



W E L C O M E

Welcome to the 23rd meeting of the North American Cartographic Information Society. The meeting will undoubtedly be stimulating, engaging, and fun for anyone interested in cartography. The content of presentations and panel sessions is extensive and diverse, as are the people attending the conference. Among the most enjoyable aspects of NACIS are the people: practicing cartographers, artists, teachers, academics, librarians, government employees, writers, and more – all who share a fascination with maps and mapping. You can learn by attending sessions, and you can learn by talking to other conference attendees.

I am pleased that Practical Cartography Day is back, spanning the Wednesday prior to the conference opening session Wednesday eve. We heartily welcome the influx of 'practical cartographers' who comprise a vital and growing part of the NACIS community. The popularity of Practical Cartography Day is such that it has 'leaked' into the main program, on Thursday and Friday, with panel sessions on Cartographic Self-Publishing, Mapping Software, and, for the first time, the 'Great NACIS Map-off' - where six cartographers will unveil their version of a map assigned two weeks prior to the conference.

Our Wednesday eve Opening Session features a talk on Cave Mapping in Florida by Can Denizman and Todd Kincaid, who will entertain us with 'what lies beneath' the landscape of Florida. The reception after the talk provides an informal way to meet new people and rekindle friendships, as well as to view the poster presentations. A cruise of the St. John's River on a paddlewheel riverboat with dinner, music, and socializing has been organized for Thursday eve. Finally, fieldtrips (St. Augustine and Okefenokee Wildlife Refuge) and workshops (SVG and Interactive Cartography, Mapping with ArcGIS) are offered on Saturday. Check the registration desk if you are interested in participating in any of these events.

A special thanks to Lou Cross and Jim Anderson for all their work on local arrangements in Florida, taken on in addition to their roles as Executive Director of NACIS (Lou) and producer of the NACIS journal *Cartographic Perspectives* (Jim). Thanks also to the NACIS Board of Directors and Officers for their help with the conference and NACIS, and Susan Peschel who is, quite simply, the glue that holds NACIS together.

John Krygier

Program Chair and Vice President

S C H E D U L E

Tuesday, October 7

6:00—8:00 P.M., Practical Cartography Day and NACIS Registration
GRAND BALLROOM FOYER

Wednesday, October 8

7:45—8:45 A.M., Practical Cartography Day Registration
GRAND BALLROOM FOYER

8:45 A.M.—4:30 P.M., Practical Cartography Day
STARBOARD

2:00—7:30 P.M., NACIS Conference Registration
GRAND BALLROOM FOYER

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

7:30—9:00 P.M., NACIS Opening Session
PORT

Application of GIS to Construct Sinkhole and Cave Databases
Can Denizman, Valdosta State University; Todd Kincaid, Hazlett-Kincaid, Inc.

9:00—11:00 P.M., Opening Reception and Poster Session
WINDWARD

Thursday, October 9

8:00 A.M.—5:00 P.M., NACIS Conference Registration
GRAND BALLROOM FOYER

8:30—10:15 A.M.

A. Coup Cartographique: Cartographic Impacts on GIS Data Design

STARBOARD

Chair: Aileen Buckley, ESRI

Washington Apples and Florida Oranges: Generalize This
Keven Roth, USGS

Harnessing the Power of Geographic Databases for Cartography: A Multi-Scale
Basemap Data Model Demonstration
Aileen Buckley, ESRI

Designing Maps that Work at Any Scale
Charlie Frye, ESRI

Designing Geographic Visualization Software with UML
Frank Hardisty, University of South Carolina

B. The Joy of Map Design

PORT

Chair: Trudy Suchan, U.S. Census Bureau

Visualization Design Issues of the Battle of Antietam
Charlie Kershner, U.S. Army Topographic Engineering Center and Frostburg State University

Maps for the Encyclopedia of Chicago History
Denis McClendon, Chicago Cartographics

Reporting Oregon's Salmon Recovery Effort using Atlas Design Techniques
Jim Meacham and Ken Kato, University of Oregon

Design Without Lines
Michael Hermann, University of Maine

10:30—Noon

C. Whither Cartography Textbooks? A Panel Discussion

STARBOARD

Panel Organizer: Brandon Plewe, Brigham Young University

Panelists: Judith Tyner, California State University–Long Beach; Dennis Fitzsimons, Humboldt State University; Barbara Buttenfield, University of Colorado–Boulder; Will Fontanez, University of Tennessee

A discussion of the 'ideal content' for cartographic textbooks given the growth of GIS and visualization, and a discussion of cartographic textbooks currently being revised or written.

D. Cartographic Software Roundtable: Taking All Comers to Discuss, Dissect, Dissemble, Divert, Divine . . .

PORT

Discussion Leaders: Alex Tait, International Mapping Associates; Glen Pawelski, NovoPrint; Dan Van Dorn, Map Link

A discussion of cartographic software, including purchasing and upgrading strategies, gaps and deficiencies in current software (the search for the perfect mapmaking tool), specific categories of software (vector, raster, 3-D), and applications.

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

WINDWARD

1:30—3:15 P.M.

E. Crunching Numbers: Cartographic Data, Steganography, Automation, and Analysis

STARBOARD

Chair: Will Fontanez, University of Tennessee

Community Mapping: Tax Records as the Base for Historic Growth Patterns and Social Class Differentiation

Stuart Allan, Allan Cartography/Raven Maps and Images/Benchmark Maps; Mary Beth Cunha, Humboldt State University; Colin May, Southern Oregon University

Mapping Demographic Change with Inconsistent Areal Units

Joshua Comenetz and Cesar Caviedes, University of Florida

Cartographic Traps and Information Hiding in Digital Cartographic Data

Matt Rice, University of California-Santa Barbara

Techniques in Creating an Automated Mapping System using Commercial GIS Application Tools

Zachariah Turner, U.S. Census Bureau

Reconstructing Campus: A Geodatabase Implementation for Map Design

Erik Steiner and Ken Kato, University of Oregon

F. Gallery Session: Creative Cartography: Social Space and Emergent Narrative

PORT

Jake Barton, Local Projects

Panel Organizer: John Krygier, Ohio Wesleyan University

Discussants: Jeremy Crampton, Georgia State University; Matthew Knutzen, New York Public Library; Margaret Pearce, Western Michigan University; Denis Wood, Independent Scholar

A gallery talk on several pieces of creative cartography, including City of Memory, WorldView, and New York Observers, and the context for the works. Barton's maps are designed for public spaces and engage social interaction, personal expression, and collaborative storytelling, all by bending the conventions of cartography.

3:30—5:00 P.M.

G. Maps for the Masses: Map Collections and Libraries

STARBOARD

Chair: Jim Meacham, University of Oregon

Evaluation of Map Link's International Topographic Map Collection
Martha Bostwick, Maps.com; Dan Van Dorn, Map Link

Finding the Ancestors of GIS in Historical Maps
David Rumsey, Cartography Associates; Edith Punt, ESRI

Finding Cartographic Materials, or How the Internet Has Changed the Way Libraries Acquire the Good Stuff
Joanne Perry, Pennsylvania State University

Using Digital Index Maps to Provide Remote Access to Map Sets and Series
Paige Andrew, Pennsylvania State University

H. The Politics of Mapping

PORT

Chair: Margaret Pearce, Western Michigan University

We'll Always Have Paris: How Maps Determined the Political Geography of the 20th Century at the Paris Peace Conference, 1919 (and Caused Even More Conflicts in the Process)
Jeremy Crampton, Georgia State University

Picking up the Pieces: Cartographic Support to Nation Rebuilding after World War Two
John Anderson, Louisiana State University

Thinking About Maps as Propositions Instead of Pictures
Denis Wood, Independent Scholar

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

7:30—10:00 P.M., St. Johns River Dinner Cruise

Cruise the St. John's River on a climate-controlled paddlewheel riverboat with dinner, dancing with DJ, cash bars, and outside viewing areas.

Friday, October 10

8:00 A.M.—3:00 P.M., NACIS Conference Registration

GRAND BALLROOM FOYER

8:30—10:15 A.M.

I. Pitfalls and Pleasures of Cartographic Self-Publishing: Making a Go of Printing and Distributing Maps and Atlases

STARBOARD

Moderator/Organizer: Alex Tait, International Mapping Associates

Panelists: Tom Harrison, Tom Harrison Maps; Martin Gamache, Alpine Mapping Guild; Larry Bowring, Bowring Cartographic; Michael Hermann, Purple Lizard Publishing

A group of mapmakers with first hand experience in self-publishing map titles will briefly share their experience and then contribute to an open discussion of the topic.

J. Places, Mysteries, Rhetoric and Poems: Alternative Cartographies

PORT

Chair: Jeremy Crampton, Georgia State University

Practical Map Rhetoric

Mark Denil, Conservation International

A Poet and Two Cartographers: Marianne Moore, Olaus Magnus, and Peter Apian
Adele Haft, Hunter College

Maps Show no Place? Experimenting with Route Frames in a Voyageurs Map
Margaret Pearce, Western Michigan University

Mysterious Maps: The Role of Maps in Detective Fiction
Judith Tyner, California State University – Long Beach

10:30—Noon

K. Mapping Nations: Atlas Design and Creation

STARBOARD

Chair: Denis McClendon, Chicago Cartographics

Atlas of Switzerland Interactive 2 – Concepts, Functionality, Techniques
Stefan Huber, Christoph Schmid, Ren Sieber, Institute of Cartography, Swiss Federal Institute of Technology

Map Design for the National Atlas of the US

John Hutchinson, SAIC, contractor to USGS Eros Data Center

Changing Faces, Changing Places: An Atlas of Changing Ethnic Patterns in Southern California

Eugene Turner and James P. Allen, California State University at Northridge

Where's the Story? Selecting Maps for the Census Atlas of the United States

Trudy Suchan, U.S. Census Bureau

L. Teaching, Learning, and Understanding Cartography and Geography

PORT

*Chair: Fritz Kessler, Frostburg State University***Bottlenecks in the Educational Process: A GIS and Cartographic Perspective**
*Charles Rader, University of Wisconsin – River Falls***The Role of Animation in Teaching Geographic Concepts**
*Benjamin Sheesley and Mark Harrower, University of Wisconsin – Madison***Development of an Expert System for Cartographic Design Education**
*Hugh Howard, University of Oregon***Brain Mapping: What Does Cognition Look Like?**
Megan Lawrence and Erik Steiner, University of Oregon

Noon—1:30 P.M., Lunch—on your own

Cartographic Perspectives Editorial Board Meeting

PROPELLER

1:30—3:15 P.M.

M. The Great NACIS Map-Off: Two Harrowing Weeks to Produce a Finished Map

STARBOARD

Organizers: Gordon Kennedy, Washington Department of Transportation and Alex Tait, International Mapping Associates

Six cartographers will be given two weeks prior to the NACIS conference to produce a map based on a given map assignment. The results will be reviewed and critiqued during the Map-Off session by audience members and by a panel of experts, including *Erin Aigner, The Washington Post; Martin Gamache, Boston Redevelopment Authority; Judy Olson, Michigan State University*

N. Disease, Death, Boundaries, and Tranquil Shores: Historical GIS and Mapping

PORT

*Chair: Charles Rader, University of Wisconsin – River Falls***Reconstructing the New Orleans Yellow Fever Epidemic of 1878: Spatially Analyzing and Visualizing Disease Spread with a GIS**
*Andrew Curtis and John Anderson, Louisiana State University***Going Digital: How the Atlas of Historical County Boundaries Switched from Printed Books to Cartographic Data Files**
*John Long, Newberry Library***American Shores: Maps of the Middle Atlantic Region to 1850**
*Matthew Knutzen, New York Public Library***(Re)Animating the Dead: Issues in Converting Historical Cartographic and Text Information for a GIS for Disease Spread Analysis**
John Anderson and Andrew Curtis, Louisiana State University

3:30—5:00 P.M.

O. Envisioning Landscapes: Panoramas and Terrain

STARBOARD

Chair: Megan Kealy, National Park Service

Historic Panorama Maps: Promoting the American City
Roberta Williams and Jeff Patton, University of North Carolina – Greensboro

Cartographic Depiction of Mountain Prominence and Distribution
Aaron Maizlish, County Highpointers

Analytical Hillshading with Luminosity from Aspect
Patrick Kennelly, Long Island University; Jon Kimerling, Oregon State University

P. Mapping With Time and Sound: Multisensory Cartographies

PORT

Chair: Frank Hardisty, University of South Carolina

An Analysis of the Utilization of Sounds for Cognitive Enhancement of Topographic Maps for the Visually Impaired
Paporn Thebpanya, University of Georgia

Animating Uncertainty in Time-Sequence Dot Map Representations
Mathew Dooley, University of Nebraska – Lincoln

Seeing Clusters that Move Over Space and Time: A Map Animation Experiment
Alan MacEachren, Amy Griffin, Bonan Li, Frank Hardisty, Brian Pacheco, GeoVista Center, Pennsylvania State University

Do Users Need Smooth Animations?
Joanna Seeber, University of Wisconsin – Madison

3:30—5:30 P.M., NACIS Board Meeting

PROPELLER

6:30—10:00 P.M., Annual Banquet

WINDWARD

Cartography in 2003
Judy Olson, Michigan State University

Saturday, October 11

Workshops

9:00 A.M.—4:30 P.M., Using SVG for Interactive Cartography

UNIVERSITY OF NORTH FLORIDA

Brandon Plewe, Brigham Young University

Scalable Vector Graphics (SVG) is a web standard for interactive vector graphics that is gaining popularity among cartographers seeking a better solution for putting high-quality, interactive maps on the Internet. This workshop will give participants a basic introduction to the standard and how to use it for cartography.

9:00 A.M.—4:30 P.M., Cartographic Production Using ArcGIS

UNIVERSITY OF NORTH FLORIDA

Stephen Hodge and Georgianna Strode, Florida State University

An introduction to the ArcGIS system from data collection, data manipulation and map production. Included in this full-day workshop will be a short field exercise on how GPS data can be incorporated into your mapping efforts. Learn how to integrate USGS and other readily available data sets into your ArcGIS project.

Field Trips

8:00 A.M.—5:00 P.M., Self-Guided Exploration of St. Augustine, the oldest city in the United States (tour packet provided)

8:00 A.M.—5:00 P.M., Okefenokee Festival/Pioneer Day at the Chesser Island Homestead

Enjoy a day of pioneer crafts, bluegrass music, storytelling, pony rides, and wood stove cooking at the Chesser Island Homestead.

The East Entrance offers the visitors access into the core of the Okefenokee via the manmade historic Suwannee Canal. The swamp's most extensive open areas branch off the Canal—Chesser, Grand, and Mizell Prairies. The small natural lakes and gator holes dotting the prairies offer some of the area's finest freshwater sport fishing. Home of the Florida sandhill crane, the prairies are excellent sites for bird watching.

Modern concession facilities offer guided boat tours; boat, motor, and canoe rentals; snacks; souvenirs; and camping supplies.

The refuge Visitor Center provides detailed information regarding the features and facilities at this entrance. Visitors enjoy a 4.5 mile wildlife observation drive, 4.5 miles of hiking trails, a .75 mile boardwalk into the swamp, two observation towers, and a restored swamp homestead.

Opening Session

Application of GIS to Construct Sinkhole and Cave Databases

Can Denizman, Department of Physics, Astronomy & Geosciences, Valdosta State University and Todd Kincaid, Hazlett-Kincaid, Inc.

This study describes an application of Geographic Information Systems (GIS) to examine the morphometric and spatial distribution of karstic depressions in the lower Suwannee River basin.

Morphometric analysis of some 25,000 karstic depressions in an area covered by twenty-four 1:24,000 standard USGS topographic quadrangles were made possible by the powerful and rapid analytical capabilities of the GIS. The parameters calculated for the study area include: length, width, orientation, area, depth, circularity index, depression density, pitting index, and nearest neighbor index.

The study also explains the procedure and the status of an ongoing project on mapping caves in Florida. The process involves digitizing cave maps, determining attributes on cave geometry, and constructing a GIS database for passages and survey points in the caves of Florida.

Annual Banquet Address

Cartography in 2003

Judy Olson, Michigan State University

Cartography continues its constant evolution and it is difficult to capture the moment in such a dynamic field. Nevertheless, we can observe some enduring content as well as new developments, examine how the definition of cartography and our relationship to GIS/GISci have changed, and look at some of the current activities that characterize the times in our field. This presentation, then, will be a potpourri of observations, an oral and illustrated collage, of cartography in 2003.

Poster Session

**Developing a Statewide Shadeset for
Manatee Protection Zones in Florida**
Chris Anderson

**Creating a 3-D Bathymetric Image and
Exploring Key Functionality Issues for
Exporting GIS Data Layers to Graphical
Software: Producing the Biscayne Safe
Boating Campaign Map**
Georgia DeStoppelaire

**GIS and Cartography at University of
Wisconsin – River Falls**
Marguerite Forest and Charles Rader

**The Map Interpretation Course in the
Modern Geography Curriculum**
James Fryman and Bonnie Sines

**Enriching Census 2000 Data with
Assessing Records in Urban Area,
Cartographic Experiments at the Boston
Redevelopment Authority**
Martin Gamache

**20th Century Expedition Maps for the
Swiss German and Austrian Alpine
Clubs**
Martin Gamache

**Recent Cartographic Projects of the
Alpine Mapping Guild**
Martin Gamache

From GIS to Website Display
Rosemary Stenback

Abstracts

Panel Sessions

Listed alphabetically by title

Cartographic Software Roundtable: Taking All Corners to Discuss, Dissect, Dissemble, Divert, Divine . . .

Moderators / Organizers: *Alex Tait, International Mapping Associates, Ellicott City, MD*

Panelists: *Alex Tait, International Mapping Associates, Ellicott City, MD; Glen Pawelski, NovoPrint, Milwaukee, WI; Dan Van Dorn, Map Link, Santa Barbara, CA*

A discussion of cartographic software, including purchasing and upgrading strategies, gaps and deficiencies in current software (the search for the perfect map-making tool), specific categories of software (vector, raster, 3-D), and applications.

Creative Cartography: Social Space and Emergent Narrative

Moderator / Organizer: *John Krygier, Ohio Wesleyan University, Delaware, OH*

Panelists: *Jeremy Crampton, Georgia State University, Atlanta, GA; Matthew Knutzen, The New York Public Library, New York, NY; Margaret Pearce, Western Michigan University, MI; Denis Wood, Independent Scholar, NC*

A gallery talk on several different pieces of 'creative cartography', and the context for the work. These maps are designed for public spaces and engage social interaction, personal expression, and collaborative storytelling, all by bending convention cartography.

Pitfalls and Pleasures of Cartographic Self-Publishing: Making a Go of Printing and Distributing Maps and Atlases

Moderator / Organizer: *Alex Tait, International Mapping Associates, Ellicott, MD*

Panelists: *Tom Harrison, Tom Harrison Maps; Martin Gamache, Alpine Mapping Guild; Larry Bowring, Bowring Cartographic; Michael Hermann, Purple Lizard Publishing*

Many cartographers dream of creating and publishing their own maps of their favorite places. Or they have a terrific idea for a map of someplace that they know will sell like hot cakes. The reality of creating, printing, marketing, and distributing your own map titles is often quite a bit different than the dream. We have gathered a group of mapmakers with first hand experience in self-publishing map titles. They will briefly share their experience and then contribute to an open discussion of the topic.

The Great NACIS Map-Off: Two Harrowing Weeks to Produce a Finished Map

Moderators / Organizers: *Gordon Kennedy, Washington State Department of Transportation; Alex Tait, International Mapping Associates, Ellicott City, MD*

Panelists: *Gordon Kennedy, Washington State Department of Transportation; Alex Tait, International Mapping Associates, Ellicott City, MD; Erin Aigner, The Washington Post, Washington, DC; Martin Gamache, Boston Redevelopment Authority, Boston, MA; Judy Olson, Michigan State Univeristy, East Lansing, MI*

Cartographers are beginning to reap the benefits of information technologies that can deliver large data sets, graphic arts production tools and fine-quality visualizations to common desktop computers. With access to such tools the cartographer has unprecedented and expanding powers to single-handedly acquire and manipulate data and design high-quality maps. The Map-Off cartographers will receive the map problem on September 24 and are to deliver finished map products as digital image files to the Map-Off moderator on October 8 at the conference. The maps will be intended for computer screen display. Panel members will present the maps at this session, and compare them as examples of map design and production done with contemporary tools and data sources. The map authors will be present to answer questions, explain techniques and offer their own assessments of the work. Audience participation will be encouraged. The critique will be conducted with friendly rigor to illuminate the various design approaches and techniques that were employed.

Whither Cartography Textbooks? A Panel Discussion

Moderator / Organizer: *Brandon Plewe, Brigham Young University, Salt Lake City, UT*

Panelists: *Barbara Battenfield, University of Colorado, Boulder, CO; Dennis Fitzsimons, Humboldt State University, Humboldt, CA; Will Fontanez, University of Tennessee, Knoxville, TN; Judith Tyner, California State University – Long Beach, Long Beach, CA*

A discussion of the 'ideal content' for cartographic textbooks given the growth of GIS and visualization and a discussion of cartographic textbooks currently being revised or written.

Abstracts

Paper Sessions

Listed alphabetically by author

**Stuart Allan, *Allan Cartography/
Raven Maps & Images & Images/
Benchmark Maps, Medford, OR;*
Colin May, *Southern Oregon
University, Ashland, OR; Mary Beth
Cunha, Humboldt State University,
Arcata, CA***

Community Mapping: Tax records as the base for historic growth patterns and social class differentiation

County property tax data, combined with cadastral plat maps, offers a ready-made georeferenced data set that permits community mapping at house-by-house resolution. This capability represents an order-of-magnitude improvement over census tract mapping. (Census tract mapping itself constituted a comparable improvement over county-scale choroplethic mapping and, of course, takes advantage of a much greater range of data than is available in county tax files.) This paper presents a general methodology and discusses some of the problems encountered and the steps taken to resolve them. Examples are presented from three counties in Oregon and California. We mapped three characteristics for each county / community: decade of construction; value of residential unit by decile class of value ranges; and value of residential unit by decile class of total aggregate value. The map of construction by decade portrays in exquisite detail the evolution of city form and of rural sprawl. Both residential value maps illustrate social and economic segregation and identify pockets of gentrification, wealth, and poverty. A comparison of the two value maps emphasizes the critical (but easily overlooked) importance of the conceptual analysis underlying every map legend. The effectiveness of these portrayals suggests that this approach offers the general outlines of a vocabulary of community mapping which may in time take

its place alongside the well-established vocabularies of terrain representation, climate mapping, etc.

**John Anderson, *Louisiana State
University, Baton Rouge, LA***

Picking up the Pieces: Cartographic Support to Nation Rebuilding after World War Two

World War Two was the first conflict where the victors sought to rebuild the defeated nations rather than punish them. Such efforts were also undertaken in the aftermath of several wars during the rest of the 20th century and into the early years of the 21st century as evidenced in the recent Operation Iraqi Freedom. Since the nation rebuilding programs after World War Two were the largest undertakings and set the tone for the succeeding rebuilding efforts, there are rich sources for examples of cartographic support for these activities. Further, World War Two drew many famous geographers and cartographers to wartime service. This paper will present examples of cartographic products produced for occupying forces and civilian affairs teams by many U.S. government agencies including the State Department, Department of Agriculture, Office of Strategic Services, the Federal Reserve System, and the Department of Commerce.

**John Anderson and Andrew Curtis,
Department of Geography and
Anthropology, Louisiana State
University, Baton Rouge, LA**

(Re)Animating the Dead: Issues in Converting Historical Cartographic and Text Information for a Geographic Information System for Disease Spread Analysis

Geographic Information Systems (GIS) are excellent tools for integrating textual information and maps to present spatial relationships for analysis. Electronic data is easily imported into a GIS where georeferenced information can be auto-

matically plotted on a map. But what if these data are in computer unfriendly formats such as printed archived text and oversized maps? Using a large historical non-electronic data set presents several problems. Among these are digitizing the data, data quality, landscape changes, cultural changes, and selecting the appropriate map for display. This paper will explore the problems encountered and surmounted while creating a GIS-based animation of the 1878 Yellow Fever Epidemic's spread in New Orleans using historical documents.

Paige Andrew, Pennsylvania State University, University Park, PA

Using Digital Index Maps to Provide Remote Access to Map Sets and Series

In most libraries today, users must visit the library to use the index map for a particular geologic map set in order to determine the sheet required. Unfortunately, it is not uncommon for the user to then find that the library doesn't own the sheet in question. This project describes an experiment in providing remote access to these index maps via the Internet and in enhancing the utility of the library catalog and the index maps for remote users. Digital index maps were created for various geologic map sets, featuring links from each individually represented map sheet on the index to the relevant library catalog record. Methods to represent sheets not owned were also explored. Records for digital index maps were added to the library catalog and links to the index were added to the library catalog records of the geologic maps and sheets. This cross-linking allows users to access the index map from multiple entry points and facilitates its use.

Martha Bostwick, Maps.com; Dan Van Dorn, Map Link

Evaluation of Map Link's International Topographic Map Collection

Map Link, North America's largest wholesale map distributor, stocks over 100,000 different titles. Among those is a substantial collection of international topographic sheets. Representing 95 countries and 157 series, the maps range in scale from 1:10,000 to 1:5,000,000. For this evaluation, we are concentrating only on international collections, omitting all U.S. Government series as most NACIS participants are familiar with these. Existing documentation can be found that evaluates topographic maps on a quantitative level (see World Mapping Today, Parry and Perkins, 2000). We are seeking to compare and contrast the various series of maps on a qualitative level. The following variables/techniques will be analyzed: graticule, coordinate system(s), projection, language(s), legend, area covered, creator, hypsography, bathymetry, hydrography, roads, colour, typography, and unique/interesting features. The use of slides enables us to explore: a) how certain features are represented at various scales; b) variation in the level of detail at a given scale; c) compare and contrast an organisation's maps at various scales, and in some cases, differences in maps at same scale, when the maps are produced for different countries; d) the effectiveness of the chosen color palette/overall design/visual hierarchy; e) typography; f) overall usability of a map series. There will be many benefits of this evaluation. They include: a) offering useful cartographic techniques to North American cartographers. It will be interesting to discover how cartographers from other parts of the world symbolise features unique to their country, and solve problems that we may not encounter on our maps; b) inform us to the state of international government cartography today; c) remind us that government-issued topographic maps are often the best and most accurate maps available for a country.

Aileen R. Buckley, ESRI, Redlands, CA

Harnessing the Power of Geographic Databases for Cartography: A Multi-scale Basemap Data Model Demonstration

Today, nearly all cartography is derived at some level from GIS databases. Databases provide many advantages for spatial data management and analysis, but the database itself has not been used to any great extent for cartography. With the development of object-oriented geodatabases, the potential for "intelligent cartography", or maps that know "how to draw themselves" is increasing. Cartographic data models leverage the geodatabase for cartographic purposes - these models provide pragmatic tools for helping to define cartographic information in the database. They specify not only the GIS features in the database but also the specifications for how the features should be drawn on the map at particular scales. Of course, these specifications are a function of the final map product. Basemaps, for example, are compiled from various themes, but they also contain reference information, map elements, and page layout design. All of these could be defined in the cartographic data model along with rules for how they will be rendered at particular scales. The advantages of this approach to projects with many maps of a similar design for various extents (such as the USGS map series) are fairly obvious, but even more limited projects could benefit from the formalization of the mapping process and the rules for symbolization and layout. If a map that could draw most of itself, the cartographer would be free to focus on exceptions to the rules. Before cartographers can harness the power of geodatabases for mapping purposes, it is first necessary to become more knowledgeable about cartographic data models and more skillful working with them. This presentation introduces concepts relating to a cartographic data model and demonstrates related techniques with a multi-scale basemap geodatabase.

*Joshua Comenetz and Cesar Caviedes,
Department of Geography,
University of Florida, Gainesville,
FL*

Mapping Demographic Change with Inconsistent Areal Units

Mapping demographic change is straightforward only when the administrative or statistical units for which data are gathered are stable or experience very little change, as with American counties. When areal units are revised between census years, the data for one or both years must be converted to a standard format, i.e. data for both years must be fit to a consistent set of units. Weighting and gridded population databases are often used to translate data between different boundary configurations, but such methods can introduce substantial error. An alternate method, based on amalgamation of lower-level units, was successfully employed to assess demographic change in Ethiopia between 1984 and 1994. As a result, we were able to discern the demographic results of the extended droughts followed by famine and political turmoil that were the result of the El Nino events occurring in that period. That this could be accomplished was due directly to the use of cartography, which enabled the creation of a consistent and logical set of common areal units.

*Jeremy Crampton, Georgia State
University, Atlanta, GA*

We'll Always Have Paris: How Maps Determined the Political Geography of the Twentieth Century at the Paris Peace Conference, 1919 (and Caused Even More Conflicts in the Process)

In December 1918, the American liner the *George Washington* sailed from New York City to France, carrying the American president, tons of documents and maps in crates, the President of the American Geographical Society, and assorted cartographers and draftsmen, including Armin Lobeck and Mark Jefferson. This group of scholars and politicians were

united in the task of redrawing the political map of Europe, East Asia, Africa and the former German colonies around the world, following the defeat of Germany and her allies in World War I. Over the next six months, in hotels, private homes and the splendid palace at Versailles, the "big four" (USA, UK, France, and Italy) pored over maps they had brought with them, as well as hundreds more made on the spot by Jefferson and his team, before forcing Germany to sign the Peace Treaty. Although all participants consulted experts, the American delegation, called "the Inquiry" was the largest and most powerful, producing a secret dossier (the "black book") of maps to give weight to its political desires. In this presentation, I shall outline what really happened in Paris, and how maps were instrumental in shaping the political geography of the twentieth century.

*Andrew Curtis and John Anderson,
Department of Geography and
Anthropology, Louisiana State
University, Baton Rouge, LA*

**Reconstructing the New Orleans
Yellow Fever Epidemic of 1878:
Spatially Analyzing and Visualizing
Disease Spread with a Geographic
Information System**

Considerable archival epidemic disease data is available for the United States for the 1800s. These data, maps, tables and written accounts, were produced after disease outbreaks by city, county and state boards of health. Luckily, many of these report compilers included as much pertinent data as possible. Many medical histories written in the 1900s used these data rich sources to understand the great epidemics and the general disease and public health conditions. However, it is now possible to revisit these data sets with a suite of geographic technologies and techniques. These geographic tools can enrich the understanding of previous epidemic histories, and provide fresh insight into the 1800s disease landscape. This paper will use the New Orleans 1878

Yellow Fever Epidemic's spatial and temporal characteristics to illustrate how current spatial analytical capabilities can be used to investigate historic epidemics. This significant epidemic claimed approximately 4000 lives out of just over 200,000 residents. Following the epidemic, the New Orleans Board of Health published a report giving the fever victims' name, age, nativity, residence and date of death. These data were imported into a Geographic Information System (GIS) that mapped each victim's address onto a 19th century city map. This paper will demonstrate manipulating the data set to reveal insights into the data's attributes, identifying disease clusters, and visualizing the death surface using cartographic animation. Although the 1878 epidemic is used as an example, this paper is intended as a template for other spatial analysis using GIS.

*Mark Denil, Director of Conservation
Mapping/Chief Cartographer,
Conservation International*

Practical Map Rhetoric

Map making is the main vehicle for dissemination of geographic information, and it is likely to remain a key component in all stages of the collection, analysis, and understanding of spatial data. Far too often, however, so-called 'cartographic concerns' have gotten short shrift by gizers (GIS-ers) more concerned with (and better prepared for) data manipulation and number crunching than with public declamation. It has been proposed that all maps are rhetorical; which is to say that all maps forward some argument or other to an audience in an attempt to persuade that audience on some issue. We can see how this can be so, but the question then becomes a practical one. How can a rhetorical model of cartography assist in the composition of a new map, and conversely, how can this model work in analyzing and understanding these and other maps? On one level the question is one of applicability, and on another it is a question of application. In this talk we will

briefly examine one map of a common map type, a map not necessarily usually thought of as rhetorically based. In a logical deconstruction of the rhetorical grounding and operation of this example, we will explore the utility of viewing every map as a persuasive construct.

Mathew Dooley, Department of Anthropology and Geography, University of Nebraska – Lincoln

Animating Uncertainty in Time-Sequence Dot Map Representations

This paper is concerned with the animation of computer dot maps to communicate temporal change in discrete phenomena. While dot mapping provides a powerful means of representing discrete phenomena, the disadvantages associated with random dot positioning algorithms are significant, and so much so, that the use of dot maps has increased little since the introduction of affordable mapping software with dot mapping capabilities. These disadvantages are exacerbated when using computer-generated dot maps in a standard frame-by-frame animation to communicate temporal change because random dot distributions are inherently unstable, with the potential of producing a variety of different maps from the same data set. It follows that the comparison of any unique combination of sequential pairs will result in different patterns, making it difficult for map readers to distinguish true from false change. In order to explore the potential of computer-generated dot maps as a tool for evaluating temporal change, I draw from two sources, including Fisher's (1996) animation of dot map uncertainty and MacEachren et al.'s (1993) combination of temporal and non-temporal animation to communicate cartographic uncertainty. The result is an interactive map in which users can explore population change in the Great Plains from 1900 to 2000. While recognizing that the high degree of instability in computer-generated dot maps provides several disadvantages, I suggest that animated dot maps might still be

appropriately used as a tool to explore temporal change in discrete phenomenon, so long as map users can distinguish true change from 'false' change introduced by cartographic technique.

Charlie Frye, ESRI, Redlands, CA

Designing Maps That Work At Any Scale

Interactive digital maps have become part of everyday culture; these maps give anybody with access to the Internet a map of any scale, any location, and unfortunately many levels of quality. Only a very few of these Internet applications make use of a map that is cartographically designed, appealing, and relevant at any scale of use. The reason so few of these good examples exist is that the design of such a map is complex. The reason for such complexity is that many different kinds of data, transportation, hydrography, cultural, etc., are represented and these data are not captured at the same scales or with the same purposes-leading to graphical data integration issues. The cartographer who makes such a map must do a lot of work and data processing to make the map work by subtly interleaving layers of information. Most cartographers are familiar with the idea behind what must be done, but this idea is really an over-simplification or an obfuscation of what really must be done in terms of filtering and layering data and text to create that seamless portrayal of geographic information at any scale. The form of this layering and filtering is important and is distinctly different than the style of cartographic representation that might be used on any given map. Cartographers making multi-scale maps for the Internet need to understand this form and be able to adapt it to the specific requirements of the cartographic style their maps use.

Adele J. Haft, Associate Professor of Classics, Hunter College: CUNY, 695 Park Avenue, New York, NY

A Poet and Two Cartographers: Marianne Moore, Olaus Magnus, and Peter Apian

This paper is about a poet and two cartographers. The poet is Marianne Moore (1887-1972), one of the most lauded and loved American poets of the twentieth century. In 1924 she published 'Sea Unicorns and Land Unicorns,' a poem examining four exotic beasts--narwhals, unicorns, sea lions, lions--and their celebrated, if often unreal relationships to one another. While describing sea unicorns early in the poem, Moore specifies 'the cartographers of 1539,' a date that can only allude to the Carta Marina of Olaf Magnusson, the Swedish mapmaker and historian known as Olaus Magnus (1490-1557). For his famous 1539 'sea chart' features a profusion of Scandinavian land and sea creatures. I shall argue not only that the relationship between 'Sea Unicorns and Land Unicorns' and the Carta Marina is richer than previously recognized, but that Moore's 'cartographers of 1539' balances/anticipates her comparison of the unicorn, near the end of the poem, and 'an equine monster on an old celestial map.' Though vague, the simile may allude to the winged figure of Pegasus on a celestial chart by Peter Apian (1495-1552), a German contemporary of Olaus Magnus. This popular cartographer, astronomer, and instrument maker originally designed his chart in 1536, then reproduced it five years later in his exquisite *Astronomicum Caesareum* or 'Imperial Astronomy.' Moore's poem and the maps to which it alludes all have something invaluable to say about cartography, exploration, and science in the Age of Discovery.

Frank Hardisty, University of South Carolina, Columbia, SC

Designing Geographic Visualization Software with UML

At one end of the technical spectrum, it could be argued that geographic visualization research should focus on subjects like physical memory architectures and video card drivers, because these topics form the basic substrate upon which geographic visualization software depends. At the other end of the spectrum, it could be argued that all software issues are merely implementation details, and the core concerns of geographic visualization should be ontological and cognitive in nature. The middle ground, which is occupied by a range of object-oriented design and user-interface design issues, is important for all those involved in the design and creation of visualization software for geospatial phenomena. This includes stakeholders such as programmers, designers of systems, those who manage the programmers and designers, and those people who represent the end users of the software. Each of these stakeholders should concern themselves with different levels of abstraction in the object oriented design process. Programmers need to be able to model individual classes and groups of interacting classes. Designers need to be able to model which software objects will contain what information and what functionality. Designers and managers need to consider how the system should work in its essential features, without regard to performance or implementation details. End users be affected by how well the design decisions represented the needs of the end user, especially when those needs came into conflict with the needs of other stakeholders. UML (the Unified Modeling Language) can help mediate between all these types of stakeholders.

**Michael Hermann, University of
Maine, Canadian-American Center,
154 College Ave., Orono, ME**

Design Without Lines

Linework is an integral part of cartographic design. However, many cartographers use lines that visually compete within the context of the information hierarchy. There are situations where lines are not needed, and more legible maps are produced when designing without them. Polygons do not always need a line to compliment their fill, and the digital design era allows cartographers to evaluate lines on many levels: weight, color, or not at all, with a key-stroke. Certainly there are several design classifications that demand lines, such as roads, routes and trails. Other types of traditional linework uses may not, such as political, coastal or contour. This paper explores specific situations where cartographers can delete the line and improve the design.

**Hugh H. Howard, Department of
Geography, University of Oregon,
Eugene, OR**

Development of an Expert System for Cartographic Design Education

This paper will describe the development of SMARTcart: a simple, intelligent learning tool for cartographic design education. Cartographic education has become software driven, with an emphasis on learning how to use software applications, at the expense of learning how to apply cartographic design principles. This has resulted in poorly-designed maps created by people with insufficient knowledge of cartographic design. SMARTcart is a tool that allows students to apply concepts of cartographic design, without being distracted by complex, 'design-ignorant' software applications that are commonly used to produce maps. SMARTcart is easy to use, has virtually no default options for the inexperienced cartographer to fall prey to, and possesses knowledge of a limited set of cartographic design principles. SMARTcart is a forward-chaining expert

system that contains a knowledge base of sixty-five rules--rules that were derived from the formalization, and subsequent codification, of cartographic design principles. SMARTcart allows the user to create simple thematic maps, and evaluates the appropriateness of the user's design decisions by comparing them with rules in the knowledge base. It provides the user with real-time scores that indicate the "quality" of the map being created. In order to ensure that SMARTcart is a useful learning tool, it has been qualitatively evaluated using principles of usability engineering. Individual and focus group interviews were performed with colleagues, and more important, with typical users of SMARTcart: college students with little experience in cartographic design. The opinions and suggestions voiced by interview participants yielded valuable information that was used to improve SMARTcart through incremental software updates. Interview participants confirmed that SMARTcart has the potential to be a useful tool for cartographic design education: it is easy to use, influences users to make active design decisions, and is engaging. SMARTcart 1.0 is a fully functional, 'proof-of-concept' software application that can introduce students to cartographic design in an easy to use, hands-on environment. www.geog.ku.edu/smartcart

**Stefan Huber, Christoph Schmid, and
Renzi Sieber, Institute of
Cartography, Swiss Federal Institute
of Technology (ETH), Zurich,
Switzerland**

Atlas of Switzerland Interactive Version 2: Concepts, Functionality, Techniques

(The first version of the Atlas of Switzerland - interactive was released in 2000. This thematic national atlas on CD-ROM consists of more than 250 statistical maps and includes a 3D topography tool. Data can be called up and simple analyses can be made for both 2D and 3D representations. The second edition, which is currently being developed, introduces many

new features while maintaining the established concepts of its predecessor. The aim was to not overstrain the average user while at the same time provide a powerful tool to the more advanced user. Emphasis was placed on interaction possibilities. The user should not only look at a map and query its data, but also be able to combine maps, make advanced queries and alter the visualization to create the map that meets his or her requirements. Introducing two completely new topics nature and environment, the new atlas will include a total of over 600 thematic maps. This broad selection of maps emerges from a variety of newly obtained data, including raster and nominal data. A selection of these maps and their queries are also available for 3D views, incorporating this part into illustrating thematic content as well. Almost all base map elements of the first version were completely worked over. The new high standard base maps are derived from the 1:500'000 print versions and include several new layers (e.g., a satellite map and glaciers). They are linked against a name database and thus can be queried in detail. The 3D part is based on an improved version of the Swiss terrain model, complemented with parts from adjacent countries. The underlying software for the new Atlas of Switzerland is a complete rework of the first edition. In this new design, maps are dynamically created by evaluating XML description files. This new interface allows easy development and independent map editing also for non-programmers. Great importance was attached to the user interface. In spite of the extended functionality the average user must be able to perform the basic operations and intuitively find the information he or she is looking for. All advanced features (e.g., data comparison lists, interactive legend, map comparison etc.) must then be accessible in a logical way. With this new edition, we hope to contribute to creating the next generation of high standard atlases by demonstrating methods for improving interactive thematic mapping.

**John A. Hutchinson, SAIC, contractor
to USGS Eros Data Center, Sioux
Falls, SD**

Map Design for the National Atlas of the United States

The National Atlas of the United States was originally published in 1970, and contained more than 400 pages and 765 maps. Since its publication, there have been regular calls for a revision, and in 1997 Congress appropriated funds for a new edition of the National Atlas. The new National Atlas is published not as a book, but as a Web site and selected printed maps. The Web site features an interactive map browser with over 400 data layers, of which a small number have been developed as printed maps. A team of cartographers in the U.S. Geological Survey is responsible for the design of printed maps for the new National Atlas. Because the maps are not bound into a book, sheet size is limited only by the size of the printing press, and formats have been developed on the basis of four different map scales. The challenge of developing a unified and consistent look for National Atlas maps at different scales has been met through the use of common graphic elements, such as banners and locator globes. The new National Atlas maps have a distinctive look, yet retain elements of the original 1970 format and use some of the same type styles as a way to connect with the 1970 edition. Nine maps have been printed for the new National Atlas, including one that depicts forest cover types on a background of shaded relief. Thumbnail maps in the legend help the reader locate each forest cover class, and, in a departure from previous National Atlas formats, all 50 states are shown at the same 1:7,500,000 map scale. To develop the new format, the design team considered several options for the treatment of Alaska and the inset maps of Hawaii and Puerto Rico. Test plots and design kits were distributed that helped the design team reach consensus on the layout as efficiently as possible. Public response to the new format has been favorable, and it has been used at 1:5,000,000 scale for a new National Atlas

general reference map. National Atlas of the United States and The National Atlas of the United States of America are registered trademarks of the U.S. Department of the Interior.

Patrick J. Kennelly, Department of Earth and Environmental Science, Long Island University, NY; A. Jon Kimerling, Oregon State University

Analytical Hill Shading with Luminosity from Aspect

Analytical hillshading provides a rendering of topographic surfaces by assigning brightness to surface elements based on the cosine of the angle between the surface element's normal and illumination vector. Users easily visualize many features in hillshaded topography, but some areas lack detail as one shade of gray does not define a unique surface orientation. We clarify some of this ambiguous hillshading using the Hue-Saturation-Value (HSV) color model. Traditionally, users assign surfaces an aspect-invariant color or colors based on H and S, and vary V (brightness) to achieve the hillshading effect. In our research, we map the luminosity of the brightest (V=100%) slice of the HSV color model. We vary H and S values with aspect and assign these colors to the topographic data so that the least saturated colors face northwest, and the most luminous colors face northeast. We then vary V in the traditional manner with hillshading. Topographic details that were not apparent in the original hillshading are highlighted by including this aspect-based luminosity.

Charlie Kershner, US Army Topographic Engineering Center and Frostburg State University, Frostburg, MD

Visualization Design Issues of the Battle of Antietam

Animations of military engagements offer many advantages over static small multiples or flow maps, which often over

generalize the battle sequences. Using Macromedia Flash to animate the U.S. Civil War battle of Antietam, four design issues were encountered that were specific to civil war military engagements. First, almost 500 regiments, artillery batteries, and cavalry units participated in the battle, and developing an effective symbology when zooming to different scales becomes difficult. Second, land feature symbology should be distinct for every feature class as each may affect troop movement differently, changing the outcome of the battle. Third, data quality issues arise when battle reports from one army conflict with the same report from the opposing army, and the cartographer must decide which description to use. Fourth, movements of regiments are not smooth and continuous during the battle. They follow roads and trails, avoid obstacles, and, depending on terrain and the amount of enemy resistance encountered, speed up and slow down. Thus, the cartographer must interpret if these non-linear movements of units are significant enough to be included or if they should be more generalized. While these issues are specific to this animation, other design issues must be explored in order to build effective animations of military engagements.

Matthew Knutzen, New York Public Library, New York, NY

American Shores: Maps of the Middle Atlantic Region to 1850

Last year, the New York Public Library's Map Division completed work on a two-year project to catalog, conserve and make broadly available through digitization and the creation of a website, a collection of antiquarian maps and atlases of the United States Middle Atlantic region generally dating from 1660-1850. This presentation will outline that project from inception to completion, highlighted by an overview of the project website.

Megan Lawrence and Erik Steiner,
Department of Geography,
University of Oregon, Eugene, OR

Brain Mapping: What Does Cognition Look Like?

The science of brain mapping (neuro-imaging) tracing human behavior to specific parts of the brain has been well established over the last 50 years. Neuropsychologists have long been interested in localizing brain activity in an effort to understand the link between behavior and physiology and improve cognitive theories. Functional MRI technology (fMRI) has generated excitement in the psychology community recently because it produces higher spatial and temporal resolution images than previous techniques, allowing for a progressive analysis of a user's response. It works by revealing a detailed three-dimensional picture of blood flow in the brain (BOLD method). Highly localized changes in oxygenation in the brain are physiologic signals that can be traced to specific motor activity, sensations, and/or cognitive processing. Despite a rich history of psychological experimentation in the geographic community, cartographic research in cognition has relied heavily on behavioral measures such as response time, quality, and accuracy on map tasks. Many studies reveal consistencies in quantitative and qualitative responses to map stimuli, but draw few conclusions about the process involved in reaching a response. Instead of simply measuring the success of map use, fMRI may reveal the neural processes that underlie map reading, the strategies employed while engaged in map reading activities, and differences in how the human brain perceives cartographic representations. This presentation will be a primer on the fMRI technique and its potential as a research tool in cartography. Preliminary research results will be presented illustrating brain activation while performing map tasks under tightly controlled experimental conditions.

John H. Long, The Newberry Library,
Chicago, IL

Going Digital: How the Atlas of Historical County Boundaries Switched from Printed Books to Cartographic Datafiles

This paper will describe the transition from creating a multi-volume printed atlas of the historical evolution of states and counties in the United States to producing the same information in digital form for dissemination as shapefiles for use with a geographic information system (GIS) and as map images for display via the Internet. After a brief description of the elements of the project and the anticipated differences between making print and digital products, the paper will compare the processes actually used to produce the printed books with those used to make the digital files. The paper will argue that books and datafiles are not perfectly equal forms and that, as different products, they require distinct apparatus and methods. The paper will compare the major strengths and weaknesses of the two different forms and the costs associated with them and will conclude with an argument in favor of the digital files over the books.

Alan MacEachren, Amy L. Griffin,
Bonan Li, Frank Hardisty, Brian Pacheco, GeoVISTA Center,
Department of Geography,
Pennsylvania State University,
University Park, PA

Seeing Clusters that Move over Space and Time: A Map Animation Experiment

A long-standing question in both cartography and cognitive psychology is whether map animation (and animation more generally) facilitates learning. Morrison (2000) reviewed a large number of controlled experiments that tested the efficacy of animated graphics, and concluded that because of experimental design flaws, these studies did not provide any evidence to support a hypothesis that animated

maps and graphics promote either faster or more complete learning. Notably, none of the studies Morrison reviewed involved animated maps or the types of complex knowledge construction activities that animated maps may be most useful in supporting. This paper reports on the structure of a test instrument designed to investigate questions of how differences in the design and construction of map animation (e.g. use of different color schemes, classification methods, pacing, etc.) either helps or hinders map readers in performing particular map reading and knowledge construction tasks. We also report on the results of a first experiment carried out using this test instrument. This experiment was designed to assess how the pacing of an animation may affect the degree to which map readers can detect clusters of events that move through both time and space.

Aaron Maizlish, County Highpointers

Cartographic Depiction of Mountain Prominence and Distribution

Mountain summits are historically measured by absolute elevation. Increasingly a group of hiking enthusiasts have become interested in promoting the concept of relative elevation, that is, the height of a summit above its surrounding environment. A mountain's prominence is the difference between the summit elevation and the elevation of the lowest contour that encircles it and no higher summit. Prominence is a non-arbitrary derivative of elevation that can be measured for any summit. Based on insights gained by the study of prominence, I and several others are developing multiple metrics and statistical observations about the topography and topology of mountainous terrain. This sub-discipline has been called prominence theory or orometrics, and may have a broader inter-disciplinary application. To date, our findings are mostly unpublished. I have developed a style of cartographic representation that highlights mountain prominence and distribution. A series of 14 maps for the United States were com-

pleted and are available for viewing. The maps illustrate both the distribution of prominent summits and the series of watershed divides that link all points in a given terrain. A divide tree has been constructed which represents the terrain skeleton of the United States. This cartographic style has been embraced by some mountain climbers, and may prove useful to cartographers depicting mountainous terrain. Other aspects of prominence theory will be presented and demonstrated cartographically. These include a summit's lineage, lineage area, isolation, and some early observations on the statistical distribution of prominence.

Denis McClendon, Chicago Cartographics, Chicago, IL

Maps for the Encyclopedia of Chicago History

The forthcoming Encyclopedia of Chicago History contains some 55 new thematic maps, most requiring original research. Preparing them presented a number of challenges in research, in compilation, and in design. Presenter: Dennis McClendon, Design Director, Chicago CartoGraphics.

James Meacham and Kenneth Kato, InfoGraphics Lab, University of Oregon, Eugene, OR

Reporting Oregon's Salmon Recovery Effort using Atlas Design Techniques

The Oregon Plan for Salmon and Watersheds is a governor-led statewide effort to improve watershed health and contribute to salmon recovery. The plan is widespread and involves many federal, state and local agencies, along side private industry, citizen groups and landowners. As cartographers we were approached to aid in the reporting and the presentation of this unprecedented conservation effort. Applying our experience from the recently published second edition Atlas of Oregon, we developed a series of two-page layouts covering individual basins, using a combination of information graphics. The design

process became very extensive and involved because of not only its environmental significance but also because of its political, economic, and social impacts. We had to navigate through an immense amount of data from many sources of varied quality, and through agency partnerships and administrative protocols. The page layouts identify basin environmental stresses, restoration projects, and the Plan's contributors and funding. The displays were designed in a way to encourage comparisons between themes and basins and promote learning about each basin's geography. The final product reflects the goal of reporting and communicating a very complex subject in a way that draws the reader into clear and data-rich map and graph displays.

Deborah Natsios, Natsios Young Architects, New York, NY

National Security Sprawl: Targeting the Homeland

The digital mappings in this series examine the emergent national security geography called 'homeland'. They track the metamorphosis of America's civil landscapes into incipient battlespace – the virtual, multidimensional locus of information-rich databases serviced by networks of complex sensors and information devices that provide real-time intelligence frameworks for visualizing and prosecuting warfare. The maps explore the security environment at the US homeland's epicenter: Washington DC and its greater metropolitan region, where in recent decades, a new national landscape of amorphous edge cities and chaotic exurban sprawl have been annexed to the emblematic Capital, displacing the idealism of L'Enfant's 1791 plan for the city. In an earlier era of internal enemy threat, during the US Civil War, the Capital and its Monumental Core had been hardened by a ring system of fortifications known as the Defenses of Washington. The network was supported by an extensive program of military mapping informed by ongoing intelligence and reconnaissance opera-

tions. Cartographic information systems are also circumscribing the 21st century militarization of homeland, supporting its regime of purported Total Information Awareness. The new defenses of Washington are expanding beyond the centralized apparatus of the nation state, targeting the constitutionally ambiguous terrain of suburban battlesprawl.

Margaret Pearce, Western Michigan University

Maps Show No Place? Experimenting with Route Frames in a Voyageurs Map

Maps are becoming less useful to human geography, particularly when there is a need to graphically portray place. The trend in digital map design is to empty a map of, rather than infuse it with, the visual noise or conflicting visual variables that ordinarily would evoke the diverse experiences of everyday life. Clean figure/ground composition brings together a seamless whole composed of disparate geographic elements while maintaining uniform scale, direction, and orientation. The effect is all space, no place. As a result, some cultural and historical geographers are abandoning the map and going elsewhere for representations of place. Close readers of the human landscape have instead turned to the photograph, the painting, and, primarily, the written word for expressing place and spatial stories. Alternative solutions, such as faux antique maps or mental maps, depend on disconnection or separation from conventional map design for their ability to convey geographical place. Does it remain impossible to convey the experience of place without separation from conventional digital cartographic design? This paper documents my work experimenting with route frames and the dimensions of color to convey place in the digital map. The context is a map of the landscape of eighteenth-century voyageurs in the Upper Great Lakes, along the primary artery of the North West Company's summer fur trade route between Lachine Rapids and Grand

Portage. The landscape is mapped as the journey and experience of NWC voyageur John MacDonnell as he travels from East to West.

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

Finding Cartographic Materials or, How the Internet has changed the way Libraries acquire the good stuff

Teaching introductory cartographic concepts can be challenging as students are faced with a variety of topics that can be difficult to conceptualize. One such challenging topic is map projections. To assist cartography students when learning map projection concepts, MaPEd (Map Projection Education) was developed. This software is designed to teach various map projection concepts such as the mathematics behind projections. MaPEd is envisioned to be an interactive resource for cartography students rather than other software typically used in the classroom whose functionality is oriented more toward map production.

To assess MaPEd's usefulness as a teaching tool, a series of focus groups was conducted. The focus groups had three main goals. First, the learning process from the student perspective (e.g., why are some topics more complex than others) was assessed. Second, how students tackle learning complex topics and integrating those learning strategies into new methods on teaching map projections was investigated. Third, the focus groups examined if MaPEd appealed to students as a learning tool and if not, what advice could they offer for improving the software.

Overall, the focus group results revealed how student-learning strategies could be incorporated into interactive teaching tools. Students indicated that new terminology, abstract processes, and mathematics made some cartographic concepts more complex than others,

especially map projections. When approaching complex topics, many reported the desire to "see the process happen." Participants in the focus groups found MaPEd facilitated the complexity behind map projection chiefly through the interface design. Moreover, participants offered many beneficial suggestions to improve the software's existing design.

Charles Rader, Department of Geography and Mapping Sciences, University of Wisconsin – River Falls, River Falls, WI

Bottlenecks in the Educational Process: A GIS and Cartographic Perspective

Where are the "bottlenecks" in the educational process which takes place in the cartographic and GIS classroom? The 'competing' goals of achieving sound theoretical understanding and appropriate levels of software literacy create highly challenging teaching and learning dynamics. This paper reports on the initial phases of a course redesign project that assesses teaching and learning under these conditions. Issues of learning styles, identifying learning bottlenecks, teaching methods, formative and summative assessments, and strategies for gathering evidence will be discussed from a Scholarship of Teaching and Learning (SoTL) perspective. These issues are placed in the context of the classroom, working with student, and redesigning a course to match one's learning objectives.

Matt Rice, National Center for Geographic Information and Analysis, Department of Geography, University of California, Santa Barbara, CA

Cartographic Traps and Information Hiding in Digital Cartographic Data

Recent information hiding research has demonstrated the ease with which hidden messages can be secretly communicated through a host such as a digital photo-

graph or a digital audio file. Several researchers in the Geographic Information Science community have suggested that information hiding techniques including digital watermarking and steganography could be adapted for use with digital cartographic data. Although many different strategies have been suggested, some of the most promising techniques involve an analysis of the carry capacity of the cartographic data using the Coordinate Digit Density Function, developed by Keith Clarke and Sarah Battersby from Shannon's well-known information theory work. This paper seeks to outline a general technique for information hiding in digital cartographic data using the Coordinate Digit Density Function, with special emphasis on the relationship between coordinate storage precision and the data accuracy. This technique can be used for creating digital 'cartographic traps', and for augmenting the functionality of digital cartographic data within a Geographic Information System. The author's work in this area is presented in context of an ongoing doctoral dissertation research project. Implementations of information hiding with cartographic data are also discussed in relation to digital earth initiatives and the digital geo-libraries of the future.

**Keven Roth, U.S. Geological Survey,
Reston, VA**

Washington Apples and Florida Oranges: Generalize this

The National Map contributes base geographic data to the National Spatial Data Infrastructure. The National Map depends heavily on partnerships with local data producers to develop a seamless collection of geographic data that will undergo continual growth and revision. In the past, when USGS made a map, all data were collected from the same source, using similar processes. As a result, data on the published map were consistent and horizontally intergrated. The National Map incorporates the best available data from multiple sources, which may cover a

whole State, or a county, or a watershed. This means multiple resolutions and classifications of data will exist and if the goal of a common base of data from which multiple, generalized views can be created is to be met, technical and operational barriers must be overcome.

**David Rumsey, Cartography
Associates; Edith Punt, ESRI Press**

Finding the Ancestors of GIS in Historical Maps

David Rumsey and Edith M. Punt, Co-Authors of the forthcoming ESRI Press book, *Cartographica Extraordinaire, The Historical Map Transformed*, will discuss how modern day GIS is not a break with mapping traditions of the past 300 years, but rather has grown out of many cartographic techniques that first appeared in the 18th century with the rise of scientific surveys and have continued up to the present day with innovations in map-making technology. GIS is the culmination of a long process of maps increasing their power over time, and older mapping traditions still have value for GIS. These concepts will be illustrated by drawing on examples of maps from the book and from Rumsey's online map library, www.davidrumsey.com. The authors will also discuss the process of making their book and how their ideas on the genealogy of GIS grew out of that work.

**Joanna Seeber and Mark Harrower,
Department of Geography,
University of Wisconsin – Madison,
Madison, WI**

Do Users Need Smooth Animations?

While quite familiar with managing data in a spatial context, cartographers often struggle with the temporal component of geographic visualizations. In creating animated maps cartographers often work with temporally sparse data sets that, when animated, produce abrupt and choppy movies. Since this is regarded an undesirable design aesthetic, cartogra-

phers will frequently choose to make their animations smooth by creating in-between data frames to fill the time gaps in the data. While considerable research has focused on methods of incorporating time in visualization tools, including data interpolation and data smoothing, there is a great deal to discover about how these techniques affect users' perceptions. It is purported that the visual smoothing of temporal data in an animation assists users in identifying patterns because smooth change is easier for the user to comprehend than abrupt change. However, the current body of literature provides no proof of this contention. Despite the fact that most animated maps contain temporally interpolated or smoothed data, researchers have not yet explored the usefulness of the inclusion of this data in animations. This study attempts to expand the existing research by testing whether smooth animations are necessary for the user to understand patterns in animated maps. Specifically, the objectives of this study are to determine: if users need smooth animations to answer both quantity and pattern questions correctly, and if they have a preference for abrupt or smooth animations. To this end, novice and experienced map users were tested on their ability to answer questions about both abrupt and smooth interactive dot map animations. The results of this research are still being analyzed; however, it is expected that users will prefer smooth animations.

Benjamin Sheesley and Mark Harrower, Department of Geography, University of Wisconsin – Madison, Madison, WI

The Role of Animation in Teaching Geographic Concepts

The role of animation as an educational tool has been studied since the development of computer-assisted instruction in the early 1980s. In the field of geography, few animation-based resources exist for learning about the history of cartography. The purpose of this research is to explore

the potential use of animation for teaching about historical maps of the oceanic tides. The theories they represent help to mark progress in the development of tidal science and reveal information about the contexts in which the historical maps were made and used. Two isoline maps of the tide, originally published in 1833 and 1901, were animated using Macromedia Flash MX software. The establishment of an educational learning objective pertaining to the concept of tidal movement governed the cartographic design process and extent of user interaction permitted. It is hypothesized that animation enhances perception of the speed of the tide, the direction of its movement, and unique or anomalous characteristics of its behavior according to several distinct theories represented on the historical tidal maps. Structured user testing will be required for a formal evaluation of these hypotheses. One particular interactive tool permits users to view animated isolines independently or simultaneously with their historical static isoline counterparts for more complete knowledge of tidal movement. An unexpected result of tidal map animation deals with the misinterpretation of moving isoline symbols as moving entities in the world, causing potential learning difficulties.

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

Reconstructing Campus: A Geodatabase Implementation for Map Design

The InfoGraphics Lab both maintains a campus Geographic Information System and produces campus maps for the University of Oregon. The lab serves the campus community through base layer data management, and the publication of a standard suite of campus thematic maps. While both GIS and publication efforts rely on similar data, over time, the general trend has been towards updating graphics and GIS documents in independent tiers. The lab began designing a Geodatabase for data storage, editing, and sharing in an

effort to improve GIS data management. The potential benefits for managing GIS data were obvious—providing a foundation for integrating campus Arc and CAD-based data—but would such a tool enhance our map production workflow and/or the quality of our maps? With changes constantly occurring on the campus, designers face the responsibility of acquiring and integrating new data into campus maps based on ad hoc protocols. For example, a building remodel update on the main campus map may not be corrected on the parking, crime, or accessibility maps. Over time, the graphics and the data diverge. The database model streamlines the update process, integrating changes in the data tier rather than the production tier. By designing a cartographic-minded data model, we have reconstructed our campus data to serve both our GIS and publication needs. From a single source, we can now more easily maintain our standard suite of maps, leaving more time and energy to create custom print and web-based map publications from this high-quality data.

**Trudy A. Suchan, U.S. Census Bureau,
Population Division, Washington,
DC**

Where's the Story? Selecting Maps for the Census Atlas of the United States

I will talk about developing a coherent body of "only" 750 maps as I show Census 2000 stories in maps prepared for the Census Atlas of the United States. The book evolved into three parts and 13 chapters with many basic topics mapped that support a few detailed demographic stories. Developing the table of contents, however, was a complex, iterative, and ultimately pragmatic process. First we consulted with subject matter experts who were brimming with map ideas? ideas that, once mapped, oftentimes required a subject matter expert to interpret. Considering our strawman audience, the Barnes and Noble shopper, the litmus test for inclusion became, Will a 50-word caption tell

the story? Should we map the story about two parent families, or about one parent families? We chose to present mirror-image maps for some topics such as this rather than assume the reader could mentally build the inverse. This also alludes to a goal of balancing numbers of maps for all groups (whether family types, race groups, age groups, or native and foreign-born populations). Organizational considerations influenced the table of contents. For instance, we proposed to combine race, ethnicity, and ancestry maps in one chapter, but were directed to make a separate chapter each for race and ancestry. Ten percent of maps in the Census Atlas show historical information. Some of the very interesting time comparisons we created finesse accuracy and rely on the human interest to make the story, for example, we map, side by side, country of birth data from the 1900 census and ancestry data from Census 2000. Maps that cross demographic variables could fit in multiple chapters. Sometimes the decision was made pragmatically, to balance page designs or length of chapters. Some favorite maps were orphans that did not fit the multi-map page templates and were dropped reluctantly from the book plan. If time permits, I will show several of these.

**Paporn Thebpanya, University of
Georgia, Athens, GA**

An Analysis of the Utilization of Sounds for Cognitive Enhancement of Topographic Maps for the Visually Impaired

For learning geographic environment, sight is often quoted as the sense par excellence. It is generally contended that people with visual impairment or blindness experience a world different from those who were sighted. Cognitive mapping research allows an insight into the mental landscapes of people with blindness and has the potential to provide clues as to how spatial information is learned, processed, and stored. 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. This research aims to provide an initial investigation into the use of multi-modal (e.g., haptic and auditory) information for exploring topographic data. The objectives of this research are to design and develop a user-friendly interface in which topographic maps can be examined in a more efficient manner than traditional maps allow, and to evaluate the implementation of two sound variables, pitch and duration, with regard to their effect on the interpretation of spatial features and contour lines. The use of audio cues will also be applied to enhance the ability of topographic map reading and interpretation for both sighted and non-sighted people. The researcher performed a limited pre-test to discover problems with interfaces, especially for the visually impaired individuals, before the experiment is implemented. The development of new representations of geographic space allows access to spatial information without vision. By expanding the presentation of geographic information to multiple modalities there will be considerable benefits for many disciplines.

Eugene Turner and James P. Allen,
Department of Geography,
California State University at
Northridge

Changing Faces, Changing Places: An Atlas of Changing Ethnic Patterns in Southern California

Over the last several decades the greater Los Angeles area has become the destination of many new immigrants to the United States. This has resulted in a highly diverse population in which Hispanics have now become the majority minority. To better visualize the spatial patterns that have developed over the last ten years we have prepared a 64-page, 15" x 11" color ethnic atlas of the larger racial and Hispanic groups that live in the census tracts of the greater Los Angeles area. The various ethnic groups are represented by choropleth maps and by colored dot maps

that show change in population 1990 - 2000. A blue dot indicates a loss of 100 persons and a red dot a gain of 100 persons. The atlas is a desktop publication that was generated with a suite of software including Microsoft Access, Excel, ESRI's ArcMap, Adobe Illustrator, and Quark X-Press. The book text interprets the changing patterns, levels of segregation, and status of enclaves. Also, discussed are various recording errors made by the Census Bureau and the challenge of dealing with the new multi-race categories in Census 2000 when mapping change.

Zachariah Turner, U.S. Census Bureau

Techniques In Creating An Automated Mapping System Using Commercial GIS Applications Tools

The U.S. Census Bureau's Geography Division is responsible for creating a number of automated mapping systems to meet its requirements for producing nationwide mapping projects. In the past Census Bureau cartographers and computer programmers developed these mapping systems in-house. With improvement over the years in GIS software development, the Census Bureau is turning to commercially available mapping software. While GIS software is normally used in highly interactive processes, the Census Bureau is developing functional capabilities for high quality mapping through customization to create large volumes of unique maps in a batch processing, completely non-interactive environment. Most recently, the Census Bureau created outline maps of the approximately 4,000 Urbanized Areas (UAs) of the United States. Urbanized Areas are delineated after the decennial census and serve as the basis for demographic research to support government programs. The urban areas are delineated through a block-by-block calculation of population density, resulting in very amorphous geographic areas. The Urbanized Area Outline Maps show the boundaries of these areas, with their underlying features and their identifiers. This presentation will discuss aspects of

system design and the production process such as text placement, batch scripts, and macros, to create maps in an automated environment. Other topics include issues in making several different software packages work together across different computer platforms and operating systems; achieving effective feature names placement; creating high quality output available for electronic viewing and suitable for printing. Other issues requiring further development for future mapping systems also are presented.

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

Mysterious Maps: The Role of Maps in Detective Fiction

Maps are popular devices in detective fiction. Maps may be clues, aids to the detective, references for the reader, or simply decorative elements on the book's end papers. The places shown may be real, fictional, or a combination. An actual map, such as a USGS topographic map, British Ordinance Survey map, or Automobile Association road map may be described in the book, but not actually reproduced. This paper categorizes maps in mystery fiction and looks at the why of maps in mysteries: why are they made, what purpose do they serve, did the author begin with a map that became an integral part of the story, or did the publisher or art department decide to add a map?

Roberta Williams and Jeffrey Patton, University of North Carolina at Greensboro, Greensboro, NC

Historic Panoramic Maps: Promoting the American City

Between 1850 and 1920, panoramic city maps enjoyed an extraordinary popularity in Victorian America. During this 70-year period, over 2000 maps were produced by hundreds of artists/cartographers who recorded the growth of a budding nation.

While these maps have been examined for their artistic merit, little work has been done to evaluate them as cartographic documents. This study is a preliminary look at the components of panoramic maps. Panoramic views of three North Carolina cities (Raleigh, Greensboro and Winston-Salem) were compared with the Sanborn Fire Maps of the same cities of approximately the same dates. By matching streets, buildings and identifying landmarks on each pair of maps we attempted to define what the artist included and excluded from these drawings as well as the use of iconography associated with the maps and their artists. These maps have long been viewed as unique and important documents recording the urban and rural development of pre- and post-Civil War America. Created as a means of communicating civic pride and prosperity, these maps played an important role in attracting immigrants and new industry to towns across America. Thirteen hundred of these views are available online in high resolution through the Library of Congress; undoubtedly their use by scholars and the general public will grow enormously. However, this research indicates that caution should be exercised in viewing them as historical "snapshots" and that their use should be tempered with a thorough understanding of how they were created and for what purposes.

Denis Wood, Independent Scholar, Raleigh, NC

Thinking About Maps as Propositions Instead of Pictures

Maps are not representations, are not pictures of the world. Rather maps are propositions that advance claims about the way the world is, about the way it might have been in the past, or about the way it might become in the future. These propositions take the form of linkages made on the plane of the map between things (residence and school attendance; topography and vegetation), these

linkages comprised of cartographic existence claims (“this is there”). These in turn depend on fundamental existence claims (“this is”). Existence claims made

by maps have unique credibility. The cartographic construction of voting districts and flood plains are raised as examples.

As is the tradition at NACIS meetings, the Hospitality Suite is a place to sit, relax, and converse with friends. This year the Hospitality Suite will be in the Anchor Room. Hours of operation will be posted at the registration desk.

We hope to see you at

NACIS XXIV
Portland, Maine
October 6–9, 2004