



W E L C O M E

On behalf of the NACIS Board and the Local Arrangements Committee, I would like to welcome you to Portland, Oregon. This marks the first time a NACIS meeting has been held in the Pacific Northwest.

This year's program has attracted a record number of papers, panel discussions, posters and exhibits. To accommodate the great response to the Call for Participation, we needed to modify the paper presentation format to a 20-minute length to increase the number of presentations per session. The variety of the work being presented here is extensive, from cartographic education and GIS advances to atlas and map design. New to the program this year is the first "Practical Cartography Day" preconference event organized by Alex Tait. Also new this year is the "NACIS Electronic Slide Show" set up by David Nelson and Steve Spindler located with the posters and exhibits.

Our opening speaker, Mike Houck, is well known for his work on "Livable Cities" and "Urban Greenfrastuctures." Jeff McMichael has organized an exceptional selection of posters and exhibits that will open following the Opening Session. Our banquet speaker is Stuart Allan, of Allan Cartography and Raven Maps. Stuart will reveal some of his insights on the craft and artistry in map-making.

Thursday night activities include an invitation to attend an open house at the Oregon Historical Society and informal tours to some Portland micro-brew pubs and Powell's City of Books, "The largest new and used bookstore in the world."

Many people need to be thanked for their hard work in the preparation of this conference. They include the Local Arrangements Committee members Gordon Kennedy (chair), Joe Poracsky, Richard Lycan, and Jeff Baldwin (AV coordinator). Many thanks to George Beltran for the publication work on this program. As always it is impossible to thank the home office enough for the efforts of Susan Peschel and Chris Baruth. And lastly I would like to thank all the participants and attendees for making this meeting such a success.

Jim Meacham  
Program Chair and Vice President

## S C H E D U L E

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**Wednesday, October 3****8:00–9:00 A.M., Registration**

WAHKEENA FALLS

**9:00 A.M.–5:00 P.M., Preconference Practical Cartography Day**

WAHKEENA FALLS

*Organizer: Alex Tait, Equator Graphics***2:00–7:30 P.M., Conference Registration****3:00–5:00 P.M., NACIS Board Meeting**

PYRAMID LAKE

**7:30–9:00 P.M., Opening Session**

MULTNOMAH FALLS

“In Livable Cities is Preservation of the Wild: The Role of GIS Mapping in Securing the Urban Greeninfrastructure for Livable Communities;”

*Mike Houck, Urban Naturalist, Audubon Society of Portland and Chair, Natural Resources Working Group, Coalition For A Livable Future*

**9:00–11:00 P.M., Opening Reception and Poster Session (sponsored by MapQuest)**

ELOWAH FALLS

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**Thursday, October 4****8:00 A.M.–3:00 P.M. Poster Session**

ELOWAH FALLS

**8:00–9:50 A.M.****A. Alternative Cartographies**

WAHKEENA FALLS

*Chair: Jeannine Schonta, Rand McNally*

Poetic City—Maps of Italy: (Di)Versifying the Teaching of Geography, IV;  
*Adele Haft, Hunter College—City University of New York*

WORDMAPS;

*Howard Horowitz, Ramapo College, Mahwah, New Jersey*

A Methodology for Examining Alternative Cartographies: Researching Embroidered Maps;  
*Judith Tyner, California State University—Long Beach*

Quilts: An Alternative Cartography;

*Ren Vasiliev, State University of New York—Geneseo*

## B. GIS Databases and Models

### MULTNOMAH FALLS

*Chair: Carolyn Weiss, Statistic Canada*

The Role of Technical and Local Expertise in GIS Analysis: Case Studies from Mexico;  
*Janet E. Mersey, University of Guelph, Ontario, Canada and Andrew A. Millward, University of Waterloo, Ontario, Canada.*

Reducing Data Chaos: The Wind Cave National Park Experience;  
*Ed Delaney, Wind Cave National Park, Hot Springs, South Dakota*

GIS Data Models and The Representation of Time;  
*Barbara P. Battenfield and Russell D. Huff, University of Colorado*

Mapping with the Geographic Names Information System: Let the User Beware.  
*Lewis L. McArthur, Oregon Geographic Names Board, and Mark E. Flannery, USDA-Forest Service, Pacific Northwest Region.*

### 10:10 A.M.–Noon

## C. Atlases

### WAHKEENA FALLS

*Chair: Trudy Suchan, U.S. Census Bureau*

Exploring the National Atlas of the United States On-line;  
*Deborah A. Reusser, U.S. Geological Survey*

An Atlas Design Evolves: The Case of the Atlas of Historical County Boundaries;  
*John H. Long, The Newberry Library, Chicago*

Creation of the 106th and 107th Congressional District Atlas;  
*Nick A. Padfield, U.S. Census Bureau*

The Electronic Historical Atlas: Web Maps or Something More?;  
*Brandon Plewe, Brigham Young University*

Mapping Census 2000: The Geography of U.S. Diversity;  
*Trudy A. Suchan, U.S. Census Bureau and Cynthia A. Brewer, Pennsylvania State University*

## D. Cartography/GIS Education

### MULTNOMAH FALLS

*Chair: Janet Mersey, University of Guelph*

Map Design Education with Multimedia Final Report;  
*Rex G. Cammack, Southwest Missouri State University-Springfield*

Teaching Map Design in an Age of Technical Transition;  
*David Woodward, University of Wisconsin—Madison*

Educating Professionals about Cartography in the Transportation-Planning Environment;  
*Scott Ryan-Hart, Burgess & Niple, Ltd., Columbus, Ohio*

Working in the GIS World;  
*David K. Patton, Central Michigan University*

GIS for your Professions;  
*Adeola Gbadebo, University of Lagos, Nigeria*

**Noon–1:30 P.M., Luncheon—Annual Business Meeting**

CLUB MAX

**1:30–3:20 P.M.****E. Specifying and Evaluating Cartographic Competencies for Professional Certification in GIS**

MULTNOMAH FALLS

*Panel Moderator: David DiBiase, Pennsylvania State University**Panelists: Barbara Battenfield, University of Colorado**C. Peter Keller, University of Victoria**Mark Monmonier, Syracuse University**Judy Olson, Michigan State University**Terry Slocum, University of Kansas**David Woodward, University of Wisconsin—Madison***F. Cartographic Animation**

WAHKEENA FALLS

*Chair: Erik Steiner, Pennsylvania State University**Mapping the Historical and Territorial Evolution of Iqaluit, Nunavut Territory;**Dieudonne Mouafo, Eva Siekierska, Ken Francis, Jean-Louis Moisan, Anita Muller, Natural Resources Canada**3D Map Animations for Public History: Visualizing the Battle of Guilford Courthouse, North Carolina;**Michael A. Swaim, Roy S. Stine, and Jeffrey C. Patton, University of North Carolina at Greensboro**Scoring and Scripting Music for Animated Maps;**Keith Rice and Steven Rice, University of Wisconsin at Stevens Point**Spatial Visualization of Southeast Asia through Cartographic Animation;**Paporn Thebpanya, University of Georgia***3:40–5:30 P.M.****G. Atlas 2001: Evolutions in Content, Audience, and Form**

MULTNOMAH FALLS

*Panel Moderator: Mark Mattson, Temple University—Philadelphia**Panelists: David DiBiase, Pennsylvania State University**Ann Johnson, ESRI**Ka Iu Fung, University of Saskatchewan**Aileen R. Buckley, University of Oregon***H. Field Checking: Three Veterans' Tales**

WAHKEENA FALLS

*Panelists: Nat Case, Head of Production, Hedberg Maps**Dennis McClendon, Design Director, Chicago CartoGraphics**Ryan Lewelling, Field Research Manager, MapLink***5:30–8:00 P.M. Open House, Oregon Historical Society**

HISTORY CENTER

**7:30 P.M., Tours: Portland Micro-brew Pubs, Powell's City of Books**

Information provided at registration desk

**Friday, October 5****8:00 A.M.–Noon Poster Session**

ELOWAH FALLS

**8:00–9:50 A.M.****I. Map Design and Content Analysis**

MULTNOMAH FALLS

*Chair: Martin von Wyss, Boston Redevelopment Authority*An Analysis of Maps in Elementary Geography Texts, 1850–1920;  
*Karen M. Trifonoff, Bloomsburg University—Bloomsburg, Pennsylvania*Design Heuristics for Improved “State of the Practice” in Cartography;  
*Adam Light, Patrick J. Bartlein, University of Oregon*Maps in Geographic Journals—Learning from Practical Lessons;  
*Dennis Fitzsimons, Southwest Texas State University—San Marcos*Content Analysis of Choropleth Maps in Academic Geography Journals, 1974 to 1999;  
*Andrew Dolan, University of Missouri—Columbia*Rich Maps;  
*Denis White, US EPA***J. Maps, Politics, Propaganda, and Place**

WAHKEENA FALLS

*Chair: John Krygier, Ohio Wesleyan University*Jerusalem SKY: Conflict Resolution and New Bird's Eye Views;  
*Deborah Natsios, Natsios Young Architects, New York*Portland Election Maps 1908–1922: Using Archival Spatial Information;  
*Paul Fyfield, Portland State University*Interpreting the Map(s) of Portland;  
*Joseph Poracsky, Portland State University*Propaganda Maps on Postcards from Germany's Third Reich  
*Pat Gilmartin, University of South Carolina*Media Coverage of the Post-2000 Remap: Early Returns,  
Promising Designs, and Missed Opportunities  
*Mark Monmonier, Syracuse University***10:10 A.M.–Noon****K. Map Design and Symbolization**

MULTNOMAH FALLS

*Chair: Alex Tait, Equator Graphics, Inc.*

Manipulating DEMs for 3D Cartographic Illustration

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

Visualizing Continuous Data: Guidelines for Creating Continuous Color Schemes

*Eugene Carpentier III, University of Oregon*

Bivariate Thematic Maps: Evaluating Symbology in the Map Environment

*Elisabeth S. Nelson, University of North Carolina at Greensboro*

Using Satellite Imagery to “Bump Map” Relief Backdrops in Cartographic Presentations

*Jeffery S. Nighbert, Bureau of Land Management*

## **L. Census 2000**

### **WAHKEENA FALLS**

*Chair: Jenny Marie Johnson, University of Illinois at Urbana-Champaign*

Mapping Urban Structure: Analysis of 2000 Population Density in Portland, Oregon

*John T. Gunn, Portland State University, Portland, Oregon*

Mapping Demographic Changes Using Administrative Records Data

*Richard Lycan, Irina Sharkova, Portland State University*

Seeing More with Less: Applying Dasymetric and Pycnophylactic

Techniques to Disaggregate Census Data

*Karen A. Mulcahy and Carol Jensen, East Carolina University, Greenville, North Carolina*

Virtual and Real Maps: Are they Interchangeable?

*Gerald J. Coleman, Census Bureau*

Census 2000 Cartographic Products

*Timothy Trainor, U.S. Census Bureau*

**Noon–1:30 P.M., Lunch—on your own**

## **CP Editorial Board Meeting**

### **PYRAMID LAKE**

**1:30–3:20 P.M.**

## **M. GIS Map Production Round Table Discussion**

### **WAHKEENA FALLS**

*Moderators: Charlie Frye and Joe Poracsky, Portland State University*

## **N. Visualization**

### **MULTNOMAH FALLS**

*Chair: Aileen Buckley, University of Oregon*

Visualizing Uncertainty in Global Water Budget Simulations

*Terry A. Slocum, Johannes J. Feddema, Daniel Cliburn, and James R. Miller, University of Kansas*

Visualizing the Geologic Processes that Shape Oregon

*Aileen R. Buckley, University of Oregon*

Dynamic Cartographic Visualization of Statistical Data in a Web-based Environment

*Patrick McGlamery, Robert Cromley, University of Connecticut*

A Wearable Computer Mapping System

Applying Eye-Movement Tracking for the Study of Usability of Maps  
*Lars Brodersen, National Survey and Cadastre, Denmark, Hans K. Andersen  
 and Steen Weber, Risø National Laboratory, Denmark*

**3:40–5:30 P.M.**

## **O. Maps and the Internet**

**MULTNOMAH FALLS**

*Chair: C. Peter Keller, University of Victoria*

Building Internet Map Libraries; *David Rumsey, Cartography Associates-San Francisco*

Maps and Tourism Destination Marketing on the Internet: Users Speak; *Erin R. Richmond and  
 C. Peter Keller, University of Victoria*

Design and Implementation of an Interactive Map-Based Community Information Systems  
 in East Kalimantan, Indonesia; *Jon Corbett and C. Peter Keller, University of Victoria*

Development of Collaborative Land Valuation Information Products: An Interactive Web Site  
 as an Aid for Stakeholders and Decision-Makers; *Ian J. O'Connell and C. Peter Keller,  
 University of Victoria*

**3:40–5:30 P.M., NACIS Board Meeting**

**PYRAMID LAKE**

**6:30–10:00 P.M., Annual Banquet**

**COLUMBIA FALLS**

“Craft, Concept, and the Art in Cartography”  
*Stuart Allan, Allan Cartography, Medford, Oregon*

Cartographic training commonly concentrates on the craft. Concept is assumed to have been covered in the course of one's geographic education. Artistry in cartography makes people nervous. The roles of all three elements in the making of good maps is discussed with reference both to maps that exist, and to the much better ones that have not yet been created.

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## **Saturday, October 6**

### **Workshops**

**8:30 A.M.–5:00 P.M., Cartographic Capabilities with ArcMap**

**MULTNOMAH FALLS**

*Charlie Frye, ESRI*

This seminar will cover the recently released ESRI ArcView 8.1 and ArcMap 8.1 software's cartographic capabilities including symbology, labeling, projections and grids, layout and composition, and printing and output. This seminar is taught by the principal cartographer at ESRI. Handouts and Lunch will be provided.

**8:30 A.M.–Noon, Macromedia Flash Cartography**

**322 CRAMER HALL, PORTLAND STATE UNIVERSITY**

*Eric Steiner, Pennsylvania State University*

This workshop will introduce Macromedia Flash as a powerful design tool for publishing

*Keith C. Clarke, Andrea Nuernberger, University of California at Santa Barbara*

knowledge of this tool that combines the vector graphic design tools of software such as Illustrator or Freehand with intuitive scripting to create advanced animated and interactive displays. Flash is revolutionizing the market for cartography on the web allowing us to quickly publish high quality zoom-able maps that appear crisp on screen and print in vector form. From interactive online GIS applications to high quality vector print and web cartography, Flash also pushes the envelope on combining GIS and cartographic design in the form of database driven displays.

### **1:30–5:00 P.M., 2000 Census and Mapping**

**322 CRAMER HALL, PORTLAND STATE UNIVERSITY**

*Richard Lycan, Irina Sharkova, and George Hough, Portland State University*

Learn about map making with the new data now becoming available from the 2000 Census. During Summer 2001 the first detailed information for census tracts, blocks, and other mapping geographies will become available. Then over the next year the details on variables such as income, ancestry, and privy's will come rushing at you. Learn how to effectively map with this data before your local newspaper beats you to the punch. George Hough, Oregon's Census Data Center Coordinator, will bring you up to speed on the new features of the 2000 Census and the new ways in which the Census Bureau will make this information available. We will visit web sites where you can download this data and look at on-line mapping programs that allow you to view the data. Dick Lycan and Irina Sharkova from the Population Research Center at Portland State University will lead you through the use of ESRI ArcView for census mapping. Some of the topics that they will cover are: simple choropleth and point mapping, using grid maps to generalize data, combining Census data with data from other sources, and mapping of 1990–2000 changes. The prerequisites for this class are basic skills in ArcView and in spreadsheet analysis.

### **Field Trip**

**8:30 A.M.–5:00 P.M.**

### **Columbia River Gorge National Scenic Area Field Trip: All Day**

**MEET IN HOTEL LOBBY**

*Organizer: Richard Lycan, Portland State University*

*Tour Guide: Elaine Lycan*

Includes lunch, maximum capacity 44.

This all-day trip will leave the hotel at 8:30 A.M. Saturday morning in a tour bus and visit sites of geological, historical and social importance in the history of the fascinating Gorge of the Columbia River. Geologists theorize that a cataclysmic flood of mammoth proportions carved the Columbia River's course through the Cascade Mountain range, producing a deep, steeply sided valley with numerous waterfalls, spectacular scenery and amazingly diverse flora and fauna, all within a compact geographic region. The trip will visit Crown Point, seventy-year-old Bonneville Dam, and pause in historic Cascade Locks for lunch. Continuing east we will visit waterfalls along the Historic Columbia River Highway that winds along the base of cliffs, and Hood River, a world-renowned sail-boarding destination. Crossing to the north side of the river we visit the Gorge Interpretive Center at Stevenson on the way back, and return to the hotel at 5:00 P.M. An on-board guide will offer interpretation during the trip and private tours are being arranged for some of the stops. There will be frequent stops to stretch and explore briefly—easy walking and stairs at most sites. Bring your camera. Within the narrow confines of this scenic Gorge we find a focal point for tourism, history, public lands policy, debate over hydro-electric power, fish management and native peoples' rights, and endangered species issues. It will be an enlightening and fun day!

## Opening Session

### In Livable Cities is Preservation of the Wild: The Role of GIS Mapping in Securing the Urban Greeninfrastructure for Livable Communities

*Mike Houck, Urban Naturalist, Audubon Society of Portland & Chair, Natural Resources Working Group, Coalition For A Livable Future*

Henry David Thoreau's aphorism, "In wildness is the preservation of the world" has driven this country's conservation agenda for a century, the emphasis being the protection of wilderness and pristine habitats in the rural hinterlands. Today, as we strive to stem the tide of urban sprawl our new mantra should be "In livable cities is preservation of the wild."

Yet, there are those in the conservation community who would argue that cities are beyond hope and that our efforts to restore salmonid populations and other species of fish and wildlife should be focused on more pristine wilderness areas. I argue that unless we create compact, land-conserving cities the effort to save the "wild" out there, in the rural landscape and wilderness areas will be impossible.

And to be livable, cities must include a vibrant urban Greeninfrastructure with healthy streams, natural areas and neighborhood parks inside our cities where the vast majority of our population lives. We need to do so through acquisition, regulation and stewardship. We also need innovative urban design that integrates the natural and built into a unified urban landscape that is also a unique, functioning ecosystem, an ecosystem worthy of stewardship on its own terms, not as a stepchild to so-called real ecological systems that have drawn virtually all of the attention of the conservation and natural resource agency community for many decades. We no longer have the luxury of "writing off" the urban environment as an ecological sacrifice area in deference to protecting the rural landscape.

Some would offer the newly emerging Smart Growth or Sustainable Growth movement as a solution. In my opinion neither they nor the "New Urbanism" yet adequately address the integration of nature in their schemes for the creation of livable cities. While there has recently been more receptivity within the Smart Growth community with regard to integrating the built and natural environment, they are still dominated by architects and transportation planners who are focused almost exclusively on the built environment.

Fault also lies with the Oregon land use planning program. With regard to containing urban sprawl I would agree with most supporters of the program that it has been a national model for containing urban sprawl. Compared with other regions of the United States, Oregon has fared well with respect to containment of urban sprawl. Robert Liberty, Executive Director of 1000 Friends of Oregon, provides the following figures regarding sprawl across America. Between 1970 and 1990 the Chicago region's population grew by 4% but its land area increased by 50%. Kansas City's population grew by 29% during that same period and its land consumption was 110%. A New Jersey study showed that low-density development consumed 130,000 more acres at cost of \$740 million for roads and \$440 million for sewer and water infrastructure. The Portland metropolitan region, by contrast, accommodated 300,000 more people between 1980 and 2000, growing from 978,000 to 1,280,000 or about 31%. Land area increased from 229,337 to 236,337 acres or 3%.

The problem here is less about sprawl, of which Oregon and the metropolitan region can justly be proud, and more about how we have grown within our Urban Growth Boundary. Our panel was asked to address whether we can rest on our laurels. With respect to protecting natural resources inside our Urban Growth Boundary the Oregon land use program has been a largely a failure.

How to reverse this trend? Beginning in 1988 Portland State University's Geography Department, primarily through the leadership of Dr. Joseph Poracsky, has been an active participant in the Portland metropolitan region's efforts to identify and protect its regional Greenspaces resources. Metro, the only directly elected regional government in the United States has also played an extensive role in this effort. Mr. Houck will describe how PSU and Metro GIS resources have played a crucial role in the regional effort to protect, restore and manage Greenspaces throughout the Portland-Vancouver metropolitan region.

He will also describe how GIS resources assisted in the production of the highly popular book, *Wild in the City*, a guide to Portland's natural areas.

## Poster Session

### New

#### Electronic Slide show

*Organizers: David Nelson, J. D. Nelson, Mapping Services, and Steve Spindler, Steve Spindler Cartographay*

### Posters

*Erin Aigner, Department of Geography, University of Oregon ponzi@darkwing.uoregon.edu. Mapping Oregon's Economy: Atlas of Oregon Design and Production Methods.*

*Patrick Bardel, Portland State University, bardelp@teleport.com, Andrew G. Fountain, Departments of Geography and Geology, Portland State University, Dorothy Hall, NASA/Goddard Space Flight Center and Ron Kwok, Jet Propulsion Laboratory, California Institute of Technology. Synthetic Aperture Radar Detection of the Snowline on Commonwealth Glacier, Taylor Valley, Antarctica.*

*Cynthia A. Brewer, The Pennsylvania State University, cab38@psu.edu, and Trudy A. Suchan. U.S. Census Bureau, Population Division. Mapping Census 2000: The Geography of U.S. Diversity.*

*Jermey Crampton, Department of Anthropology and Geography, Georgia State University, jcrampton@gsu.edu. A GIS Analysis of Atlanta's Digital Divide.*

*Pat Dunlavey, Pat Dunlavey Cartographics, pat@pdcarto.com, and David Imus, Imus Geographics. Wallowa Mountains-Eagle Cap Wilderness, Oregon. Yokun Ridge, Massachusetts. Chugach State Park, Alaska.*

*Ted Florence, Avenza Systems Inc. Developers of MAPublisher, MAPublisher-GPS & pdfPlus,. ted@avenza.com. Bridging the Gap Between your GIS and Major Graphics Software.*

*James F. Fryman, fryman@uni.edu, and Bonnie Sines, sines@uni.edu Geography Department, University of Northern Iowa. Cartographic Education in the United States.*

Dana Gantz, *Equator Graphics, Inc.*,  
 dgantz@equatorgraphics.com. *Antique New York:  
 Reconstructing a Period Map.*

Tom Hager, *University of Oregon Press, Eugene,  
 Oregon.* *Atlas of Oregon*, second edition.

Robert Hickey, *Department of Geography and Land  
 Studies, Central Washington University,*  
 rhickey@cwu.edu. *Mudflat Mapping: five years  
 of GIScience in northern Western Australia.*

Stephen Lavin, *Department of Anthropology and  
 Geography, University of Nebraska*  
 slavin@unlserve.unl.edu. *The Congressional  
 Quarterly Atlas of United States Politics.*

Keith Eric Pitts and Kate Smith, *University of  
 Akron,* cartography@uakron.edu, and Amy Rock,  
*Forward Thought Cartographic and GIS Solutions.*  
*Current Cartographic Projects at the University  
 of Akron.*

Barbara Trapido-Lurie, *Staff Cartographer,  
 Department of Geography, Arizona State  
 University,* btl@asu.edu. *Cartographic  
 Production at Arizona State University.*

Chris Wayne, *ESRI-Olympia,* cwayne@esri.com.  
*Assessing Cartographic Suitability of Digital  
 Raster Data.*

Barbara Welsh, *Bureau of Land Management,*  
 Barbara\_Welsh@or.blm.gov. *Roads and Trails of  
 Oregon with Ownership.*

## Abstracts

*Listed alphabetically by author*

**Lars Brodersen, National Survey and  
 Cadastre - Denmark (KMS),  
 Rentemestervej 8, 2400 Copenhagen  
 NV, Denmark, lrb@kms.dk., and Hans  
 K. Andersen and Steen Weber, Risø  
 National Laboratory, 4000 Roskilde,  
 Denmark**

### **Applying Eye-Movement Tracking for the Study of Usability of Maps**

The aim of this study was to evaluate a new method for studying usability of maps. The method is based on a combination of eye and head movement tracking, think aloud protocol, semi-structured interviews, and video analysis of non-verbal behaviour. Examined was the relationship between perceived map complexity? (instructor ratings and other nonverbal data) and cognitive behaviour (eye-movement data).

Similar set-ups have been used to evaluate e.g. cockpits in aircraft and in modern locomotives. Maps, cockpits and control panels may in certain respects be considered as analogous devices. The study was based on 10 subjects/users with a high level of education, but no specialized map knowledge. Each answered 22 questions with the help of two topographic maps that differed in design but had the same content. A video camera observed the subjects, and recorded their answers and verbalized thought processes. Eye movements were recorded using a helmet-mounted eye-tracking device.

Measured were; time, number of words used, percentage of correct answers, type of fixation, length and number of fixation, saccades etc. Marks were given for time, strategy and overall performance. Correlation between quantitative factors was sought. Similar behavior or statements by the subjects were also noted. The results were in general remarkable. General answer correctness (based on 220 answers) was only 60% with standard deviation 4%. Other results show to some extent the same clear, uniform tendency. Interesting and

remarkable correlation's between the different measures were found. The method looks promising but more evolutionary work has to be done.

**Aileen Buckley, University of Oregon,  
Department of Geography, Eugene,  
Oregon, 97403-1251,  
aileen@darkwing.uoregon.edu**

### **Visualizing the Geologic Processes that Shape Oregon**

The Pacific Northwest is known for its wonderful landscape and captivating landscapes—andscapes that were born of dramatic and dynamic geologic processes. Mapping these landscapes in a way that captures their overwhelming beauty and the incredible forces that shaped them is a challenge. Some of the best representations result from employing time honored mapping techniques coupled with computerized enhancements. GIS data management and analysis alone are often insufficient for generating beautiful and accurate representations - DEM manipulation and artistic expression supplied through further manipulation using graphic software, such as FreeHand and Photoshop, enhance the GIS depiction to create attractive, alluring, and accurate maps.

Perhaps more difficult, and in some cases more important, than the artistic depiction of the landscapes themselves is representation of the processes that shaped them—in Oregon, those processes involved the work of floods, tsunamis, earthquakes, volcanoes and landslides. Examples of methods to visualize Oregon's unique landscapes as well as these processes are discussed, as are methods used to depict the resulting landscapes. Methods to map these processes are discussed, as are methods used to depict the resulting landscapes. Some of the methods presented were used in the compilation of the print version of the Atlas of Oregon, Second Edition, while others are prototypes for the proposed on-line version.

**Barbara P. Battenfield and Russell D. Huff, University of Colorado,  
Department of Geography, CB-260,  
Boulder, Colorado 80309-0260,  
babs@colorado.edu**

### **GIS Data Models and the Representation of Time**

The study of geographic entities as they change though time is of increasing importance throughout society. Current generations of GIS software cannot fully support temporal study because the underpinning data models portray the world as single snapshots-in-time, or as a 'thin-slice' through a data set. A space-time model must be able to answer two deceptively simple questions. The first is state-related (e.g., 'What was the population distribution in Colorado in 1990?'). The second is change-related (e.g., 'How did the surface temperature patterns in the Antarctic change between 1970 and 2000?'). A temporally enabled GIS must incorporate a data representational scheme suited to asking change-related questions. Moreover, analytical tools (also called GIS services) must be developed to incorporate both spatial and temporal characteristics. Time has commonly been treated in spatial analysis as a "fourth dimension" appended to spatial dimensions, and computationally identical to them. This approach has proven unrealistic, impeding rather than supporting temporal complexities. This paper presents a taxonomy of change-related questions common to spatial analysis. The taxonomy cross-tabulates the types of temporal change (discrete, continuous, regular and irregular cycles) with the types of feature and attribute manipulations available in a GIS environment. We overview geographic models specific to each cell. We demonstrate analytic situations where relational models may break down. We extend a class of spatial analytical tools to explicitly incorporate a temporal component, and discuss a working

example of the tools in practice. We conclude with a reconsideration of the "thin-slice" model to argue for an alternative metaphor, a "thick-slice" metaphor for temporal data representation.

**Rex G. Cammack, Department of Geography, Geology, and Planning, Southwest Missouri State University, 901 S. National Ave, Springfield, MO 6580**

### **Map Design Education with Multimedia Final Report**

Map design, as a topic in an introductory cartography course has always been a difficult issue to teach students. Over the past ten semesters, students have been designing maps and putting them on file for an introductory cartography course. This study has three different teaching strategy groups. Group one, learned map design by lectures only during the fourth and fifth weeks of the semester. Group two, had the same lectures but were also given an interactive map design multimedia CD-ROM. Group three, had the same lectures and an interactive map design program on the computer to design maps. In this study, three maps from each student were evaluated for map design quality. The first map was made before the map design lecture. The second was made during the map design lecture. The third map was made five weeks after the map design material. Two general hypotheses were developed and evaluated. First, students that received only lecturing on map design will design maps of poorer quality. Second, students in all three groups will show significant improvement in map design quality after seeing and hearing the map design materials.

**Eugene Carpentier III, Department of Geography, University of Oregon**

### **Visualizing Continuous Data: Guidelines for Creating Continuous Color Schemes**

Data sets representing continuous phenomena are becoming very common. Examples include remotely sensed satellite data, environmental data relating to climate characteristics and climate variation, and digital elevation models. This paper focuses on the use of continuous color schemes, which can be an effective means of visualizing the data. In many ways, the display of continuous data is related to the cartographic symbolization of discrete data. However, displaying continuous data and defining a continuous color scheme can present special challenges that are unique to continuous data. This paper describes the process of creating a continuous color scheme, examines the position of continuous color schemes in color space, and provides guidelines and examples of continuous color schemes appropriate for selected distributions.

**Keith C. Clarke and Andrea Nuernberger, Department of Geography/NCGIA, University of California, Santa Barbara, CA 93106-4060, kclarke@geog.ucsb.edu**

### **A Wearable Computer Mapping System**

As part of the National Science Foundation's Digital Government Initiative, UCSB has been involved in the design and construction of a highly mobile, fully portable and wearable computer mapping system. This consists of a PC-104 standards-based PC, powered by batteries and linked to continuous feed input and a monocular eye display. The result is a GPS-tractable system, with some advanced GIS and mapping capabilities, that directs its map display into the human vision field to achieve augmented

reality. With phase two of the project, we are working on linking the system to the World Wide Web via cellular mobile Internet, and delivering seamless imagery and map data to the eyepiece in real time. The system presents some unique user interface design issues, especially since it must be used both in navigation mode and in data collection mode. We will demonstrate the system, and show some of the user interface components that are under development. The power of the wearable computer for changing the way that people use and interact with mapping systems is immense, and some of the implications of the next generation of what is currently only a prototype will be discussed.

**Gerald J. Coleman, U.S. Census Bureau,  
Geography Division, Washington, D.C.  
20233-7400, gcoleman@geo.census.gov**

### **Virtual and Real Maps: Are they Interchangeable?**

As technology advances, mapping has become more a science that is dealing with electronic media for the creation and dissemination of its product. Cartographers have to now deal with issues of creating maps in digital format for dissemination over medium such as the internet, while still keeping in focus the demands of the map user who wants a hard copy, or real map in their possession. These hard-copy map users traditionally created the transformation between the virtual "digital" map to a real map, and there are technology issues with this transformation that the cartographer must address. Examples of these include file format, output resolution, font characteristics, choice of color, color method selection, and most importantly, the unknown user environment. This presentation will show how these factors and others impact the interchangeability of virtual and real maps. Discuss the difficulty that this transformation can cause to the cartographer designing maps for concurrent virtual and real use, as well as the limitations

of this transformation and its impact on the user community.

**Jon Corbett,  
maryandjon@pacificcoast.net and C.  
Peter Keller, pkeller@uvic.ca,  
Department of Geography, University  
of Victoria, Victoria, British Columbia,  
Canada**

### **Design and Implementation of an Interactive Map-Based Community Information Systems in East Kalimantan, Indonesia**

Interactive map-based community information systems are under development in collaboration with two indigenous communities in East Kalimantan, Indonesia. Both communities are 'oral societies'. They therefore are limited in the extent and content of information they can present. We initiated a project, therefore, to install information systems to explore the use of digital interactive maps, photos and video clips as a basis for presenting information about a community.

Using participatory processes, our project aimed to facilitate the two communities in the creation of information about their land and community. Our involvement ranged from initiating community decision-making, to deciding what information to collect and how to organize the collection process, to training community members in the use of equipment including computer software, video equipment and digital camera. Faced with outside development pressures on their traditional land base, the two communities so far have made maps to document and clarify boundaries, land uses and related features. Both communities have used video, digital photographs and text to document current and historical information about their culture, land use management practices and significant events in the village using, storing this information on a computer and managing, accessing and presenting it through the interface of interactive maps.

Information collected already has been used successfully to communicate information to groups from outside the village.

In this presentation we will introduce the project, comment on the significance of managing, accessing and presenting information using interactive maps, introduce the types of information that the communities choose to record, and comment on how the tools and training we introduced served to empower the two local communities.

**Ed Delaney, Wind Cave National Park,  
Hot Springs, SD 57747,  
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### **Reducing Data Chaos: The Wind Cave National Park Experience**

This is a case study in combining legacy and new data management in a multidimensional public agency. Wind Cave National Park, about 50 miles south of Mount Rushmore National Memorial, was the seventh national park created in the US. Wind Cave has used automated mapping in a variety of guises for over a decade to map surface resources like its bison, elk, prairie dogs, and vegetation, and subsurface cave passages. Beginning with CAD drawing technology, a switch was made to PC ArcInfo in the early 1990s. ArcView and workstation ArcInfo were adopted with Windows NT towards the end of the 1990s. GIS was developed by a combination of volunteers, regular staff as collateral duties, students, researchers, and seasonal employees over the years. Many people learned to "do" GIS by creating data, and several interesting and unique forms of data management are reflected in an eclectic collection of data. In 2000, a full-time GIS Specialist position was created and filled, and over 1,200 discrete data layers were addressed for cataloging and documentation with metadata. This paper documents the problem of developing a multi-use database from largely unplanned project-specific data, potentially representing many tens of thousands of dollars of salaried

time. It emphasizes the development and implementation of a data management plan, and the process of data archeology.

**David DiBiase, Pennsylvania State University, Session Moderator.**

### **Panel Discussion: Specifying and Evaluating Cartographic Competencies for Professional Certification in GIS**

Panelists:

Barbara Buttenfield, University of Colorado  
C. Peter Keller, University of Victoria  
Mark Monmonier, Syracuse University  
Judy Olson, Michigan State University  
Terry Slocum, University of Kansas  
David Woodward, University of Wisconsin-Madison

Michael Phoenix, former ESRI manager of university relations, estimated recently that more than 200 U.S. colleges and universities offer GIS certificate programs. Curricula vary widely among these programs because no standards exist for what a GIS professional ought to be able to do. For better or for worse, standardization of GIS certification programs may be, as proponent Nancy Obermeyer argues, "an idea whose time has come."

Several professional organizations have begun attempts to identify the core competencies that GIS professionals ought to possess. Competence in cartography \_ specifically, in map design \_ is consistently included in the wish lists that these groups compile. Cartographers have an opportunity to influence these emerging standards, but only if they act decisively. This session will call upon the expertise of NACIS members to identify a very short list of essential cartographic competencies and evaluation strategies. Each of six distinguished panelists will present a five- to ten-minute-long argument that justifies one or more demonstrable cartographic competencies. Discussion will follow.

Andrew Dolan, Department of Geography/  
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### **Content Analysis of Choropleth Maps in Academic Geography Journals, 1974 to 1999**

Until recently, most maps in the long history of cartography have been produced by hand. Recent technological developments, namely the proliferation of the personal desktop computer, have revolutionized cartography. Mapmaking is no longer limited to a select few with the needed technical skills, but can now be done easily by the public at large. Choropleth maps are especially simple to create with current mapping software. Within the discipline of geography, however, the new ease and simplicity of mapmaking is coinciding with a decrease in importance of teaching cartographic skills; a proliferation of maps can potentially lead to many more maps being produced with errors or used in inappropriate fashions. Using content analysis techniques, this paper examines five general scholarly geographic journals over five-year periods from 1974 to 1999 and examines each quantitative choropleth map from the selected year. This research will attempt to answer the question of whether or not current choropleth maps, largely produced by article authors on easily available mapping software, feature more errors in their content and usage than in years before desktop computers were widely available.

*Dennis Fitzsimons, Department of  
Geography, Southwest Texas State  
University, San Marcos, Texas, 78666*

### **Maps in Geographic Journals— Learning from Practical Lessons**

While serving as the Cartography Editor for the ANNALS and The Professional Geographer, two journals of the Association of American Geographers, it has been illuminating to notice the practical state of

cartography among professional geographers. Map preparation for publication continues to be difficult for many geographic authors. Is the discipline of geography becoming so specialized that basic cartographic vocabulary is foreign to most geographers? This presentation addresses the most prevalent problems encountered by the Cartography Editor and offers suggestions and comments in support of better maps in professional journals.

*Charlie Frye, ESRI, Redlands, CA, and  
Joe Poracsky, Portland State University*

### **GIS Map Production Round Table Discussion**

Over the past five to seven years GIS has gone from the thing that 'killed' cartography to a means by which a staggering number of maps of increasingly very high quality are produced. Today, GIS is rapidly becoming the basis for production cartography in many large governmental agencies, but how well have cartography workflows been integrated into GIS? In other words, GIS software is certainly adaptable and being used to create cartographic process but has or should cartography/cartographers adapt to GIS? How do production cartographers manage their data holdings? Do these data holdings represent data that are only used to create maps with or, from an organizational standpoint, is the data generic?

*Paul Fyfield, Geography Department,  
Portland State University,  
fyfield@pdx.edu*

### **Portland Election Maps 1908–1922: Using Archival Spatial Information.**

The creation of maps for historical geographic analysis presents a set of problems different than those encountered in cartographic representation of modern day phenomena. The complete absence of data in digital form is compounded by the scarcity or incompleteness, of period maps

for reference. However, much information of a spatial nature exists in other forms, such as textual descriptions of boundaries or attributes in tabular format.

Such a case was the execution of maps for a book in preparation, "The Radical Middle Class: Populist Democracy and the Question of Capitalism in Progressive Era Portland, Oregon." Microfilmed newspaper accounts of election results, a pamphlet found in the County Library detailing precinct boundaries, and a partial set of maps in the collection of the Oregon Historical Society were among the diverse sources incorporated into the final product.

Consistent similarities in voting tendencies between neighborhoods in different sectors of the city shown by the resulting maps support the author's thesis in a more direct and easily interpretable way than would have been possible with several pages of text. The conversion of this information into maps demonstrates the visual power of cartography, clarifying spatial patterns that may have only been inferred from the same data in its previous state. The value of overcoming the obstacles in this process is thus demonstrated.

***Adeola Gbadebo, University of Lagos,  
Nigeria***

### **GIS for your Professions**

This paper session is part of my present research work at the University of Lagos for my postgraduate study in the Department of Electronic and Communication Engineering. You will see GIS and its impact in certain professions, such as engineering, environmental science, art & culture, and education. This paper is divided into four parts.

The first part points out the impact of GIS in engineering as a profession and the vital role of Computer Aided Design (CAD) mapping in the work done by engineering professionals. It also gives more emphasis on

how GIS has rapidly changed the telecommunication sector, and on the quality of the services it offers to customers.

The second part talks about GIS applications in the environmental science Profession, as it ranges from land planning, surveying, and architecture to construction. It points out how GIS allows surveyors to create intelligent land plans through automated mapping, data capture and surveying analysis tools. It also addresses the GIS application in architecture and construction management and points out some tasks that can be accomplished more easily with GIS software in these professions.

The third part talks about the impact of GIS on libraries and museums related to art and culture. It also points out the history of keeping geographical records in the library that can be exhibits in a museum.

Finally the last part will focus on GIS for Education. This paper takes a critical look at its impact in primary, secondary, university and community college levels. Emphasis is on the use of geographical tools and study by students of all ages to solve the problems of the world today ranging from environmental, economics, political, technological development etc. as they exist in their geographical context.

***Pat Gilmartin, Department of  
Geography, University of South  
Carolina, gilmartin-pat@sc.edu.***

### **Propaganda Maps on Postcards from Germany's Third Reich**

"The essence of propaganda is simplicity, force and concentration ... the art of propaganda is to gather completely confused, complex and composite ideas into a single catch slogan and then to instill this into the people as a whole." These are the words of Joseph Goebbels, Adolf Hitler's Minister of Propaganda, as he spoke in 1933 to representatives of the press about the newly established Ministry for Popular

Enlightenment and Propaganda. In seeking to unify the masses of Germany behind their government, the Third Reich made extensive use of propaganda in various media, including radio, newspapers, film, posters, music, and the like. Graphic design, including cartography, played a major role in the propaganda campaign, with maps appearing in popular magazines, classroom wall maps and atlases, newspapers, posters, and postcards. This paper comprises an examination of Nazi propaganda in maps, on postcards. And including 1) an analysis of the maps' primary messages, such as Germany's vulnerability to outside attack, themes of patriotism and political legitimacy, and the inseparability of Hitler and the nation, and 2) a study of the symbolization techniques to achieve the maps' goals.

*John T. Gunn, Portland State University,  
Portland, Oregon*

### **Mapping Urban Structure: Analysis of 2000 Population Density in Portland, Oregon**

Using the 2000 Census data, this paper investigates spatial patterns of population density inside the Portland Urban Growth Boundary (UGB) in order to test several conceptual models of urban structure. Conducting its analysis at the block level, the study models the 2000 population density as a function of the distance from the Central Business District to test the Burgess concentric ring model, the distance from regional centers to test the Ullman and Harris multinuclear model, and the distance from major arterial roads for the Hoyt sectoral model. A separate model is developed to analyze the relationship between the density and the distance from the UGB. I argue that the three models are interrelated and represent different yet connected stages of the evolution of urban form: they are coincident with the transportation epoch of the time of each model's conceptualization. The presence of the UGB designed to limit the urban sprawl

in the region may be tipping the balance from the centripetal, away-from-the-city development back to the mononuclear phase by introducing certain centrifugal forces. The study utilizes the map analysis to develop plausible explanations of the 2000 density patterns not explained by the regression models. It develops series of maps displaying 1990 and 2000 density patterns, 1990-to-2000 changes in density as well as maps of factors likely leading to these changes, such as housing construction activities. Besides block-level choropleth maps, it produces maps of density trend surface contours and the density gradients to facilitate the analysis.

*Adele Haft, Hunter College-City  
University of New York*

### **Poetic City-Maps of Italy: (Di)versifying the Teaching of Geography, IV**

In 1942, Henry Reed's "A Map of Verona" appeared. Four years later, it became the title and opening poem of the only volume of poetry the English poet produced during his lifetime (1946: *A Map of Verona*). As such, the poem's significance cannot be overstated for this multi-talented writer, cryptographer, and broadcaster. Two places imprinted themselves indelibly on his memory. One was his home in Dorset, England; the other was Italy. What connected them was Reed's obsession with Thomas Hardy, the novelist and poet of another map-poem, "A Place on the Map" (1914).

"A Map of Verona" is autobiographical. It nostalgically recalls his trip to Naples and prophesies his return to Italy, this time to Verona. In it, Reed presents himself as the star-crossed lover—not of a person but a place. While poets from Aristophanes on read the human body like/as a map, Reed eroticizes a map into the beloved's body.

In the end, Reed rejects his map not only as a practical guide but as an image onto which to project his dreams. Yet the poem invites us

to consider the historical and psychological links between maps, travel, and desire. Understanding these enables us to explore the gap that separates the type of map he was probably using from earlier, more romantic depictions of Verona. Although Reed did not know it, "A Map of Verona" is the poetic culmination of a long tradition of breathtakingly beautiful Italian town-plans and of geographies that personify regions as the beloved.

**Howard Horowitz, Geography  
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Mahwah, NJ 07430,  
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## WORDMAPS

This presentation explores a creative interface of poetry and geography, the making of "wordmaps." These wordmaps range widely in subject matter and style. Some are symbolic representations of natural features such as rivers and dunes, and others are information-rich images of places that are more-or-less "cartographically correct." Some of the wordmaps represent specific watersheds, others represent political jurisdictions such as states, and still others represent physiographic or ecological regions.

I will display a variety of wordmaps, some finished and others partially finished, and will discuss some of the issues and problems that I have encountered during their creation. Like other cartographic efforts, each wordmap is built on a foundation of substantial field work and library research, and requires repeated revision in order to achieve a presentable form.

Among the completed wordmaps to be displayed are "Manhattan" (which was published on the Op-Ed page of the New York Times on 8/30/97), "The Walkill Watershed," "Idaho," and "The Reading Prong." Completed symbolic images include "River," "Dune", and "Redwood Creek." Partially finished wordmaps include the

Hudson River, the Ramapo River, Greater Yellowstone, and Nevada. If time permits, I will perform a reading of one of the wordmaps.

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and Patrick J. Bartlein, Department of  
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## Design Heuristics for Improved "State of the Practice" in Cartography

The innate human ability for visual analysis exceeds our natural aptitude for designing data graphics. This imbalance presents a fundamental challenge to the discipline of data visualization, which requires an interactive dialog between analysis and design. Despite continual advances in cartographic knowledge and techniques, the average quality of published maps may actually be in decline as investigators in many fields routinely use sophisticated mapping and design software to create maps without the benefit of cartographic expertise.

Design heuristics are parsimonious rules that capture design expertise and make it accessible to non-experts. To demonstrate the potential benefits of automated design heuristics for cartography, we present an application for mapping large sets of environmental data commonly portrayed using pseudocolor images or isarithms. Our proof-of-concept comprises a core mapping platform and a heuristics module that merges domain knowledge and statistical methods with design expertise. Specific heuristics provide tailored advice on cartographic decisions pertaining to class-intervals, colorable, projection, and line properties among others.

In data graphics and visualization for the environmental sciences, the operant problem is not that the cartographic "state of the art"

is inadequate to the tasks at hand. But rather than the everyday “state of the practice” remains underdeveloped, failing to show improvement with technological progress or the passage of time. Cartographic design heuristics close the gap between state of the art and state of the practice by providing decision support to data experts: users who understand their data and its analysis deeply, but who lack design expertise.

**John H. Long, Editor, *Atlas of Historical County Boundaries, The Newberry Library, 60 W. Walton Street, Chicago, IL 60610. longj@newberry.org***

### **An Atlas Design Evolves: The Case of the Atlas of Historical County Boundaries**

Tried-and-true is the standard in atlas design, even for specialty atlases on unusual topics, because changing an atlas is expensive and because commonly there are few opportunities to revise or refine the original design. Over the decade since our first volume went on sale, the Atlas of Historical County Boundaries has produced 19 volumes on 24 different states. Those volumes share common goals, differing only in their specific content and, in some cases, in the details of their design. Dealing with 24 different states requires conscious decisions to continue standard features or to revise or refine them, or to add new features, to improve readers' access to the information.

The paper will focus on seven changes or steps in the evolution of the current design. They range from a modification of initial page design shortly before the first volume through changing placement of an important reader's aid to new base “maps” and new symbols that have emerged from our shift to electronic map-making. In nearly every instance, people outside the project's staff—mostly readers—provided the experience, observations, or insights that produced changes.

Richard Lycan and Irina Sharkova, Population Research Center, Portland State University, Oregon. Mapping Demographic Changes Using Administrative Records Data.

This paper illustrates how school administrative records data may be used to map demographic changes. It is a byproduct of research conducted for Portland Public Schools that analyzed past and forecast future enrollment trends. The maps are derived from a database containing information about schools, school children, and the locations where they live. The scope of the mapping data is increased by links from the residential locations of students to the tax assessor's database and to data from the 2000 census of population and housing. The database contains information as of October 1 for each year from 1996 to 2000 and will be updated on an annual basis. The data may be mapped from aggregations for finite geographical units like census tracts or school attendance areas or may be generalized directly from point locations using grid mapping techniques. Examples of maps based on this database are presented showing: (1) changes in age composition, (2) changes in racial composition, (3) residential mobility, and (4) movers by housing type. The type of data captured in this database and displayed on these maps shows one method of monitoring demographic changes in cities between censuses at a much finer level of geographical detail than is possible using existing census sources such as the American Community Survey.

**Mark Mattson, Cartographic/GIS Lab, Temple University, Session Moderator**

### **Panel Discussion: Atlas 2001: Evolutions in Content, Audience, and Form**

Panelists: Anna Jasiak, Senior Research Geographer, National Atlas of Canada. David DiBiase, Faculty and Director of the Gould Center of Geography Education, Penn State University. Ann Johnson, Director for

High Education, ESRI. Ka Iu Fung, University of Saskatchewan. Aileen R. Buckley, Assistant Professor, University of Oregon.

The Atlas of Pennsylvania was produced during the 1980s. A second edition, at least in concept, is now on the drawing table. During preliminary planning sessions, certain questions come immediately to mind. While the original participants recall clearly what an atlas was 12 years ago, many are baffled as to what it is today.

Our panel considers this question by: looking at the impact of technology on cartography and atlas composition; assessing GIS technology and map browser software on cartographic representations; and evaluating dissemination mediums and shifts from paper paradigms to electronic formats. The session also re-evaluates the concept of atlas audience. Panel members will discuss audience needs and access to geospatial information offering solutions for content delivery to an evolving readership with varied expectations, resources, and technological capabilities.

Final technological considerations include management and adaptation strategies in the areas of geographic/cartographic information housing, data warehousing, and historical continuity of information.

**Lewis L. McArthur, Oregon Geographic Names Board, and Mark E. Flannery, USDA-Forest Service, Pacific Northwest Region**

### **Mapping with the Geographic Names Information System: Let the User Beware**

The GNIS is the official repository of domestic geographic names information for the United States, maintained by the U.S. Geological Survey's geographic names staff. GNIS is commonly accessed to determine correct place name locations and spellings, and subsequently creating text placement

databases for mapping. Cartographers should be aware that GNIS is not entirely up-to-date, especially with regard to administrative names. The frequently changing status of these names calls for more effort from the states to keep GNIS current. USGS GNIS manager: Roger L. Payne (703) 648-4544; rpayne@usgs.gov. USGS GNIS URL: <http://geonames.usgs.gov/gnishome.html>

**Dennis McClendon, Chicago CartoGraphics, Session Moderator**

### **Panel Discussion: Field Checking: Three Veterans' Tales**

Panelists:

Nat Case, Head of Production, Hedberg Maps, [ncase@hedbergmaps.com](mailto:ncase@hedbergmaps.com)

Dennis McClendon, Design Director, Chicago CartoGraphics, [dennis@chicagocarto.com](mailto:dennis@chicagocarto.com)

Ryan Lewelling, Field Research Manager, MapLink, [rlwelling@maplink.com](mailto:rlwelling@maplink.com)

Field checking is something that's not really covered in the textbooks, but it's invaluable for serious large-scale mapping. The dilemmas faced by a conscientious and thoughtful field-checker illuminate many cartographic issues: what qualifies as a street? What's the proper name for a particular landmark? What's the point of numbering an unmarked highway? Three veterans of the field will discuss their experiences in field-checking a wide variety of sources and locations, from campus and neighborhood guides to city street maps to entire state atlases.

Patrick McGlamery, MAGIC, Homer Babbidge Library, University of Connecticut, patrick.mcglamery@uconn.edu and Robert Cromley, Department of Geography, University of Connecticut, robert.cromley@uconn.edu

### **Dynamic Cartographic: Visualization of Statistical Data in a Web-based Environment**

This paper is the next in the evolution of a series of papers documenting the progress of a state-based data warehouse of statistical data. Cromley and I presented a paper at the Pre-Conference of NACIS XX entitled "A Geo-Relational Approach to the Dissemination of Geographic Information on the Internet", and at the 2000 AAG meeting: "Integrating Metadata and Data Dissemination Over the Internet." This current paper will describe a thin client cartographic visualization of thematic data using OpenSource software: mySQL and GeoTools. Issues of web cartography, data visualization, metadata and delivery will be discussed.

*Janet E. Mersey, University of Guelph, Ontario, Canada and Andrew A. Millward, University of Waterloo, Ontario, Canada*

### **The Role of Technical and Local Expertise in GIS Analysis: Case Studies from Mexico**

This paper explores the increasingly sophisticated roles that GIS technology can play in land management, focusing on its application in protected environments. This evolving use of GIS entails a shifting cast of experts and institutional arrangements, since local knowledge, expertise and cooperation are essential components of any realistic management plan. The progression of GIS applications from mapping, measuring, and monitoring, to modeling and management is illustrated with three brief case studies from the Sierra de Manantlan Biosphere Reserve

(SMBR) in Mexico.

The first case study examines the pattern and extent of deforestation in the Reserve; this required little local involvement since the necessary data could be gleaned from remote sources. In the second example, a soil erosion potential model is developed; here greater local expertise was needed to gain an understanding of local environmental conditions and agricultural practices. Implementing changes to land use practices based on this model again requires local acceptance and community participation. In the final example, GIS is used to create a resource allocation plan for the optimal use of land for pasture, crops and conservation activities. Aspects of this model, such as the weighting scheme for the various land uses, reflect the preferences and priorities of the analyst. Thus, the effective use of this planning tool is only feasible with the cooperation and involvement of all local stakeholders. Although this may be a difficult task when conflicts exist over land-use priorities, the potential benefits of GIS analysis in participatory planning and resource management deserve greater attention.

*Mark Monmonier, Maxwell School of Citizenship and Public Affairs, Syracuse University, Syracuse, NY 13244-1020, mon2ier@syr.edu*

### **Media Coverage of the Post-2000 Remap: Early Returns, Promising Designs, and Missed Opportunities**

The post-2000 redistricting exercise presents the news media with a rare opportunity to use maps to describe an important political process, evaluate the handiwork of political cartographers and their critics, and educate readers on demographic change, voting behavior, partisan machinations, and constitutional constraints. This paper looks at news maps produced during the first few months of the post-2000 remap by the New techniques. The census units in Pitt County

York Times, the Associated Press, and daily newspapers in several states. Foci include coverage of the April 2001 Supreme Court decision in *Hunt v. Cromartie* (the final word on North Carolina's ill-fated post-1990 congressional redistricting plan and a comparatively clear statement on the proper role of race); the Republican Party's challenge to the proposed reconfiguration of New Jersey's legislative districts; and speculation in several states about partisan strategies for accommodating population growth or decline, supporting minority groups, and protecting incumbents. In addition to critiquing the design of maps that were produced, this paper examines linkages between maps and their accompanying text, the plausible treatment of other geographic themes and relationships, and revealing roles cartography might play as redistricting plans emerge and the arena moves from state legislatures to the federal courts.

***Diudonne Mouafo, Eva Siekierska, Ken Francis, Jean-Louis Moisan, and Anita Muller, Mapping Services Branch, Geomatics Canada, Natural Resources Canada, 615 Booth, Ottawa, Ontario. dmouafo@nrcan.gc.ca***

### **Mapping the Historical and Territorial Evolution of Iqaluit, Nunavut Territory**

Changes in technologies are changing the way maps are created and displayed. Especially, digital and Web-based multimedia cartography are bringing maps outside the main stream flow by giving a new life to archive data such as old paper maps and photographs. Therefore, Historical Cartography is a way of building bridges between the past, the present and the future. This is the main purpose of 'The Historical Evolution of Iqaluit' Mapping Project. Based on the concept of interactive cartographic visualization, its main objective is the development of an electronic interactive map of Iqaluit, the booming capital city of the

newborn territory of Nunavut in Northern Canada. By using a graphic interface and interactive navigation tools, the user will be able to visually reconstruct change in space and time of the city over the last 50 years (1948-1998) through aerial photographs and thematic map layers and therefore, intuitively perceive transformations in the form of dynamic or animated maps on computer screen. Such a cartographic product may serve many purposes including culture, tourism, education, and also city planning and development. Understanding the development of the town over time is valuable for education of youth and interesting for city visitors and tourists. More, displaying change in a very dynamic environment of a fast-growing town like Iqaluit is also very important for decision-support. That may help to learn about the history of the Town and to understand the spatial growth process of the city area so as to plan its future development in a more suitable way. Web site <http://maps.NRCan.gc.ca/Visualization/>.

***Karen A. Mulcahy and Carol Jensen, Department of Geography, East Carolina University, Greenville, NC 27858, mulcahyk@mail.ecu.edu***

### **Seeing More with Less: Applying Dasymetric and Pycnophylactic Techniques to Disaggregate Census Data**

Often the "best available" data is not good enough. Data at the level of the relatively coarse enumeration units used for the US population census did not provide sufficient information to evaluate racial inequity in exposure to floodwaters. The relatively coarse census enumeration units in Pitt County, NC were all that was available to study racial inequity in flood exposure following Hurricane Floyd in the fall of 1999. A more detailed and realistic portrayal of population distributions was achieved by applying a combination of dasymetric mapping and pycnophylactic interpolation

vary greatly in size. Particularly large units exist along the Tar River and its tributaries where the majority of the flooding occurred. Residential areas were identified using data from Pitt County for unincorporated areas and aerial photography for incorporated cities and towns. Next the pycnophylactic interpolation technique was applied to redistribute population into two categories, African American and non-African American. The pycnophylactic interpolator has the significant advantage of being mass-preserving. No persons are lost or gained during the interpolation process. The results consisted of two separate population surfaces, which were compared to flood extent. The combination of these two techniques permitted a desegregation of census data for analysis of racial inequity in flood exposure while maintaining personal privacy.

**Deborah Natsios, Natsios Young**  
*Architects, New York, NY,*  
*dn@pipeline.com*

### **Jerusalem SKY: Conflict Resolution and New Bird's Eye Views**

Each Spring and Fall, spectacular migrations involving 500 million birds confirm the biogeographic prominence of Israel / Palestine as a landbridge linking Africa, Asia and Europe, a transcontinental pattern of avian flyways that recalls Jerusalem's centric role in the schemata of early T-O maps.

Advances in military and civil aviation have increased competition for the region's crowded airspace, as demonstrated in the serious problem of catastrophic birdstrike hazards—collisions between birds and aircraft resulting in costly damage, injuries and fatalities that have exceeded losses from airwar incidents.

Jerusalem SKY is a web-based project of hypermedial image maps that supports current research in bird conservation and birdstrike avoidance. SKY image maps explore the unusual convergence between

cartographies that construct distinct representations of space for conservation biology and military interests.

SKY digital maps are portals hyperlinked to the website's open information architecture, databases and archives that represent a hybridization of previously discrete technologies. Zoogeographic mappings and military imaging are superimposed, interweaving avifaunal habitats and flyways with geospatializations typically restricted to national security's classified domain — including tracking radar, meteorological remote sensing, and high-resolution satellite imagery.

Jerusalem SKY constructs new bird's eye views of the city and region, in which maps are transparently linked to an open information architecture offering new solutions to some intractable territorial disputes and unresolved boundary litigation.

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### **Bivariate Thematic Maps: Evaluating Symbolism in the Map Environment.**

Research conducted on the theory of selective attention suggests that varying the graphic combinations used when designing bivariate point symbols affects the functionality of the symbol. Some graphic combinations appear to facilitate the ability to visualize correlation between the data sets mapped onto the symbol; others appear to be more effective at representing the data sets individually, some even at the expense of extracting correlational information. The purpose of this research was to test the strength of these findings in a map use context. Several bivariate symbol designs were tested in the study, using map use tasks Nick A. Padfield, Cartographer, U.S. Census

designed to test subjects' abilities to extract either correctional information from the two mapped data sets or individual information from one of the two data sets. Subject reaction times provided an assessment of the types and levels of interactions that occurred with each symbol set. Results corroborate previous research in both cartography and psychology, with several symbol designs falling into each of three interactional categories: separable, integral, and configural. By confirming and expanding previous research, this study provides further evidence of the strength of selective attention theory in aiding the design of bivariate thematic maps.

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### **Using Satellite Imagery to "Bump Map" Relief Backdrops in Cartographic Presentations**

Shaded or "painted" relief backdrops add tremendous visual interest and value to cartographic products. Addition of relief backdrops have proven effective at portraying realistic landscapes and geographical situations and is widely practiced in cartography today. However, the beautifully smoothed and colored shaded relief surfaces commonly portrayed as "backdrops" on many maps do not reveal additional information widely available through interpreted satellite imagery or geographic information systems. Incorporation of additional "geographic textures" is possible, while maintaining visual balance and readability, through "bump mapping" techniques. This presentation will discuss "bump mapping" techniques and issues with several real-world examples.

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### **Development of Collaborative Land Valuation Information Products: An Interactive Web Site as an Aid for Stakeholders and Decision-Makers**

First Nations treaty negotiations and land claim settlements require valuing land for diverse land uses, including usage difficult to quantify in absolute or monetary terms. This paper presents an attempt to develop a methodology to capture, compare and evaluate perceived value of landscape as expressed by stakeholders and experts. A research methodology was designed to facilitate data collection and analysis of stakeholders' judgements of land value for tourism and outdoor recreation from a holistic perspective employing an orthophotograph. We justify and explain our methodology in detail and report what types of information products can be derived from such an exercise, including statistical summaries and maps reporting average responses, measures of consensus and divergence, and strategies for grouping responses. The case study presented involves data collected from stakeholders on Galiano Island, of British Columbia's Gulf Islands. The results were inputted into an interactive web site, which enables stakeholders to both investigate their own results, but also to compare them to other stakeholders. We conclude by demonstrating examples of the web site as well as commenting on what we perceive to be the general value of this type of exercise to landscape valuation, and its potential development to an "on-the fly" interactive Internet-based GIS and Collaborative Spatial Decision System for land valuation.

Bureau

## Creation of the 106th and 107th Congressional District Atlas

The U.S. Census Bureau is responsible for producing the Congressional District Atlas, which presents a collection of maps depicting the boundaries of the congressional districts of the United States. The Atlas for the 106th and 107th Congress was produced using a variety of ESRI products including ArcInfo and Maplex and developing a complex mapping system to meet the requirements of this product proved to be challenging. This presentation will describe the major components of the AML-based mapping system including interactive map sheet layout and configuration, text placement and editing, and map output. Problems encountered throughout the project and how to overcome them in the development of future mapping systems will be discussed as well.

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## Manipulating DEMs for 3D Cartographic Illustration

Although cartographers routinely manipulate vector geo-data to achieve desirable presentation goals, in the case of Digital Elevation Models (DEMs), we tend to consider these data to be as immutable as the landscapes they represent. This is mostly a matter of unfamiliarity. This paper will examine the ways in which DEMs can be manipulated, like virtual modeling clay, for creating 3D landscape views, geologic block diagrams, and illustrations. Topics to be discussed include topographic substitution, a method for reverse engineering present-day landscapes into the past or projecting them

into the future; selective vertical exaggeration; resolution bumping GTOPO30 data for presenting legible high-mountain landscapes; painting and filtering effects; and, warping the projection plane of DEMs to create views that emulate the panoramas of Heinrich Berann and the spherical over-the-horizon views of Richard Edes Harrison. The manipulations to DEMs are done in Adobe Photoshop, freeware and shareware utilities, and dedicated terrain generation software applications.

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## Working in the GIS World

In recent years, there has occurred a sharp increase in the number of academic departments in the United States offering applied programs in Geographic Information Systems and/or Geographic Information Science. These new programs include baccalaureate degrees, post-baccalaureate certificates, Master's degrees, and even Ph.D. degrees. By definition, the majority of these applied degrees are aimed at the student that will seek employment outside of academia as a GIS professional. As these programs evolve, faculty and administrators must ask themselves "What does a new graduate in the field of GIS need to know?" In an attempt to answer that question, this paper investigates some current trends in GIS employment. What skills are employers seeking from new graduates? Conversely, what skills that employers don't ask for do GIS professionals need? What resources exist for students interested in careers in GIS? What types of organizations are currently hiring GIS graduates? What is the typical career path for a GIS professional? Hopefully, this paper will generate discussion among GIS faculty and GIS professionals about how students are being experience a continually growing variety of

trained. It is critical for the health of academic programs and for the health of GIS as a whole that students are adequately trained to meet the challenges of working in a GIS world.

**Brandon Plewe, Brigham Young University, Provo, UT, 84602**

### **The Electronic Historical Atlas: Web Maps or Something More?**

The term "electronic atlas" is becoming a popular moniker for a wide variety of digital map-based products, distributed via CD-ROM or increasingly the Internet. Many of these are little more than database-generated map views that one can pan and zoom. These services take advantage of neither the historic power of printed atlases nor the new power of digital cartography. The former was more than a collection of maps; it taught the principles of geography and other subjects through thoughtful design and interpretive narrative. The latter, especially in the forms of geographic visualization, interactive cartography, and multimedia, opens new avenues for self-directed exploration and learning. Operational examples of "true" electronic atlases are few, but form a valuable foundation for taking the next step.

Creating an electronic-historical-atlas, such as the projects under construction as part of the Electronic Cultural Atlas Initiative, particularly our Atlas of Utah's Past, requires a further integration of traditional technique and new technology. Interactive temporal cartography is more than just animated maps. Uncertainty is unavoidable. Strong connections between map information and textual or map sources is required. Increased functionality makes the design of effective user interfaces more difficult and more critical. If these challenges can be met, the result will be a powerful tool for basic education, self-paced learning, and scholarly research.

**Joseph Poracsky, Geography Department, Portland State University, Portland, OR, 97207, poracskj@pdx.edu**

### **Interpreting the Map(s) of Portland**

When looked at in the aggregate, the variety of maps of a particular place can present some very interesting physical, cultural and cartographic issues. Maps of the city of Portland, Oregon are one example of the richness of local cartographic sources. In some instances examination of a common map will reveal something unusual and raise a question ("I thought there were only 36 sections in a Township?") Sometimes the presence of a feature in an unusual spatial context may elicit a question ("Why is there such a large forest so close to downtown?") In other instances the subject matter of a map may be uncommon and arouse curiosity ("What is radon gas?") Some maps may have stories hidden in them, but the fact that a story exists or its details may not be obvious ("Isn't that a lovely park next to the river?") The answers to the variety of questions that arise from maps can reveal much about a place, the people who have lived there, and how the place has changed through time.

**Deborah A. Reusser, U.S. Geological Survey, Western Geographic Science Center**

### **Exploring the National Atlas of the United States On-line**

The first and only National Atlas of the United States published by the U. S. Geological Survey in 1970, weighed more than 10 pounds and featured 335 pages of information, mapping everything from maximum monthly temperatures to minerals in the water. Updates of those maps, plus hundreds of others, are now available through the new National Atlas of the United States at [nationalatlas.gov](http://nationalatlas.gov). From hardcopy maps to interactive, customizable digital views including multimedia presentations, it is now possible to

cultural, economic, and scientific information about our nation on-line. Join in an exploration of our Nation on the Web and discover the many facets of nationalatlas.gov.

**Keith Rice, Department of Geography & Geology, University of Wisconsin-Stevens Point, Stevens Point, Wisconsin 54481, [krice@uwap.edu](mailto:krice@uwap.edu), and Steven Rice, Music Department, University of Wisconsin-Stevens Point, Stevens Point, Wisconsin 54481, [srice161@uwsp.edu](mailto:srice161@uwsp.edu)**

### Scoring and Scripting Music for Animated Maps

Over the last decade cartographers have amply defined the various parameters of animated maps. Yet, with the increase of multimedia presentations it is surprising that little research has been conducted on the usage of sound with animation. In particular, music plays a major part in the human condition and presents a unique avenue for enhancing animated maps. Music can be used to entertain as well as augment human perception and cognitive abilities. Historically it has been composed with specific purpose; it can create a state of attentiveness, encourage introspection, or evoke empathy. The union of animated maps and music is therefore a natural association that holds great potential in aiding the cartographic communication process.

As a basis for defining a nomenclature for animated map music, this paper first explores the usage of music with maps in movies and cartoons in the twentieth century, as well as summarizing significant research in the perception and cognition of music. Particular emphasis is given to the usage of music that gives a 'sense of place' to the audience. Given this historical context, a formal structure is presented for creating musical scores with animation graphic scripts. Utilizing cinematic scoring taxonomy (e.g. phasing, spotting), guidelines for map music are defined based upon the type of

animation (e.g. fly-by) and its particular genre (e.g. flow of migration). Logistics for original music scoring and composition are discussed. A research agenda for the potential of music in spatial information memory enhancement and knowledge acquisition is also outlined.

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### Maps and Tourism Destination Marketing on the Internet: Users Speak

We report on an ongoing research project exploring the use of maps in Web based tourism destination marketing. Part of the research is to test the hypothesis that Web users think of the map as an important component of a tourism destination Web site, and that they seek to use the map as a navigation tool to travel the site. In this presentation we briefly introduce the overall research project before moving on to report on an on-line user survey finding where we ask respondents to comment on a number of travel destination Web sites, asking them to identify the role of maps in these sites, as well as commenting on site quality and map design.

**David Rumsey, Cartography Associates, San Francisco, California, [rumsey@luna-img.com](mailto:rumsey@luna-img.com)**

### Building Internet Map Libraries

David Rumsey will discuss the creation of his online library of over 4,400 historic map images, [www.davidrumsey.com](http://www.davidrumsey.com). Topics will include methods used in high-resolution scanning of the maps, creation of metadata, choice of viewing software and image compression formats, archiving for long-term storage, planning for data migration, strategies for sharing site images and data for example, in the case of temperature, we

with other online collections, integration with search engines, structuring the site to facilitate use by schools as well as scholars, and how historical maps can be used with and integrated into GIS. Rumsey's physical map collection, numbering over 150,000 historical maps, is one of the largest private map collections in the United States. Rumsey's Web site library has received numerous awards, including Yahoo Pick of the Week, Best of the Net from About.com, Site of the Day from USA Today, and Editor's Choice from Netscape, Lycos, AOL, and other search engines. The site has been featured in Wired magazine, Mercator's World magazine, and on ZDTV.

**Scott Ryan-Hart, Burgess & Niple,  
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### **Educating Professionals about Cartography in the Transportation- Planning Environment**

Within the transportation-planning environment there are a number of different types of professionals that need to work together to create deliverable products for clients. Increasingly, mapping has become an integral part of these products. Many transportation-planning firms have begun to hire map-making professionals to generate these maps for reports and stand alone products. Unfortunately, most of the professionals involved in transportation planning are not cartographically or even geographically knowledgeable. This lack of cartographic knowledge leads to a variety of common misconceptions about map-making. These misconceptions include not being able to see mapping for anything

beyond pictures of locations and, conversely, expecting a single map to be able to illustrate the entirety of the geographic data associated with a transportation-planning project. Another issue involves the need for maps to be completed in one business day using an engineering level of precision and an artistically pleasurable aesthetic. Due to these concerns, it is necessary to continually educate and inform other employees, executives, and clients about the capabilities and limitations of cartographic production in order to maximize the effectiveness of both the maps and the mapmaker. This education can take many forms; including informal conversations about map-making, to formal in-house seminars providing a more precise description of cartography and the capabilities of this profession. This paper describes the most common misconceptions about map-making in a non-cartographic specific professional environment, and how to educate other professionals about cartography for the purpose of maximizing the efforts of cartographers in the transportation-planning consulting environment.

**Terry A. Slocum, and Johannes J.  
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University of Kansas, Daniel Cliburn,  
and James R. Miller, Department of  
Electrical Engineering & Computer  
Science, University of Kansas, t-  
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### **Visualizing Uncertainty in Global Water Budget Simulations**

We are developing the Water Balance Visualization System, software that will enable domain experts and decision makers to visualize simulated water budgets for any terrestrial region of the world. Of particular interest to us are the uncertainties associated with these simulated water budgets. A water budget is computed using four basic inputs: temperature, precipitation, soil water holding capacity, and a sub-model for calculating potential evapotranspiration. We can visualize uncertainties in all of these inputs;

can contrast a data set that maximizes spatial coverage with one that provides a more consistent temporal coverage. We are also considering the uncertainties that arise from various global circulation models (GCMs) that have been developed to simulate global warming. To depict uncertainty, we have implemented numerous techniques, including an RGB method, minimum and maximum surfaces, transparency, diverging color schemes, and various glyphs. We are evaluating the software through a series of usability studies involving domain experts, usability experts, and decision makers. It is noteworthy that our study is interdisciplinary in nature, involving a cartographer, a climatologist, and computer scientists. Also of interest is our computer display platform, which consists of a 25 x 6 foot wall-mounted display that is driven by three SGI InfiniteReality2 graphics subsystems. Eventually, we hope to study the ability of decision makers to collaborate in this environment.

*Trudy A. Suchan, U.S. Census Bureau  
Population Division and Cynthia A.  
Brewer, The Pennsylvania State  
University*

### **Mapping Census 2000: The Geography of U.S. Diversity**

The Census Bureau published statistical atlases following the 1870, 1880, 1890, 1910, and 1920 censuses. To the delight of many, the Census Bureau is again presenting census data on maps in a print atlas format. *Mapping Census 2000: The Geography of U.S. Diversity* presents a synthesis of the basic patterns and changes in United States population distribution from 1990 to 2000. Maps feature county-level detail for the 50 states, the District of Columbia, and Puerto Rico. The Census 2000 data in the book are based on the U.S. Census Bureau Redistricting (PL94-171) Summary File which provides total population, and population by race, ethnicity, and voting age. *Mapping Census 2000* provides a news-filled

look at diversity and change in the population. In our presentation, we will discuss:

- Deriving data, making maps, and preparing the atlas at the same time as standards were being developed for presenting the expanded race categories for Census 2000;
- Assumptions statisticians and demographers bring to data classification and the implications for legend design;
- The complex institutional process of developing, producing, and distributing an atlas from within a federal agency;
- The wide effect of the project through spin-offs such as individual maps used in analytic briefs, single-sheet handouts for promoting the Census Bureau, maps used in professional presentations, and spreading geographic thinking in the Census Bureau.

*Michael A. Swaim, Roy S. Stine, and  
Jeffrey C. Patton, Dept. of Geography,  
University of North Carolina at  
Greensboro*

### **3D Map Animations for Public History: Visualizing the Battle of Guilford Courthouse, North Carolina**

In the early Spring of 1781 British forces under the command of Lord Cornwallis met the Continental forces led by Nathaniel Greene near modern day Greensboro, North Carolina in what is often said to have been the pivotal battle of the Southern Campaign of the American Revolution. Due to the losses suffered at the Battle of Guilford Courthouse Cornwallis decided to move north to Yorktown, Virginia, a fatal change from his original strategy. This paper chronicles the creation of a 3D map animation showing troop movements and engagements during the battle. The animation was designed for general public  
Karen M. Trifonoff, Department of

use, meant for display on the typical home personal computer, and was developed on a limited budget. This paper emphasizes the steps taken to create the 3D animation, including the initial concept design, locating available data, software selection, data integration, problems encountered when matching historic maps with modern geodetic surveys, and cartographic design.

**Paporn Thebpanya, The University of Georgia, Athens, GA 30602, paporn@arches.uga.edu**

### **Spatial Visualization of Southeast Asia through Cartographic Animation**

Recent developments in multimedia techniques have provided a wide range of hardware and software enhancements that enable cartographers and map users to create and use cartographic multimedia presentations. The creation of cartographic animation becomes a practical alternative for display of maps since it allows for viewing the phenomena that cannot be shown using static maps. This paper describes the utility of map animation and interaction in improving the perception and understanding of various geographic concepts in the Southeast Asia region. Several techniques, such as slideshow, metamorphosis, tweening, and flashing, are incorporated in the animated maps. The cast-based animation that contains map of each country is developed and hypermedia concepts with "hot spots" are implemented in order to allow one to interact with maps. An exploration of the locations of countries and physical features, such as rivers and capital cities, can be performed through a simple click of the mouse. The subjects are evaluated according to how well they perform on the map quiz where one group is provided the animated maps to study and the other is instructed to study the static maps. The questions include the labeling and identification of countries, cities, and major rivers. The preliminary results indicate that

the animated maps and hands-on interactivity increase accuracy and decrease response time to map questions. Shape and line animations also make memorizing easier because they gain the map readers' attention and emphasize the existence of the location on the map.

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### **Census 2000 Cartographic Products**

For Census 2000, the Census Bureau will be providing a wide variety of cartographic products for the data user. Census will be providing a spectrum of maps and GIS products, including the Census 2000 Block Map series, Census Tract Outline Map (Census 2000) series, Cartographic Boundary Files and TIGER/Line files for public use, either through on-line access or purchase. The Census 2000 maps will be available to users in different formats, and over the Internet for download or purchase. Census maps will be made available not only in the standard paper format, but in Adobe's Portable Document Format (PDF), for large and small format maps, over the Internet or on CD-ROM, for large format maps. Also available will be the popular Cartographic Boundary Files, for all geographic areas from the block group and above, which are provided in ArcInfo export format, ArcView shapefile format, and ASCII text file format, over the internet and for import into any GIS system. The Census Bureau will also be providing numerous other outline, reference, and thematic maps, such as the Metropolitan Area Wall Map, the Population Distribution "Nighttime" Map and the 108th Congressional District Wall Map, based on Census 2000 data and boundaries as data are released.

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### **An Analysis of Maps in Elementary Geography Texts, 1850–1920**

Geographic education in the first half of the nineteenth century was dominated by a memorization pedagogy, and maps in geography textbooks, with an abundance of place names, were well suited to this approach. In the second half of the nineteenth century, memorization was still the dominant educational methodology, but there was a shift to include more detailed descriptions of the human and physical world, and to include map-making activities to encourage geographic learning. James Monteith's *Comprehensive Geography* (1882) encouraged map-making activities, the use of relief maps in describing the physical world, and "learning from observation". Spencer Trotter, in his *Lessons in the New Geography* (1894), noted, "...geography is part of everyday life, not a mere learning of the names of places..." His approach to teaching geography included the building of three-dimensional map models, and taking field trips to observe the natural world. He also notes the importance of geographic instruction in helping students build mental maps. The purpose of this paper is to examine the maps in geography textbooks used in the United States in the last half of the nineteenth century, in order to gain a clearer understanding of the role of maps in the teaching of geography.

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### **A Methodology for Examining Alternative Cartographies: Researching Embroidered Maps**

When studying maps of specific types it is

necessary to compare maps by different authors, of different countries, or of different time periods side by side to see similarities and differences in form and content. For conventional maps this is not a major problem. Map collections often specialize in maps of a certain area or a specific time period and the researcher can view several maps at one collection.

For a researcher studying unconventional maps or alternative map types, comparing maps is difficult. The maps may be widely scattered in collections that do not specialize in cartography and a collection may have only one map of a given type. Unless one has an unlimited budget and time, it is not possible to visit enough "collections" to view and gather information for more than a few maps. Small folk museums, local libraries, and individual collectors may not have the facilities to make quality slides or transparencies, and for color maps, photocopies are not satisfactory. Over the past 30 years I have studied various kinds of unconventional maps, most recently embroidered maps and globes, and I have had to devise a methodology for each study. This paper discusses various methodologies and focuses on how a scanner can be used in the study of alternative maps using embroidered maps as examples.

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York, College at Geneseo, Department  
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### **Quilts: An Alternative Cartography**

The representation of cartographic and geographic information has had many forms over the years. A little known form in the United States has been in the hands of women for the last two hundred years, that of needle worked maps and geographic descriptions. This paper will focus on one needle working craft, the making of quilts, and the use of this medium for the

representation of cartographic and geographic information. Through history, the women making these quilts made them for a number of reasons, not the least of which was to keep their families warm in their beds at night. However, working with scraps of fabrics and threaded needles, the quilts became maps and geographic representations of what the women saw around them or thought about during, for example, their migrations on the Mormon or Oregon Trails, or while settled in the midst of Civil War conflicts over the abolition of slavery. Many had no voice, especially slave women, and so expressed themselves as they could, through their needlework. More currently, women have been using the medium of quilt making as an art form with which to express their cartographies of life and their personal geographies. The major point of this research is that the making of maps is a ubiquitous activity, one that uses the methods at hand, in this case quilt making.

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### Rich Maps

Michael Goodchild recently gave eight reasons why traditional maps are limited as communication devices, and how interactive Internet mapping can overcome these limitations. In the past, many authorities in cartography, from Jenks to Bertin, have emphasized the importance of simplicity in map design. Is the practice of cartography to become simple maps on the Internet?

While not disputing technological trends and the value of simplicity, particularly in maps with simple purposes, nevertheless I want to argue for the value of maps as containers and mediators of complex information. A rich map, by this argument, contains many objects or phenomena, and conveys their spatial relationships in ways that are more effective and meaningful than

a set of simple maps. The argument in favor of such maps is based on several mapping traditions, on an analysis of information content in complex maps, and on an aesthetic theory. Two mapping traditions with rich maps are the Swiss school of topographic mapping and multivariate mapping in some atlases. An analysis of the information content of multivariate maps in national atlases reveals striking differences across these national efforts.

The aesthetic theory is the internal order, high informative value aesthetics of Ruth Lorand. In this philosophy, parts are related to a whole through complementary interpretation, an intuitive form of knowledge that is context sensitive and informative in varying degrees. Lorand's concepts are a way to think about art, maps, and theories. Rich maps, but not necessarily all complex maps, exhibit high aesthetic value in this way of thinking.

*David Woodward, University of Wisconsin-Madison, dawoodwa@facstaff.wisc.edu*

### Teaching Map Design in an Age of Technical Transition

Students in the map design class at the University of Wisconsin-Madison have produced a full-color map as their main class project. Using illustrations of these projects from 1968 to 2001, I examine how different methods of production have affected the quality and style of project as well as the re-allotment of time for various topics in the map design courses.

In this period, techniques have changed dramatically: from lens based graphic tracing and reduction devices to PhotoShop templates; from ruling pens to Adobe Illustrator; from simulated full-color map using paints to separations in Illustrator; from hand lettering to digital fonts; from screens, negatives and laminate proofing systems to ink-jet printers.

I conclude that the ability to include GIS data, relief shading and projection software and PhotoShop files into vector drawing programs has significantly increased the ambitiousness of class projects. What has not markedly improved is the students' imaginative choice of projects, understanding of how maps are made and printed, clarity in defining the purpose of the map, matching the level of generalization to this purpose, and the general aesthetic sense of style. However, dramatic improvements during the course were observed when the students were allowed to make several drafts of their work. This depended on careful and frequent feedback from the instructor and extensive class critiques to be effective, resulting in a fundamental reapportionment of time in the course.

Map design courses are facing other far-reaching technical changes, such as improved design features in GIS software, animation, and geographic visualization. How will these modify how we should teach map design?



## North American Cartographic Information Society

*As is the tradition at NACIS meetings, the Hospitality Suite is a place to sit, relax, and converse with friends. Check the NACIS registration desk for Hospitality Suite room number.*

*We hope to see you at*

**NACIS XXII  
Columbus, Ohio  
October 9–12, 2002**

We would like to acknowledge the following people and organizations for their contributions:

Dan Etter, MapQuest; the opening reception.

Charlie Frye, ESRI; the use of two data projectors.

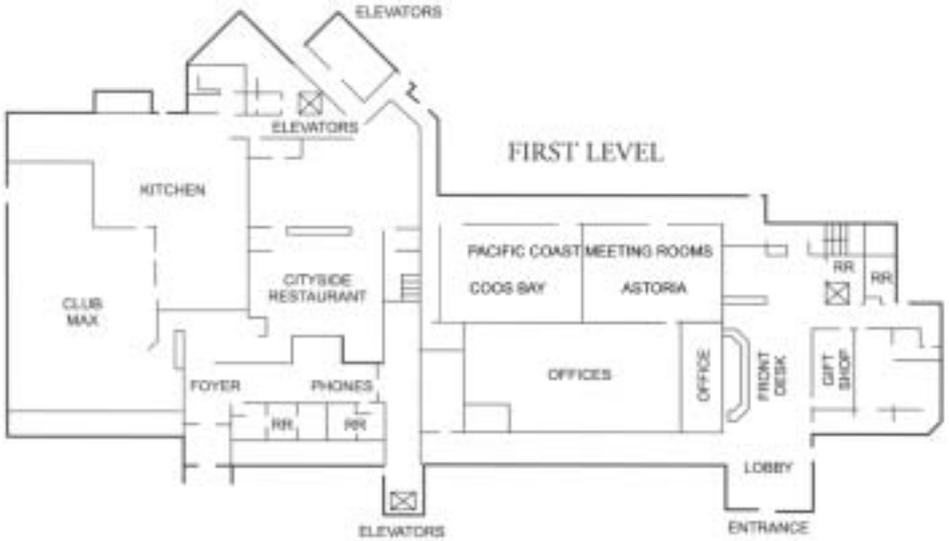
Jeannine Schonta, Rand McNally; the Portland maps.



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