

## **Program and Abstracts**

### **NACIS X**



## **CHANGING CARTOGRAPHY IN THE NINETIES: THE NEXT DECADE FOR NACIS**

North American Cartographic  
Information Society

Tenth Annual Meeting

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Holiday Inn  
Orlando, Florida

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October 24-27, 1990

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# NACIS X

## **Changing Cartography in the Nineties: The Next Decade for NACIS**

October 24-27, 1990  
Orlando, Florida



Holiday Inn on International Drive  
Orlando, Florida  
October 24-27, 1990

Welcome to Orlando, Florida, site of the North American Cartographic Information Society's Tenth Annual Meeting! This year, as in years past, the conference will strive to fulfill the primary goals of our organization, that of bringing together producers, vendors, curators and users of maps for the purpose of sharing cartographic information.

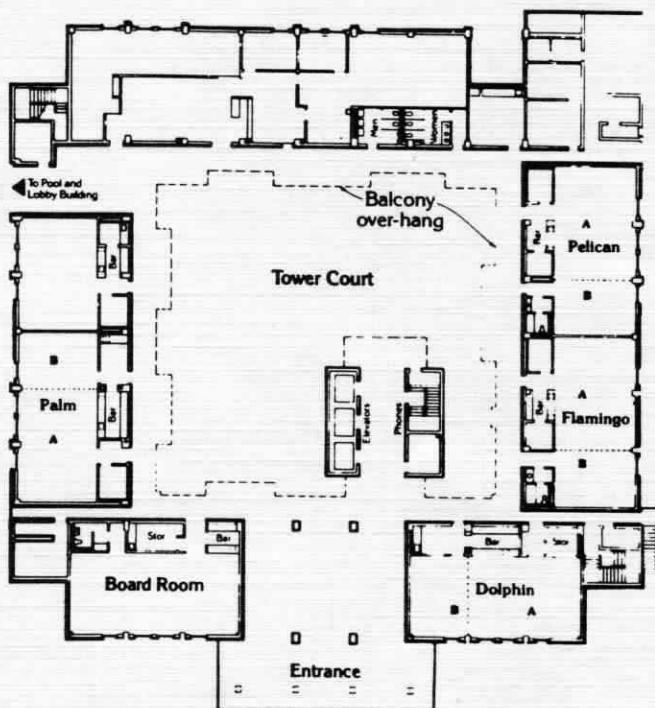
This year's conference theme "Cartography in the Nineties" focuses on changes and challenges that may occur over the decade of the nineties. The discussion of various issues that are likely to be encountered in the nineties are facilitated by paper presentations and the inclusion of several roundtable sessions focusing on broad areas of the cartographic world.

On behalf of the Local Arrangements Committee and the Executive Board, I sincerely hope that you will benefit from the conference proceedings and that you enjoy the amenities of this central Florida community. I would also like to thank the Local Arrangements Committee members, especially Jim Anderson, for an excellent effort in planning and coordinating the NACIS X conference.

Thank you for attending and participating in NACIS X. I hope to see you next year in Milwaukee.

James F. Fryman  
Program Chair  
NACIS X









## CONFERENCE NOTES

### *Registration*

The NACIS Registration Desk is located in the Grande Hall Foyer of the Holiday Inn. Registration hours are:

Wednesday, October 24	1:00 p.m.-8:00 p.m.
Thursday, October 25	8:00 a.m.-7:00 p.m.
Friday, October 26	8:00 a.m.-4:00 p.m.
Saturday, October 27	8:00 a.m.-11:00 a.m.

The registration fee for the entire conference includes: conference packet, conference program with abstracts, admission to exhibits, admission to all formal sessions, choice of field trips, banquet, luncheon, and refreshment breaks. Individuals are responsible for their own expenses for cash bars.

### *Field Trips*

Registration for field trips will be handled at the NACIS Registration Desk. Three field trips have been planned for NACIS X. Please check at the NACIS Registration Desk for descriptions of the trips, sign-up sheets, and departure times and locations. The field trips have size limitations so please check at the NACIS Registration Desk to see if you made the cut for the trip you have signed-up for on your registration form. You may have to make a second choice or put yourself on a waiting list. If you decide not to go on a field trip you have signed-up for, please let the NACIS Registration Desk know so we can put an alternate on the trip.

### *Exhibits*

The Exhibits will be set-up in Grande Hall of the Holiday Inn. Exhibits will be open:

Thursday, October 25	9:00 a.m.-Noon
Friday, October 26	9:00 a.m.-3:00 p.m.

## PROGRAM SCHEDULE

### WEDNESDAY, OCTOBER 24

- 1:00-8:00 p.m.      Registration--Grande Hall Foyer
- 1:00-3:00 p.m.      **NACIS Committee Meetings**
- 3:00-5:00 p.m.      **NACIS Board Meeting--Board Room**
- 5:00-7:00 p.m.      Dinner Break
- 7:30-9:00 p.m.      **Opening Session--Grande Hall**

#### Welcome

James F. Fryman  
Vice President and Program Chairperson  
University of Northern Iowa

#### Keynote Address:

Mr. Thomas Hammond  
NASA  
Kennedy Space Center

- 9:00-11:00 p.m.      **Reception and Cash Bar--Grande Hall**
- 9:00-11:00 p.m.      **Poster Session--Grande Hall**

*Products and Resources of University  
Cartographic Labs*  
Organizer: Craig Remington, University of  
Alabama, University, Alabama

#### Participants:

James Anderson, Florida State University  
Henry Castner, Queen's University

Diana Drigot, Marine Corps Air Station, Hawaii

Will Fontenez, University of Tennessee

Barbara Hartman, University of Texas

Tom Kallsen, University of Alabama

William Loy, University of Oregon

Bob Lyons, Albuquerque, New Mexico

Gyula Pauer, University of Kentucky

Ed Robertson, Champion Maps

Donna Schenstrom, University of Wisconsin-Milwaukee

Muriel B. Seto, University of Hawaii

Jeff Simpson, University of North Carolina-Charlotte

Bonnie Sines, University of Northern Iowa

Joseph Stoll, University of Akron

Barbara Trapido, Arizona State University

Ellen White, Michigan State University

#### **THURSDAY, OCTOBER 25**

8:00 a.m.-7:00 p.m. **Registration**--Grande Hall Foyer

9:00 a.m.-Noon **Exhibits Open**--Grande Hall

8:30-10:30 a.m. **Session A: Cartographic Production**--Pelican

Chair: Patrick McHaffie, University of Kentucky,  
Lexington, Kentucky

*A Cost-Benefit Analysis of Computer Aided Map  
Design and Production*

Charles P. Rader and Ellen R. White, Michigan  
State University, East Lansing, Michigan

*Communicating with a Cartographer*

William G. Loy, University of Oregon, Eugene,  
Oregon

*Textbook Graphic Production*

Bonnie Sines, University of Northern Iowa, Cedar  
Falls, Iowa

**Session B: Demonstration--Flamingo**

*Using the Tiny TIGER System*

Tammi Browder and April Robbins, U.S. Bureau of  
the Census, Washington, D.C.

10:00-10:30 a.m.

Break

10:30 a.m.-Noon

**Session C: Animated Cartography--Pelican**

Chair: Alan MacEachren, The Pennsylvania State  
University, University Park, Pennsylvania

*Tips and Techniques for Maintaining Visual  
"Headroom" on Animated Maps*

Don Pirius and Phil Gersmehl, University of  
Minnesota, Minneapolis, Minnesota

*Visualizing Eocean Ocean Circulation*

David DiBiase and William Peterson, The  
Pennsylvania State University, University Park,  
Pennsylvania

*Summary Graphics to Supplement Animated  
Cartographic Sequences*

Mark Monmonier, Syracuse University, Syracuse,  
New York

## **Session D: Workshop--Flamingo**

### *Color as a Map Skill and a Descriptive Tool*

Henry W. Castner, Queen's University, Kingston,  
Ontario, Canada

Noon-1:00 p.m.

**Lunch Break**

1:00-5:00 p.m.

### **Field Trips**

#### *American Automobile Association*

Visit to newly opened headquarters of AAA with  
tour of their cartography facilities.

#### *Orange County GIS*

Orange County has an extensive GIS under  
development. Tour will look at all aspects of their  
program.

#### *Local Area Tour*

Trip will include boat tour of the lakes of Winter  
Park. Opportunity to visit shops in downtown  
Winter Park and/or visit local art museum.

6:30-7:15 p.m.

**Reception and Cash Bar--Grande Hall**

7:15-9:00 p.m.

**Annual Banquet--Grande Hall**

**President's Address**

Diana Rivera  
Michigan State Libraries  
Michigan State University  
East Lansing, Michigan

**Banquet Address**

John Stearns  
Research and Development  
American Automobile Association  
Heathrow, Florida

## FRIDAY, OCTOBER 26

8:00 a.m.-4:00 p.m. **Registration**--Grande Hall Foyer

9:00 a.m.-3:00 p.m. **Exhibits Open**--Grande Hall

8:30-10:00 a.m. **Session A: Automation in Cartography**--Pelican

Chair: Dennis P. Enberg, North Carolina Central University, Durham, North Carolina

*Global Positioning Systems: Status and Issues*  
Ronald M. Bolton, NOAA and Claudette M. Dellon, NOAA, Rockville, Maryland

*Implementing a Cartographic Database to Enable Automation*  
Virginia Galvin, NOAA, Rockville, Maryland

*Cartographic Change at National Geographic*  
David Miller, National Geographic Society, Washington, D.C.

**Session B: Roundtable--Ethics in Cartography**--Flamingo

Moderator: Sona Andrews, University of Wisconsin-Milwaukee, Milwaukee, Wisconsin

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

10:30 a.m.-Noon **Session C: Atlases**--Pelican

Chair: Jeff Patton, University of North Carolina-Greensboro, Greensboro, North Carolina

*National Atlas of Mexico*  
Atlantida Coll-Hurtado, UNAM, Mexico, DF

*Changing Directions: Historical Atlas of Canada*  
Geoffrey J. Matthews, University of Toronto, Toronto, Canada

*Climatic Atlas of Michigan*

Hans J. Stolle, Western Michigan University,  
Kalamazoo, Michigan

**Session D: Roundtable--Cartography Labs in  
the Nineties--Flamingo**

Moderator: James R. Anderson, Jr., Florida State  
University, Tallahassee, Florida

Panel:

Craig Remington, University of Alabama

Gregory Chu, University of Minnesota

Will Fontenez, University of Tennessee

Ellen White, Michigan State University

Noon-1:30 p.m.

**Luncheon**

1:30-3:00 p.m.

**Session E: Geographic Information Systems--  
Pelican**

Chair: Charles P. Rader, Michigan State University,  
East Lansing, Michigan

*GIS Applications for Transportation Planning*

Eckart F. Leistikow, Pennsylvania Department of  
Transportation, Harrisburg, Pennsylvania

*Computer Mapping for Decision Support in  
Facilities Management and Environmental  
Compliance in Spite of Shrinking Funds and  
Increasing Requirements*

Diana Drigot and Karen Glyn, Marine Corps Air  
Station, Kaneohe Bay, Hawaii; Marge Elliott, Insight  
International, Ventura, California

**Session F: Roundtable--Maps and Their  
Keepers in the Nineties--Flamingo**

Moderator: Johnnie D. Sutherland, University of  
Georgia, Athens, Georgia

Panel:

Helen Armstrong, University of Florida

Nancy B. Rychman, University of North Carolina-  
Charlotte

Nancy Kandoian, New York Public Library

Andrew Johnson, Free Library of Philadelphia

Jim O. Minton, University of Tennessee

3:00-3:15 p.m.

Break

3:15-5:00 p.m.

**Annual Business Meeting--Pelican**

**SATURDAY, OCTOBER 27**

8:00-11:00 a.m.

**Registration--Grande Hall Foyer**

8:30-10:00 a.m.

**Session A: Cartographic Information--Pelican**

Chair: Patricia Gilmartin, University of South  
Carolina, Columbia, South Carolina

*Cartographic Information Sources on Topographic,  
Hydrographic and Cadastral Maps*

A. J. Brandenberger and S. K. Ghosh, Laval  
University, Quebec, Canada

*Main Factors of Land Degradation in Mexico*

Maria Concepcion Garcia Aguirre and Graciela  
Perez Villegas, Universidad Nacional Autonoma de  
Mexico, DF



*Recovering an Ancient Hawaiian Cultural Landscape for Purposes of Modern Land Use Planning*

Muriel B. Seto, Donna Wong, and Mikilani Ho,  
Hawaii's Thousand Friends, Kailua, Hawaii

**Session B: Roundtable--Automated Cartography in the Nineties--Flamingo**

Moderator: Ronald M. Bolton, NOAA, Rockville, Maryland

Panel:

David Miller, National Geographic Society

Elke Owen, American Automobile Association

Will Fontenez, University of Tennessee

Craig Remington, University of Alabama

James Anderson, Florida State University

John B. Krygier, Pennsylvania State University

10:00-10:30 a.m.

Break

10:30-Noon

**Session C: General Cartography--Pelican**

Chair: Ellen White, Michigan State University

*Deconstructing Brain Harley (Or, How Cartography Lost Its Innocence)*

Jeremy Crampton, The Pennsylvania State University, University Park, Pennsylvania

*Affordances and Invariants in Navigation and Landscape Analysis*

Henry W. Castner, Queen's University, Kingston, Ontario, Canada

*Patterns of Cartographic Materials Usage*

Johnnie D. Sutherland, University of Georgia, Athens, Georgia

**Session D: Roundtable—Commercial Mapping in  
the Nineties—Flamingo**

Moderator: Bertram Green, Map & Globe Store,  
Orlando, Florida

Panel:

Barbara Adele Fine, The Map Store, Inc.

Vera Benson, American Map Corporation

John Forsyth, Trakker Maps

1:00 p.m.

*Post Conference Trip to Kennedy Space Center*

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**FUTURE NACIS CONFERENCES**

1991

Milwaukee, Wisconsin

## ABSTRACTS

### *Main Factors of Land Degradation in Mexico*

**Maria Concepcion Garcia Aguirre and Graciela Perez Villegas, University of Mexico**

In Mexico, problems related to pollution and land degradation became more notorious in the beginning of the fifties. However, it was until the seventies when several institutions undertook projects to study and solve these problems. Most of the present information about this topic refers to local studies. For this reason, the coordinator of the project Atlas Nacional de Mexico, devoted a special section to thematic maps about impact of human activities on land resources, water resources, air, etc. The map of land degradation shows the main factors causing the deterioration of land resources, such as deforestation, fires, erosion, grazing activities, several types of industry (oil, thermoelectric, chemical, etc.) and the effect produced by human settlements and tourism. It indicates the distribution of these factors and its level of impact (medium or severe) throughout the Mexican Republic. In the top right side of this map, there is a small map scale (1:16,000,000) that indicates the level of degradation of natural resources. The evaluation was based on the measurement of area transformed into grassland, crops, secondary vegetation and soil erosion. Impact on wildlife was estimated considering species extinction, level of endemism and percentage of disturbed habitat. Finally, a table indicates the land cover change in three periods. It was estimated by measuring existing vegetation maps with a digitizing programme (AU220).

### *Ethics in Cartography Roundtable Discussion*

**Sona Andrews, University of Wisconsin-Milwaukee, Milwaukee, Wisconsin**

Various aspects of professional ethics in cartography will be discussed by a diverse group of map producers and users.

### *Cartography Laboratories in the Nineties Roundtable Discussion*

**James Anderson, Florida State University, Tallahassee, Florida**

What are the major issues and problems that face cartographic laboratories in the 1990s? What will be the major changes that may take place in cartographic lab technology and organization? These are some of the questions to be discussed by cartographic laboratory representatives.

## *Automated Cartography in the Nineties Roundtable Discussion*

Ronald M. Bolton, Aeronautical Charting Division, National Oceanic and Atmospheric Administration, Rockville, Maryland

What are the myths and realities of automation in cartography? What are the anticipated changes in automation in the 1990's and how will these affect the production of cartographic products? These are several of the questions to be discussed in this roundtable discussion.

## *Global Positioning System: Status and Issues*

Ronald M. Bolton and Claudette M. Dellon, Aeronautical Charting Division, National Oceanic and Atmospheric Administration, Rockville, Maryland

System Status -- The Global Positioning System (GPS) space segment has eleven satellites in operation, and another was scheduled for launch in January, 1990. If spaced properly in their orbits, these twelve satellites will provide 24-hour, two-dimensional (latitude and longitude) global positioning capability--a milestone in history! Around 1993, the entire GPS configuration of twenty-one satellites should be in place. Three active spares will be orbited sometime later to ensure system integrity and continuous operation.

GPS receiver developments have been astounding--over 100 models are now manufactured. These sets allow precision survey and time transfer, and development of marine and aviation navigation equipment is gaining momentum.

Issues -- The key issues affecting the future of GPS are:

- (1) DOD clarification of its commitment to provide GPS signals and related coding information to the civilian community.
- (2) The development of international standards that allow GPS and USSR's Global National Satellite System (GLONASS) to be used interchangeably by the user community.
- (3) The planned selective ability (S.A.) which provides a civil signal at an accuracy of 100 meters as opposed to the current civil military signal with 30-40 meter accuracy.
- (4) GPS integrity related to frequency, modulation of the frequencies and content of the satellite message sent to users is a significant issue. The Radio Technical Commission for Aeronautics (RTCA) is studying these issues.
- (5) The final issue is the full participation of the GPS civil community in GPS planning, implementation and operation to ensure that the DOD does not overlook cost and technical considerations of civil users.

The GPS will service more users than any surveying/navigation system in the history of the world. It can meet survey or 3-D needs with the use of signals from four satellites, or it can meet less stringent 2-D navigational requirements by monitoring the signals of three satellites. All told, GPS is an important national and international resource.

## ***Cartographic Information Sources on Topographic, Hydrographic and Cadastral Maps***

**A. J. Brandenberger and S. K. Ghosh, Laval University, Quebec, Canada**

Topographic, hydrographic and cadastral maps are indispensable tools to provide quantitative information on the earth's surface on land and under water. However, in the context of the enormity and complexity of such mappings, the obtaining and retrieving of such information remain perpetual exigencies. The paper identifies the specifics and pertinent map production organizations. The information sources and their limitations are discussed. Finally a data bank developed at Laval University with world-wide potentiality is presented. Its feasibility is discussed.

## ***Using the Tiny TIGER System***

**Tammi Browder and April Robbins, U.S. Bureau of the Census, Washington, D.C.**

The Tiny TIGER system is a series of programs designed to prepare for display and to display data from the 1990 TIGER/Line files. The programs were written by the Mapping Operations Branch in the Geography Division of the U.S. Bureau of the Census in order to show that medium sized PC's can effectively process and display TIGER/Line file data. The version of TIGER/Line files being used is the precensus version which is an extract from the TIGER data base and is organized as a topologically consistent line network. Each file consists of six record types that collectively contain geographic information such as address ranges on selected street segments, names and code of feature types, political area codes, selected 1980 Census geographic area codes and latitude/longitude coordinates.

This demonstration software can be portrayed to meet a users particular needs. First, select the features to view; for example, roads, railroads, hydrography, and boundaries. Then choose the priority of those features, and finally the color in which they will be displayed on the screen. After the map is on the screen, zoom in or out of an area as much as desired to view the different parts of the data. The source code is provided so that the geographer or cartographer can modify the program and to see how easy it is to read and manipulate TIGER/Line file data to suit individual needs.

## ***Color as a Map Skill and a Descriptive Tool***

**Henry W. Castner, Department of Geography, Queen's University, Kingston, Ontario, Canada**

**DESCRIPTION** -- A hands-on workshop using color cubes in various activities to demonstrate various perceptual principles of color and to develop concepts of color description useful in the application of color in graphic communication.

**BACKGROUND** -- One essential "map skill" involves the ability of children to use colors effectively in the maps and graphics that they produce in classroom assignments. There are a small number of perceptual principles that govern that use and they can easily be demonstrated.

A related "geographic skill" involves the ability to describe accurately the colors in our environment. For this, some sort of perceptual model of color space is useful as well as some experience in discriminating colors by their perceptual dimensions.

Both of these skills can be demonstrated and enhanced with a color box based on the Munsell color system. The box is made up of cubes whose facets vary systematically by hue, value and chroma. Fortunately for geography teachers, these perceptual dimensions of color can be related to the earth itself, its axis, poles and equator; latitude and longitude; and distance below the earth's surface.

The workshop will involve hands-on activities with the color box as a way of demonstrating these skills and suggesting how color can be more effectively utilized.

### *Affordances and Invariants in Navigation and Landscape Analysis*

Henry W. Castner, Department of Geography, Queen's University, Kingston, Ontario, Canada

Information processing and constructivist approaches to environmental cognition have been challenged by James Gibson's theory of direct perception of the environment. His theory is based upon the idea that structures in the environment are present in the ambient light reflected from surfaces in that environment.

For animals, sensitivity to a structure makes possible certain actions; the evolution of that sensitivity would then define the animal's ecological niche. Aspects of the environment which have functional consequences for the animal are called affordances. From this, perception can be viewed as a process of directly perceiving the affordances of one's ecological niche.

This paper examines some implications of Gibson's theory for map skill research and education. Two specific ideas are examined: affordances, which may provide a way of identifying landscape attributes that are functionally meaningful to a body in motion; and transformations in the ambient array which facilitate the detection of invariant structures, structures which geographers seem particularly responsive to in landscape description and analysis.

### *National Atlas of Mexico*

Atlantida Coll-Hurtado, Instituto de Geografía, UNAM, Mexico, D.F.

The National Atlas of Mexico will be finished in December, 1990. It will show the actual knowledge we have on Mexico's nature, society and economy in the 1980's through more than 600 maps, scales ranging from 1:16,000,000 to 1:4,000,000, published in 164 separate sheets.

Being the first atlas of this kind in Mexico, its construction presented interesting aspects - academical, financial, organizational, etc. - which could be discussed within the Latin American realities: the main contents; analysis of quantity and quality of data available; mastering of cartographic language with or without the use of hardware and software; editing and publishing aspects; etc.

From another point of view, this National Atlas is the result of a wide team work involving academic personnel of the National University of Mexico as well as other professionals from academic and government institutions. The inner organization is worth discussing: 120 authors working in more than 15 different institutions in Mexico City, Guadalajara and Monterrey.

The main contents of the National Atlas of Mexico are: I. General maps; II. History; III. Society; IV. Nature; V. Environment; VI. Economy; VII. Mexico and the world.

***Deconstructing Brian Harley (Or, How Cartography Lost Its Innocence)***  
Jeremy Crampton, The Pennsylvania State University, University Park, Pennsylvania

At first glance, it is surprising that a practical discipline like cartography should greet Brian Harley's exhortations toward probably its most radically theoretical (and theoretically radical) "elements of cartography" if not with total acceptance, then at least with a dawn chorus of recognition unparalleled for the discipline. Yet it is that very practicality, in comparison with academically more prestigious (and theoretical) colleagues in the humanities that no doubt fuels the welcome. Out of insecurity, cartographers have sighted/cited a tasty fad to call their own. Yet while the praise is justified, it would be a mistake to have cartography shape itself around his exact formulations. For one thing, Harley is only one voice among the clamor of "postmodernists," "poststructuralists," and "deconstructionists," and brings his own particularly historical agenda to the discipline. Harley does not pretend to be offering "The Way" in the evangelical manner (pace Godlewski), but is offering an example. For another, he has not yet come close to pushing the boundaries of exploration, that, map in hand, we expect of cartographers. By this, I refer to the theoretical side of his writing (which is, after all, what has caused the excitement). While Harley has begun the critique of maps as records of the landscape to be examined mathematically (for example he rejects the cartographic criticism of the Gall-Peters' projection as scientific reductionism) he would still allow maps, problematically, to have full representational status. That is, that graphic symbols simply "stand for" something else ("reality," "the world," "the landscape," or whatever). This position, to me, is outmoded and difficult to sustain convincingly. I would like to propose an alternative to the "maps as representations" position, one which more radically incorporates postmodern critiques of representation; perhaps even to subvert it altogether.

***Visualizing Eocene Ocean Circulation***

David DiBiase and William Peterson, The Pennsylvania State University, University park, Pennsylvania

Four-dimensional cartography enables earth system scientists to represent the behavior of dynamic environmental processes in space and time. This presentation will include a five-minute animated video simulation of Eocene ocean circulation patterns based on the research of Eric Barron and William Peterson at Penn State's Earth System Science Center. Discussion will focus on technical and design issues involved in producing the video with a Macintosh microcomputer at the Deasy GeoGraphics Laboratory.

***Computer Mapping for Decision Support in Facilities Management and Environmental Compliance in Spite of Shrinking Funds and Increasing Requirements***

Diane Drigot, and Karen Glyn, Marine Corps Air Station, Kaneohe Bay, Hawaii and Marge Elliott, Insight International, Ventura, California

As staff and budgets shrink and environmental requirements grow, facilities managers face a critical need for more timely access to geographic-based information to achieve regulatory compliance. Geographic Information Systems (GISs) can successfully satisfy this need for large municipalities. But for managers at smaller-scale facilities, a traditional GIS often exceeds what is needed and affordable. One can gain similar benefits of a GIS with minimal staff, budget, and equipment investments by developing a microcomputer-based system, using CAD/CAM software as a mapping package linked with third-party database management software.



This paper describes how a military installation in Hawai'i—an urban microcosm influenced by a myriad of environmental issues—successfully built such a system using AutoCAD and dBASE III+. A team led by a government environmental specialist and a geographer, with the support of cartographers, facilities managers, and engineers, used a unique developmental approach resulting in an automated graphic and non-graphic environmental information management system. This system allows for: (a) working within a modest budget to procure minimal and expandable equipment; (b) on-the-job staff participation in the creation and use of real-time products as the system evolved; (c) further refinement by the user as additional requirements surface; and (d) later expansion from environmental compliance to all areas of facilities management applications.

Examples show use of this system in the areas of: wildlife law enforcement, environmental impact assessment, endangered species management, historic preservation compliance, hazardous waste training, oil and hazardous substances spill contingency planning, selection of sites for military housing and training, and leak detection management of underground storage tanks.

Recommendations cover: (a) other practitioners with similar needs and constraints; (b) novice and professional cartographers who know of others with similar requirements; (c) GIS system designers regarding the needs of beleaguered bureaucrats and other potential users with little or no computer literacy.

### *Implementing a Cartographic Database to Enable Automation*

Virginia Galvin, National Oceanic and Atmospheric Administration, Rockville, Maryland

The Aeronautical Chart Branch (ACB) of the National Ocean Service is beginning to automate the production of some of its charts. The transformation of the production process is an ongoing effort, depending on human considerations and technical factors for success. Currently, production techniques for the Branch's products range from traditional manual compilation, engraving, and stick-up to the use of various levels of computer-assisted cartographic tools. Each chart series, with its standard scale, complexity of feature representation, revision cycle, and other characteristics, poses more or less of a challenge in the process of automation.

This paper describes the extent of current automation at ACB and evaluates the feasibility of introducing further automated solutions with regard to various types of charts. By implementing a cartographic database, using a commercially available relational database management system, increased efficiency and flexibility can be realized in the production of a significant number of charts. The paper summarizes the concepts that define a cartographic database and how these concepts serve to resolve problems of redundancy in the revision of charts, increase flexibility in the creation of new products, and enable the automatic flow of cartographic information from the database to the digital chart product.

Finally, the paper presents an overview of the operation of a commercial cartographic database developed for production of aeronautical charts by the Intergraph Corporation. It describes the software components of the Intergraph Aeronautical Charting System (IACS) to be installed by the Branch and provides a scenario of the cartographer's interaction with the system, emphasizing the expansion of his responsibilities in controlling the automated compilation process.



## ***Commercial Mapping in the 1990's Roundtable Discussion***

**Bertrum Green, The Map and Globe Store, Orlando, Florida**

What are the major issues and problems that face commercial mapping in the 1990's? This, plus many other relevant questions will be discussed by a panel of personnel engaged in commercial mapping.

## ***GIS Applications for Transportation Planning***

**Eckart F. Leistikow, Pennsylvania Department of Transportation, Harrisburg, Pennsylvania**

This presentation will identify and describe the essential components that define an automated cartographic operation. It further introduces the concept of computer assisted cartography and describes the relationships between manual and automated ones. Special emphasis focuses on the cartographer's role in facilitating cartographic automation within the framework of an ever growing Geographic Information System for Transportation. The paper will demonstrate the idea of teaching cartographers to use computers - rather than teaching computer operators to make maps; thereby promoting the rapid proliferation of automated cartography among State Dot's and leading Metropolitan Planning Organizations.

## ***Communicating with a Cartographer***

**William G. Loy, Department of Geography, University of Oregon, Eugene, Oregon**

Like an architect designing a building, a cartographer designing a map needs to establish clear communications with the client. Like a city building permit department limits the size of a building on a lot, a publisher limits the image area on a page. Before a cartographer can design a map a copy of the publisher's "Instructions for Contributors" setting the above limits and providing other information must be given to the cartographer. It is also useful to have a sample of a recent publication in the series for which the map is being designed to reveal actual publisher's practices regarding graphics. The client must also provide a recent good-quality somewhat oversize base map on which to compile. On a photocopy of this map the area of the thematic map to be created must be delineated (north to the top, if possible) in the proportion of the final image area. The information to be shown on the new map must be indicated clearly or referenced to the compilation map, probably in red on the photocopy. The cartographer must stress that it is the responsibility of the client to provide all of this necessary information before map design can proceed. Matters of schedule and cost should be settled at this time.

With publisher's information, client's information, and time/cost decisions made the cartographer can proceed to prepare an over-scale first-draft map using an easy-to-change method of map-making. Non-automated shops will probably use ink-on-mylar methods for linework and Laserprinter or Linotronic lettering. Key to this process is the expectation by both client and cartographer that the first-draft map will be modified and improved. Time for corrections and improvements must be allowed and money budgeted for producing second or third drafts of the original effort. The final product will probably be a PMT at printing scale.

## ***Changing Directions: Historical Atlas of Canada***

**Geoffrey J. Matthews, Department of Geography, University of Toronto, Toronto, Canada**

Volume III of the Historical Atlas of Canada is scheduled to be published in October 1990 after four years of intense production and is expected to emulate the critical success achieved by Volume I. Rising production costs, a depleted budget and a paucity of new funding have compelled the project to examine more cost effective methods of production than are now being utilized. As a result of that study, the atlas executive and the University of Toronto in order to rescue the remaining volume in the project, have decided to cease operations for one year while the cartography office is refitted to a computer based operation. A drastically smaller nucleus of computer trained cartographers will commence production of Volume II in 1991 with the goal of completion within two years. The style, design and integrity of the two previous volumes will be maintained, only the method of production will dramatically change.

## ***Cartographic Change at National Geographic***

**David Miller, National Geographic Society, Washington, D.C.**

The discipline of cartography is being buffeted by technological change. These changes have transformed National Geographic's Cartography Division over the last ten years from an elite group, vested in traditional mapping methods, modestly producing some of the best maps in the world – to an elite group, sustained by digital revolution, modestly producing some of the best maps in the world. Our Scitex system brought us the benefits of raster technology in 1982, but it was not until the introduction of ARC/INFO in 1988 that computer technology began affecting every single person in Cartographic. ARC/INFO has changed the way we manipulate the fundamental qualities of a map: projection, symbolism, and scale. The Society's new Atlas of the World provides numerous examples of how our new technology has been applied in updating and creating maps.

## ***Summary Graphics to Supplement Animated Cartographic Sequences***

**Mark Monmonier, Department of Geography, Syracuse University, Syracuse, New York**

Viewers of animated sequences of maps might benefit from a single, more cognitively friendly graphic that summarizes dominant trends, salient relationships, and significant deviations introduced in the dynamic presentation. The theory of human information processing suggests that because the human eye-brain system does not instantaneously process patterns from short-term memory through to long-term memory, information presented toward the end of a dynamic cartographic sequence retards the memorability and comprehension of information presented earlier in the sequence. Four types of summary graphics hold particular promise as animation supplements. The simplest and oldest of these is the centrographic time-series map, used since the late nineteenth century to portray the march westward of the center of the United States population. Useful modifications include disaggregation by population subgroups and point symbols for which size or value portrays relative dispersion about the geographic average. A second promising supplementary graphic is the biplot, a joint two-dimensional representation of time units and places based upon two principal components. Among the points in the biplot representing time periods, similar instants or periods of time plot as closely clustered points whereas highly dissimilar time units are more widely separated. Similarly, among the points representing places, similar places are close together and dissimilar places are far apart. A third strategy is canonical trend-surface analysis, which might extract one or two salient spatial trends,

the canonical loadings of which can be plotted in a time-series graph showing when each trend was particularly prominent. A fourth summary representation is the time-series correlation graph, which reveals temporal variation in the apparent influence of given trends or regionalizations on a particular bivariate correlation. The time-series correlation graphic not only portrays the spatial coherence and temporal stability of a correlation but also fosters an understanding of geographic correlation, which is more complex than statistical correlation. Because an animated sequence of maps can promote understanding of an otherwise complicated summary graphic, the two approaches are complementary.

### *Tips and Techniques for Maintaining Visual "Headroom" on Animated Maps*

**Don Pirius and Phil Gersmehl, Department of Geography, University of Minnesota, Minneapolis, Minnesota**

It is convenient to approach the topic of four-dimensional cartographic design by way of analogy: a televised map has a relationship to its narration that resembles the connection between a printed map and surrounding text. This analogy may help clarify the similarities and differences between the design decisions for print and television maps.

For example, establishing a visual hierarchy on a printed black-and-white map is a relatively simple conceptual problem: the cartographer can select from a range of grays that fall along a single continuum from the color of the ink to the color of the paper. That constraint can make it difficult to design type that is legible across several intermediate grays. This problem of providing contrast is more complex but often easier to solve in color printed maps. The cartographer can choose to use hue, value, chroma, or a combination of those attributes to help separate figure from ground information.

Designing a map for broadcast television adds a number of additional constraints and opportunities to the decision process. The low resolution of a television image makes type selection difficult, but simultaneous narration can reduce the need for on-screen type. Similarly, the ability to zoom in or out through time can make locational inset maps unnecessary. The analog nature of the broadcast signal poses some unique problems: the legal limits on color intensity are different for different colors, and the message should still be legible on black-and-white receivers. The designer of animated maps can employ a variety of techniques, including flicker, gradient screens, patterned backgrounds, and changes in intensity through time, in order to maintain visual headroom for the points that are to be emphasized. We will illustrate some of these choices by demonstrating a series of animated maps we have designed for a 10-part television-based correspondence course.

### *A Cost-Benefit Analysis of Computer-Aided Map Design and Production*

**Charles P. Rader and Ellen R. White, Department of Geography, Michigan State University, East Lansing, Michigan**

Within the last five years, microcomputer-based map design and production have become viable alternatives to manual design and production for cartographic production labs. A cost-benefit analysis between computer-aided map production and manual map production was carried out to determine their relative advantages. Two essential questions guided the analysis: (1) what are the relative capital investments in facilities and equipment, and (2) what are the relative costs of labor and materials in the design

and production of maps between computer-assisted and manual techniques? A survey of vendors was conducted to determine the investments in setting up two new labs, one which emphasized manual technologies and the other computer-assisted technologies. Two map design problems, a thematic map and a reference map, were each produced twice, once using traditional manual techniques and once using computer-assisted techniques, to determine relative production costs for each design. The results from this study indicate that the computer-assisted technologies and techniques compare favorably to more traditional ones. The results of the analysis are discussed in the context of the types of cartographic products that are customarily produced by labs, the expanding capabilities brought to cartographic representation by computer-assisted techniques, and the future role of cartographic labs in providing services. While no cost-benefit analysis is definitive, this study should contribute to understanding the tradeoffs in the ongoing change from older to newer technologies.

### *Recovering an Ancient Hawaiian Cultural Landscape for Purposes of Modern Land Use Planning*

Muriel B. Seto, Donna Wong and Mikilani Ho, Hawaii's Thousand Friends, Kailua, Hawaii

Hawaii is target for a host of investment interests, but our land use planners too often find evidences of native culture lying where least expected in pathways of modern progress, after construction is well underway. Unfortunately, early cartographers brought bias to Hawai'i mapping: "The names of many geographical features in the islands known to the Hawaiians are not given in the gazetteer...outstanding cliffs, rocks, small streams and gulches, and some trivial land marks. Such names were thought not to be of enough importance to include in the work." (*A Gazetteer of the Territory of Hawaii*, J. W. Coulter, 1935, University of Hawaii, Honolulu). This attitude comes home to haunt us.

Hawaiian activists, applying historic preservation and environmental laws, are occasionally able to modify, delay, or halt public and private developments perceived detrimental to cultural, land-centered value systems. Acrimonious confrontations have resulted at great financial cost to development interests, but without generating long term solutions.

For five years, Hawaii's Thousand Friends has authored an ambitious effort to fill the void through federal Library Services funds employing knowledgeable native Hawaiian researchers for a computerized database of cultural sites. In our paper we show how we developed criteria for re-discovery of the original Hawaiian cultural landscape through recording sites mentioned in publicly available standard texts, many of which are early observations made by post-contact western residents and visitors, or are from the writings of early literate Hawaiians.

We will also describe how, with a small state grant for a pilot project, we concentrated on inventorying early maps for the Island of O'ahu, recording their locations, conditions, and public availability. Many early maps are not officially recorded, controlled, nor are they properly archived. Some are believed to have been lost, strayed, or stolen. We show how, using our data collection forms, we recorded those cultural sites which are shown on the maps, including them in our database collection.

In this paper, we describe how wedding data from the literature to information contained on O'ahu maps serves to create a mappable pre-historic record of sites for use by native Hawaiians, and by land use managers and developers, among others. We also analyze future steps to be taken, utilizing computers, for greater public accessibility to expanded cultural maps, and toward obtaining greater protection and maintenance for unusually vulnerable early maps of Hawai'i.

### ***Textbook Graphic Production***

**Bonnie Sines, Department of Geography, University of Northern Iowa, Cedar Falls, Iowa**

The maps in geography textbooks appear to be the work of the cartographer, who must accept the compliments or the criticism. However, the fact remains that often the final product is the result of decisions made by other technicians, who may lack the cartographic knowledge needed in understanding the intent of the original graphic. This paper will examine the problems encountered in creating maps and graphics for textbooks. In addition, possible solutions and alternatives will be discussed.

### ***The Climatic Atlas of Michigan***

**Hans J. Stolle, Department of Geography, Western Michigan University, Kalamazoo, Michigan**

The Climatic Atlas of Michigan is the product of a nine year cooperative undertaking of two Western Michigan University faculty members, the state climatologist, and one member of the Michigan State University faculty. The atlas was published by the Notre Dame University Press and it is one of just a few existing state climate atlases.

This paper summarizes the production of the atlas from its early planning to the print-ready color separations. Problems of data collection and compilation are explained, the design of the atlas format as well as individual maps is illustrated, and the methods of cartographic production and project management are discussed.

Helpful insights gained during this project are pointed out and a sabbatical research project which is a direct result of work done for the atlas is briefly described.

### ***Maps and Their Keepers Roundtable Discussion***

**Johnnie D. Sutherland, University of Georgia Libraries, Athens, Georgia**

Such topics as the handling of non-standard cartographic formats and new technologies in cartographic information delivery will be the focus of this roundtable session.

### ***Patterns of Cartographic Materials Usage***

**Johnnie D. Sutherland, University of Georgia Libraries, Athens, Georgia**

One of the traditional ways of measuring library performance, or how well does a library perform or meet its objectives and goals, is the measurement of user satisfaction. User studies have focused on either users or use. The user focused study attempts to survey user behavior while the use focused study measures material used. This paper will describe both types of studies. Using data from a long-term use research project at the University of Georgia Library's Map Collection, use patterns in this Map Collection will be defined. Combining this study with other published and unpublished data patterns of use in United States Map Collections will be outlined.

## **Local Arrangements**

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