Program and Abstracts

NACIS IX

NUEVAS PERSPECTIVAS
NOUVELLE PERSPECTIVES
NEW PERSPECTIVES

North American Cartographic Information Society

Ninth Annual Meeting

The Ann Arbor Inn
Ann Arbor, Michigan

October 11-14, 1989

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NACIS IX

New Perspectives

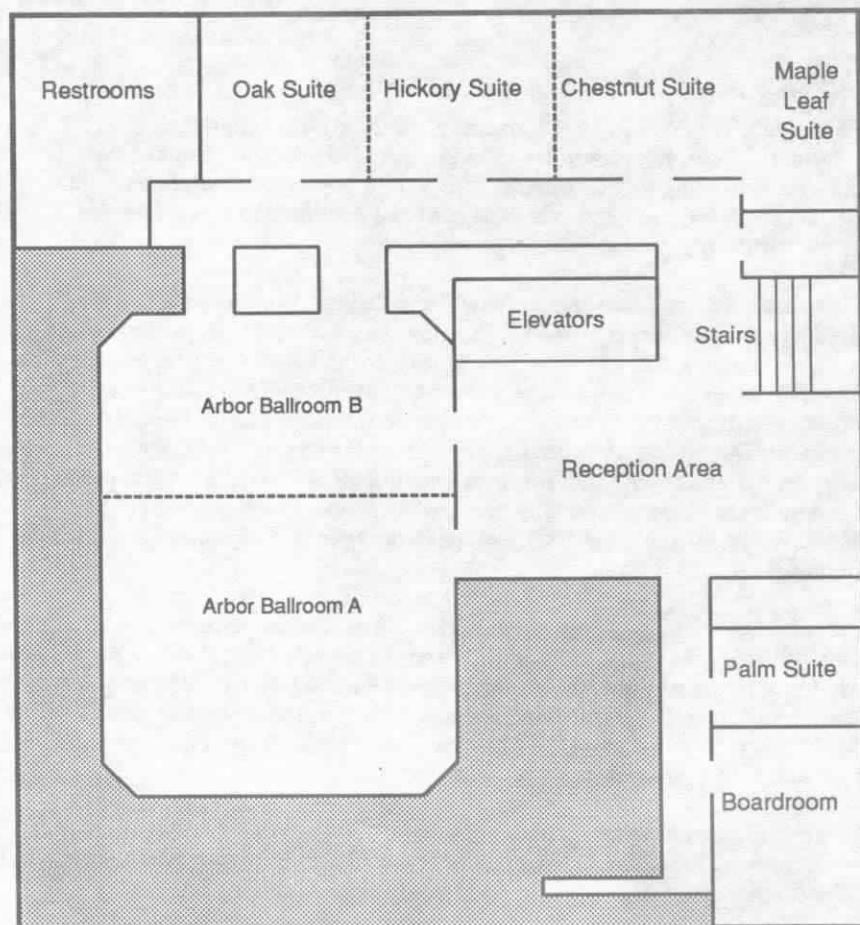October 11-14, 1989
Ann Arbor, Michigan

Welcome to Ann Arbor, Michigan, site of the North American Cartographic Information Society's Ninth Annual Meeting! Like previous annual meetings, our goal is to bring together professionals from government, academic and private organizations to share discussions and information as it relates to cartographic information.

This year's conference theme is "New Perspectives." We sought to draw a diversity of opinions on new and changing perspectives in the profession. The new, or changing, perspectives concept is one which we hope you, as the conference participant, will make more meaningful by your participating in posing questions, voicing your opinion and being an interactive part of the entire program. The program includes paper and poster sessions, workshops, exhibits, discussions, and the Annual Business Meeting that will enable you to participate. I encourage members, especially new members, to speak to persons on the Executive Board about getting involved in next year's program, or in Committees of interest.

On behalf of the Local Arrangements Committee and the Executive Board, I hope you will enjoy the program, field trips and the attractions in the Ann Arbor area. There are many cultural and social attractions in the vicinity we hope you will enjoy. All conference participants are invited to join the post-conference social at the Domino Farm's Classic Car Museum, Frank Lloyd Wright Gallery and site of this year's Ann Arbor Arts Guild annual art show.

I extend my thanks to all speakers, session chairs and participants this year. I want to thank the Local Arrangements Committee members, especially Ellen White, who spent countless hours advising and encouraging me.

Diana Rivera
Program Chair
NACIS IX

Restrooms

Oak Suite

Hickory Suite

Chestnut Suite

Maple Leaf Suite

Elevators

Stairs

Arbor Ballroom B

Reception Area

Arbor Ballroom A

Palm Suite

Boardroom

Second Floor Meeting Rooms
Ann Arbor Inn

CONFERENCE NOTES

Registration

The NACIS Registration Desk is located in the Reception Area on the second floor of the Ann Arbor Inn. Registration hours are:

Wednesday, October 11	1:00 p.m. - 8:00 p.m.
Thursday, October 12	8:00 a.m. - 7:00 p.m.
Friday, October 13	8:00 a.m. - 4:00 p.m.
Saturday, October 14	8:00 a.m. - 11:15 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 and the post-conference social.

Field Trips

Registration for field trips will be handled at the NACIS Registration Desk. Three field trips have been planned for NACIS IX. 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 the Chestnut and Maple Leaf Suites on the second floor of the Ann Arbor Inn. Exhibits will be open:

Thursday, October 12	9:00 a.m. - Noon
Friday, October 13	9:00 a.m. - 3:00 p.m.

PROGRAM SCHEDULE

WEDNESDAY, OCTOBER 11

1:00 - 8:00 p.m.	**Registration** - Reception Area
1:00 - 3:00 p.m.	**NACIS Committee Meetings**
3:00 - 5:00 p.m.	**NACIS Board Meeting** - Boardroom
5:00 - 7:00 p.m.	Dinner break
7:30 - 9:00 p.m.	**Opening Session** - Arbor Ballroom A

Welcome

> Diana Rivera
> Vice President and Program Chair
> Michigan State University

Keynote Address:

> Judy M. Olson, Chairperson
> Department of Geography
> Michigan State University

9:00 - 11:00 p.m.	**Reception and Cash Bar** - Reception Area
9:00 - 11:00 p.m.	**Poster Session** - Arbor Ballroom B

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

Participants:

James Anderson, Florida State University

Gregory Chu, University of Minnesota

Will Fontenez, University of Tennessee

John Krygier, University of Wisconsin

Geoffrey Matthews, University of Toronto

Mark Mattson, Temple University

Arvo Peltonen, University of Helsinki

Craig Remington, University of Alabama

Benjamin Richason, St. Cloud State University

Gyula Pauer, University of Kentucky

Eugene Turner, California State University, Northridge

Richard Vaupel, Northern Illinois University

Everett Wingert, University of Hawaii

THURSDAY, OCTOBER 12

8:00 a.m. - 7:00 p.m.	**Registration** - Reception Area
9:00 a.m. - Noon	**Exhibits Open** - Chestnut and Maple Leaf Suites
8:30 - 10:00 a.m.	**Session A: Cartographic Design** - Arbor Ballroom B

Chair: Kathleen Bergen, University of Michigan, Ann Arbor, Michigan

Color Chart Use in Map Design
Cynthia A. Brewer, Michigan State University, East Lansing, Michigan

A Functional Model of Color in Cartographic Design
Charles P. Rader, Michigan State University, East Lansing, Michigan

The Look of Maps: Maintaining a Balance Between Form and Function
Jeremy Crampton and Debra Daggs, Pennsylvania State University, University Park, Pennsylvania

Session B: Atlases - Arbor Ballroom A

Chair: Chris Baruth, American Geographical Society Collection, Milwaukee, Wisconsin

The Design and Production of the Political Atlas of Illinois
Richard Vaupel, Northern Illinois University, DeKalb, Illinois

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Ukranians in Canada
Geoffrey Matthews, University of Toronto, Toronto,
Ontario, Canada

Boundary Symbols in World Atlases to 1800: Towards a
Standard Vision of the Political World
James R. Ackerman, Hermon Dunlap Smith Center for the
History of Cartography, Newberry Library, Chicago,
Illinois

10:00 - 10:30 a.m.	Break
10:30 - Noon	**Session C: Ethics in Cartography Roundtable Discussion** - Arbor Ballroom A

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

Panel:

Ronald M. Bolton, NOAA

Warren G. Glimpse, U.S. Statistics, Inc.

Gyula Pauer, University of Kentucky

Session D: Map Library Management - Arbor Ballroom B

Chair: Carl Longstreth, University of Michigan, Ann
Arbor, Michigan

Managing Map Collections: An Introduction/Overview
John Sutherland, University of Georgia, Athens, Georgia

Managing Cartographic Collections: The Development of a
Selection and Retention Model
James O. Minton, United States Geological Survey, Reston,
Virginia

Noon - 1:00 p.m.	Lunch break

1:00 - 5:30 p.m.   **Field Trips**

Remote Sensing - Environmental Research Institute of Michigan and Geospectra.

Ann Arbor and Vicinity Geomorphology - Continental Glacial Features of the Interlobate Area of Southeastern Michigan. Guide: Allan Cichanski, Department of Geology, Eastern Michigan University, Ypsilanti, Michigan.

Map Collections and Tour of Ann Arbor - Harlan Hatcher Graduate Map Library - Host: Carl Longstreth; William L. Clements Library - Host: David Bosse; Bentley Historical Library - Host: Leonard Coombs

6:30 - 7:15 p.m.   **Reception and Cash Bar** - Reception Area

7:15 - 9:00 p.m.   **Annual Banquet** - Arbor Ballroom

President's Address

       Juan Jose Valdes
       Cartographic Division
       National Geographic Society
       Washington, D.C.

"New Perspectives on Cartography"

       D.R. Fraser Taylor, President
       International Cartographic Association
       Carleton University
       Ottawa, Ontario, Canada

FRIDAY, OCTOBER 13

8:00 a.m. - 4:00 p.m.   **Registration** - Reception Area

9:00 a.m. - 3:00 p.m.   **Exhibits Open** - Chestnut and Maple Leaf Suites

| 8:30 - 10:00 a.m. | **Session A: Microcomputer-Based Cartographic Production** - Arbor Ballroom A |

Chair: Gregory Chu, University of Minnesota, Minneapolis, Minnesota

Practical Problems and Prospects
John Krygier, Brian Goudreau and Onno Brouwer,
University of Wisconsin, Madison, Wisconsin

Theoretical Problems and Prospects
John Krygier, Brian Goudreau and Onno Brouwer,
University of Wisconsin, Madison, Wisconsin

Marketing Cart Lab Services in Research-Oriented Universities
David DiBiase, Pennsylvania State University, University Park, Pennsylvania

Session B: Geographic Information Systems - Arbor Ballroom B

Chair: John Sutherland, University of Georgia, Athens, Georgia

An Integrated Software Package for Solution of Location-Allocation Problems
Jacek Malczewski, University of Warsaw, Warsaw, Poland and Wlodzimierz Ogryczak, University of Poland, Warsaw, Poland

GIS in Michigan - Today and the Future
Michael Scieszka, Michigan Department of Natural Resources, Lansing, Michigan

Issues to be Considered in the Development and Management of GIS/LIS Systems
Claudette M. Dellon and Ronald M. Bolton, Aeronautical Charting Division, NOAA/NOS, Rockville, Maryland

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

| 10:30 - Noon | **Session C: Cartographic Visualization of Time-Space Relationships** - Arbor Ballroom A |

Chair: Alan MacEachren, Pennsylvania State University,

University Park, Pennsylvania

Time-Space Mapping: Early Evolution of Skyscrapers in Lower Manhattan
Deryck W. Holdsworth and Matthew S. Tharp, Pennsylvania State University, University Park, Pennsylvania

Disoriented Prism Maps: A Recognition Experiment
Keith W. Rice, University of Wisconsin - Stevens Point, Stevens Point, Wisconsin and Dan Seidensticker, George Mason University, Fairfax, Virginia

Animated Maps of Aggregate Data: Conceptual and Practical Problems
Alan M. MacEachren and David DiBiase, Pennsylvania State University, University Park, Pennsylvania

Session D: Mapping Software Workshop - Oak Suite

Chair: Richard E. Groop and J. Michael Lipsey, Michigan State University, East Lansing, Michigan

Noon - 1:30 p.m.   Lunch break

1:30 - 3:00 p.m.   **Session E: Map Projections**

Chair: Juan Jose Valdes, National Geographic Society, Washington, D.C.

Map Projection Applications
Ronald M. Bolton and Claudette M. Dellon, Aeronautical Charting Division, NOAA/NOS, Rockville, Maryland

The Effects of Map Projections on Map Distance and Emotional Involvement
 Robert Lloyd and Patricia Gilmartin, University of South Carolina, Columbia, South Carolina

Microcomputer Tools for Teaching Map Projections
Douglas J. Dudycha, University of Waterloo, Waterloo, Ontario, Canada

Session F: Management of Geographic Information - Arbor Ballroom B

Chair: Nancy Kandoian, New York Public Library, New York, New York

The Cartographic Resource Development Program, A Management Approach to Better Local Information and Utilization
David Wiltsee, Information Sciences, Applegate, California

Using the 1990 Census TIGER Files on CD-ROM
Warren G. Glimpse, U.S. Statistics, Inc., Alexandria, Virginia.

3:00 - 3:15 p.m.   Break

3:15 - 5:00 p.m.   **Annual Business Meeting** - Arbor Ballroom A

SATURDAY, OCTOBER 14

8:00 - 11:15 a.m.   **Registration** - Reception Area

8:30 - 10:00 a.m.   **Session A: Cartographic Education** - Arbor Ballroom A

Chair: Jerry Thornton, University of Michigan, Ann Arbor, Michigan

Cartographic Education at the College Level: A Cognitive Developmental Perspective
Roger M. Downs and Lynn S. Libon, Pennsylvania State University, University Park, Pennsylvania

Anatomy of the Introductory Cartography Course
James F. Fryman, University of Northern Iowa, Cedar Falls, Iowa

Session B: General Papers - Arbor Ballroom B

Chair: Ellen White, Michigan State University, East Lansing, Michigan

Regional Patterns on Choropleth Maps
Ruth Anderson Rowles, University of Kentucky, Lexington, Kentucky

Color and the Figure-Ground Relationship in the Perception of Bipolar Choropleth Maps
Richard E. Lindenberg and Audrey E. Clarke, Kent State University, Kent, Ohio

Use of Maps in Children's Literature
Nancy B. Ryckman and Jeffrey C. Patton, University of North Carolina, Greensboro, North Carolina

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

10:00 - Noon

Session C: Map and Atlas Preservation and Collection Management - Arbor Ballroom B

Chair: Jerry Thornton, University of Michigan, Ann Arbor, Michigan

Presentor: Maria Grandenetti, University of Michigan, Ann Arbor, Michigan

Session D: Inter-American Mapping Roundtable Discussion - Oak Suite

Organizer: Bill Stewart, Bill Stewart, Inc., Ann Arbor, Michigan

Bill Stewart, Bill Stewart, Inc., Ann Arbor, Michigan

J. Hull McLean, United States Department of State, Washington, D.C.

Joao Francisco de Abreu, University of Brazil, Belo Horizonte, Brazil

Noon - 1:30 p.m. **Luncheon** - Arbor Ballroom A

1:30 p.m. **Post Conference Social** at Domino Farms - Frank Lloyd Wright Gallery, Classic Car Museum, Ann Arbor Arts Guild Annual Art Show

SUNDAY, OCTOBER 15

9:00 a.m. - Noon   NACIS Board Meeting - Boardroom

ABSTRACTS

Boundary Symbols in World Atlases to 1800: Towards a Standard Vision of the Political World
James R. Akerman, Hermon Dunlap Smith Center for the History of Cartography, The Newberry Library, Chicago, Illinois

Although the boundary line is one of the oldest and most easily grasped cartographic symbols, it is absent from the majority of early printed maps. The specific use of boundary lines to represent the limits of political sovereignty or jurisdiction in early modern Europe developed slowly, as the concept of territorial sovereignty itself took hold as the guiding principle of political relationships among European states. Study of 50 atlases published between 1500 and 1800 and now housed in Chicago's Newberry Library reveals three stages in this development. In the first stage (to about 1640), engraved boundaries became increasingly common, but were limited to larger and medium-scale maps. Lines were infrequently used to designate the fluctuating frontiers of larger states, such as France and the German (Holy Roman) Empire, and hardly used at all on maps of continents and world maps. In the second stage (circa 1640-1740), engraved boundary lines became standard features of atlas maps at all scales, and the first graded symbols were introduced to help distinguish between the limits of sovereign territories and the limits of their internal provinces. Finally, after about 1740, the hierarchical systems for the delineation of political territory were applied consistently throughout individual atlases. Moreover, the geopolitical meaning of engraved lines was effectively reinforced by the more rigorous application of other symbolic elements, such as color and marginal detail reduction.

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

The subject of map projections and their use has been discussed in thousands of books and papers dating from at least the time of the Greek astronomer Claudius Ptolemy (about 150 A.D.). Projections are known to have been in use some three centuries earlier. This paper describes twelve commonly utilized projections in terms of their history, features, and application.

Each of the projections covered has distinctive features which make it preferable for certain uses, no one projection being best for all conditions. For anyone selecting a projection, we recommend the manual entitled, *Map Projections - a Working Manual* (U.S.G.S. Professional Paper 1395).

Color Chart Use in Map Design

Cynthia A. Brewer, Department of Geography, Michigan State University, East Lansing, Michigan

Color charts are a commonly available aid for selecting map colors. I interviewed sixteen cartographers who design color maps for academic, government, or private organizations to gather background information on their use of color charts. Each cartographer uses color charts and, altogether, they use a wide variety of chart types. We discussed the chart characteristics they prefer and the many problems they have while using charts. The interviews provide insight into the approach of experts to the complex problem of map color selection. This information is essential background for designing future research on specific aspects of color selection in cartography.

The Look of Maps: Maintaining a Balance between Form and Function

Jeremy Crampton and Debra Daggs, Department of Geography, Pennsylvania State University, University Park, Pennsylvania

In *The Look of Maps*, Robinson proposed that "form follows function," an observation most cartographers would agree with. However, function has two meanings. The cartographic communication model highlighted a cognitive component which addresses how we operate on the map. This diverts attention from a more fundamental and complementary component, that is , what a map is *for*, or why we would use a map in preference to another form of representation.

Form also has two dimensions. Selecting the type of map establishes a framework within which subsequent design decisions will be made. Whether non-professional cartographers adhere to this conception and whether their range of map types is constrained is important because their maps appear frequently in the media. The increasing availability of computer cartographic software also places map design in the hands of people who do not necessarily have a cartographic or geographic background.

The result of this is that important map design questions are ignored. When the questions of what a map is *for* and what type of map is appropriate are not addressed, the "look of maps" will revert to defaults. This can result in what Petchenik has called map-like objects (MLO's) which are ill-conceived graphics.

We analyze these interlinked questions with reference to our beginning statement that map design is dictated by its function. We argue that an area where this is especially relevant is in education, where children are taught "map skills." We argue that it is just as important that the child be able to judge just when it is necessary to employ a cartographic representation (and not, say, a written description). By emphasizing the two aspects of function and of form, cartographers will best be able to resist the question of their obsolescence.

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Issues to be Considered in the Development and Management of GIS/LIS

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

The sources of GIS/LIS implementation problems are many but tend to fall into similar categories for most systems: 1) too much emphasis on technical issues and available technology; 2) failure to identify system requirements; 3) inadequate study of organizational impact and system/organizational staffing changes caused by GIS/LIS operations; 4) organizational inflexibility and lack of preparation for the changes that occur with the installation of a GIS/LIS; 5) failure to assess long-term costs of operating a GIS/LIS and underestimation of data base creation and maintenance costs; 6) lack of management control due to oversight in defining policy-making, advisory, and execution roles.

A quick review of these problem areas reveals that organizational problems outweigh technical ones. However, this is not surprising; the organizational aspects of most systems development and system operations have more to do with a system's success than the quality of technology. Unfortunately, many GIS/LIS systems are developed on an *ad hoc* basis with technical personnel leading the efforts, and proper executive and policy-making level direction lacking. The traditional systems analysis techniques are circumnavigated under the guise of expediting or facilitating the implementation of many GIS/LIS systems. The following questions are not being satisfactorily addressed prior to hardware/software procurement. 1) What are the actual system requirements? 2) Can the proposed system do the task at hand more cost effectively? 3) Will it meet the schedules outlined in the requirements documentation? 4) Will it produce the required outputs faster than the existing system? 5) Does the proposed system have the ability to expand and change as requirements change? 6) What are the hardware, software, systems maintenance, data base creation, and data base maintenance costs? 7) Is the technology mature and tested? 8) What risks are involved in the development and implementation of the system, and how would they impact the organization?

In summary, GIS/LIS development often occurs on an *ad hoc* basis without proper systems requirements, cost analysis, and executive control exerted. The probability of a successful outcome is far greater if more traditional methods are applied to the development of GIS/LIS systems. How a system will meet, or has met, its requirements is a major consideration in the successful operation and development of a GIS/LIS.

Marketing Cart Lab Services in Research-Oriented Universities

David DiBiase, Deasy GeoGraphics Laboratory, Pennsylvania State University, University Park, Pennsylvania

Facilities for the production of maps and other scientific graphics are a common fixture in North American universities. Such facilities - commonly known as "cart labs" - represent the principal academic niche for practicing cartographers. Recent research reveals that the typical North American cart lab is managed by a professional cartographer with a staff (if any) of two or three part-time student employees. Geography departments are the principal clients of cart labs (nearly 60 percent of all clients). About 80 percent of Cart Lab products are produced by manual photomechanical methods. In light of the ongoing proliferation of computer graphics hardware and software, it seems likely that the traditional niche of cart labs may be changing, especially in research-oriented universities. This paper will introduce the notion of a "scientific graphics studio" as an evolutionary advance on the traditional cart lab model. Strategies will be suggested whereby cart lab managers may upgrade their facilities and market their design skills to a wider client base within research universities. Benefits likely to accrue from such efforts include increased quality of all types of scientific graphics, and a more fertile niche for university cartographers.

Cartographic Education at the College Level: A Cognitive Developmental Perspective

Roger M. Downs, Department of Geography, and Lynn S. Liben, Department of Psychology, Pennsylvania State University, University Park, Pennsylvania

Successful teaching at any educational level requires an appreciation of the cognitive developmental level of students. By cognitive developmental level, we mean the structure of cognitive skills that students must deploy in order to understand a concept.

Cognitive skills undergo significant developmental change from early childhood onwards. We argue that it is dangerous to presume that developmental changes are complete for all people, even those in college-level cartography courses. The entire audience may not possess the necessary skills in either equivalent ways or to the same extent. Moreover, students build models of how they think the world works (naive models) and develop expectations based on these models. Teachers must not presume that students share disciplinary-based, expert models and expectations.

We argue that cartography and geography teachers need a more sophisticated understanding of the cognitive skills of college students. Once this understanding is achieved, it is possible to match the curriculum to the students. This match will affect the choice of classroom examples, sequencing of concepts, model of explanation (graphic, algebraic, geometrical), design of exercises, type of feedback, performance expectations, design of testing procedures, etc.

To support and illustrate this argument, we review the recent psychological literature demonstrating the lack of adult mastery of spatial concepts. These deficiencies have serious implications for students' understanding of cartographic concepts. We consider two aspects of map understanding that depend upon spatial concepts: map projections and coordinate reference systems. In each case, we point out the relevance of the underlying spatial concepts; cite data showing that many college students may have difficulty understanding these concepts; and apply these findings to the teaching of basic cartographic concepts.

Microcomputer Tools for Teaching Map Projections

Douglas J. Dudycha, University of Waterloo, Waterloo, Ontario, Canada

Consideration of map projections is a common component of introductory cartography courses although, to judge by textbook presentations, treatment of the topic varies considerably in scope and level of technical detail.

Students often find the topic bewildering due to the variety of projections available and the lack of clearly defined criteria for choosing among them. This problem is exacerbated by the limited time available for discussion of map projections in an introductory course.

Use of microcomputer-based teaching tools offers one means of more effectively presenting this topic. This paper outlines an approach to the discussion of map projections, describes a computer program for generating map projections which forms the basis for a map projection lab exercise and presents a framework for a self instruction module using HyperText.

Anatomy of the Introductory Cartography Course

James F. Fryman, Department of Geography, University of Northern Iowa, Cedar Falls, Iowa

Introductory cartography courses have undergone considerable change within the past two decades. These changes reflect new technological advancements as well as shifts in emphasis within the profession. This paper will explore the differences and similarities between introductory cartography courses offered in the United States in an attempt to determine characteristics common to all courses. In addition the paper will summarize variations in course content and teaching strategies.

The discussion of course characteristics is based on a survey of instructors responsible for teaching introductory courses. Specific subjects covered in the survey are equipment availability and use, text and readings required, types and quantity of laboratory exercises, extent of computer use and differences in course goals.

Using the 1990 Census TIGER Files on CD-ROM
Warren G. Glimpse, U.S. Statistics, Inc., Alexandria, Virginia

The presentation covers issues concerning access to and use of the 1990 Census TIGER (Topologically Integrated Geographic Encoding and Referencing) files on CD-ROM. The FEDSTAT/TIGER CD-ROM (38 titles) developed by U.S. Statistics contain all of the prototype Census Bureau TIGER/Line files for the United States. Successor CD-ROM titles will be developed by U.S. Statistics as the Census Bureau releases updated versions of the TIGER files.

While the FEDSTAT/TIGER CD-ROM files may be used with several mapping packages, U.S. Statistics has developed the Integrated Mapping and Geographic Encoding (IMAGE) System to process the TIGER files with other major digital cartographic databases. The presentation covers features of the IMAGE System which make it economical and application-effective to use the TIGER files in a PC processing environment ranging from thematic mapping to broader types of geographic applications.

The presentation will also address issues concerning linkage between the TIGER files and the USGS elevational data from the DLG files and frequently updated 9-digit ZIP carrier route data from the Postal Service data files.

Finally, issues will be discussed concerning federal statistical policy, use of optical disc technology by federal agencies, and broader considerations having to do with pricing of public data resources by the government.

Map and Atlas Preservation and Collection Management
Maria Grandinetti, Conservation Lab, University Library, University of Michigan, Ann Arbor, Michigan

This session will address the following basic preservation questions:

— How does the environment affect my collections? How do I monitor the environment and what can I do to improve unsatisfactory environmental conditions?

— What bearing do storage and handling have upon the life of maps and atlases? What can I do to improve the storage conditions of my collections?

— How do I integrate preservation principles into my daily activities?

— How do I provide for the physical repair of damaged items? What kinds of repairs can be handled in-house? What kinds of repairs should be referred to a conservator? What does a conservator do?

The format will encourage discussion of these topics as they relate to the participants' collections.

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Mapping Software Workshop
Richard E. Groop and J. Michael Lipsey, Department of Geography, Michigan State University, East Lansing, Michigan

A hands-on mini lab set up for participants to review various cartography software products on the market. The workshop chairs are available to provide participants technical assistance rather than qualitative opinions on software. Software available for review will include titles such as: PC Globe+, MAPIT, OSU Map-for-the-PC, Concepts Computerized Atlas, Student Atlas USA, Student Atlas World, and others.

Time-Space Mapping: Early Evolution of Skyscrapers in Lower Manhattan
Deryck W. Holdsworth and Matthew S. Tharp, Department of Geography, Pennsylvania State University, University Park, Pennsylvania

Since the inventions of the elevator and the self-supporting steel frame in the late 1800's first permitted the building of skyscrapers, the role of those structures in the development of New York City has been undeniably significant. One plate in the proposed *Historical Atlas of New York City* is devoted to graphically portraying this growth through the use of a series of three-dimensional maps of Lower Manhattan, the cradle of building development in the city. Inherent in the creation of such images are questions of appropriate map orientation, and a suitable map projection. Limitations complicating these decisions include availability of 3-D computer mapping packages, lack of precise data concerning building heights and uses, and space restrictions of the atlas itself. This paper addresses several of these problems and presents some preliminary solutions.

Microcomputer Cartographic Production: Practical Problems and Prospects
John B. Krygier, Brian Goudreau, and Onno Brouwer, Department of Geography, University of Wisconsin, Madison, Wisconsin

Initially, a series of important practical problems must be dealt with when considering the implementation of microcomputer cartographic production. General hardware configuration questions deal with the type of computer, its memory, and monitors that are suitable for digital cartographic production (i.e., IBM or MAC, necessary RAM and hard disk capacities, color or monochrome monitors, 4-bit, 8-bit, or 24-bit color). Viable software, that is, software that can be modified to be of use for cartographers, must be chosen and learned (i.e., cartographic software, paint/draw software, PostScript software). Devices with which to input data, base maps and compilation worksheets must be decided upon (i.e., digitizers, pre-existing files, or scanners; input resolution). Output of a quality similar to traditionally produced maps is necessary if the microcomputer

is to be a viable cartographic production tool (i.e., laser printers or film output, PostScript or bitmapped). Each of these areas will be reviewed and specific problems and prospects, with reference to microcomputer cartographic production, will be discussed.

Microcomputer Cartographic Production: Theoretical Problems and Prospects
John B. Krygier, Brian Goudreau, and Onno Brouwer, Department of Geography, University of Wisconsin, Madison, Wisconsin

This paper will cover several theoretical and general questions which the implementation of microcomputer cartographic production has raised in the UW Cartographic Lab. Included among these are modifications in the "layer" concept inherent in the traditional map production process; the shift to "real-time" map design and interaction with the map; the questions of accuracy and efficiency in microcomputer versus traditional production, and the impact on cartography of PostScript, a graphics computer programming language. In all these cases traditional and ingrained cartographic concepts must be reevaluated and reapplied to a new production environment crowded with new tools, capabilities, and possibilities.

Color and the Figure-Ground Relationship in the Perception of Bipolar Choropleth Maps
Richard E. Lindenberg and Audrey E. Clarke, Department of Geography, Kent State University, Kent, Ohio

Cartographic researchers have shown that information on a bipolar choropleth map is understood better when it is symbolized with value progressions of two hues. Some hues used in this way in map experiments perform better than others. The conception of a choropleth map as a statistical surface suggests that certain hues may enhance the communication of the bipolar character of the data displayed by these maps. An experiment was conducted to determine if advancing hues should be associated with high data values and receding hues with low data values mapped on bipolar choropleth maps. This paper reports the results of this experiment.

The Effects of Map Projections on Map Distance and Emotional Involvement
Robert Lloyd and Patricia Gilmartin, Department of Geography, University of South Carolina, Columbia, South Carolina

Previous research has shown that there is a relationship between subjective distance and how emotionally involved people feel with events at places: the

closer the places are thought to be, the more people care about events there; and the further away locations seem, the less emotionally affected people are by events there.

Specifically, the intensity of emotional involvement has been found to decrease according to the square root of increasing subjective distance. It is not so clear whether the same relationship holds between objective distance and emotional involvement. All of the existing research on this topic appears to have been conducted by psychologists, but it is a topic which should be of great interest to geographers, since it involves spatial relationships between places and people's perceptions of places. The topic can also be related to map design — in particular, the use of different projections to represent global locations. For example, certain places can be shown to be relatively close together or far apart, depending upon the geometric properties of the projection selected for the map and how it is centered. This paper reports the results of a study which was designed to investigate whether people experience different levels of emotional involvement with places as a function of the distances between the places as shown on the maps. Three different combinations of map projections and centerings were used in the experiment. Emotional involvement with locations as experienced in people's cognitive maps was also investigated.

Animated Maps of Aggregate Data: Conceptual and Practical Problems
Alan M. MacEachren and David DiBiase, Department of Geography, Pennsylvania State University, University Park, Pennsylvania

Mapping of data collected by political enumeration unit always presents the cartographer with a choice among several symbolization methods. This choice should be made to reflect the underlying phenomenon that the data represent. This criterion, however, is often not observed. When the data represent changes over time, and the planned representation is to be a dynamic one, the decision on appropriate form of representation may be even more critical. Our cartographic laboratory has been faced with such a problem in the representation of quarterly data on AIDS incidence per county.

Our presentation addresses the conceptual issues behind mapping of epidemiological data that is aggregated to county. We draw on Jenks' concept of a data model as the basis for a discussion of how various symbolization choices match to the spatial pattern of AIDS distribution. We then consider the implication of the data model choice, and the available data, for dynamic maps of AIDS. Practical problems encountered in generating a dynamic map using relatively inexpensive microcomputer software are addressed. A set of dynamic maps generated thus far are then compared. Emphasis is placed on both the mental image communicated by different choices for the underlying data model as well as on differences in difficulty of implementing the model using different hardware and software configurations.

An Integrated Software Package for Solution of Location-Allocation Problems
Jacek Malczewski, Institute of Geography and Spatial Organization, Polish
Academy of Sciences, Warsaw, Poland and Wlodzimierz Ogryczak, Institute of
Informatics, University of Warsaw, Warsaw, Poland

In the last decade substantial progress has been made in the development of
analytical capabilities of geographic information systems (GIS). Nevertheless,
some spatial planning problems, such as location-allocation, are still beyond
capabilities of a GIS.

This paper is a preliminary report on a project which aims to integrate the carto-
graphic and data-handling function of a commercial GIS with a location-
allocation package; namely, to combine the capabilities of ARC/INFO with the
Dynamic Interactive Network Analysis System (DINAS). ARC/INFO is one of
the most popular GIS software; yet, the capabilities of this software to solve a
location-allocation problem are very limited. DINAS is an interactive decision
support system which enables the solution of various multiobjective location-
allocation problems. The paper focuses on testing ways to integrate the two
packages.

Atlas of Ukrainians in Canada
Geoffrey Matthews, Department of Geography, University of Toronto,
Toronto, Ontario, Canada

Published to help commemorate the centennial of Ukrainian settlement in
Canada, the atlas of *Ukrainians in Canada* is unique in North America. For the first
time through the use of maps and graphs we can discover the history of an
ethnic group who migrated to Canada and created a new landscape through
their settlement patterns and architecture, and through the formation of Ukrain-
ian cultural, social, religious, and political organizations. Simple in design,
modest in size and presentation, this atlas about people is a significant contribu-
tion to the cartographic catalogue.

Ethics in Cartography Roundtable Discussion
Patrick McHaffie, Department of Geography, University of Kentucky, Lexing-
ton, Kentucky

Representatives from academic, private and government cartographic agencies
will provide a summary of their perspective of professional ethics in their sector
of the cartography profession. Roundtable participants: from government Ronald
M. Bolton, Chief, Aeronautical Charting Division, NOAA; from the private sector
Warren G. Glimpse, President, U.S. Statistics, Inc.; and from academics Gyula
Pauer, Director of the Cartographic Laboratory, Department of Geography, Uni-
versity of Kentucky.

Managing Cartographic Collections: The Development of a Selection and Retention Model

James O. Minton, United States Geological Survey, National Center, Reston, Virginia

The collection management function in large academic map collections consists of many elements: budgeting, community surveys, policy development, selection, cooperative programs, weeding, storage, preservation-conservation , security and more. This paper will address the evolution of a collection development policy and present models for the selection and retention of cartographic and related materials. As emphasis in academic libraries has moved from building collections to managing information resources, map librarians are finding that they are not isolated from this process and are expected to write mission statements, conduct community surveys and assign levels of collection strength and manage cartographic collections in a manner similar to librarians responsible for managing book collections. There have been debates as to how much emphasis to place on any of the varied steps in the collection development process and librarians must balance their time and energies accordingly.

A model based on the Research Libraries Group (RLG) Conspectus using Library of Congress subject classes and the assignment of specific field values of 0-5 representing collecting intensities which can expand to consider 20 subject categories and scale as elements in selection decisions is presented. A geopolitical profile sheet for each selected LC class (geographic area) is generated to document collection intensities for future consultation. Additional maps and tables are presented as aids in the selection process.

A Functional Model of Color in Cartographic Design

Charles P. Rader, Department of Geography, Michigan State University, East Lansing, Michigan

Color performs a number of important functions in the graphic and conceptual organization of a map. A map can be thought of as having a conceptual structure, a cartographic statement or message, and a related graphic structure, the coding of the symbols. The cartographer's job is to organize both of these structures in such a way that the intended message of the map is made apparent. Color provides a powerful means for organizing the map's message. A model is developed which examines the major functions of color (symbolization, legibility, and visual emphasis) in creating the required visual differences and syntactic relationships between the map symbols. This involves relating communication goals to the ways in which color can be systematically modulated to change the map's message. The model provides an explanation of and a systematic approach to the use of color in cartographic design by focusing on the relationship between the formation of the map's conceptual structure and the formation of the map's graphic structure using color. While cartographic color syntax is, at

present, somewhat elementary and highly variable depending on the nature of the map, the approach to color map design provided by the model indicates that the choice of specific colors may not be the overriding concern in determining the effectiveness of the colors employed, but rather that the relationships between the colors may be the most important concern in color selection. Ultimately, the utility of the model should fall in four main areas: the creation of new maps, the evaluation of existing maps, the instruction of students, and the design of expert systems.

Disoriented Prism Maps: A Recognition Experiment

Keith Rice, University of Wisconsin, Stevens Point, Wisconsin and Dan Seidensticker, George Mason University, Fairfax, Virginia

Predicated by past psychology and cartography image rotation studies, it was postulated that the amount of time needed to recognize a prism map is directly related to the degree by which it was rotated from the north. Sixteen prism maps of Wisconsin were digitally encoded for display on a high-resolution computer monitor. There were two sets of maps, both having eight north-at-the-top 45 degree incremental rotations. One set were "correct" representations of the state, the others were "mirror" images, which were needed to verify the accuracy of responses. A prism map program was then used to plot three different geographic data sets for each of the sixteen base maps, which created a total set of 48 test stimuli. The three data sets represented both askew northern and southern concentrations, and a uniform distribution. Test maps were presented to forty-six subjects who had to determine if the map was a correct or mirror image. Cognitive rotation of the map image was inherently implied by subject task reaction time. Maximum reaction time was achieved with a 180 degree rotation from the north, with a systematic time decrease back to 360 or 0 degrees. But, the highest rotation time for both mirror images of the northern and southern distribution was at 135 degrees. Plotted mean reaction times were asymmetrical for the non-uniform maps. ANOVA results illustrated a significant difference between the uniform and southern distribution mean reaction times. Rotation time variation was attributed to the influence of particular prism surfaces obscuring prominent map outline features or landmarks. Present cartographic procedures for prism maps may therefore be inadequate. Animated or dynamic map displays may represent one viable solution to achieving an optimal viewer perspective for visualizing three-dimensional maps.

Regional Patterns on Choropleth Maps

Ruth Anderson Rowles, Department of Geography, University of Kentucky, Lexington, Kentucky

This paper presents the result of research on regional patterns as they are portrayed on choropleth maps. In choropleth mapping statistical data are

collected for unit areas, classified based on similarity, and symbolized on the map with patterns or colors covering areas. Regional patterns are formed on the map when contiguous unit areas are covered by the same symbol. Choropleth maps serve two main functions: 1) they provide information about values at specific places, and 2) they create an impression of overall geographic trends. Choropleth maps can be made to maximize the first function, that is, providing the most accurate information about values at specific places for a given number of classes using Jenks' method of classification. Although it is known that the number of regional patterns usually, but not always, increases with an increase in the number of classes, there is no model to predict the number of regional patterns for a choropleth map. Different simulated data sets are used in order to systematically investigate how the spatial structure of the data changes the number of regional patterns on choropleth maps. The simulated spatial distributions are constructed using four pseudo-random data distributions, which are normal, uniform, skewed, and bimodal, and placed on a base map to produce eight different levels of spatial autocorrelation measure by Moran's I. The base map for the research was composed on 100 hexagons, which can be considered a theoretical surface closely representing the average number of joins on a typical base map of continguous polygons. The choropleth maps were made with Jenks' optimal method of class interval selection. Finally, a model is presented: the number of regional patterns on a choropleth map is a function of the type of data distribution, its spatial arrangement, and the number of classes on that map.

The Use of Maps in Children's Literature

Nancy B. Ryckman, University Library and Jeffrey C. Patton, Department of Geography, University of North Carolina, Greensboro, North Carolina

This paper reports the findings of a survey conducted to determine the frequency and use of maps in children's literature. This study focused on works of fiction aimed at children just beginning to read through those reading at the sixth-grade level. The survey was conducted using children's literature collections of the Greensboro Public Library and the Learning Resources Center of the University of North Carolina at Greensboro. The survey consisted of three parts.

In the first part of the survey every tenth book on the shelves of the public library's Easy (kindergarten through 2nd grade) reading section was examined to determine if maps were utilized. If so, the number of maps, type, general scale, and other attributes were noted. The second part of the survey was a similar sampling of books from the public library's Intermediate (grades 3 through 6) collection. The last part of the investigation surveyed the Newberry and Caldecott award or honor-winning books. Similar information was gathered for these books as for those in the first two categories. Results from the three categories were then statistically compared and analyzed. The paper also includes a series of slides on the use or non-use of maps in children's literature, as well as suggestions for areas of future investigation.

GIS in Michigan - Today and the Future
**Michael Scieszka, Michigan Department of Natural Resources, Lansing,
Michigan**

This session will focus on the Michigan Resource Inventory Program and its GIS
called MIRIS. MIRIS was started in 1980 and contains the most extensive digital
base in the nation. Base maps, with land cover/use, soils, thematic overlays are
being delivered to state, local and private decision makers across the state. The
presentation will discuss how the data base was developed, who uses it and for
what purposes.

Managing Map Collections: An Introduction /Overview
John Sutherland, University of Georgia Libraries, Athens, Georgia

This paper is an overview of the state of management in map libraries in the
United States. Management issues related to size, age/history, budget, space,
the place within the administrative hierarchy (departmental, branch, etc.) and
other characteristics will be examined.

The Design and Production of the Political Atlas of Illinois
**Richard P. Vaupel, Department of Geography, Northern Illinois University,
DeKalb, Illinois**

The creation of the *Political Atlas of Illinois* was a cooperative effort to integrate
two different data streams into a useful information source for state legislators
and the general public. The database for the atlas required that 80,000 census
units be aggregated into 118 house district levels to permit linkage of political to
demographic data. The result was an integrated information product containing
112 colored maps together with tables and graphs.

A three-way partnership was formed to create the atlas. The Social Science
Research Institute established the need for the atlas and provided the necessary
political expertise. The NIU Press served as publisher and provided book design
and marketing expertise. The conceptual geographic structure, together with the
design and production skills, were provided by the Laboratory for Cartography
and Spatial Analysis.

The creation of the atlas was compressed within a ten-month period, four of
which were expended in reaching a consensus on the atlas dummy. Considerable
time in base map construction was saved by using portions of existing census
maps. Choosing colors proved to be difficult and several prototypes had to be
made before consensus could be reached. All typesetting was done by NIU Press
and as the components for each page came together, it was routed numerous
times among the three units for editing. As mass production of final composite
negatives began in month seven, three shifts worked for several weeks. The

Cartographic Lab invested approximately 1,730 hours of labor and nearly 1,500 pieces of mylar, scribe coat, peel coat, and film. 2,150 copies of the 104 page atlas were printed and have sold well. The atlas was warmly received by state legislators who showered our President's office with accolades. The atlas has received favorable reviews, including an award for best design of its class in the Chicago Book Clinic competition in 1989.

The Cartographic Resource Development Program, A Management Approach to Better Local Information and Utilization
David Wiltsee, Information Sciences, Applegate, California

For both public and private institutions cartographic information is an essential tool. Nowhere is cartographic information more important than at the local "grassroots" level. Practically every local government function requires geographic data, for purposes as earth-shaking as big land use decisions and as mundane as locating buried sewer lines. And at the local level private business is equally hooked on maps.

Sadly, few communities are cartographically "up-to-snuff." Inadequate information, misuse, lack of geographic knowledge, and failure to coordinate efforts are all too common. Just as sad, few institutions recognize their inadequacies or know what to do about them.

Local governments need cartographic help more desperately than any other single institution. The Cartographic Resource Development Program (CRDP) was designed primarily to help localities focus on, understand, and improve their cartographic "systems." Offered as a consulting service, the Program has been extended to include private map-dependent institutions.

The Cartographic Resource Development Program (CRDP) is a systematic approach to local cartography. The Program involves an intensive 3-phase study involving (1) fact finding, (2) evaluation, and (3) planning. The Program typically takes 6-12 months to complete. Many improvements are made along the way, others contemplated for longer-term implementation. Comprehensive and pragmatic, the Program examines clients' cartographic "systems" in 10 areas: management; public information; applications; reference and research aids; products (data); processes and procedures; staff development; technology and techniques; external relations; special projects.

A description of the CRDP process, with examples and "success stories," and a description of the "ideal" community from a cartographic standpoint is provided. Wiltsee believes strongly that the cartographic community, including NACIS, is on the cutting edge of the "Information Explosion." The potential contributions to public policy and functional activities are infinite. To make the most of this potential, however, requires focused efforts such as the CRDP to "set

the stage" for cartographic specialists.

Wiltsee concludes with a challenge to cartographers: walk a mile in the shoes of the information user, and design to meet his/her needs.

FUTURE NACIS CONFERENCES

1990	Orlando, Florida
1991	Milwaukee, Wisconsin

Local Arrangements

Kathleen Bergen
University of Michigan

Carl Longstreth
University of Michigan

Bill Stewart
Bill Stewart, Inc.

Jerry Thornton
University of Michigan

Tim Utter
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Program Committee

Diana Rivera, Program Chair
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