in a mountainous park. The study will be comprised of two parts. At the trailhead passive observation methods will measure the percentage of hikers who take the time to read both types of maps and the duration of time spent reading. A 2001 study by a team from Virginia Polytechnic

Institute at Yosemite National Park revealed that only 10 percent of all hikers (n = 1,279) studied a 2D trailhead map for one minute or more before commencing their hike—a statistic calling out for improvement. The second part of the study will consist of a survey administered to hikers on the trail to test their retention of geospatial information. Choosing an appropriate trail to test on, crafting the survey questions, designing the 2D and 3D maps for testing, and logistical challenges are just some of the many factors critical to the success of the study. After presenting the details of my proposed study, I will ask the audience to comment on the methodology and will open the floor for a general discussion about effectiveness of 2D versus 3D for mountain tourism mapping.

***Joanne M. Perry, Maps Librarian and Head of Cartographic Information Services, The Pennsylvania State University, University Park***

#### **Cartographic Data on the Web: What's Out There and How to Find It**

It is no secret that there is a lot of cartography on the Web, so finding something is no problem. However, locating what you really need is not always easy because there is so much scattered among so many places.

Many federal, state, and local government agencies have extensive Web sites and there are federal and state-level clearinghouses that can be accessed for digital data. While I cannot promise to provide the single best site for every cartographic need, I can provide suggestions for Web searching strategies and a list of URLs of likely sources of cartographic information.

**Ben Sheesley, Jeff Stone, Bill Buckingham, all Department of Geography, University of Wisconsin-Madison**

### **User-Defined Benchmarks for Visualizing Object Movement in a Large Spatiotemporal Database**

Animation as a mapping technique has the potential to directly represent process and change over time in ways that traditional mapping techniques cannot. However, one challenge in extracting meaningful information from animated maps involves storing visual information in short-term memory and making comparisons over time. Temporal comparison tasks not only involve change detection but also comprehension of how much, where, and when change occurs. An important distinction is thus made between low-level perceptual comparison tasks and high-level cognitive comparison tasks, although surely some overlap exists between them. Ideally, visualization tools should help animated map users with both tasks (e.g., change detection and comprehension). This research takes a large spatiotemporal database characteristic of those now common in much geographical research and examines how visualization tools called object benchmarks can decrease demands on short-term memory and thus help make meaningful comparisons within groups and between groups of animated objects. A “proof of concept” map animation of the American Birkebeiner cross-country ski marathon will demonstrate the advantages and limitations of this concept. Future work includes focus-group sessions to refine interface design and map functionality, as well as technical development involving database structure and web delivery mechanics. A major goal of this research is the design of flexible visualization tools that meet the needs of a diverse group of potential users. As object tracking devices become more prevalent, it is not difficult to imagine numerous other areas of application (e.g., species migration and transportation).

**Erik Richard Strandhagen, InfoGraphics Lab, Department of Geography, University of Oregon, Eugene**

### **Views of the Rivers, Representing Hydrologic Data of the Greater Yellowstone Ecosystem**

Water resource management represents a field where there is an opportunity to improve geospatial visualization methods for collaboration and public outreach. The majority of work in water resource management with geospatial information involves decision-making carried out by groups. The Greater Yellowstone Ecosystem (GYE) provides an excellent testing ground for research on geospatial visualization applications in hydrology. The ecosystem contains the headwaters of three major river systems, the Snake / Columbia, Yellowstone / Missouri, and Green / Colorado, which bring together many resource management issues and managers in a centralized location.

The research aim is to investigate GYE geospatial hydrologic data domain user applications in order to create reference tools that contribute to coordination and collaboration in hydrological management. Interviews were conducted with 14 expert users of hydrologic data in the GYE to define their needs for products that contribute to coordination and collaboration in management. Based on the needs defined in the interview process, the objective for the research is to design products that visually communicate information pertaining to the hydrology of GYE with an integration of maps and hydrographs presented in a series of atlas-style two-page layouts. Layouts are themed based and illustrate the spatial and temporal variability of rivers and stream flow. Page layouts provide an authoritative reference tool for collaboration among resource managers and as a visual medium to communicate information to the public. Clear data-rich maps and hydrographs aid in the understanding of information for policy making, collaboration in management, and education concerning the GYE hydrology.

**Alex Tait, International Mapping Associates, Ellicott City, MD**

**Mapmaking for the Census Atlas of the United States**

The *Census Atlas of the United States* will contain over 750 maps and the map selection process involved the creation of over 1100 maps. To produce such a large number of maps, most of them choropleth maps, with a small team of cartographers required careful planning and effective use of ESRI ArcMAP, Adobe Illustrator, and supporting applications.

This presentation will look at how International Mapping tackled the Census Atlas mapmaking challenge and examine specific examples of “the right tool for the right” job in the mapping process. Certain maps stayed in full GIS mode until the last moment and others required extensive graphic design work early in the process. Careful use of map prototyping and design samples was key to the process.

**James Tice, Department of Architecture and Erik Steiner, InfoGraphics Lab, Department of Geography, both University of Oregon, Eugene**

**Remastering the 1748 Nolli Map of Rome**

This presentation will describe the historical and contemporary significance of the 1748 Nolli map of Rome, and demonstrate how the authors are building an interactive website to provide access to this important document.

A contemporary of Piranesi, Giambattista Nolli (ca.1692-1756) was an architect and cartographer who's most important contribution is his lifelong monumental work, *La Pianta Grande di Roma* (“the great plan of Rome”) of 1748. Arguably one of the most revealing and beautiful urban plans of all time, it is the first accurate map of Rome, capturing the city at the height of its artistic and architectural achievements.

About nine feet across and consisting of twelve exquisitely engraved copper plates,

the Nolli map is a technical wonder and represents a milestone in the art of cartography. While it has been an important reference for Rome scholars and architectural specialists ever since its creation, its full potential as a multidisciplinary educational and research tool has not yet been realized.

Unfortunately cost and other challenges related to 18<sup>th</sup> century engraving and printing techniques have limited its accessibility, as very few high quality prints are still in existence (one of which we have at the University of Oregon).

Our goal has been to create a multi-use educational website that preserves the delicate integrity of the original Nolli map while providing an enhanced viewing experience and revealing both modern and historical significance through related interactive themes.

The site is projected to go live in May, 2005 at the following address: <http://geography.uoregon.edu/infographics/projects/rome/>

**Karen M. Trifonoff, Department of Geography and Geosciences, Bloomsburg University, Bloomsburg, PA**

**“The Shape of Ohio” as Seen in Quilts**

The Bicentennial of Ohio provided the occasion for the display of over 1,000 quilts, both old quilts made by early Ohio settlers, and new quilts made specifically for the statehood celebration. The quilts entered in the quilt competition portion of the Bicentennial quilt show at the Ohio State Fair in August of 2003 featured many of the traditional symbols association with states, such as the state flower (carnation), bird (cardinal) and tree (buckeye). Maps of Ohio were also dominant design elements in many of the quilts. In some cases the shape of Ohio created the overall shape of the quilt and in others the Ohio outline was used within the individual quilt blocks. The quilted map presentations were not limited to the state

outline, but also included maps at the county and local level. The dominance of maps within these quilts suggests that quilting may be one medium through which women can exhibit geographic knowledge and spatial understanding. Richard Francaviglia's *The Shape of Texas* notes the importance of the state outline as a metaphor for Texas popular culture. An examination of the quilts of the Ohio Bicentennial suggests that the shape of Ohio is likewise ingrained in the minds of Ohioans and is an effective symbol that evokes memories and gives meaning to Ohio traditions and events.

**Judith A. Tyner, Department of  
Geography, California State  
University, Long Beach**

**“Staid in School and Worked on My  
Map”: Nineteenth Century American  
Schoolgirl Cartography**

Prior to the eighteenth century, young women primarily learned accomplishments such as dancing, drawing, painting, playing the harpsichord, and fancy needlework. They would learn to read and perhaps write. Toward the end of the eighteenth century, accomplishments were less emphasized and by the nineteenth century, education for women had begun to change in earnest. Science began to be taught in boarding schools and fancy needlework was eliminated. At most schools the earliest science to be taught was geography, and one of the ways of learning geography was by making maps. Girls at Middlebury School in Vermont, Westtown School in Pennsylvania, Litchfield Academy in Connecticut, and Emma Willard's Academy in Troy, NY are among the schools where girls made maps. The maps they made were not fill-in outline maps, but elegant maps of states, countries, and the world. At least one young woman made an atlas of the United States. At some schools, girls learned basic surveying and made wall-sized maps. Girls wrote letters to friends about making their maps and recorded their thoughts

about geography lessons and map making in their diaries.

This paper looks at the kinds of maps made by young women in the first half of the nineteenth century in the United States and how they fit into education of the time.

**Dalia Varanka, U.S. Geological Survey**

**Modern Map-like Art, Images  
Interpreted Through a Perspective  
Learned from J.M. Blaut**

Modern artists have been producing map-like art since about the 1960s. These works have been mentioned only briefly in the geographical or cartographical literature. This presentation addresses the problem of defining and evaluating the cartographic value of contemporary map-like art.

The procedures of this research were primarily concerned with understanding the visual markers that compose map-like art and understanding its context for possible explanations about it. I studied as many works of map-like art as possible, developing a catalogue of about 60 examples. The internal elements of each work were compared to those of the others and to some conventions in cartography. Each artwork was then interpreted for ideas it communicates as a whole. After interpreting the works, I developed a classification system for the corpus. Background reading and research about the art and the artists, and interviews with artists and curators formed the basis of interpreting these works, in part by formulating the historical and social contexts of contemporary map-like art. Peripheral literature includes histories of the relation between art and cartography and the theoretical literature about cartography.

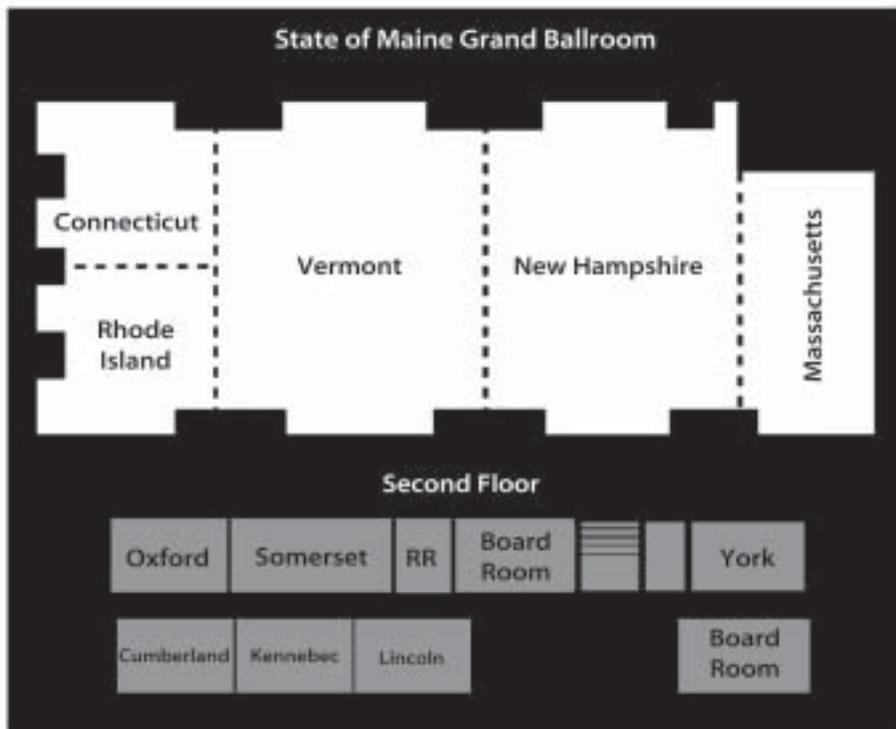
This presentation will discuss three conclusions. First, the way the artists used maps in their work; second, some explanation is offered of the way that modernism in art relates to cartographic concepts; and third, the theoretical foundations of the art are placed in the

context of J.M. Blaut's theory of mapping behavior. I conclude among other things that most artists use a cartographic process that is validly geographic.

***Roberta Williams, Jeffrey Patton,  
Elisabeth Nelson, and Rick Bunch,  
University of North Carolina  
Greensboro***

### **Defining the Map Prototype**

This paper reports the results of an experiment-based study aimed at determining the influence of various graphic elements and data representations in shaping an individual's assessment of the degree to which an illustration is or is not a map. A series of factors that were thought to be possible influences on the individual's decision were developed—these included perspective, scale, generalization, presence of labeling, cartographic iconography, type of data being represented, and familiarity with the geographic shape. A set of illustrations was created that varied the level of each factor tested. Two experiments were developed. In the first test subjects were shown a series of paired illustrations and simply asked "which is more map like A or B?" In the second, the subjects were presented a single illustration and asked to rate how map-like the image was on a scale from 1 to 10. Subjects for the experiments were undergraduate students at the University of North Carolina Greensboro. The data was compiled and analyzed utilizing a simple t-test. The authors plan to replicate the experiments with cartographic professionals to be able to contrast expert and non-expert concepts of the map prototype.



## NOTES

NOTES

*We hope to see you at*  
**NACIS XXV**  
**Salt Lake City, Utah**  
**October 12-15, 2005**