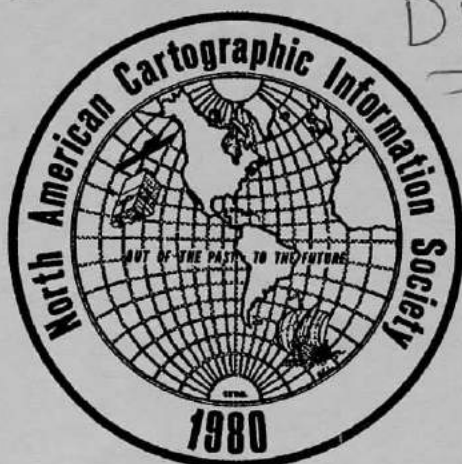


REGISTRATION

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NACIS XVIII CONFERENCE PROGRAM

*The Eighteenth Annual
Meeting of the*

*North American
Cartographic Information Society*

**Oct. 7-10, 1998
Hyatt Hotel
Milwaukee, Wisconsin**

*Hyatt Hotel
Milwaukee, Wisconsin
October 7-10, 1998*

Welcome to NACIS XVIII! As Cindy Brewer organizing a meeting in a city devoted to brewing beer and Brewers baseball, I feel well qualified to offer you a hearty welcome to Milwaukee. This is our eighteenth annual conference. We are excited to be partnering with the Newberry Library to offer a symposium that brings more historical and educational perspectives to this meeting. Thank you very much to James Akerman for proposing the joint symposium on *Maps and Minds* that precedes this year's meeting. We have an especially well-rounded range of topics for posters, talks, roundtables, and workshops this year. We have presentations from commercial map makers, software makers, map librarians, cartographers from government agencies, cartographers in university cartography labs, students, and academics working on both education and research. It is wonderful to get to know each other at a NACIS meeting where we are not lost within a larger general gathering and where both our presentation and break times are spacious. This is a meeting where you genuinely are able to get to know your colleagues from all aspects of our discipline.

I would like to extend a heartfelt thank you to Sona Andrews, Chris Baruth and Susan Peschel for all of their work on local arrangements. They did double duty this year as Executive Office and local arrangements. If I have done a good job organizing this conference, it is because Sona, Chris and Susan were coaching me and giving me deadlines throughout the year. They are the 'power behind the thrown' who envision and maintain the high quality of NACIS conferences. Thank you to our special speakers at the opening session, at AGSC, and the banquet: Michael Duckett, Ronald Grim, Stephen Percy and Olmedo Varela. They were invited by our great local arrangements group. Thank you also to Tom Patterson for extra promotion of this meeting.

We welcome your involvement in our lively journal, *Cartographic Perspectives*, edited by Michael Peterson and produced by Jim Anderson. We invite you to become involved in planning and participating in future conferences or becoming a member of our board of directors. NACIS is a thriving organization and working on a project within this supportive group is immensely satisfying. If you are new to NACIS, we sincerely ask you to join us through a new membership.

Again, welcome to the 1998 NACIS conference. I look forward to seeing you next year in beautiful colonial Williamsburg for NACIS XIX.

*Cindy Brewer
Vice President and Program Chair*

CONFERENCE SCHEDULE

WEDNESDAY, OCTOBER 7, 1998

8:00 a.m. - 7:30 p.m.

REGISTRATION - Regency Prefunction East

9:00 a.m. - noon

**MAPS AND MINDS: A HISTORY OF CARTOGRAPHY IN GEOGRAPHY
EDUCATION PART I: TRADITIONS - Regency A**

Maps in the 18th Century British Geographies
Barbara Mc Corkle, Yale University retired

*The Design and Evolution of
19th Century American School Atlases*
Jeffrey Patton, University of North Carolina-Greensboro

Maps and Geography Education in the Renaissance
Robert W. Karrow, Jr., Newberry Library

*Old Maps, New Geographies:
Historic Maps in the K-12 Classroom*
James Akerman, Newberry Library

noon- 1:30 p.m.

LUNCHEON - Executive A & B

1:45 - 5:00 p.m.

**MAPS AND MINDS: A HISTORY OF CARTOGRAPHY IN GEOGRAPHY
EDUCATION PART II PROSPECTS - Regency A**

Cartography, Theory and Geography Education
Roger Downs, Pennsylvania State University

GIS, the Web, & the Future of Cartographic Education
Charles Fitzpatrick, ESRI

*Stone-Axe Multimedia: Designing Multimedia
for Real Students*
Phil Gersmehl, University of Minnesota and
Carol Gersmehl, Macalester College

General Discussion

WEDNESDAY • WEDNESDAY • WEDNESDAY • WEDNESDAY • WEDNESDAY •

3:00 - 5:30 p.m.

NACIS BOARD MEETING - Manager's Suite

7:30 - 9:00 p.m.

OPENING SESSION - Regency A

Keynote Speaker: Michael R. Duckett, Executive Director
Southeast Wisconsin Professional Baseball Park District

9:00 - 11:00 p.m.

POSTER SESSION / EXHIBITS AND RECEPTION - Regency C

Organizer: Donna Schenstrom - University of Wisconsin-Milwaukee

The Florida Marine Spill Analysis System

Chris Anderson - Florida Marine Research Institute

Creating Quality Maps with GIS Software

David Barnes - ESRI

*Geographic Visualization of Stream Water Quality-
Which Representation for Which Users?*

Sebastien Caquard - Universite de Saint-Etienne

University Cartography Lab

Louis Cross II - Florida State University

GPS Error Visualization

Patrick Guiberson - University of Nebraska-Lincoln

Maps as Stories, Maps as Arguments

Steven Holloway - University of Montana

University Cartography Lab

David Howard - Pennsylvania State University

University Cartography Lab

Bryan Kelley - Ohio University

The Atlas of Historical County Boundaries

John Long - Newberry Library

1998 Atlas of Lane Co., Oregon:

A Student Created Product for Print and WEB Publication

Jim Meacham - University of Oregon

Louis-Clark Valley Street Map

Dale Sanderson - US West Dex

University Cartography Lab

Donna Schenstrom - University of Wisconsin-Milwaukee

Cartographic Analysis of Student Identification of US States

Shawn Slade - University of Nebraska - Lincoln

THURSDAY, OCTOBER 8, 1998

8:00 a.m. - 2:00 p.m.

REGISTRATION - Regency Prefunction East

8:00 a.m. - 4:00 p.m.

POSTER SESSION / EXHIBITS - Regency C

8:30 - 10:00 a.m.

SESSION A. THE PETCHENIK MAP AWARD WITH SPECIAL REFERENCE TO THE NATURE OF CREATIVITY IN CARTOGRAPHIC DESIGN - Regency A

Chair: Pat Gilmartim - University of South Carolina

The Barbara Petchenik Children's Map Award 1993-1999

Jacqueline M. Anderson, Concordia University

The Nature of Creativity in Cartographic Design: Some Thoughts for Discussion

Henry W. Castner, Pittsboro NC

Creativity, Art, and Cartography in Geographic Education

Karen M. Trifonoff, Bloomsburg University

SESSION B: METADATA AND EDUCATION - REGENCY B

Chair: Keith Rice - University of Wisconsin - Stevens Point

Exploring Scale and Metadata Issues

Carol Gersmehl and Susanna McMaster, Macalester College

E.O. 12906, Metadata, and the U.S. Census Bureau

Kristen O'Grady, Census Bureau

Wisconsin State Cartographer's Office - Outreach and Education

Ted Koch, University of Wisconsin - Madison

10:00 a.m. - 10:30 a.m.

BREAK - Regency Prefunction East

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Chair: Jeremy Crampton - George Mason University

Adele J. Haft, Hunter College

Valerie Krejcie, Cartographic Consultants

Karen Severud Cook, George F. McCleary, Jr.,

& Darin Grauberger, University of Kansas

Chair: Carolyn Weiss - Statistics Canada

Alex Tait, Equator Graphics

Dennis McClendon, Chicago Cartographics

Claudia James, University of Akron

LUNCHEON AND ANNUAL BUSINESS MEETING – Regency D

SESSION E: EDUCATING WITH MULTIMEDIA – Lakeshore B & C

Chair: Kathryn Thorne - Mansfield University

Amy K. Lobben, Michigan State University

for the U-boat Conflict of 1939-1945

Fritz C. Kessler, University of Kansas

David L. Howard and Mark Wherley, Pennsylvania State University

SESSION F: ROUNDTABLE DISCUSSION - CUSTOM CARTOGRAPHY BUSINESS
ROUNDTABLE - Lakeshore A

Dennis McClendon, Chicago Cartographics;

Martin von Wyss, Hybrid Designs

FRIDAY, OCTOBER 9, 1998

8:00 a.m. - 4:00 p.m.

REGISTRATION - Regency Prefunction East

8:00 a.m. - noon

POSTER SESSION / EXHIBITS - Regency C

8:30 - 10:00 a.m.

SESSION I: TECHNICAL ASPECTS OF MAP CONSTRUCTION - Regency A

Chair: Elizabeth Nelson - San Diego State University

Selecting Appropriate Age Classes for Population Maps
Richard Lycan, Portland State University

*Automated Names Placement Software Development by
the US Census Bureau and Rutgers University*
William Thompson, Census Bureau

*Symbol Functionality and the Role of Selective
Attention in Cartographic Design*
Elisabeth S. Nelson, San Diego State University

SESSION J: PLANNING FOR QUALITY MAPPING - Regency B

Chair: Michael Peterson - University of Nebraska - Omaha

*Census 2000 Data Access and Dissemination System:
Improved Customer Service*
Timothy Trainor, Census Bureau

About the Quality of Maps
Georg Gartner, Vienna University of Technology

Making it Easy for Anybody to Make Good Thematic Maps
Charlie Frye, ESRI

10:00 a.m. - 10:30 a.m.

BREAK - Regency Prefunction East

10:30 a.m. - noon

SESSION K: UNDERSTANDING MAPS – Regency A

Chair: Ren Vasiliev - SUNY - Geneseo

Spatial Cognition of Small and Large-scale Spaces

Scott M. Freundschuh, University of Minnesota - Duluth

Maps as Stories, Maps as Arguments

Steven R. Holloway, University of Montana

Leila Daw's Maps: Is This Art Cartography?

Ren Vasiliev, SUNY - Geneseo

SESSION L: PANEL DISCUSSION – INTERACTIVE CARTOGRAPHY: CURRENT & FUTURE RESEARCH PATHS – Regency B

Chair: Rex Cammack - Southwest Missouri State University

Rex Cammack (Organizer), Southwest Missouri State Univ.; Brandon S. Plewe, Brigham Young Univ.; Charles P. Rader, Univ. of Wisconsin - River Falls; Michael P. Peterson, Univ. of Nebraska - Omaha; Jeremy Crampton, George Mason Univ.; Keith W. Rice, Univ. of Wisconsin - Stevens Point

noon - 1:30 p.m.

LUNCH BREAK – On your own

CP EDITORIAL BOARD MEETING – Manager's Suite

1:30 - 3:00 p.m.

SESSION M: DATA CHALLENGES – Regency A

Chair: Valerie Krejcie - Cartographic Consultants

Mapping Custer's Last Stand

Paul D. McDermott, Montgomery College

Volunteers, Street Tree Inventory, and GIS

Joseph Poracsky, Portland State University

Integrating Disparate Data Sets in an Environmental GIS

Mark Wiljanen, SUNY - New Paltz

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1:30 - 3:00 p.m. (continued)

SESSION N: VISUALIZATION – Regency B

Chair: Cynthia Brewer - Pennsylvania State University

*Existing and Proposed Sources of Data for On-Board Databases
to Support Aircraft Synthetic Vision Systems*
Ronald M. Bolton, NOAA

Visualizing Properties of Spatial and Temporal Periodicity in Geographic Data
Robert Edsall, Mark Harrower, and
Jeremy L. Mennis, Pennsylvania State University

Three-dimensional Visualization as a Cartographic Problem
Sidney J. Freitag, U.S. Geological Survey

3:30 - 5:30 p.m.

NACIS BOARD MEETING – Manager's Suite

6:00 - 10:00 p.m.

ANNUAL NACIS BANQUET – Regency A

*Youth Mapping in Milwaukee: Community Partnerships to
Measure and Map Youth Assets*
Speakers: Steve Percy & Olmedo Varela
University of Wisconsin - Milwaukee

10:00 p.m. - ?

HOSPITALITY ROOM – Manager's Suite

SATURDAY, OCTOBER 10, 1998

WORKSHOPS

8:30 a.m. - 4:30 p.m. - Workshop A

MULTIMEDIA, MAPPING AND THE WEB (296 Bolton Hall - UWM)

(transportation provided - meet in hotel lobby no later than 8:00 am)

8:30 -10:00 a.m. - Workshop B

USING FREEHAND 8 AND MAP PUBLISHER (293 Bolton Hall - UWM)

(transportation provided - meet in hotel lobby no later than 8:00 am)

10:30 a.m. - noon - Workshop C

**CREATING, DISPLAYING AND MANIPULATING DIGITAL ELEVATION MODELS
(293 Bolton Hall - UWM)**

(transportation provided - meet in hotel lobby no later than 10:00 am)

1:30 - 4:30 p.m. - Workshop D

QUICKTIME VR FOR CARTOGRAPHERS (349 Mitchell Hall - UWM)

(transportation provided - meet in hotel lobby no later than 12:45 pm)

FIELD TRIPS

1:15 -3:30 p.m

BREWERY TOUR

(transportation provided - meet in hotel lobby no later than 12:45)

SELF-GUIDED WALKING TOUR OF DOWNTOWN MILWAUKEE

(info available at NACIS registration desk)

6:30 - 10:00 p.m.

NIGHT AT COMEDY SPORTZ (126 N. Jefferson Ave.)
(transportation provided - meet in hotel lobby no later than 6:00)

Cancelled
EVENT EVENT
(no joke)

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NACIS
Abstracts

THURSDAY, OCTOBER 8, 1998

SESSION A

**THE PETCHENIK MAP AWARD WITH SPECIAL REFERENCE TO
THE NATURE OF CREATIVITY IN CARTOGRAPHIC DESIGN**

The Barbara Petchenik Children's Map Award 1993-1999

Jacqueline M. Anderson

Concordia University, 1455 de Maisonneuve Blvd. W, Montreal, P.Q. Canada H3G 1M8;
514-848-2052; JAHFH10@VAX2.concordia.ca

The Barbara Petchenik Children's Map Award was created by the International Cartographic Association (ICA) in 1993 as a memorial Barbara Petchenik, a past president of the ICA and a cartographer who worked throughout her life with maps for children. The aim of the award is to promote childrens' manually prepared creative representations of the world.

This paper provides an illustrated historical perspective to this Award. To date three contests have been held: Koln (1993), Barcelona (1995) and Stockholm (1997). The next award will take place in Ottawa in 1999. What are the strengths and shortcomings of the Award as a means of promoting childrens' involvement with maps and cartographic education? These questions are considered and issues which require further investigation and discussion outlined.

The Nature of Creativity in Cartographic Design: Some Thoughts for Discussion

Henry W. Castner

164 Fearington Post, Pittsboro, NC 27312; 919-542-1602; hcastner@mindspring.com

The International Cartographic Association sponsors every other year an international map design competition, for children 15 years old or younger, that coincides with its biennial international congress. Ottawa, Canada will be the site of the next congress in August of 1999. The competition guidelines set out certain technical requirements and states the theme of "A World Map."

Given the breadth and ambiguity of this theme, it is difficult to understand what is the conceptual basis of this competition. In discussions about the competition, words like "creativity" or "creative representation" often crop up. But it is unclear what they mean in this cartographic context. Is it a spontaneous artistic event or a more deliberate attempt to express certain ideas or feelings about the world, no matter how simple, in cartographic ways? Can it be that our concepts concerning communication, mapping, and geography are so complex and abstract that they cannot be presented in simpler forms so that they can become accessible to young children? Are there no ideas that children can begin to work with that relate to their experiences of the world and our concepts about graphic expression? What do we want children to know about the nature and role of creativity in mapping? How do we introduce these ideas in classrooms? What specific tools should we be providing? Some views on these questions will be provided.

Creativity, Art, and Cartography in Geographic Education

Karen M. Trifonoff

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17815; 717-389-4569; trifonof@planetx.bloomu.edu

Creativity is an important (if not well defined) part of the cartographic process because it can often result in unique map presentations that present information in new or unusual ways. Teachers who engage in mapping activities often lack training in the technical aspects of map making as well as having little knowledge of the role of art, design, and creativity in the cartographic process. The purpose of this paper is twofold.

First, it explores linkages between art and cartography and the nature of creativity in the cartographic design process. The incorporation of graphic principles (e.g., those of Bertin) into mapping can lead to original and creative ways of expressing ideas and of increasing their potential for communication.

Second, it suggests a model for helping elementary and intermediate school teachers in integrating artistic perspectives and mapping. A workshop for middle school teachers, co-led by a cartographer and an artist, is described. The cartographer provided ideas on displaying quantitative and qualitative information and the artist spoke about artistic and design elements. The workshop proved to be an effective vehicle for increasing teachers' knowledge of both map making and art and gave them a model for classroom use.

SESSION B

METADATA AND EDUCATION

Exploring Scale and Metadata Issues

Carol Gersmehl and Susanna McMaster

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For our NSF grant, we have developed tutorials for use with ArcView and IDRISI software. The tutorials lead students to explore scale and metadata issues, especially for areas near our campus. We want students to consider whether digital data at particular scales is appropriate for applied projects in areas that they can actually visit or understand by first-hand experience.

E.O. 12906, Metadata, and the U.S. Census Bureau

Kristen O'Grady

Geospatial Research and Standards Staff, Geography Division, U.S. Bureau of the Census,
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On April 11, 1994 President Clinton signed Executive Order (E.O.) 12906 which created the National Spatial Data Infrastructure (NSDI) for the coordination of geographic data acquisition and access by and between federal agencies. Under the auspices of the Federal Geographic Data Committee (FGDC), all federal agencies are directed to advance the goals and ensure growth of the NSDI. The Census Bureau, a member of the FGDC, is establishing plans and procedures to comply with and implement E.O. 12906.

The Census Bureau views geographic data in its broadest sense. The Census Bureau includes in its definition of geographic data feature data sets (such as TIGER/Line files), georeferenced statistical data sets, the geographic series of the economic census, population estimates for governmental units, and all other geospatially referenced data sets. Essentially, this includes all data the Census Bureau provides to the public.

The Geography Division's Geospatial Research and Standards Staff (GRASS) is responsible for coordinating the Census Bureau's implementation of E.O. 12906. GRASS is working with the appropriate divisions, staffs, and offices to produce metadata, or data about data, for all the Census Bureau's geographic data sets to meet the requirements of E.O. 12906. The metadata will be electronically accessible as part of the National Geospatial Data Clearinghouse and provide a wealth of information about Census Bureau products to potential data users. This paper discusses the Census Bureau's implementation of E.O. 12906, focusing specifically on metadata.

Wisconsin State Cartographer's Office--Outreach and Education

Ted Koch

Wisconsin State Cartographer, Room 160, Science Hall, University of Wisconsin - Madison,
Madison, WI 53706; 608-262-6852; tkoch@facstaff.wisc.edu

Over the past decade, the quantity of digital geospatial data, the sophistication of computer systems to store and analyze this data, and the diversity of individuals and organizations needing electronic geographic data has increased dramatically. With this growth has come the growing challenges of educating new and less experienced users on where to locate data, on the appropriate uses and limitations of digital geospatial data, and on the basic principals of mapping and graphic communication.

Since 1973, the Wisconsin State Cartographer's Office, a unit of the University of Wisconsin-Madison, has functioned as an educational and outreach office with the clearinghouse mission of gathering, maintaining, and disseminating information about mapping and geographic data collections in the state. Within the past three years, the Internet has become an increasingly used medium by the office for the dissemination of information and educational materials to the Wisconsin community. Also, this activity has been augmented by the establishment of WISCLINC, the Wisconsin node of the National Spatial Data Infrastructure. The purpose of this presentation is to

explain how the State Cartographer's Office has attempted to advance the quality and quantity of mapping and map use in the state by serving as a clearinghouse, and how the office educates users in the state through its publications, presentations, and leadership by acting as a liaison with many agencies and organizations, and through serving on various task forces, committees and boards.

SESSION C EDUCATING WITH MAPS

Poets and Maps in Education

Adele J. Haft

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In "The Clouds", Aristophanes made the dimwitted Strepsilades protest that Socrates' students hadn't placed Athens far enough from Sparta on their maps. Twenty-five centuries later, poets still reflect on the role maps play in education. I wish to introduce a few of these map-obsessed poets to further the dialogue begun by some of the most widely-read educators in the fields of mapping and history of cartography: David Greenhood, J.B. Harley, R.V. Tooley, and Denis Wood. Map-poems are not only quotable but offer an exciting way to teach the meanings and uses of maps to children of all ages.

John Fuller and May Swenson both composed playful map-poems for children. Fuller's "Geography Lesson" (1983) comes with an anthropomorphic map illustrating the poem's message—that England is a poor nurse to baby Ireland; the piece teaches children the various "parts" of Great Britain and acquaints them with zoomorphic maps generally. Swenson's "The Cloud-Mobile" (1958) uses the map-image to describe time and change, and can accompany a discussion on Pangaea. In "Geography" (1986), Fiona Pitt-Kethley criticizes the Philips' Atlases required in British schools and suggests that medieval world-maps or Mark Twain are better enticements for studying geography. Karl Kirchwey imagines a teenager laboring over a map in "The Geographer's Line" (1990), and compares his imminent growth to the expansion of the United States during the nineteenth-century. Finally, in "My Story: Maps" (1977), Don Gutteridge eulogizes his childhood by naming all the ways his teachers taught him to view his native Sarnia, Ontario.

Goode's World Atlas: 20th Century Classic

Valerie Krejcie

Cartographic Consultants/Independent scholar, 4020 W. Kirk St., Skokie, IL 60076;
847-677-1881; t-krejcie@nwu.edu

Goode's School Atlas: Physical, Political and Economic for American Schools and Colleges was first published by Rand McNally in 1922. The 19th edition was published in 1995. This classic atlas has filled a niche in American geography education for over 75 years. The content, design and production of the maps has changed over the decades, but in many ways the elements of the first 96-page edition remain. In addition to the customary reference

maps, Goode's evolved to include an increasing number of thematic maps. In the 8th edition in 1949 Edward Espenshade began a long term as editor. He brought in a team of 'cooperating experts' to compile various 'special maps' and oversaw the transition to offset printing. His original agreement with the publisher kept the price of the atlas low and the revisions on a schedule. With the 9th edition in 1953 the atlas was renamed Goode's World Atlas. Geography education has changed over the century and Goode's Atlas has reflected some of those changes. What standards did the Atlas set with its design and educational goals? How was it used and marketed? Has its format affected the development of other materials? What kinds of products can educators/students/consumers expect to see in the future? Discussion will focus on these questions as well as others.

Thoughts on Making an Atlas Fly

Karen Severud Cook, George F. McCleary, Jr., and Darin Grauberger
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66045; 785-864-5540; ksccook@eagle.cc.ukans.edu

This proposal for a paper about our Multimedia Atlas of Kansas project is being written at the planning stage. We are still trying different angles with potential grant sponsors and hoping for an acceptance that will allow the project to fly. Our ideas have already come a long way since last Fall, when we decided it was about time to make an atlas of Kansas. We would like to share our developing ideas for the atlas: its target audience and functions, formats, design and production methodology, publication and distribution, and updating plans.

The main goal of the Multimedia Atlas of Kansas project is to promote geographical literacy by creating a vehicle for teaching geography skills (including GIS) through the Kansas social studies curriculum for grades K-12. The atlas will form a bridge between the local maps used to introduce geography to young children and the study by older children of more abstract spatial relationships on world maps. Publication in both paper and electronic formats will render the atlas adaptable to available facilities in different schools and to differing teaching strategies. Promotion through teacher workshops will encourage the interactive use of electronic maps and GIS analytical methods.

The initial stage of the atlas project, planned (if funded) to start September 1998, will be to use iterative prototyping and classroom testing (cooperating with Design and Education faculty and University of Kansas-affiliated schools) to design a sample atlas. Possible themes for the sample atlas are "Kansas Takes Shape, 1850-1890" and "Water Issues In Kansas." The sample atlas will be distributed to Kansas school districts for publicity and feedback, as well as forming the design model for the entire atlas.

SESSION D
EXAMINING MAP DESIGN

Two Centuries of Designing Washington, DC Street Maps

Alex Tait, Equator Graphics, Inc. Washington DC;

taite@equatorgraphics.com

A critical viewing of maps of our National Capital from different publishers and different centuries. The talk will focus on representation of streets and blocks and buildings around the well-recognized Mall area in downtown Washington.

Design of Street Maps

Dennis McClendon

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dmc@ais.net

It's what the public thinks of when they hear "map," but cartographic research tends to gloss over these commercial products. Here's a brief look at design variations from around the world, looking especially at what helps the tourist to navigate the unfamiliar city.

Mapping the Ohio & Erie Canal: What Goes Around, Comes Around

Claudia James

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The development of the "Ohio Country" in the early 1800s was in part motivated by the maps of the area, maps that advertised the endless possibilities of settlement in the newly opened "west." The importance of transportation in the growth and prosperity of the area was evident early on, and as a result, the Ohio & Erie Canal was often the focus of maps that found their way back to the east promoting economic opportunities of all kinds in the Ohio Country. Thus the cartographic endeavors contributed to the advancement of Ohio in the early 1800s.

The advent of the railroad and the great flood of 1913 initiated the demise of the Ohio & Erie Canal, relegating its cartographic representations to the dusty confines of museums and libraries for the better part of the next 60 years. However, a renewed interest in the canal appeared with redevelopment and historic preservation in the late 1970s. The canal again was identified for its economic potential, not as a form of transportation, but as a recreational, educational and historic focus.

With this renewed interest came a resurgence of mapping the Ohio & Erie Canal corridor, maps to record extant canal locks, maps to identify green space along the canal corridor, maps to establish connections from Cleveland to Zoar that were long ago abandoned with the canal. State grant money has been awarded to numerous projects with a mapping component, underscoring the importance of maps as tools for promoting the parks, paths and interpretive sites that are springing up along the canal right-of-way in many cities and villages.

This paper will present some of the earliest maps of the Ohio & Erie Canal and some of the recent maps created locally with grant money aimed at the development of the Ohio & Erie Canal National Heritage Corridor.

SESSION E EDUCATING WITH MULTIMEDIA

Integrating Multi-Media Lessons Into Large College Classrooms

Amy K. Lobben

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517-355-4649; lobbenam@pilot.msu.edu

Multi-media is being used increasingly as an educational tool. This method of presentation offers students an alternative mode of obtaining information (compared to the traditional lecture format). At Michigan State University we are creating a series of interactive, multi-media modules for use in an integrated social science class (200 students per class). These lessons will be presented to students on a single CD and are designed to provide individualized, weekly, lab-like instruction.

In all modules, information is presented through static and animated graphics as well as text. In addition to viewing the material, students are required to answer built-in questions to which they receive immediate feedback. This multi-lesson CD represents a new educational approach to the large classroom teaching method of impersonal lectures that generate limited student engagement. In addition to the traditional lecture, students will participate in individual, active learning offered by the modules. We anticipate that this planned restructuring of the teaching approach will be well received by students as a welcome alternative to the present method used in these large classrooms on so many college campuses.

U-Boat Narrative: Data Exploration Possibilities for the U-boat Conflict of 1939-1945

Fritz C. Kessler

University of Kansas, Department of Geography, 213 Lindely Hall, Lawrence, KS
66045; 785-832-9268; batavus@falcon.cc.ukans.edu

This paper presents the U-Boat Narrative (UBN), a data exploration software system developed to investigate the U-boat conflict of World War II. During this conflict, thousands of merchant ships and U-boats were sunk. Authors typically present this conflict's chronology using a combination of text, tables, and static maps. Such methods limit understanding by forcing the reader to mentally visualize the temporal progression of the war. Moreover, they prevent the user from asking questions about the data. The goal of UBN is to remove these limitations by taking advantage of the computer's strength as a display device and tool for data exploration.

UBN has two basic components: a set of narratives and data exploration software. The narratives are a mixture of animated and static maps, graphs, and text that enables users to obtain an overview of the U-boat war's causes, progression of events, and reasons for the eventual outcome. The narratives permit users to develop questions about the U-boat war that can then be pursued in the data exploration component. Here, users have three options: view a temporal animation (e.g., a day by day account of merchant ships sunk), select attributes (e.g., view ships sunk by a particular U-boat commander), and view numerical summaries (e.g., compare the number of merchant ships sunk between May, 1941 and May 1943). The net result is that users can acquire knowledge about the U-boat conflict's complex temporal and spatial data in an appealing and understanding manner.

Interactive Educational Software in Action

David L. Howard

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Mark Wherley

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Software supplements to textbooks are becoming common due to the power of multimedia in education. This is especially true in introductory courses where students need extra input to offset large class sizes. Multimedia is important to professors because it helps to keep student interest and enthusiasm high. Recently, the Deasy GeoGraphics Lab has been involved in two interactive multimedia products. World Regions Interactive (WRI) will be used in introductory regional geography courses and is loosely tied to a textbook for those courses. It helps students understand regions by making them form regions based on shared physical and human characteristics. The impetus for forming regions is to discover the origin of a postcard. Human Geography in Action (HGIA) is more tightly tied to a workbook that students use in an introductory human geography course. HGIA allows the student to visualize things that can not be represented as well in the static format of the workbook. Exercises in HGIA allow the student to explore such things as different mapping techniques, map overlays, diffusion over time, population change over time, changes in market areas, and the effect fertility rates have on future populations. These educational tools help students get more from introductory courses by encouraging them to learn in different ways.

SESSION F ROUNDTABLE DISCUSSION

Custom Cartography Business Roundtable

Alex Tait (Organizer), Equator Graphics, Inc. Washington DC; taite@equatorgraphics.com

Dennis McClendon, Chicago Cartographics, Chicago IL

Martin von Wyss, Hybrid Designs, Cambridge MA

Informal discussion about administration, marketing, sales and other topics from the business side of running a custom cartography business. Don't worry (or get too excited), we will work around trade secrets and other sensitive information!

SESSION G DIGITAL LIBRARY ISSUES

The Digital Map Library as a Moving Target: Evaluation of Technology and Knowledge

Barbara P. Battenfield, Ming-Hsiang Tsou, Andrew D. Smith and Suzanne Larsen

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Setting up any complex project requires careful planning. In maintaining a physical library, one plans that many procedures will stabilize in the long-term, with gradual accumulation of knowledge about their utility for responding to patron needs. In maintaining a digital library, stability is less probable. One anticipates that library services and patron demands will undergo continual, rapid and perhaps dramatic change, paralleling technological advance. Accumulated knowledge may or may not be applicable under the newly adopted technology. One of this year's conference themes is "handling digital map library data." This paper raises a more general question of "handling the digital map library." Two sets of issues will address migration to a particular digital technology, and management of accumulated knowledge evaluating library use.

In its first four years, the Alexandria Project has implemented three versions of a digital library, based on three different technologies (UNIX/ArcView, Web/html, and Web/JAVA). Each successive version incorporates an expanded catalog, a different system architecture, modifications to the search engine, and a completely revised interface. We have essentially three separate digital libraries developed for a common task, to retrieve maps and satellite image data distributed across multiple Internet archives. User evaluation data (tape/video recording, user demography surveys, focus groups summaries, and transaction logs) links actual use to expressed levels of user satisfaction. Comparing these data across versions can tell as much about the chosen technology as about the knowledge gained from evaluation by a particular method.

The migration to a new technology has important consequences for system functionality, design, and use. How does an organization maintaining a digital library decide what technology to adopt, and when to migrate? How can the inevitable loss of system integrity be minimized? What are the consequences of migration for system engineers, or library patrons? To what extent does adoption of a new technology necessitate adopting new practices of user evaluation? The paper will present criteria to guide migration decisions and library assessment, based on the Project's experiences.

Scanning Early Aerial Photos for Collection Conservation and Access

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60,000 of the earliest aerial photos produced for the state of Illinois are in imminent danger of perishing unless steps are taken to digitize and preserve the data that they contain, thus making them more accessible to a broad audience. This archive, stored at the University of Illinois Library, is an invaluable resource for scholars, citizens, and the business community because it provides the only remaining footprints of historical land and resource use in Illinois.

The photographs are the focus of a pilot project currently under way as a joint project of the Map and Geography Library, the University Library's Digital Imaging Initiative, and the Geographic Modeling Systems Laboratory at the University of Illinois.

The goals of this project are two-fold: conservation of a badly deteriorated collection (no existing archival film negatives); and provision of innovative electronic access to digital information.

Based on benchmarks previously established by the Map and Geography Library, the Illinois State Geological Survey, and Scantech Color Systems, Inc., of Champaign, the pilot is working toward developing protocols and an interface to make scanned photography of Illinois flown between 1935 and 1955 available through the Web. Users will be able to view JPG images and download the JPG files and TIFF files produced by scanning the photographs at approximately 600 dpi.

A test database of nearly 270 photographs flown in 1939 and 1954 of central Will County is available for access and evaluative purposes. The pilot project is being supported by the Illinois State Library and Scantech Color Systems, Inc. of Champaign, Illinois. The web site for the project is located at:
images.grainger.uiuc.edu/airphotos.htm

*Online Library Catalog for Cartographic Data: Collection, Conversion, and Organization
of Cataloging Records for a GIS-based Map Retrieval System*

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The development of GIS enables users to create maps interactively. Users can add desired features to a map and generate the map at any scale. However, there is still a need for traditional paper maps due to many factors, such as the lack of digital map coverage of certain subjects, the incompetence of ordinary users to make professional quality maps, etc. This research project studies how to use GIS to establish an online map retrieval system for the library paper map collections.

This research studies the data fields and standard which should be included in the system. Librarians, GIS experts, and library users will be interviewed. Traditional cataloging data for maps will be evaluated. The paper will introduce the information retrieval features of the GIS-based map retrieval system, including the bibliographic information retrieval and cartographic information retrieval. The cost and feasibility of retrospective data conversion from traditional library catalog to the proposed system will be studied.

A prototype of such a system is being developed using Visual Basic and Map Objects from ESRI. The system features subject retrieval and topographic retrieval. Users can interactively and graphically identify the area of interest on the screen and specify the topographical relationship between the selected area and the coverage of the maps. The user needs and preferences to the system interface will be collected from the interviews. Procedures to implement Internet access capability will also be studied.

**SESSION H
DIGITAL RESOURCES**

*New Products for Visualizing Census Data Through A Cooperative Research and
Development Agreement (CRADA) Between the Census Bureau and Environment
Systems Research Institute, Inc.*

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In March of 1997 the Census Bureau entered into a Cooperative Research and Development Agreement (CRADA) with Environment Systems Research Institute, Inc. (ESRI). The goal of the CRADA is to explore new technologies that will enable the Census Bureau to improve its digital geographic database (TIGER) and develop new consumer products to enhance the display of its socioeconomic data on maps.

This presentation will focus on the new product component of the CRADA which will combine quality statistical and spatial data from the Census Bureau with graphic display and analysis tools provided by ESRI. The

resulting product will enable the Census Bureau's statistics along with the corresponding geographic units to be mapped in an easy to use, intuitive software environment. The potential result is the dissemination of public information oriented more towards users requirements than ever before.

This presentation will describe and demonstrate the first public product, and will report on the future direction of the development process. While generating the first product, the Census Bureau has participated in a number of research and development activities including the selection of appropriate statistical and geographic data, the evaluation of mapping software functionality, and the promotion of Census 2000 and other Census Bureau census and survey data.

The Water Resources Atlas of Florida: From Idea to Reality

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The Water Resources Atlas of Florida was originally published in 1984. It has been out of print for some time and many different interests in the state were inquiring as to when it would be redone. A completely revised edition of the original atlas has just been completed. The purpose of this paper is to briefly describe the process that took place to make this new atlas a reality. The major steps involved included the development of the table of contents, selection of authors, funds for production and printing, editing and cartographic production, printing, and distribution.

For the purposes of this presentation emphasis will be placed on the cartographic production and the printing process. The printed atlas was prepared totally from digitally supplied files. An explanation of the various steps to make these digital files into the final printed volume will be detailed.

The "Outline Map Home Page" and Related Virtual Cartography Resources

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Outline maps have a long tradition of educational use in Geography and many other disciplines where knowledge of location is important. Librarians and teachers frequently need to provide copies. Cartography students can use outline maps at the starting points for map production.

Until a few years ago, outline maps were sold commercially in large quantities. Recently, outline maps have become available via the Internet, but with great variations in quality, scale and area coverage. The authors have compiled a listing of Internet sites, low-cost software, and related materials for users to obtain outline maps easily. That listing plus additional assistance

is posted on the "Outline Map Home Page" which has links to many contributing and complimentary Internet sites, such as the Map Projection Home Page (which will also be highlighted in the conference presentation).

[Note: The exact address for the Outline Map Home Page is not yet finalized, but will be ready well before the NACIS meeting on 7-10 October 1998. Until then, information about the site can be obtained from either of the two authors at their e-mail addresses.]

The Outline Map Home Page features completed maps (graphics files for immediate printing) and also instructions for using MicroCAM for Windows software to make limitless variations of the maps on personal computers.

The Home Page also allows user feedback and possible user contributions of additional maps. Through further construction, the Outline Map Home Page could expand to include (or link to) educational instructions and exercises for using the outline maps at different grade levels and for various disciplines of study.

SESSION I TECHNICAL ASPECTS OF MAP CONSTRUCTION

Selecting Appropriate Age Classes for Population Maps

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Deciding how to map information on population age structure poses problems for the cartographer. The client may have particular requirements, such as a program providing funding only for persons age 65 and over. In other cases, the client may want maps showing the location of less well defined groups, such as "young families with children." Often age data is presented for some regular interval such as eighteen five year age classes (i.e.: age 0-4, 5-9, 10-14, ..., 85+). If one correlates the percentage of persons in the age groups one finds that for many metropolitan areas the spatial variability shown in the eighteen maps can be represented on only two to four maps. This reduction of dimensionality can be done through use of methods like principal components factor analysis. This approach has been investigated for a number of U.S. and Canadian metropolitan areas, using data for census tracts and block groups. Samples of the mapped results will be shown. For smaller metropolitan areas the results usually differentiate the locations of (a) families (younger and older) with children but few elderly, (b) areas of older but not elderly households with few children, and (c) areas with many young adults and few children. Geographic distribution of persons by age in larger metropolitan areas is more complex. For example, tracts in large metropolitan areas more commonly contain both families with children and elderly. Based on this research, and experience serving clients, suggestions will be made regarding the selection of appropriate age class groupings for mapping and how to pose the choices to clients.

*Automated Names Placement Software Development By The US Census Bureau
and Rutgers University*

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The US Census Bureau's Geography Division is responsible for producing a large number of maps to support Census 2000 data collection and data dissemination activities. In addition, a variety of maps are designed and produced to support other censuses and surveys, and special requests from Congress, governmental agencies, and the public. To meet this diverse set of user requirements, automated mapping systems developed in-house and commercial mapping software are utilized.

One of the most challenging aspects of large map production operations is automatic placement of text. Large volumes of maps used in census field operations by enumerators are produced in a batch mapping environment in which interactive editing is not an option due to time, budget and staffing constraints. High quality automated text placement capabilities also are important for publication-quality maps since this has the potential to significantly reduce the amount of interactive editing required to achieve optimal text positioning. After examining current trends of automated text placement capabilities for both in-house and commercial systems, it was clear that more research was necessary to meet basic mapping requirements.

The Census Bureau entered into a joint research and development project with Rutgers University for the development of an automated text placement software package. This presentation will describe the key elements of this process including text placement requirements and the software system design model. Versions of the software have been used to produce a number of Census Bureau map products. Examples of these products are shown that illustrate the current software capabilities, functionality and limitations. Plans for future development directions are presented.

Symbol Functionality and the Role of Selective Attention in Cartographic Design

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This study applied the theory of selective attention to graphic variables used in designing map symbols. Selective attention contends that our ability to analyze a symbol's graphic variables (i.e., color, size) is affected by other graphic variables present in the same symbol. Psychological research suggests that certain combinations of graphic variables can enhance or restrict selective attention. In this literature, variables are described as either separable (capable of being attended to independently of other dimensions), integral (cannot be processed without interference from other dimensions), or configural (shows characteristics of both integrality and separability and may also form new, emergent properties). Cartographers need to understand how graphic variables interact on maps, especially for complex symbols. For example, sometimes it may be desirable for a map user to focus individually

on separate symbol dimensions, whereas under other conditions it may be advantageous for graphic variables to be integrated visually. Without empirical evidence of these interactions, cartographers cannot truly evaluate the functionality of the symbols they use on maps. The research reported here is the result of the first of a set of four interrelated experiments. Combinations of graphic variables were examined in an abstract setting using a speeded-classification task. Response data and accuracy data were used to provide an initial assessment of the levels of integrality, separability and configularity of several graphic combinations. Findings from this study will be integrated into subsequent map-using experiments, the results of which will assist cartographers in the design of complex map symbols.

SESSION J PLANNING FOR QUALITY MAPPING

Census 2000 Data Access and Dissemination System: Improved Customer Service

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The U.S. Census Bureau is developing new technologies to disseminate results from censuses and surveys. The technologies, Data Access and Dissemination System (DADS), are internet based and designed to improve service to the Nation by improving and extending access to official demographic, economic, and geographic information. The first full-scale implementation of DADS will support Census 2000. Other interim surveys and censuses such as the 1997 Economic Census and the American Community Survey will use DADS as the principal means for data dissemination.

Functional capabilities of DADS include statistical data, geographic and cartographic information and tools to access and display the data (including maps). Use of metadata not only provides useful resource information to data users, but will aid in the functional operation of the electronic system. Geography is the integrating principle for the data.

DADS will be accessible to the widest possible user-base through the Internet. Partners for dissemination will include State Data Centers, libraries, universities, and private firms. Disclosure protection will be built into the system design to ensure data confidentiality requirements.

Interaction with testers and users aids in refining basic components such as data content and user interface requirements. The presentation will offer a view on the DADS development process, recent accomplishments, lessons learned and future direction. DADS is a long-term service commitment offered by the Census Bureau to better serve data users in their quest for timely and valuable information.

About the Quality of Maps

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The Internet has brought about a major change in how maps are distributed. Analogous to the invention of printing, the capabilities of the Internet for map reproduction and delivery can be seen as a revolution (Peterson 1995, 1997). Although the WWW meets most of the needs of the 'new cartography' (Taylor 1994, Muller 1997), such as enabling interactive and dynamic maps and using technologies associated with multimedia, the cartographic response has focused on a missing 'quality' (Dickmann 1997, Crampton 1997, Harrower et al. 1997), in particular, the lack of graphic quality and resolution. This concern with the graphic quality of computer-produced maps is not new in cartography. Concerns were raised in the 1960s and 1970s about early computer maps. Similar reservations are still expressed about maps produced by GIS software. This concern with graphic quality arises from subjective criteria of good and bad that are often not explicitly stated, even among cartographers. Numerous ideas have emerged in the cartographic literature about how to improve maps, without explicitly defining the concept of quality in relation to maps. The increased use and the further development of technologies like interactivity, multimedia and computer-animation, have led to new cartographic expressions and products and further intensified the questioning of map quality. Problems arise in judging these new products and expressions through the use of the former definitions of quality. This presentation deals with the meaning of 'quality' in cartography. The first part will consider the concept of 'quality' developed in other areas, particularly philosophy and economics. The second part focuses on more general concepts of what the term 'quality' could mean, and the consequences that must be considered when thinking about the quality of maps. The third part analyzes what is understood as quality, characterized by major trends in cartography, in their correlation and relevance to developments like interactivity, multimedia or map distribution through the Internet. Finally, a synoptic interpretation of the importance of understanding quality for cartography is given.

Making it Easy for Anybody to Make Good Thematic Maps

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The computer mapping and GIS software industry has recognized and is responding to market demand that their tools become commonplace on the average person's desktop computer. As cartographers we must ask ourselves what will keep these average people from making the most common cartographic, graphical, and geographical communication errors? Cartographic educators cannot hope to educate all these people in time for the widespread availability of mapping and GIS software. Thus, there is a responsibility on the part of mapping and GIS software makers to provide intelligent tools that give users relevant choices for given situations, and to provide software documentation that teaches the software and cartographic principles. The difficulty in owning up to this responsibility is that mapping software is

designed not to have limits and is traditionally intended for many levels of user expertise and a multitude of discipline-specific representation preferences. One potential solution to this conflict of interest is to create multiple user interfaces for the same tasks. One interface for the novice user, another for advanced users, and yet another for technical users, or programmers. For novice users, a robust decision-making and choice-determination model for thematic mapping backed up with algorithms that trap for common errors is needed. This creation and use of this model recognizes there will now be map-makers needing to make good maps with little or no knowledge about map making or map-making software, and these users don't have any intention of acquiring such knowledge.

SESSION K UNDERSTANDING MAPS

Spatial Cognition of Small and Large-scale Spaces

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Locatives are words which denote place location, and in English include terms such as in, under, near, far, through, front and back. Previous empirical research into the understanding and use of locatives has focused on primarily one spatial context—a table-top space—therefore little is known about the development of locative use and understanding in other spaces. In this study, 40 subjects (balanced for sex) in each age group of 3, 4, 5, 7 and 9 years, and a control group of adults, were tested in a large model landscape (6ft x 4ft) possessing different terrain features as well as in a table top layout (22in x 17in) with various objects. Locatives tested included in, in front, behind, on, between, in & across from, on & in front, near, far, away, next to, next to & far, near & next to, far & away, close & next to, through, in a corner, among, and in the middle. Subjects were given instructions of the form "put [object] [locative term] [referent]"; e.g. "put the [car] [near] the [school]". Responses were recorded on maps of the models. Preliminary results suggest a number of developmental differences, and that by age 5, children recognize constraints in landscape spaces (such as cars are placed on roads), and respond accordingly. Results also show that errors in subject responses decrease with increasing age, and that around age 7, subjects' responses do not differ significantly from those of adult subjects. Lastly, results suggest that small scale environments are "cognized" differently than are large-scale spaces.

Maps as Stories, Maps as Arguments

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Maps both tell stories, and build and support arguments. As stories they tell us about dreams, feelings, deaths and births, the sweat and the joy of things. As arguments they explain direction, shape, size, and the location of things. Good, even great arguments often start as pure stories. Stories are hung on the fabric, the geography of place. Both argument and story are two sides of cognitive thought (Bruner). Over the years maps have been both. How have and do maps work as stories? How do they function as arguments? Do the map makers tools affect the map as story or argument? As the definition of a map has become identified with argument, all "good" maps are nonfiction, clean, rational and quiet. The cartographer however has a choice; understand the essential elements of story, the canonical, and dramatic action and maps become alive and vibrant or let maps play a back seat and watch them become lifeless. Maps are both art and technology (Monmonier) and good maps are both argument and story.

Leila Daw's Maps: Is This Art Cartography?

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Maps are recognized in our society as tools of expression for particular kinds of messages. They incorporate information concerning space and place, and can be, but are not required to be, imbued with extra meaning, such as of power or control, or as a way of expressing oneself in an established language that provides for the articulation of spatial relationships and the discussion of the importance of place.

This paper is a continuation of the research that I presented at NACIS two years ago, 'The Use of Maps in Art.' Maps have been used as graphic components in artworks, such as the wall decorations in 17th century Dutch paintings, and as iconic elements in modern art, for example in Rauchenberg's 'Small Rebus,' 1956.

Of interest also is the construction of art that claims to be maps. Leila Daw is an American artist whose work contains many cartographic elements. For example, she uses symbology that is standard on topographic maps in her narrative works that explore her own life. She has said that she makes maps.

In this presentation, I examine Leila Daw's artwork with the aim of understanding what she, as an artist, means when she says that she creates maps. She says that she uses the map form as a suitable representation of her message because that message contains elements of time and of events that occur in a particular space or place. I examine her work to try to answer the question, 'Would cartographers recognize her artwork as maps?'

SESSION L

PANEL DISCUSSION

Interactive Cartography: Current and Future Research Paths

Rex Cammack (Organizer, cammack@cart1.smsu.edu),

Southwest Missouri State University

Brandon S. Plewe, Brigham Young University

Charles P. Rader, University of Wisconsin - River Falls

Michael P. Peterson, University of Nebraska - Omaha

Jeremy Crampton, George Mason University

Keith W. Rice, University of Wisconsin - Stevens Point

Over the past ten years cartographers have discussed and worked with the concept of interactive cartography. During this decade many cartographers have developed different forms of interactive cartography products. As cartographers and map users move forward into a period of greater interaction, cartographers face the challenge of exploring and solving a multitude of new mapping problems. The focus of this discussion panel is to identify core research areas of interactive cartography. Some of the issues to be addressed are: the definition of interactive cartography, forms of interactive cartography, implementation of interactive cartography, education and interactive cartography and other issues centering on developments in interactive cartography. By identifying principle research ideas for interactive cartography, researchers, designers and users of interactive cartography can develop improved communication of spatial information.

SESSION M

DATA CHALLENGES

Mapping Custer's Last Stand

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Since June 1876, historians and others have attempted to map the landscape upon which Custer's Last Stand took place. These efforts have been the product of considerable investigation using at first reports submitted by military personnel and Native Americans. In the last fifteen years, the maps have been improved using archeological materials gathered after a massive prairie fire swept the area in the early 1980s. This paper chronicles the different efforts and attempts to demonstrate how knowledge of the confrontation has lead to the development of more accurate maps. The presentation will be accompanied by numerous slides illustrating the battlefield and different maps used to document this very famous battle.

Volunteers, Street Tree Inventory, and GIS

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Increasing use is being made of non-professionals for performing urban environmental inventories. To be successful, the methodology for such activities must be inexpensive, easy to learn, and not prone to errors. This set of requirements often puts mapping activities beyond the reach of volunteers, particularly when digital techniques are involved. In conjunction with recent street tree inventory efforts in the Portland metropolitan area, a methodology has been developed that allows citizen-volunteers to collect data that subsequently can be used by a GIS technician to easily georeference tree locations, with no need for scanning or digitizing. The automated georeferencing methodology results in maps that place points more reliably than either address-matching or GPS and has general application for any sort of point placement along straight-line linear features. The low-tech methodology requires neither surveying equipment nor manual field mapping, and its simplicity allows the volunteers to focus their attention on the central objective of the inventory -- details about the trees.

Integrating Disparate Data Sets in an Environmental GIS

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Many environmental geographic information systems incorporate various data sets created at different scales and by means of different technologies (GPS, digital orthophotos, digital line graphs, digital elevation models, digitizer input, scanner input, etc). In such systems, some degree of misalignment between related spatial features derived from different data sets is inevitable. Focusing on recent work with an environmental GIS in New York's Hudson Valley, this study evaluates the nature and magnitude of such spatial discrepancies across multiple data sets. Questions of generalization due to differences of scale and of spatial error due to different digital technologies are addressed. Procedures are examined that are intended to accomplish the alignment of spatial features across these disparate data sets with a minimal amount of residual spatial error.

SESSION N VISUALIZATION

Existing and Proposed Sources of Data for On-Board Databases to Support Aircraft Synthetic Vision Systems

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Synthetic Vision Systems (SVS) are being developed to reduce accidents by improving a pilots situational and spatial awareness during low visibility conditions, including night and Instrument Meteorological Conditions (IMC). The intuitive displays of the SVS are expected to lower the accident rates involving Controlled Flight Into Terrain (CFIT), loss of control, and runway incursion-the types of accidents which constitute the majority of all aviation accidents.

For SVS to be a viable technology, the on-board database will support the 3D/4D intuitive display and associated Global Positioning System (GPS) derived position display. Key elements in the database will be: obstacles, terrain, navigation, and airport surface/environment information.

The SVS database(s) will be utilized during all phases of aircraft operations-en route, transition, approach, departure, and surface movement. The requirements for the database(s)-resolution, vertical and horizontal accuracy, and general content-must be defined.

This paper discusses possible sources of data for SVS operations and the need to utilize new technology for the collection of data to support SVS displays-especially in final approach and airport surface operations.

Visualizing Properties of Spatial and Temporal Periodicity in Geographic Data

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Exploration of complex spatio-temporal environmental data demands creative methods of analysis. We present an interactive visualization technique based on a three-dimensional Fourier transformation designed to decompose geographic time series data into coherent spatial and temporal periodicities that are otherwise difficult to extract. This approach is demonstrated on a series of synthetic data sets as well as applied to the analysis of climate phenomena captured within a precipitation and temperature data set for the Susquehanna River Basin in central Pennsylvania. This enables the user to explore existing hypotheses as well as generate new insights into

environmental process. Moreover, since the spatial and temporal parameters of the phenomena under investigation are not necessarily predetermined, exploration of the data itself can drive the phenomena definition. Ultimately, this technique may lead to insight concerning the behavior of a given environmental phenomena over a variety of scales, indicate appropriate spatial and temporal scales for further analysis, or reveal strategies for resampling or filtering of the data. The reader is encouraged to visit www.geog.psu.edu/apoala for dynamic visualizations.

Three-dimensional Visualization as a Cartographic Problem

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Cartography is concerned with the visualization of geographic information and can use scientific visualization techniques, such as animation and 3-dimensional views, to create alternatives to traditional, printed 2-dimensional maps. These visualization techniques may be more effective than 2-dimensional maps at showing certain types of information, such as time-series or surface renderings. The use of new methods of graphically presenting geographic information, however, can bring unforeseen problems.

Some of the possibilities and challenges of visualization of geographic data were found during an effort to portray 3-dimensional representations of a series of surface and subsurface hydrogeologic layers. Traditionally, hydrogeologic layers have been depicted by a series of planimetric maps that are accompanied by schematic diagrams and cross sections. The pursuit of an alternate, screen-based method of portraying hydrogeologic layers led to visual communication difficulties that were not encountered in 2-dimensional mapmaking. Base features, such as state lines and coastlines, were not recognizable when they were translated to locations below land surface. The level of detail that could legibly be shown on a 2-dimensional printed map was too detailed to be legible on a 3-dimensional screen view at a similar scale.

The visualization techniques that allow a researcher to gain insights into data can cause confusion when the researcher tries to communicate graphically these insights to an audience that is unfamiliar with the data and the visualization method. The use of visualization techniques in cartography may require changes in the presentation of basic cartographic concepts to convey geographic information effectively.

WORKSHOPS

WORKSHOP A

Multimedia, Mapping and the Web

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An overview of multimedia techniques, the World Wide Web (WWW) and applications for mapping. Emphasis will be on the display of maps and map distribution through the web. Topics include file formats for graphics, animation, sound, authoring programs, digital video, and HTML. Presumes some familiarity and experience with the WWW. More information on the half-day workshop can be found at: <http://maps.unomaha.edu/Workshops/GISWEB.html>

WORKSHOP B

Using Freehand 8 and Map Publisher

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The first part of this workshop will cover the basics of creating and manipulating graphics in Freehand 8. Particular emphasis will be given to those features most useful in mapping. For example, Freehand 8 allows selection of objects by color, line width or shape, the creation of actively linked insets with a "magnifying lens" and the clipping of one polygon with another.

The second part of the workshop will focus on the Map Publisher plug-in for Freehand. This plug-in imports STDS, ArcView shape files, Arc-Info generate, MID/MIF and DXF. The program also allows some manipulation of projections. Participants will create sample maps using geographic files.

WORKSHOP C

Creating, Displaying and Manipulating Digital Elevation Models

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Digital Elevation Models (DEMs) represent continuous surfaces that encode an estimation of height above sea level for every position on the map. DEMs, and statistics derived from them, play an important role in many types of GIS analysis. If a DEM is not available in digital form for a particular study area, the researcher is faced with the challenge of creating a DEM from hardcopy sources.

This introductory hands-on workshop will demonstrate methods of generating digital elevation models from data obtained from hardcopy topographic maps (digitized spot elevations or contour lines) or sample observations (x,y,z coordinates). Several alternative interpolation models will be used, and their effects on surface generalization examined.

Participants will explore various methods of visualizing the three-dimensional surface (e.g., contour maps, perspective views, shaded relief maps), noting the pros and cons of each technique and the options that are available to customize each view. Finally, the derivation of other terrain characteristics, such as slope, aspect, and viewsheds, will be demonstrated.

This workshop will utilize Idrisi for Windows. The functions demonstrated, however, can be carried out with many commercial GIS packages and the workshop is not intended for Idrisi users only.

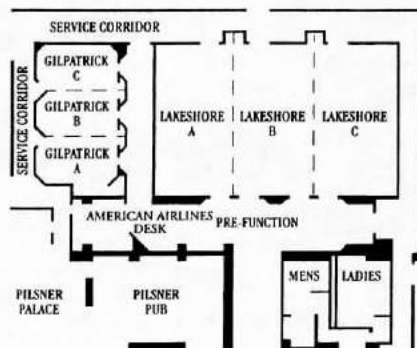
WORKSHOP D

QuickTime VR for Cartographers

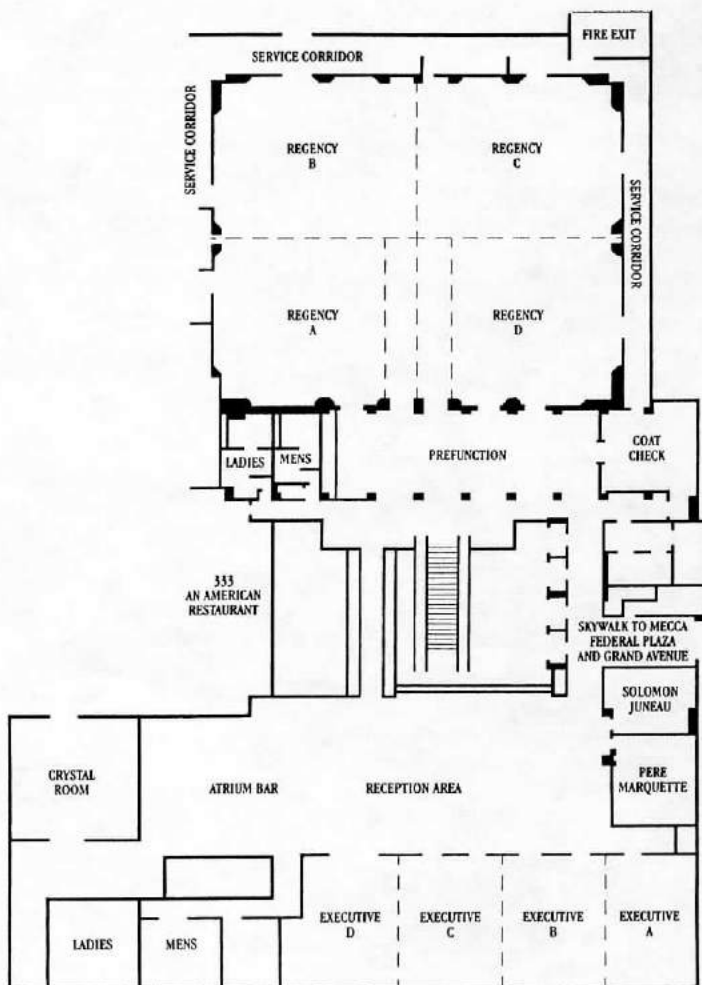
Tom Patterson

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Apple QuickTime is the cross-platform software standard for creating and delivering multimedia content on CD-ROM and the Internet. QuickTime provides a powerful medium for interactively exploring spatial relationships between 2D maps, aerial photographs, photographic panoramas, and 3D landscapes. The workshop will introduce participants to QuickTime 3 Pro and QuickTime VR Authoring Studio.



FIRST FLOOR



SECOND FLOOR

The Manager's Suite is located on the third floor

It is a NACIS tradition that our meetings be informative, thought provoking, and reflect the cutting edge in the field of mapping. It is also a tradition that conference participants take the time to engage in informal conversations with their colleagues.

In order to facilitate the later, we welcome everyone to join us during the conference in the NACIS Hospitality Room (Manager's Suite-third floor)

Upcoming NACIS meetings:

October 20-23, 1999

Williamsburg, VA

Magruder Inn

October 11-15, 2000

Knoxville, TN

Knoxville Hilton