

cartographic perspectives

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cartographic perspectives

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messages

MESSAGE FROM THE EDITOR *Perspectives on CP*

It has been one year since I took over the editorship of *Cartographic Perspectives*. In that year we have tried to make some changes in the journal, while trying to maintain the high quality and standards that *CP* has been known for.

At the start of my editorial tenure I had hopes of increasing the number of featured articles published in *CP* from one an issue to two. I am pleased that we were able to do this and I would like to continue this practice. The articles published this year were representative of a range of cartographic subjects. We published articles on map production; processing and analysis of map information; map compilation; and national mapping activities. We were also honored to publish an article by Arthur Robinson on the Behaim Globe (Spring 1993).

In the past year we have made certain that the Map Library Bulletin Board and Cartography Bulletin Board appeared as regular features in the journal. The Bulletin Boards are an important

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contribution to *CP* and add to the scholarly content of the journal.

Another significant change this year was the publication of the first color issue of *CP* (Spring 1993). Last year the NACIS Officers and Board of Directors unanimously approved a request that one issue a year of *CP* be published in color. This decision provides *CP* with a unique opportunity to enhance, through the use of color, the information presented in its articles. It also provides an outlet for research articles specifically dealing with color and map design. It is my hope that potential authors will see this as an opportunity seldom offered by

other cartographic journals.

Our first color issue (Spring 1993) did not come about without some trials and tribulations. These included problems with conversion calibrations of RGB colors on computer monitors into CMYK printed colors; the uncertainty of determining which pages would have color until the total number of pages in the publication were predetermined; and an extremely busy April and May for the Editor and Assistant Editor. Although the color issue was the Spring Issue, many of you probably noticed that you did not receive it until late July or early August. I apologize for the delay. A colleague of mine told me to just tell everyone that "Spring comes very, very late in Milwaukee." I said that was fine, however, our Fall Issue would be on schedule and members would receive it only one month after receiving the Spring Issue. Her reply was "tell them not only does Spring come late in Milwaukee, but our summers are very, very, very short—sometimes lasting only a week or two." Even with all the production problems, I am very pleased with the color plates in the issue and I would like to thank the authors for their patience and work.

I would like to encourage all of you to consider *CP* as an outlet for your research and other information that you feel is worth sharing with our readers. I extend a special invitation to individuals presenting papers at NACIS XIII to consider submitting their manuscripts to *CP*.

Finally, I would like to thank *CP*'s Assistant Editor, David Tilton, for all the work he has done (and will hopefully continue to do), Michael Peterson (*CP* Editorial Board Chair), and the members of the *CP* Editorial Board.

Sona Karentz Andrews
Editor, *CP*

NACIS XIII



OCTOBER 20 - 23, 1993

SILVER SPRING, MARYLAND

see pages 29 - 31
for conference program
and schedule

about the cover



Part of a Washington D.C. topographic map was scanned and imported into Adobe Photoshop 2.5 on the Macintosh. Contrast and brightness were boosted 70% and a high pass filter (10 pixel radius) was applied. The *CP* logo (created in Aldus FreeHand 3.1) was imported, pasted into a new channel, and saved as a selection. Photoshop's emboss filter was then applied (41 degrees/4 pixel border). Contrast was again boosted (67%) and the brightness increased another 10%. The logo selection was then loaded and used as a mask while the brightness was increased another 20%. The file was imported into Aldus PageMaker 4.0 where the lettering was applied.

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featured articles

RELATING COGNITIVE DEVELOPMENT TO CARTOGRAPHIC EDUCATION WITH A MODEL OF ORIENTATION SPACE

An "orientation space" is briefly described as a means of synthesizing a vast literature and of providing psychologists and cartographers with some common ground for discussing the issues of cognitive development in children as they might apply to elementary cartographic education. The vast literature refers to the work in many fields on the questions of how children navigate and orient themselves, how they visualize and organize space and spatial relationships, and how they express these ideas graphically.

Henry W. Castner

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During the last decade there has been great interest in geographic education and the role that mapping might play in its rejuvenation. Unfortunately, many of the new initiatives and teaching strategies generated do not make reference to the great body of literature on cognitive development. In a session at the recent NACIS meeting in St. Paul, five psychologists associated with the Institute of Child Development at the University of Minnesota made presentations based on their work. In particular, the participants were interested in learning more about such questions as how children navigate and orient themselves, how they visualize and organize space and spatial relations, and how they express these ideas graphically. Continuing from these questions, what ideas might be developed that would have significance for elementary cartographic and geographic education? This paper, which introduced that session, describes an "orientation space" which may encompass many of these questions and thus provide some common ground for both cartographers and psychologists.

In planning this session, I drew on my interest in the work of Dee Joy Coulter. Trained in special education, neurology, and holistic education, Ms. Coulter has taught courses on right brain/left brain and the neurology of learning in the Department of Psychology at the University of Northern Colorado. In a paper published in 1985 by the American Orff-Schulwerk Association, entitled, "The Brain's Timetable for Developing Musical Skills," she describes stages typical of the brain's growth and links them to skills related to auditory perception. From this she considers what instructional strategies might relate to these various stages of neurological readiness. For example:

- 1) In regard to kindergarten to 2nd grade children (ages 5 - 7), she states (Coulter 1985 90)," ...the child is incapable of separating the information coming in from the motor activity going out. Until midway through the 6 to 8 year old brain growth spurt, learning remains inextricably linked to movement."

This is the essence of the Orff-Schulwerk "process" pedagogy of music and movement for children. In this process, children often find them-

INTRODUCTION AND CONTEMPORARY BACKGROUND

selves in environmental situations that involve the need to orient themselves and "navigate" through created worlds. This suggests that one formal aspect of environmental education should begin with movement within various environmental settings, and that we acknowledge this beginning by finding ways to relate it to our more established educational goals.

2) In regard to 2nd to 3rd grade children (ages 7 - 9), Coulter states (Coulter 1985 91), "Math, phonics and music notation [and dare we add cartographic notation?] involve skill in linking visual to auditory centers within the brain. Children must discover that math symbols, phonics and musical notations are all reversible code systems. They must learn to play with these codes easily, translating from visible marks on paper to a grasp of the sounds those marks represent and from the musical and spoken words back to their visual code forms."

She continues (Coulter 1985 91), "The music educator is faced with a curricular dilemma in addressing 6 and 7 year olds. When should this "code work" be introduced? By postponing this task as long as possible, ideally until age 8, and substituting active performance experiences based on imitation, rhythm and movement strategies, the joy of music is kept alive. As the Orff-Schulwerk approach has so ably demonstrated, enjoyment and success in early music experiences is much more likely to stimulate a long term commitment to music education than early exposure to music theory and the mechanics of reading musical notation."

The suggestion here is that all code systems are interchangeable and expressible in many different forms. Cartography is in the enviable position, if we would only acknowledge it, of being able to demonstrate this.

Surely there is more to cartographic notation than some rules of historic convention. The suggestion here is that all code systems are interchangeable and expressible in many different forms. Cartography is in the enviable position, if we would only acknowledge it, of being able to demonstrate this. So much of our work involves expressing information variously in both digital and analog forms, and in numerical, verbal and graphic terms. One is tempted to paraphrase Coulter and ask: "By substituting active performance experiences, can the joys and skills of exploring the environment be kept alive more successfully than by too early exposing our students to cartographic theory and the conventions of formal maps?"

What might these active performance experiences be? On what basis do we organize them? Should we be looking for a parallel neurological explanation for the development of visual and graphic skills? Or are there other foundations on which to address this question of performance experiences?

My first attempt at seeking an answer to these questions took the form of a diagram (Figure 1). In it I tried to relate some of the items that we recognize in our various geographic and cartographic curricula with some general topic areas that might be of common interest to researchers in the many disciplines that consider human interactions with the environment. The three general areas (Navigation, Visualization, and Graphic Expression) can be broken down into more specific topics of inquiry. But the key connections that allow links to be made across the diagram are what I call the intellectual or perceptual bridges in Column 3. Many of these are familiar as the subjects of research from the extensive literature in such diverse disciplines as art, cartography, child development, geography, landscape architecture, and the many sub-disciplines of psychology. As far as I know, none of the elements of our cartographic curricula have any acknowledged foundation in the fundamental concepts that arise out of

GENERAL AREAS	SPECIFIC TOPICS OF INQUIRY	INTELLECTUAL OR PERCEPTUAL BRIDGES	GEOGRAPHIC-CARTOGRAPHIC CURRICULA ITEMS
NAVIGATION VISUALIZATION GRAPHIC EXPRESSION	ORIENTATION	<ul style="list-style-type: none"> •FRAMES OF REFERENCE: EGO-CENTRIC, & GEOCENTRIC (relative, absolute) •ENVIRONMENTAL CLUES: shadows, gravity, distance, size constancy •LANDMARK DIFFERENTIATION •STRUCTURAL & ORGANIZATIONAL FEATURES OF LANDSCAPES •AFFORDANCES & THEIR ASSOCIATED INVARIANT RELATIONSHIPS •TRANSFORMATIONS W/IN THE FLUX OF AMBIENT LIGHT •MEMORY: TEMPORAL ORDERING & SPATIAL DIFFERENTIATION •PROCEDURAL & SURVEY KNOWLEDGE •ESSENTIAL CHARACTERISTICS •INVARIANT DIMENSIONS & RELATIONSHIPS (shape constancy) •DEPTH PERCEPTION & THE METRIC OF SCALE CHANGE •METRIC RELATIONSHIPS •ARITHMETIC LOGIC & NUMBER SKILLS •INFORMATION SCALING •RIGHT BRAIN ANALOGIES TO LEFT BRAIN STATISTICAL PROCEDURES •COLOR AS A 3-D & TEXTURE AS A 7-D PERCEPTUAL PHENOMENON •"PERCEPTUAL DIMENSIONS" OF OBJECTS AND SURFACES •GESTALT GROUPING PRINCIPLES •SIZE DISCRIMINATION: Steven's power functions, jnd's, lsd's •FIGURE GROUND •LANDSCAPE DRAWING •ANALYSING GRAPHIC IMAGES 	<ul style="list-style-type: none"> •CARDINAL DIRECTION •COMPASS USE •POLAR COORDINATES
	MOVEMENT		<ul style="list-style-type: none"> •TRANSFORMATIONS •MAP PROJECTIONS •CO-ORDINATE GEOMETRY (alpha numeric grids) •LATITUDE/LONGITUDE
	POSITION		<ul style="list-style-type: none"> •SYMBOLIZATION •GENERALIZATION •REGIONS: taxonomic & hierarchical •CARTOGRAMS •CARICATURES •MAP PROJECTIONS •SCALE AS A POINT PHENOMENON •STATISTICS •SPATIAL STATISTICS
OBJECT PERCEPTION	<ul style="list-style-type: none"> •CARTOGRAPHIC DESIGN •COLOR USE •SYMBOL DESIGN •LETTERING DESIGN •PROPORTIONAL POINT SYMBOL MAPPING •DOT MAPPING 		
EUCLIDEAN SPACE	<ul style="list-style-type: none"> •BASE INFO/SUBJECT INFO •PERSPECTIVE DRAWING •USING MAPS & GRAPHIC •BLOCK DIAGRAMS 		
NON-EUCLIDEAN SPACES			
NUMERICAL RELATIONSHIPS			
GRAPHIC SCALING { ENCODING / DECODING			
HIERARCHICAL SCALING { PLANAR / VERTICAL			
REPRESENTING SPACE			

our early visual transactions with the world. I have been arguing (1990) that perhaps they should.

More recently, I have been working with a simple model of the potential interaction between cartographers and psychologists (Figure 2). This model is derived from a broad view of orientation which may in itself subsume all of the areas of our mutual interest. In the formal sense, we are concerned with three needs in human orientation:

- 1) How we achieve various levels of accuracy, in specifying position, that are appropriate to our actions and needs.
- 2) How we convey this information to other people, to increasing numbers of them, some remote from us.
- 3) How we obtain and manipulate feedback from the environment to be used in meeting these first two needs. This problem is exacerbated by a number of factors such as changing task demands or increases in our speed relative to the environment, in the complexity of our surroundings, or in the extensiveness of the area.

The arrows along the three axes reflect gradients of increasing needs. But it should not be implied that higher level solutions should always be pursued or are the hallmark of the expert orienteer. Rather our goals in education should be to acquaint students with a broad range of techniques which they can apply selectively to various levels of need and to introduce these techniques to children in developmentally appropriate ways.

These three needs can be represented as intersecting axes which collectively define the cubical "orientation space." I use the term orientation here in its broadest sense. That is, in order to establish the position of ourselves and of objects external to us, we must come to appreciate how we interact with our environment, how we visualize it, and how we might

Figure 1. A table of areas of potential interest to psychologists and cartographers, items from geographic-cartographic curricula, and some intellectual and perceptual bridges which may link them.

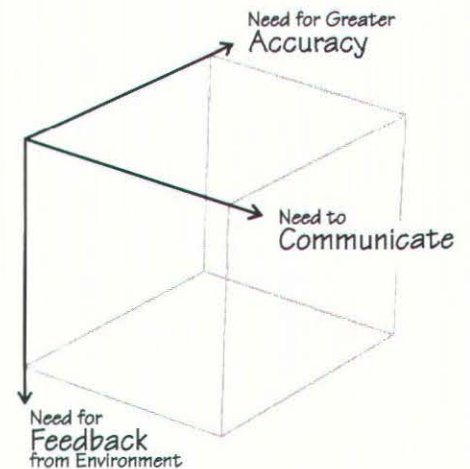


Figure 2. An "orientation space" defined by the three needs in human orientation.

At some level of need, observers must begin to use landmarks external to themselves. Further, as the number of observed points and landmarks increases, we need some kind of document to keep track of all these points and their positional interrelationships.

The other two facets involve more right brain ways of knowing (the way most of us interact with our environments)—ways that are holistic, intuitive, spatial, and non-verbal.

represent important elements or relationships within it. Let us examine the three facets so defined: the top, back and near side.

The relationship between the needs for accuracy and communication (the top facet) forms the basis of much of our traditional curriculum in cartography. It is crowded with techniques for angular measurement and systems for organizing space, particularly at medium and small, i.e. global scales. They all begin with the problem of an individual, without instruments, establishing positions within a landscape relative to and for the benefit of him or her self. The work of James Gibson suggests that this is closely related to our sensitivity to, and use of, structures in the flux of ambient light (Heft 1981 236). For example, environmental textures created through ambient light playing or casting shadows upon surfaces allow us to perceive how far away an object is or what form those surfaces take.

At some level of need, observers must begin to use landmarks external to themselves. Further, as the number of observed points and landmarks increases, we need some kind of document to keep track of all these points and their positional interrelationships. Just how geodetically correct these documents must be is a moot point. But clearly some kind of map-like document is needed.

Eventually, as distances increase so that we can no longer view the entirety of space or see others with whom we wish to communicate, we come to use what I call universal landmarks— the sun, and stars like Polaris. With these we can communicate accurate information about global positions to anyone who shares knowledge of the system being used.

A second facet (the back one) of this orientation space is described by the interaction between the needs for accuracy and for better feedback from the environment. This feedback may also be coming from a physical or mental representation of the environment in which we are at rest or through which we may progress by walking, then running, and finally to “flying” in both its literal or figurative senses. To me, the essence of this transaction involves the change from our general use of peripheral vision to the need to have more focused vision and finally to rely upon some kind of instrumentally assisted vision as we change the types of landmarks utilized. The lower right-hand section of this facet is clearly in the high-tech domain of remote sensing, radar, satellites, and digital imagery.

The third facet (the near or facing side) is described by the interaction between the needs to communicate and that of obtaining useful environmental feedback. Crucial to feedback is how we organize space and objects within it, e.g., categorical or spatial. I suspect that most of the psychological research aimed at modeling the interaction of humans with their environments takes place in this facet. Further, it takes place primarily at large, i.e., local scales or even in interior sites. The essence of this interaction may be related to the kinds of information required for the communication of more specific locational information. These may vary from explicit geographic facts to implicit or relational information, such as the perceived functional characteristics of the environment, its affordances.

For my part, I see the top facet (Accuracy vs. Communication) as being very much a left-brain domain of systematic, analytic, mathematical, and logical ways of processing information, at least in the ways we teach about these things. The other two facets involve more right brain ways of knowing (the way most of us interact with our environments)—ways that are holistic, intuitive, spatial, and non-verbal.

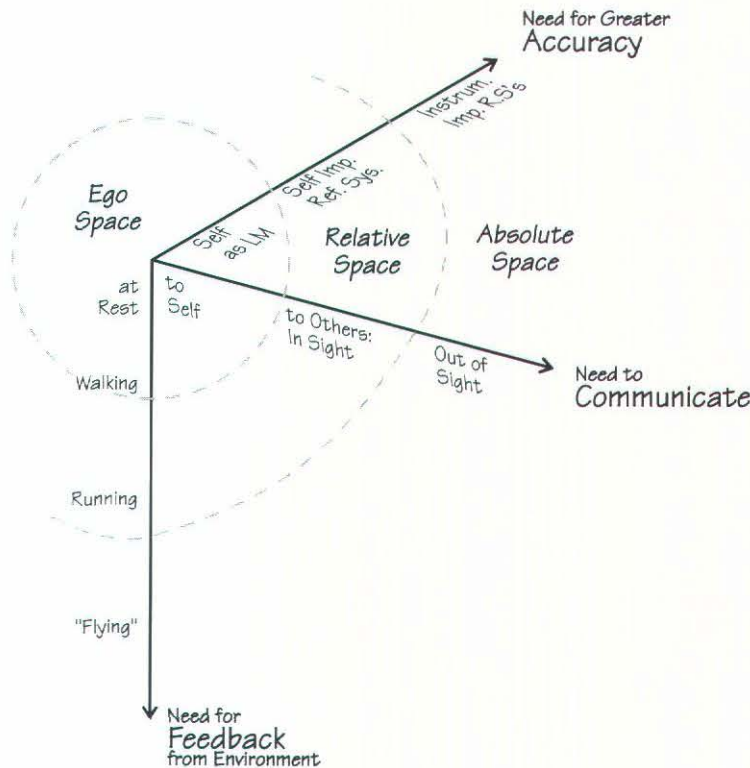


Figure 3. The "orientation space" in greater detail. The origin, or top left corner, of the orientation space suggests the convergence of these three needs in the "ego-space" of an individual at rest, communicating positional information to himself, and using himself as landmark. From this situation there is a hierarchy or continua of scales out into relative and absolute space where such communication may be to others (often out of sight) and with greater levels of accuracy.

The top surface of the "space" makes reference to a sequence of techniques, which make possible more accurate orientation, beginning with the use of oneself as a landmark, to self imposed reference systems (e.g., using clock-face directions), to instrumentally imposed reference systems with external landmarks. The near side facet makes reference to the sequence of problems in communicating first with oneself, then to others, in sight, and finally to those out of sight. Also, there is the suggestion that the need for, and form of, feedback changes as one's speed relative to the environment increases.

The combination of these three facets defines in Figure 3 an orientation space in which a rough hierarchy or continua of scales is suggested. The hierarchy originates at the "ego space" of an individual observing or moving about a relatively limited environment. It is a place where affordances structure our individual worlds. Representations of these worlds are scaled to personal values and reflect individual experience.

At the extremities of the orientation space, there is "absolute or formal space" where we measure precisely and we employ systematic ways of defining space and positions within it, using universal landmarks. It is a space we probably only experience indirectly and abstractly. Representations of it are scaled to logical geometric properties and mathematical measures.

In between is the "space of relative position," where meanings are derived from the relationships of positions, not of their absolutes. It is the most important and familiar space for it is here that most of our actions and thinking take place. Structures and representations of this space are tied very much to the needs associated with specific activities; which attributes we visualize or illustrate should arise from the need to grasp a specific relationship or situation. If we must appreciate a topological connection, then we need not preserve all the Euclidean relationships in our representation. Thus there is a cartography for each of ego, relative and absolute space, i.e., for not only the formal geographic worlds but also the behavioral and perceptual worlds of our minds. In early education, usually the cartography of absolute space is the only one considered and utilized. As a result, children may presume that conventional and Euclidean representations are to be used rather than more cost-effective and informal ones, which in the real world are the maps of choice.

The interior of this orientation space is ill-defined. This suggests that we still know very little about human orientation. On the other hand, the

magnitude of the current research, alluded to by Figure 1, suggests that our problem is one of choosing research topics which synthesize what we know rather than further dividing the various threads of our current research. It is my hope that this orientation space may help us to better understand our different perspectives on human orientation and to see across this space to others so that some useful research linkages might be established. I also suspect that the intellectual and perceptual bridges referred to in Figure 1 may provide the kinds of vehicles for developing performance activities for classrooms and articulating the kinds of linkages useful in structuring a curriculum for students wanting to discover the nature of cartography and maps and to understand the bases of their cognitive transactions with their surroundings.

EPILOGUE

At St. Paul, this paper introduced presentations by Jodie Plumert of the University of Iowa and by Herbert L. Pick Jr., Marian Heinrichs, Gina Dow and Catherine Sullivan, all of the Institute of Child Development. Plumert, in her paper which follows here, examines one relationship which may connect the facets of this orientation space— the relationship of cognitive organizational structures and their influence on the process of learning and remembering spatial relations. It is hoped that a related set of papers by other participants in the session will appear in a future issue of *Cartographic Perspectives*.

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RESUMEN

Un "espacio de orientación" es descrito brevemente como un medio de sintetizar documentación y proveer a los psicólogos y cartógrafos con una base común para discutir el desarrollo cognitivo en los niños cuando se aplica a la educación elemental cartográfica. La documentación hace referencia al trabajo en varios campos, como por ejemplo; cómo navegan y se orientan los niños?, cómo visualizan y, organizan el, espacio y, las relaciones espaciales?, y cómo expresan éstas ideas gráficamente. □

The Development of Children's Spatial Knowledge: Implications for Geographic Education

One of the many challenges facing the education system today is providing children with a better understanding of geography. Increasingly, cartographers and educators have turned to developmental psychologists for information about how children's spatial cognitive development influences their ability to understand and learn about the spatial relations on maps. Central to the process of learning and remembering spatial relations is the ability to organize locations within some kind of spatial structure. Recently, the role that hierarchical organization plays in remembering and reasoning about locations has received increasing attention within the field of cognitive psychology. Studies have shown that both children and adults alike tend to organize locations into regions with nested levels of detail. For example, the location of a toothbrush might be remembered as on the second shelf in the medicine cabinet in the bathroom upstairs, or the location of Iowa City might be known as in the state of Iowa in the Midwest region of the United States. There are, however, limitations in children's ability to make use of hierarchical spatial structures; this has important implications for cartographic education. As a result, younger children may require more visual aids and explicit organizational frameworks when learning and communicating information about locations. The ideas and suggestions presented here about the relations between children's spatial cognitive development and their understanding of geography are aimed at fostering further collaboration between cartographers and developmental psychologists.

The American education system has experienced increasing pressure in recent years to provide children with a better understanding of geography. One integral aspect of geographic education is, of course, to teach children about the spatial relations among geographic locations. Quite naturally, this raises the issue of how one might best teach children of different ages about the spatial relations represented on maps. In response to this problem, educators increasingly have turned to developmental psychologists for information about how children's cognitive development influences their ability to understand and learn about spatial relations. One central aspect of spatial cognition that has many implications for geographic education is how children and adults organize and remember spatial information. In particular, how do children and adults extract and organize spatial information from maps and the environment, and how does this affect their ability to remember and communicate this information? The goal of this paper is to review the psychological litera-

The writing of the paper was stimulated by an invitation to participate in a session chaired by Henry Castner on child development and cartographic education at the Twelfth Annual Meeting of the North American Cartographic Information Society in St. Paul, MN. The author gratefully acknowledges the comments of those present at that session, and the helpful suggestions made by Henry Castner and Rita Casey on an earlier draft of this paper.

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INTRODUCTION

ture on the structure of spatial knowledge and to suggest possible implications for geographic education. The paper is organized into three major sections: the first outlines recent theory about the nature of spatial representation; the second concerns the role of spatial clustering in memory for locations; and the third focuses on hierarchical organization of spatial information in communication about locations.

REPRESENTATION OF SPATIAL INFORMATION

The ability to organize locations within some kind of spatial structure is fundamental to the process of learning and remembering spatial relations. Without this structure, remembering the locations of the countless objects and places encountered everyday would become an insurmountable task. By organizing knowledge of location, memory demands are lessened because locations are not treated as isolated pieces of spatial information. There is emerging consensus within the field of adult spatial cognition that this knowledge of locations is organized hierarchically, that is, as regions with nested levels of detail (Eastman 1985; Hirtle & Jonides 1985; McNamara 1986; McNamara, Hardy, & Hirtle 1989; Sadalla 1988; Stevens & Coupe 1978). Within this structure, individual locations are connected to each other through their common membership within a region. Likewise, regions can be grouped on the basis of their belonging to larger, more inclusive regions. Individual locations can be organized into spatial units on the basis of physical barriers or perceptual boundaries (e.g., walls in a room or streets in a city) that mark divisions between spatial units. Likewise, locations that are proximal to a salient landmark or reference point can be clustered together into a spatial unit, for example, the Great Lakes region. In both cases, spatial organization is grounded in perceptual experience, either with encountering barriers and landmarks while

moving through the environment, or through experiences with viewing boundaries represented on maps.

This framework can be applied to knowledge of locations in everyday environments, as well as to knowledge of locations on a much larger geographic scale. For example, the location of a toothbrush might be known as on the second shelf in the medicine cabinet in the bathroom upstairs. Similarly, as Figure 1 illustrates, one might think of Iowa City as a city in the state of Iowa, which in turn is part of the United States, which is also a region in North America. Spatial clustering and hierarchical organization are also reflected in the ways in which locations and geographic regions are represented on maps. Although maps clearly preserve some metric spatial relations, they

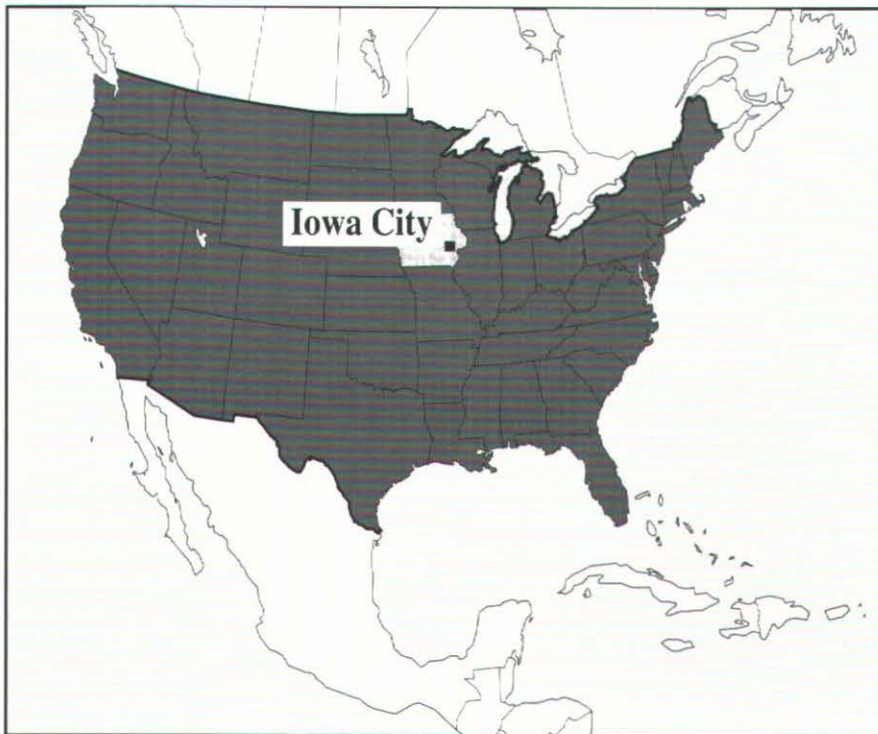


Figure 1: Hierarchical organization of spatial regions.

also take great pains to show boundaries between states and countries. Hierarchical organization is also usually present in maps, often taking the form of heavier, darker lines to represent boundaries of major subdivisions, and lighter, thinner lines to show the smaller regions that make up

the larger ones. The remarkable similarity between mental and cartographic representations of space underscores the idea that spatial clustering and hierarchical organization play an important role in our understanding of distance and spatial relations. Eastman (1985), in fact, has shown that adults have a strong bias to chunk information learned from maps, and that this chunking often takes the form of grouping locations into a hierarchy of spatial regions.

What evidence exists that supports the notion that individuals mentally organize locations into spatial units? One technique for investigating this issue is to measure how quickly individuals can respond to objects that are located in the same or in different spatial regions. In such studies, individuals read the names of two objects presented one after the other on a computer screen. Their task is to make a judgment about the second object as quickly as possible. For example, subjects may be asked to judge whether or not the object was present in the collection of objects located in the layout they had previously learned. The rationale behind this approach is that if locations from the same spatial region are more closely associated in memory, then the time required to respond to a object should be faster if it is preceded by the name of an object from the same region than from a different region. A number of these so-called spatial priming studies have shown that adults group locations by region even when the region is defined only by tape on the floor (e.g., McNamara 1986; McNamara, Hardy, & Hirtle 1989). Thus, one object will facilitate responding to another object from the same region more readily than one belonging to a different region. This occurs even if the object from the different region is physically closer to the target object than is the one from the same region as the target object.

The errors adults make when judging spatial relations also underscore the importance of containment relations between spatial regions. For example, Seattle is usually judged to be farther south of Montreal, when in fact it is farther north (Stevens & Coupe 1978). Presumably, this error occurs because individuals rely on the north-south relations between the larger geographic regions to judge spatial relations between locations contained within those regions. Similar studies with children have also shown that spatial subdivisions exert a powerful influence on their memory for locations (e.g., Acredolo & Boulter 1984; Allen 1981; Kosslyn, Pick & Fariello 1974). When asked to make spatial judgments about individual locations belonging to different spatial regions, for example, even 6-year-olds tend to rely on the overall spatial relations between regions rather than on the actual spatial relations between the individual locations (Acredolo & Boulter 1984). Similarly, Allen (1981) found that 7- and 10-year-olds and adults tend to partition routes into subdivisions, and use these subdivisions to make distance judgments about locations along the route. In particular, children and adults often judged locations from two adjoining subdivisions as more distant than locations within the same subdivision even when the locations within the same subdivision were more physically distant than the locations from adjoining subdivisions.

These studies support the argument that subjective spatial organization plays an important role in our perception of distance and memory for spatial relations. It is important to point out, however, that the tendency to group locations into spatial regions can be a double-edged sword for education. In one sense, such groupings help children simplify the problem of remembering locations and making spatial inferences. On the other hand, both children and adults are likely to make false judgments and inferences about locations when spatial organization comes into

THE ROLE OF SPATIAL CLUSTERING IN MEMORY FOR LOCATIONS

These studies support the argument that subjective spatial organization plays an important role in our perception of distance and memory for spatial relations.

conflict with actual metric relations. Therefore, it is important for teachers to be aware of locations that children are likely to misrepresent.

Another source of evidence for how children and adults organize their knowledge about locations is the order in which they recall information about objects and their locations. Again, the rationale behind this approach is that if locations within the same region are more closely related than are locations from other regions, then locations from the same region should be clustered together in recall. Studies by McNamara and his colleagues have shown that the order in which adults recall locations indeed reflects regional organization (e.g., Hirtle & Jonides 1985; McNamara, et al. 1989). For example, adults recall buildings and businesses from one area of their home town before recalling those in adjoining areas.

Several kinds of measures have been employed to investigate children's use of spatial clustering to organize their recall of objects and locations. In general, these studies have revealed that the ability to group items spatially improves over the course of childhood. Research of categorical knowledge in very young children using the sequential touching technique has shown that 20-month-olds respond categorically to classes of objects bound together by spatial and functional relatedness (Mandler, Fivush, & Reznick 1987). In this study, toddlers were presented with a tray containing kitchen things (pan, spoon, cup, and plate) and bathroom things (toothbrush, soap, toothpaste, and comb), and were encouraged to manipulate the objects. Previous studies have shown that the order in which young children touch or manipulate objects is a good indicator of their knowledge and perception of the relations among the objects. Basically, by touching most or all of the objects from one category before touching those from the other category, young children are demonstrating their ability to group the objects. The finding that 20-month-olds systematically touched objects belonging to the kitchen and the bathroom suggests that even very young children have the capacity to remember spatial groupings. It should also be noted, however, that children may have been relying on other sorts of connections between the items such as temporal and functional relations. Further research is needed in this area to examine the early emergence of children's understanding of spatial groupings. Nonetheless, these findings suggest that the ability to remember spatial clusters may be in place very early in development.

Studies of young children's ability to carry out organized searches for objects have also provided useful information about children's sensitivity to spatial organization. The basic method used in these studies is to observe the order in which children search for a set of objects that they previously saw hidden in several locations. One can then determine the extent to which the retrieval order reflects spatial clustering. This approach has proven useful for understanding developmental changes in children's ability to cluster locations, and how spatially organized searching is related to more complex tasks such as communicating about a set of locations. This method may also offer alternative approaches to teaching children about spatial relations, for example, drawing parallels between familiar activities such as searching for objects in large-scale spaces and traditional classroom activities such as searching for locations on a map.

Clearly, children as young as four years are capable of spatially organized searches in situations where there are relatively few locations that are subdivided into a small number of spatial clusters. For example, Wellman, et. al (1984) found that 4- and 5-year-olds minimized the number of traverses they made between two clusters of locations while retrieving Easter eggs they had previously seen hidden in five buckets on a

Several kinds of measures have been employed to investigate children's use of spatial clustering . . . these studies have revealed that the ability to group items spatially improves over the course of childhood.

playground. Three-year-olds, however, did not exhibit such clustering in their retrieval patterns. Similarly, Cornell and Heth (1986) found that both 5- and 7-year-olds hid objects in spatial clusters and tended to search those clusters exhaustively when later retrieving the objects. These results suggest that as children grow older they become increasingly able to use spatial organization to guide their activity within the physical environment.

Another related area of research that has implications for geographic education is the use of spatial clustering strategies in recall. The use of location to facilitate recall dates back to the time of the Greeks who developed the *method of loci* (Bower 1970; Yates 1966). To aid recall of speeches, Greek orators mentally placed each part of their speech at a location along a well-known route. When it came time to give the speech, the orator had only to imagine moving along this route to recall what he wanted to say next. Until recently, however, there has been little research on how adults and children use location to organize recall of objects and other non-spatial information. More typically, research on organizational strategies has focused on the use of categorical clustering strategies. It is well-documented, for example, that older children and adults can maximize their ability to remember information by grouping items belonging to the same category. In other words, if given a scrambled list of items to remember such as *bed, dog, chair, shirt, horse, hat, table, and cow*, children recall more if they group items by category (*bed, chair, table/ dog, horse, cow/ shirt, hat*).

More recently, the notion of recall organization has been expanded through investigations of the use of spatial clustering strategies in recall. As illustrated in Figure 2, recall of many objects encountered in everyday spaces can be organized either categorically or spatially. One issue this raises is which recall strategy do children and adults prefer to use when both are simultaneously available? Plumert (1993) investigated this question by asking 10-, 12-, 14-, 16-year-olds, and adults to recall as many pieces of furniture from their home as they could remember. Making a furniture inventory from memory is a particularly useful task for investigating spatial and categorical organizational strategies because furniture items can be grouped either by category (tables, chairs, beds, dressers), or by spatial region (kitchen, living room, bedroom, laundry). Quite surprisingly, analyses of the order in which subjects listed their furniture

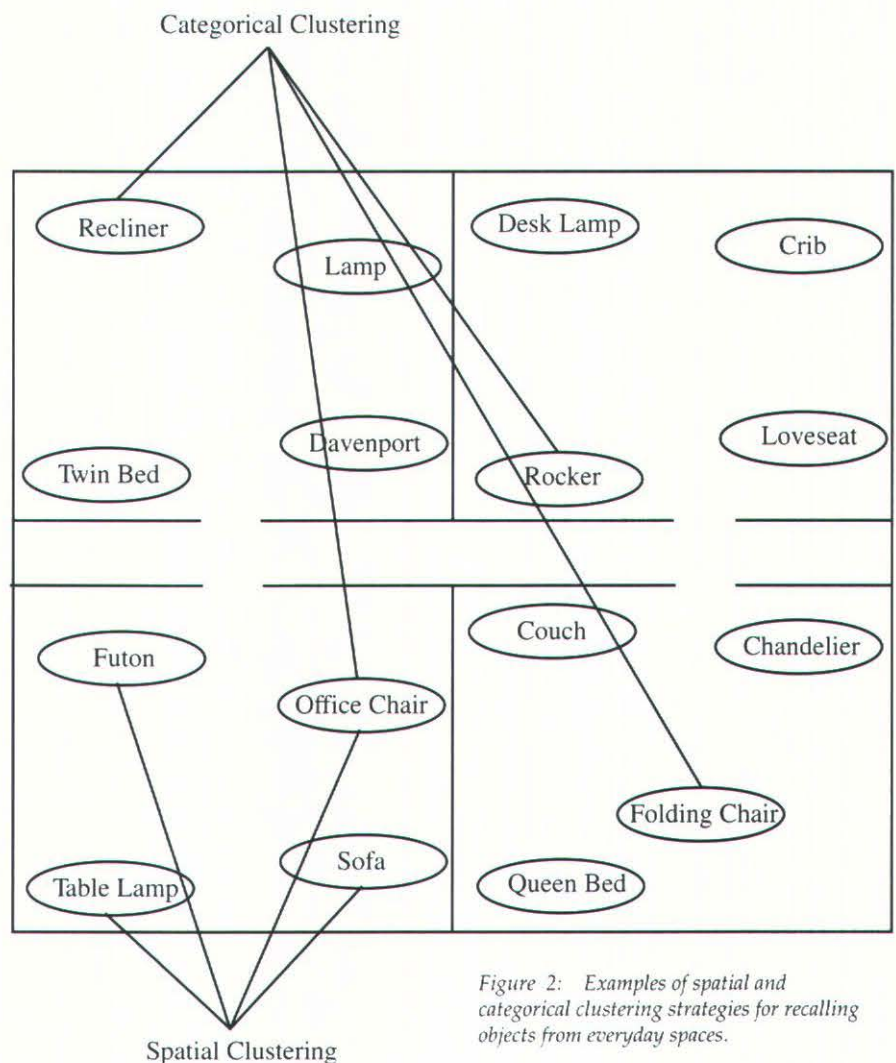


Figure 2: Examples of spatial and categorical clustering strategies for recalling objects from everyday spaces.

revealed that 10-year-olds grouped furniture items on the basis of categorical relationships, for example, *beds, chairs, couches, dressers*. Adults and 16-year-olds, on the other hand, relied almost exclusively on spatial organization, that is, most of them listed furniture room by room. The 12- and 14-year-olds, however, exhibited a mixture of categorical and spatial organization in their recall. Moreover, spatial clustering scores for the transitional groups (i.e., 12- and 14-year-olds) were significantly positively correlated with the number of furniture items they generated.

These findings raise the question of what factors might induce younger children to employ spatial organization in their recall. Although little research exists on this problem, one factor found to mediate the use of spatial clustering strategies by younger children is whether or not the recall task involves a spatial component. Plumert (1991), for example, showed that the presence or absence of a spatial component in the task had a major influence on the type of organizational strategy children used. Specifically, when the task was to recall only the names of objects, the majority of 10- and 12-year-olds used category membership to organize their recall. In contrast, when the task was to recall the objects with their locations, the majority of children abandoned categorical organization and instead clustered objects from the same room together. Thus, recalling only the names of the toys prompted children to think about categorical relations, but recalling the objects with their locations cued them to think about the spatial relations among the objects.

These results are particularly relevant to cartographic education because they show that 10- and 12-year-olds are clearly capable of organizing information spatially, but that they are most likely to do so when their attention is focused specifically on locations. This suggests that if a teacher asks students *where* coal is produced in the United States, 10- and 12-year-olds are likely to rely on the spatial relations among coal-producing states to retrieve this information. If, on the other hand, a teacher poses the question of *which* states produce coal in the United States, children may fail to use their knowledge of the spatial relations among states to retrieve this information.

HIERARCHICAL ORGANIZATION IN SPATIAL COMMUNICATION

The ability to communicate information about locations also plays a major role in classroom learning situations and in everyday social interaction. One issue is whether young children are capable of communicating information about locations in a spatially organized fashion. Plumert, Pick, Marks, Kintsch, and Wegesin (in press) investigated this question by comparing the organization of children's searches for hidden objects with the organization of the directions they gave to another person for finding those same objects. Six-year-olds helped an experimenter hide nine small tokens along a random route through the three levels of their home. After all the pieces were hidden, half of the children were asked to go find them all again and half were instructed to tell an adult experimenter how to go find those pieces. Of particular interest was whether children searched for the objects and described the locations in an order that reflected the floor organization of their home. Comparisons of children's searches and directions revealed that the order in which 6-year-olds searched for objects was far more organized than the order in which they told someone else to retrieve those same objects. The dissociation between their ability to carry out organized searches and to give organized directions suggests that 6-year-olds are adept at using the structure of the house to guide their movements, but have not developed strategies for accessing their spatial knowledge in an organized fashion. In fact, a second experiment revealed that 6-year-olds only produced organized directions if prompted by their

listener to tell her the next closest place to go each time they finished describing a location. The fact that 6-year-olds relied on the floor organization of their home to determine which locations were closest to one another is consistent with the research reported earlier showing that 5- and 6-year-olds' distance judgments are influenced by spatial subdivisions. However, it again suggests that younger children have difficulty accessing their spatial knowledge in an organized fashion without specific prompts to focus on the spatial relations among locations.

One implication of these findings is that although younger children have the knowledge necessary to convey spatial information in an organized fashion, teachers may need to provide explicit organizational frameworks to help children systematically access this knowledge. For example, when asked to recall the names of states, children may need prompts to start on one coast of the U.S. and work systematically toward the other coast. In addition, drawing parallels between the spatial groupings present in children's natural environments such as schools and those represented on maps of larger spaces may help children understand spatial relations that are not directly experienced. These suggestions are in keeping with recent theoretical discussions within the field of developmental psychology that emphasize the importance of the more experienced adult in structuring cognitive tasks for children to help bridge familiar and unfamiliar information (Rogoff 1985; Rogoff & Lave 1984).

The order in which children and adults convey the spatial information needed to find an individual location can also inform us about how they organize and understand spatial relations. For example, one might describe the location of an object in a multi-level space such as a home by first referring to the floor, then the room, then a large landmark within the room, and finally the landmark with which the object is located (*the keys are upstairs in my room next to the bed on the nightstand*). The previously mentioned study by Plumert et al. (in press) also showed that both adults and 6-year-old children organized their directions for finding a hidden object by referring to units of spatial information in an order of decreasing size. This suggests that even young children have some understanding of the hierarchical spatial relations among locations.

Plumert and Carswell (1992) have further investigated the hierarchical organization of information in spatial descriptions by examining the order in which adults convey spatial information, and how quickly they comprehend organized and nonorganized descriptions of location. In the first experiment, adults hid several objects in different places around their house and then recalled as much information about where each object was located that they could remember. Analyses of the order in which they produced information about each location revealed that a majority of their descriptions conformed to a hierarchically organized structure. A second experiment extended these findings by showing that adults comprehend hierarchically organized spatial descriptions more quickly than nonhierarchically organized descriptions.

The fact that both production and comprehension of spatial discourse are tied to hierarchical structures has implications for how the mind forms spatial connections, and how such links influence how we store and access our spatial knowledge. This suggests that how teachers verbally present geographic information may well influence how easily children comprehend the material. For example, the statement, *Iowa City is located in the Midwest region of the United States and is a city in the state of Iowa* is not as easily understood as the statement, *Iowa City is a city in the state of Iowa that is located in the Midwest region of the United States*. In short, when information is presented in a disorganized fashion, children may end up

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spending cognitive resources on restructuring the information, or may miss some pieces of information entirely.

CONCLUSION

The studies reviewed here paint a rather compelling picture of how children and adults organize spatial information. One advantage of using a system of nested spatial relations to organize knowledge of locations is that it serves to simplify spatial information. By chunking locations into spatial regions, one can think about individual locations in reference to a more general set of locations rather than as completely unique pieces of spatial information. This allows us to act and think adaptively because we do not have to know the exact location of an object or a place in order to locate it effectively. For example, I may not know exactly where a particular shop is, but I know I will bump into it if I travel through a certain section of town or along a particular street. Another advantage of such a system of spatial organization is that it supports spatial inferences. Therefore, if I know that Iowa City is in Iowa, and I know that Iowa is part of the Midwest, then I can also infer that Iowa City is a city in the Midwest. Obviously, the ability to make these kinds of spatial inferences is fundamental to our everyday functioning.

... spatial clustering and hierarchical organization of spatial information are powerful tools for remembering and reasoning about locations.

What implications might the research reviewed here have for geographic education? First, it is clear that spatial clustering and hierarchical organization of spatial information are powerful tools for remembering and reasoning about locations. Therefore, educators may be able to use children's early understanding of spatial clustering as a basis for teaching them about regional geography. In particular, children may be more likely to remember which locations are near one another if the learning process emphasizes how locations are grouped into spatial regions. Furthermore, pointing out cases in which there are overlapping spatial, categorical, and even temporal relations among locations may serve as an even stronger and more meaningful organizational framework for children. For example, New England states are related not only through spatial proximity, but also through features based on perceptual appearance and temporal events such as similar terrain and participation in the Civil War, respectively. Although little research exists on the problem, multiple sources of information about locations may be more consistent with children's everyday experiences because objects of the same class are often found in the same location. For example, kitchens usually contain locations for canned goods, pots and pans, and glassware.

... the developmental changes that occur with respect to children's ability to systematically recall locations suggest that educators need to provide young children with more concrete ways of thinking about locations ...

Second, the developmental changes that occur with respect to children's ability to systematically recall locations suggest that educators need to provide young children with more concrete ways of thinking about locations; in other words, perhaps incorporating knowledge with activity. For example, young children might find it more meaningful to physically walk to locations represented on a large map on the floor than to look at locations on a small upright map. By doing so, educators can use familiar experiences as a bridge for introducing more abstract and less familiar information.

In conclusion, these ideas may provide a basis for further collaboration between those in the field of geographic education and psychologists studying children's spatial cognitive development. Many questions about the relations between children's spatial cognitive development and their understanding of geography remain unanswered, however. We do not know, for example, how children integrate their knowledge of spatial clustering processes and hierarchical organization with their understanding of metric representations of spatial information. Cross-disciplinary research in this area offers a key to understanding not only how to edu-

cate children about geography, but also to unravelling mysteries about how children's spatial knowledge develops.

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RESUMEN

Uno de los muchos retos del sistema educativo moderno es el de proveer a los niños con un mejor entendimiento de la geografía. Cada vez más los cartógrafos y educadores se inclinan en conseguir información de los psicólogos sobre cómo es el desarrollo espacial cognitivo, la habilidad para entender y aprender sobre las relaciones espaciales en los mapas. Una parte muy importante del proceso de aprendizaje es la habilidad de organizar localidades con alguna estructura especial. Recientemente, el papel que la organización jerárquica juega en recordar y razonar localidades ha recibido gran atención en el campo de la psicología cognitiva. Estudios han demostrado que tanto los niños como los adultos tienden a organizar las localidades por regiones con niveles concentrados de detalles. Por ejemplo, el lugar del cepillo de dientes puede recordarse como en el segundo compartimento en el gabinete del baño de arriba, o la localidad de Iowa City puede ser en el estado de Iowa, en la región medio-oeste de los Estados Unidos. Sin embargo, hay limitaciones en la habilidad de los niños para hacer estructuras espaciales jerárquicas, esto tiene importantes implicaciones para la educación cartográfica. Como resultando, los niños más jóvenes pueden requerir más ayudas visuales y estructuras organizacionales explícitas cuando aprenden y comunican información sobre localidades. Las ideas y sugerencias presentadas aquí sobre la relación entre el desarrollo espacial cognitivo y su entendimiento de la geografía, tiene el objetivo de fomentar más colaboración entre los cartógrafos y psicólogos. □

cartography bulletin board

Shareware and Public Domain Software for Cartographic Applications

by Joseph W. Stoll, Supervisor-Laboratory for Cartographic and Spatial Analysis, University of Akron

Not all software valuable to cartographers is offered by such companies as Strategic Mapping, Inc., Autodesk, Microsoft, Aldus, Adobe, etc. Along with these and other well-known makers of mapping and illustration software, a parallel development has occurred in the realm of smaller private and public agencies. If one hears of desirable software applications from these low profile sources, it is likely through word-of-mouth and specialty user group publicity. This type of software often exists in the form of shareware or public domain software.

Use of the term "shareware" does not mean that this software is free of charge, but rather that it is permissible to obtain a copy from another user, or purchase a copy for a nominal duplication charge for the purpose of trying it out prior to paying the registration fee. Paying the cost of registration is left to the honor of the individual who chooses to keep and use a copy of the software. The requested or suggested registration cost of the program is usually contained somewhere in one of the program files. Upon payment of the registration fee, it is common for the registrant to receive additional software documentation or program updates and revisions.

Public domain software is uncopyrighted software that has been placed in the public domain by the software author(s). There is generally no registration fee for

public domain software, however there may be a nominal duplication fee. It is not unusual for software that originated as public domain software to be issued in a later version as a commercially available product and vice versa.

Where does this shareware/public domain software originate? Are these programs reputable and reliable? Are they worthy of consideration when there are so many well publicized programs? Surely a software advertisement that is colorfully splashed across one or two pages of a high-profile publication deserves more serious consideration than a small program that is being used by someone to develop classes for choropleth mapping of data! Are there programs which meet specific cartographic needs that the more well known commercial programs are not addressing? Are there programs which provide similar capabilities to some of the more well known commercial programs at a fraction of the cost?

These are the types of questions that come to mind when the subject of cartographic shareware is broached. This column will attempt to answer some of these questions through the introduction of some shareware/public domain programs which can be useful to cartographers. The software listing features programs that have been used by the author personally or were recommended for use by someone who was acquainted with the program. There are certain to be useful programs omitted from this list. The author apologizes for these omissions and solicits additional comments and recommendations regarding the usefulness of programs listed here as well as programs which can be added in a subsequent article on this topic.

In order to provide a simple structure to the software list, programs are classified as **Cartographic Software** or **Other Soft-**

ware. The program title is identified with information explaining where it can be obtained and the cost of registration. A statement regarding how the software is being used (application) is also included.

Cartographic Software (IBM):

Interactive Grid Coordinate Conversion for Personal Computers (Plane-PC)

Available from: United States Geological Survey, Earth Science Information Center, Reston, VA 22092.

Fee: \$2.75 (documentation and listing price), \$42.75 (complete package price-includes IBM Job Control Language to compile and execute the program, FORTRAN source code on 9-track magnetic tape, user's manual, computer listed output of the tape's contents).

Application: Performs the conversion of geographic coordinates to a State Plane Coordinate System or to Universal Transverse Mercator (UTM) coordinates, or vice versa.

Surf-III

Available from: David DiBiase, Department of Geography, 302 Walker Building, Pennsylvania State University, University Park, PA 16802, (814) 863-4562.

Fee: Uncertain.

Application: This is a DOS utility for the conversion of Surfer PostScript files into the Illustrator file format.

The following software is available from the Association of American Geographers-Microcomputer Specialty Group. These programs along with lists of other available programs can be obtained at the following addresses.

IBM: Robert Sechrist, 312 Whitmyre Hall, Indiana University of Pennsylvania Indiana, PA 15705.

(continued on following page)

Macintosh: Nancy Hultquist,
Department of Geography, Central
Washington University Ellensburg,
WA 98926.

MicroCAM (G7) (by S. Loomer)

Fee: The user is permitted to make copies of the complete program and documentation for others provided there are no charges other than duplicating fees not to exceed \$5 per disk. The latest version is available from the author for \$25. Application: This powerful program is used by many academic cartographers for the generation of base outline maps utilizing MicroCAM's support of many of the most used projections. This program is also useful for the instruction of cartographic concepts to students.

MicroCAM Interface (G40) (by Anderson, Rohweder and Brook)

Fee: \$3.00.
Application: Program for the generation of MicroCAM command files.

Cartographic Utilities (G6)

Fee: \$1.00.
Application: Utilities containing programs to facilitate digital cartography including Theissen Polygons Point-in-Poly, Degrees to Decimal.

MicroDEM (by P. Guth)

Fee: \$3.00.
Application: Digital Elevation Model analysis, creation of 3-D terrain models, line-of-sight, inter visibility maps.

Landsat and MicroMSI (by S. Loomer)

Fee: \$1.00 (Landsat), \$4.00 (MicroMSI).
Application: Image processing and analysis. Landsat requires EGA graphics while MicroMSI supports VGA graphics.

DigitizePC (by S. Sulatycki)

Fee: \$1.00.
Application: Digitizer driver software for most digitizers.

Cartographic Software (Macintosh):

Note: With the use of Soft PC (a commercially available program) the IBM compatible programs in this list can be used with Macintosh computers.

Classit

Available from: Contact Barbara Battenfield, SUNY, Buffalo, NY.
Fee: Uncertain.
Application: This is a Macintosh implementation of the Jenks Optimal Classification Method.

PostShade

Available from: Michael P. Peterson, Associate Professor, Department of Geography and Geology, University of Nebraska at Omaha.
Fee: Uncertain.

Application: This is a utility program that assigns shadings to polygons for the creation of unclassed choropleth maps (Peterson, 1992).

Other Software (IBM):

QModem

Available from: Mustang Software, P.O. Box 2264, Bakersfield, CA 93303.
Fee: Free ("test drive" version), \$99.00 (more powerful commercial version).
Application: Powerful communications program which contains numerous features and file transfer protocols (including Xmodem, Ymodem batch and Zmodem batch).

PKZIP

Available from: PKWare Inc., 7545 North Port Washington Road., Glendale, WI 53217.
Fee: \$47.00 (Includes a printed manual, latest version of PKZIP, PKUNZIP and PKSFX software as well as the next software update).
Application: Powerful and easy to use compression software. A must for anyone downloading files from bulletin boards. Will also save large amounts of hard disk space (65-70 percent compression of ASCII files).

Personal File Manager

Available from: Paul R. Culley, 7342 Odingleen, Houston, TX 77095.
Fee: Unspecified contribution.
Application: Easy to use DOS file management software. Allows viewing of file contents, displays hidden files and permits multiple file deletions and copies.

Other Software (Macintosh):

PSinfo

Available from: Bob Dahl, Cartesia Software (contact David DiBiase, Pennsylvania State University)
Fee: Uncertain.
Application: This utility counts points in paths of Illustrator files and reports the longest path. This is helpful in the prevention of errors due to exceeding point limits in a path.

Shareware Sources:

Specialty user groups: These types of groups are excellent places to determine the good shareware/public domain software from the not-so-good. To find a user group, contact: Association of PC User Groups, 1730 M St. NW #700, Washington, D.C. 20036 or FOG International, P.O. Box 3474, Daly City, CA 94015, (415) 755-2000 (Gralla 1992).

Commercial Disk Vendors: These are companies that sell unregistered versions of shareware for nominal prices. The user purchases the unregistered program and then decides whether or not to register with the author. Some vendors have membership fees and include newsletters or magazines as part of the membership. Commercial Disk Vendors include: PC-Sig, 1030 D East Duane Ave., Sunnyvale, CA 94086, (800) 245-6717; Public Software Library, P.O. Box 35705, Houston, TX 77235, (800) 242-4775; and Public Brand Software, P.O. Box 51315, Indianapolis, IN 46251, (800) 426-3475 (Gralla 1992).

On-line Services: These are possibly the most comprehensive sources of nearly every piece of top-notch shareware. The main drawbacks to the use of these services are that they are often difficult to use as well as expensive to purchase. If the user can afford the service, it is possible to access the largest shareware libraries in the world as well as experts in almost any computer application. On-line services include: Compuserve, 5000 Arlington Centre Blvd. Columbus, OH 43220, (617) 4578600 and GENie, GE Information Services, Dept. 02B, 401 North Washington St. Rockville, MD 20850, (800) 638-9636 (Gralla 1992).

As nearly every computer user has discovered, appreciating the true utility of a software package is more likely to occur following extended use and familiarity with fewer applications rather than the brief use of many applications. Most cartographers do not need more software programs to learn, when we have yet to master the programs already in our possession. This is where some of these shareware/public domain programs with their specialized applications can perhaps be most useful. Many of these programs appear to be less daunting to learn than their commercial counterparts and in many cases, when information or technical support is required, direct contact with the person who developed the software is possible. The value of keeping in touch with other users of the software, regardless of the software you use, cannot be over estimated.

Hopefully this brief guide to a few of the available shareware and public domain programs that cartographers are using is helpful—especially to readers who are at a loss for program sources when budgets are extremely tight.

Please send information about additional useful programs which should be included in a subsequent shareware/public domain software guide for cartographers to: Joseph Stoll, Department of Geography and Planning, The University of Akron, 306 Carroll Hall, Akron, OH 44325-5005.

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Telephone conversations with various colleagues including: Jan Coyne, David DiBiase, Nancy Hultquist, Scott Loomer and Charles Rader. □

map library bulletin board

THE MAP LIBRARY IN TRANSITION

On October 18 & 19, 1993 a joint conference sponsored by the Congress of Cartographic Information Specialists Associations and the Geography and Map Division, Library of Congress will be held at the Library of Congress in Washington, D.C.

The conference was spawned by the massive changes that are taking place in our libraries and the way cartographic information is being created, processed, and disseminated. The specific goal of the conference is to examine the impact of the digital revolution in

the realm of geographic information. The conference will address a variety of themes on this issue. These include:

- *the relationship of map libraries to their parent organizations*
- *the technical requirements for equipment, software, and communications to support digital forms of geographic information*
- *the skills required for the map librarian of the future*
- *defining the collections and services of the map library of the future*

The conference will bring together individuals from a variety of professional organizations. Organizations participating in the conference include:

The Library of Congress
Association of Canadian Map Libraries and Archives
American Congress on Surveying and Mapping
Committee of Southeast Map Librarians (AAG)
Geography & Map Division, Special Libraries Association
International Society of Curators of Early Maps
Map and Geography Roundtable, American Library Association
Map Online Users' Group
North American Cartographic Information Society
Northeast Map Organization
Western Association of Map Libraries

The key elements in the program will be a panel discussion on "Where Map Libraries are Today and Where They Are Headed" and "Prospects for the Map Library of the Future;" reports on GIS Initiatives; The Federal Geographic Data Committee and the Federal Depository Program; and presentations of GIS Applications within

the Federal Government. In addition, discussion groups will be organized to discuss certain topics and discussion group reports will be presented.

The Program Committee responsible for the meeting includes:

Gary Fitzpatrick
Geography and Map Division,
Library of Congress

Christopher Baruth
American Geographical Society
Collection

Patrick McGlamery
University of Connecticut

Johnnie Sutherland
University of Georgia

Alberta Auringer Wood
Memorial University of
Newfoundland

The conference dates (October 18 - 19) were coordinated with the dates for the Annual NACIS meeting (October 20 -23). It is open to all interested individuals from the cartographic information field.

To register for the conference, contact:

Gary Fitzpatrick:
E-mail: gfit@seq1.loc.gov
Fax: (202) 707-8531
Phone: (202) 707-8542

Postal: Geography and Map
Division
Library of Congress
Washington, DC 20540-4761

*There will be a modest but undetermined
registration fee*

reviews

BOOK REVIEW

*Mapping it Out: Expository
Cartography for the Humanities
and Social Sciences*

Mark Monmonier. Chicago:
University of Chicago Press, 1993.
301 pp, maps, diagrams, appen-
dices, notes, index. \$37.00 cloth.
(ISBN 0-226-53416-2) \$15.95 paper
(ISBN 0-226-53417-0).

*Reviewed by Pat Gilmartin
Department of Geography
University of South Carolina*

This latest contribution to the cartographic literature by Mark Monmonier is intended to provide scholars in the humanities and social sciences with basic guidance in map authorship and, thereby, to encourage them to use maps in their publications. The author is careful to explain that he did not write this book to serve as a conventional cartographic text: "[a] textbook would have been more rigorously comprehensive and more like a manual..." Rather, the volume focuses on the expository aspects of maps to accompany scholarly discourse.

The book's eight chapters proceed from the fundamental (map scale and projections) to the quite complex (mapping flows, correlations, and multiple variables). Chapter One is an essay on the importance of maps in scholarly communication. Many research topics in the humanities and social sciences contain a spatial component; yet all too often the significance of locations and spatial patterns is forfeited because it cannot be conveyed through verbal descriptions. In the second chapter Monmonier provides an

explanation of map scale and projections, concentrating the latter primarily on equal area projections for world maps and azimuthal projections for maps of less-than-global regions. The chapter concludes with five general rules designed to help map authors select appropriate projections for their maps.

Chapter Three presents an introduction to cartographic symbolization, organized around Jacques Bertin's six visual variables: shape, size, hue, orientation, value, and texture. Monmonier explains the functional relationship between each of the visual variables and specific types of spatial data and then demonstrates how these concepts can be applied to basic cartographic objectives such as portraying locations, routes, densities, and causal relationships among features.

In Chapter Four, entitled "Map Goals, Map Titles, and Creative Labeling," the author shows how the textual elements of maps can, themselves, be used as cartographic symbols to enhance communication through their visual characteristics and placement. The importance of the map title and other verbal links between the map and the text which it accompanies are also discussed. Sources of reference maps, compilation procedures, and copyrights are the themes of Chapter Five. The author's approach to cartographic sources is broad, offering primarily a sense of "what to consider, where to look, and what to look out for." His discussion of copyrights and permissions is more detailed, even to the point of providing a sample form for requesting permission to reproduce a map. This section of the book should be very valuable because it addresses an important issue which baffles most people and, in my experience, is difficult to obtain authoritative information on.

The final three chapters relate to specific thematic mapping procedures. Chapter Six examines the mapping of quantitative data using proportional symbols and the choropleth technique, two methods which have wide application in the social sciences. Monmonier provides basic explanations of the two systems, including scaling and classification, legend design, and graphic design issues. He also addresses in some detail the ethical implications of mapping "count" data versus intensity data. Ultimately he recommends that map authors consider providing complementary pairs of maps showing both counts and intensities. The chapter also contains very timely cautionary notes regarding uninformed use of mapping software to produce choropleth and proportional symbol maps.

In Chapter Seven strategies of representing dynamic geographic processes are explored. Flows of people and things, various spatio-temporal series, and changes along a line such as a frontier or military front are all discussed and illustrated. Chapter Eight deals with the design and use of relational maps, those which are intended to analyze or highlight geographic patterns, trends, and correlations. Monmonier includes in his discussion techniques such as cartographic overlays to illustrate spatial correlations between two variables and mapping residuals from linear regression models. The chapter concludes with several useful suggestions for integrating text and graphics so that the reader can derive the greatest possible benefit from both.

Three brief appendices complete the volume. In Appendix A the author provides a comparison of electronic and pen-and-ink equipment and methods of compilation, symbolization, and labeling, and refers the readers to other sources for more detailed instruc-

tion. The second appendix addresses the topic of an author working with a cartographic illustrator, examining various levels of working relationships and the need for clear communication between author and illustrator. Appendix C is a list of twenty-two selected readings in cartography, among which are traditional cartographic texts as well as volumes on (carto)graphic design.

Mapping it Out is organized logically and written in a lucid, straightforward style. Its tone is somewhat informal in places; Monmonier occasionally uses the first-person pronoun, "I," and shares anecdotes from his own experiences with the reader. Don't misunderstand, however. Just because the prose is sometimes casual and the book is aimed at non-cartographers does not mean that it is elementary. The author assumes that his reader is a "scholar-author" (or perhaps a "precision journalist") and quite serious about producing maps to enhance his or her text. This is not a cartographic cookbook containing how-to steps for whipping up a quick map. One cannot just skim its contents for simple cartographic solutions; the book must be read thoughtfully, like the thoughtful work that it is.

Illustrations for the volume include a number of facsimile maps from disciplines such as history, sociology, and linguistics, along with those created by the author specifically for this publication. As much as possible, the graphics appear on the same (or facing) pages with their referring text, a practice which the author recommends to his readers and manages to implement in his own book.

Monmonier advocates a few rather unconventional cartographic practices to his readers. For example, he states that graphic scales should not be used on maps spanning a thousand miles or

more because the stated scale can vary so widely across the map. It is not clear whether he objects simply to this particular form of scale for small scale maps, since it may invite (possibly erroneous) distance estimates more than, say, a representative fraction would, or whether he would recommend providing no scale at all.

Another unorthodox endorsement and practice in his own book is the use of a "visibility base map" for choropleth maps of the United States. This is a base map in which the areas of large states such as Texas and California are reduced, while areas of smaller states such as Delaware and Rhode Island are enlarged so that the areal shading assigned to small units is more legible. The shapes of the polygons representing the states are simplified and caricatured by "exaggerating one or more prominent features" in their outlines (p. 178). While I understand the problem that the author is trying to solve with this base map, I, personally, do not agree with its use. Most Americans are so uneducated about the geography of their own country (not to mention the world); why deliberately present them with an image of it containing significant areal distortion and very simplified, caricatured shapes?

Finally we come to the bottom line of this review with two questions: Will this volume achieve its stated purpose for its intended audience? And how might it serve cartographers, an unintended audience, perhaps, but the most likely readers of this review? My answer to the first question is "yes," for those humanists and social scientists are willing to read a literate exposition on cartographic principles and techniques. As for the second question, cartographers, too, will find much of value in *Mapping it Out* but probably will not use it as a primary text. In tailoring its

content to the needs of writer-scholars in the social sciences, Monmonier necessarily omitted certain topics that would be a standard part of a general purpose cartographic text. □

BOOK REVIEW

Map Use and Analysis (Second Edition)

John Campbell, Dubuque, Iowa: William C. Brown Publishers, 1993. xi, 429pp., 21.5 x 25.3 cm appendixes, glossary, index. US \$38.00. Paper ISBN 0-697-13579-9.

Reviewed by Ute Dymon
Department of Geography
Kent State University

Map Use and Analysis was prepared as an introductory textbook for map reading on the college or university level. This thorough and adeptly illustrated text reflects the author's many years of teaching experience in the field of cartography which he passes on to the reader in an exceedingly lucid manner. The very cover of this edition conveys a more dynamic, even exciting, image of cartography than the previous edition.

The 429-page text is divided into twenty-two chapters, seven appendixes and a twenty-two page extensive glossary of selected terms. In addition, there is an eleven page index. Each chapter ends with a summary and includes a bibliography with suggested readings. Over three hundred black-and-white figures are included. These maps, graphs, and illustrations were thoughtfully chosen and serve as excellent examples to clearly emphasize relevant points. The content is arranged in a coherent, well-ordered manner, and is not only

easy to follow, but provides the reader with a flow of conceptual material that facilitates mastery of the subject of cartography.

The first six chapters cover issues essential to map understanding, including why maps are useful and how maps are produced. The shape and size of the earth is outlined in Chapter Two. Chapter Three covers basic map projections and their appropriate use. Map scales and generalization are the subjects of Chapter Four. Chapter Five discusses measurement techniques. Route selection techniques and navigation on land, water and in the air are the focus of Chapter Six.

Three chapters (Seven, Eight, and Nine) provide fundamental instructions in surface and terrain representation including reading and understanding of contour maps. Chapter Ten presents a variety of locational and land ownership systems. Chapters Eleven and Twelve survey the characteristics of mapped distributions. Chapter Thirteen covers the general topic of thematic maps and how to interpret qualitative and quantitative information. Cartograms and map misuse are included in Chapter Fourteen. As Lindenberg points out in his review of this text (Lindenberg 1992), the placement of these two topics almost leads to guilt by association.

The last several chapters give an accounting of map types and graphs, mapping operations, and map producers. One entire chapter (Sixteen) is devoted to graphs, a topic often neglected in cartography textbooks. The chapters on remote sensing techniques, computer assisted cartography, and geographic information systems bring this book up-to-date with new cartographic technologies.

The final chapters of the book (Twenty-one and Twenty-two) are a compendium of the major

mapping agencies in the United States and Canada. A discussion is also included of some of the problems one can encounter using foreign maps. A valuable contribution in this edition is a new section on Canadian Government maps and their sources, including addresses for securing magnetic tape or diskettes about Canadian toponyms.

Anybody familiar with the first edition of *Map Use and Map Analysis* will enjoy this second edition even more. Some of the minor errors present in the first edition (see Loy 1992) have been corrected. Campbell has rearranged the Table of Contents to provide greater cohesiveness to the topics in the book.

One of the major strengths of this book is the integration of text and illustrations. The illustrations artfully supplement the text, an important advantage for students. The illustrations are of high quality and readable in spite of the fact that in many cases colored maps were reproduced in black and white.

After using the book in an introductory map use and analysis class, I found some students initially overwhelmed by the many technical terms and math formulas which are part of the text, especially in the theoretical presentations in chapters eleven and twelve. Classroom discussions were vital to put students at ease and to help them clarify the subject matter, however, the majority of students found the text very informative.

Map Use and Analysis is not only a textbook for classroom but it is a very practical resource for individuals who have an interest in mapping or cartography. For instance, you can find addresses of government agencies to write and order maps, and one of the appendixes provides sources for mapping programs and microcomputer databases. This is informa-

tion the novice map user may not be able to easily find. As a textbook, *Map Use and Analysis* achieves the purposes of its author and publisher by offering a comprehensive survey of the map world. I highly recommended it for introductory map reading courses as well as for the enjoyment of map aficionados.

References

Lindenberg, R. 1991. Review of *Map Use and Analysis*. *Cartographica*. 28 (1): 99-101.

Loy, W. 1992. Review of *Map Use and Analysis*. *Cartography and Geographic Information Systems*. 19 (1): 54-55. □

announcements

Curator of AGS Collection Retires

Roman Drazniowsky, Curator of the American Geographical Society Collection at the Golda Meir Library, University of Wisconsin - Milwaukee and Editor of *Current Geographical Publications*, retired July 1, 1993 after 31 years of service. Dr. Drazniowsky's association with the AGS Collection dates back to 1962, and he played a vital role in transferring the Society's library and map collections to UW-Milwaukee in 1978. A native of Ukraine, Drazniowsky holds a Ph.D. from Innsbruck University, and while in New York he taught cartography at Columbia University. An internationally recognized expert in the field of cartography, Drazniowsky received the American Geographical Society's Charles P. Daly Medal in 1978 and a Citation from the Special Library Association's Geography and Map

Division in 1979. Drazniowsky was one of the founding members of NACIS and he has been an honorary member of the Societe de Geographie (Paris) since 1982.

NGSD Presents New GIS/LIS Workshop for the Public

The National Geodetic Survey Division (NGSD) announces a new workshop available for presentation throughout the United States. "Developing an Accurate GIS/LIS" is a 1-day seminar describing the application, uses, and benefits of the National Geodetic Reference System (NGRS) as the foundation for creating an accurate Geographic Information System/Land Information System (GIS/LIS). Spatial data, by definition, requires reference to the NGRS. Topics for this workshop include essential geodetic concepts, defining horizontal and vertical coordinate systems, accuracy standards, surveying methods, and developing and maintaining the NGRS at the local level.

NGSD also conducts workshops on such topics as survey instrumentation and coordinate conversion, converting survey results from one geodetic datum to another, data reduction and analysis methods, calibration base lines for electronic distance measuring instruments, state plane coordinates, project planning and network adjustments, GPS techniques related to space coordinate and terrestrial coordinate relationships, survey mark preservation, and NGSD products and services.

These workshops are cooperative ventures involving the NGSD, the American Congress on Surveying and Mapping (ACSM), and other organizations, including universities. NGSD also develops new workshops upon request, provided it has the expertise and the resources necessary. Inquiries should be made to Mr. David Doyle, phone: (301) 713-3178.

Raster and Vector Electronic Chart Formats Developed

The Nautical Charting Division's Mapping and Charting Branch has begun the process of digitizing NOAA's nautical charts. This multiyear effort will result in both raster and vector-format nautical charts. Hardware and software to use electronic charts are presently being developed by private vendors. Draft performance standards for the Electronic Chart Display and Information System (ECDIS) have developed from the international effort. ECDIS combines digital nautical charts produced by NOAA, radar, and accurate vessel positioning using the Differential Global Positioning System (DGPS) on one computer screen.

ECDIS provides a real-time visual display of a vessel's position in relation to its environment. It also has an audible alarm to warn navigators when they are approaching hazardous navigation areas. After using ECDIS, mariners have stated that it reduces the amount of time spent on navigation and increases the amount of time available for collision avoidance. This combination of navigation and collision-avoidance equipment has been called the greatest advance in the safety of navigation since the invention of radar. Inquiries should be made to CDR George Leigh, phone: (301) 713-2779.

Coast and Geodetic Offices Move

The Coast and Geodetic Survey Offices have moved to new headquarters. Their new mailing address is:

**Coast and Geodetic Survey
N/CG
1315 East-West Highway
Room 8871
Silver Spring, Maryland
20910-3282**

North American Indian Maps Project

The Geography Department at the University of Wisconsin Milwaukee has received a \$279,400 grant from the National Endowment for the Humanities, Division of Research Programs to create an Archive of North American Indian Maps on CD-ROM

The goal of the project is to develop a research oriented visual digital database of North American Indian and Inuit Maps. This CD-ROM will contain American Indian and Inuit maps, plus descriptions and catalog information about the maps. The maps and text will be digital and linked through a hypermedia interface. This archival database is intended to function as a research tool for scholars studying the cartography, landscape perceptions, cognition, art, and history of American Indians; as well as serving as a curatorial tool. The creation of an archival database of these maps on CD-ROM will bring together a large corpus of maps currently not available in any single location; present information and images in ways that allow cross referencing of images and text; and provide a map format (digital) that allows a researcher to magnify and manipulate the images for analysis in order to gain different perspectives on the maps, their meaning, and their cultural context.

The Project is currently soliciting information on American Indian maps. Please contact the Directors with information or inquires. Professor Sona Andrews (Project Director), David Tilton (Associate Director), or Mark Warhus, (Associate Director); Department of Geography, PO. Box 413, University of Wisconsin-Milwaukee, Milwaukee, Wisconsin 53201, phone: (414) 229-2844, 4866; fax: (414) 229-3981; e-mail: sona@csd4.csd.uwm.edu.

1st Annual Walter W. Ristow Prize - History of Cartography Map Librarianship

The Washington Map Society is proud to announce the first annual Walter W. Ristow Essay Prize, honoring one of the nation's premier map librarians. Dr. Ristow began his career at the Geography and Map Division of the Library of Congress in 1946 and was Chief of the Division from 1968 to 1978. Before joining the Library of Congress he served in U.S. Army Military Intelligence during World War II, and held positions as Chief of the Map Division of the New York Public Library, and Instructor at Eastern Washington State College. He earned a B.A. in Geography from the University of Wisconsin-Madison, an M.A. in Geography and Geology from Oberlin College, and a Ph.D. in Geography from Clark University. His professional and research interests include cartography, the history of cartography, map librarianship, and map collecting.

Who may apply: The first Ristow Prize will be awarded in May 1994, to three outstanding graduate level, or upper-level undergraduate, papers on the history of cartography or equivalent bibliographic studies dealing with cartographic material. Students may be in their first post-doctoral year.

Deadline: Papers must be submitted (postmarked) by March 15, 1994, to Nancy Goddin Miller, WMS Board Member, Walter W. Ristow Essay Prize, 406 St. Lawrence Drive, Silver Spring, MD, 20901.

Criteria: Papers should be no more than 25 pages in length, including pertinent maps, photographs, or other illustrations. The paper may consist of an abstract of a course paper or doctoral dissertation. Papers should be appropriately documented. Papers shall be

submitted in typescript, double-space and single-sided. If no papers are judged to be either appropriate or sufficiently meritorious in a given year, the right is reserved to make no award.

Award: The first place winner will receive a prize of \$300, second place, \$200, and third, \$100. The papers will be printed in successive issues of *The Portolan*. □

cartographic events

Specialist Meeting of the NCGIA Research Initiative 8

Formalizing Cartographic Knowledge
The National Center for Geographic Information and Analysis (NCGIA) will hold a Specialist Meeting for Initiative 8, "Formalizing Cartographic Knowledge," at the SUNY-Buffalo University Conference Center, October 24-27, 1993. The goal of the Specialist Meeting is to identify and prioritize research needs in automated map compilation, generalization and production, and to specify an appropriate agenda for undertaking the research over the next two years. The structure of the meeting will alternate small-group and full-group discussions about specific questions. Participants will have the exciting opportunity to make active contributions to this process. The Specialist Meeting will bring together about 30 researchers concerned with formalizing rules and formalizing cartographic expertise in the context of automated mapping and GIS. Support for lodging and travel to and from the meeting may be available to participants selected to attend. For more information contact Specialist Meeting Coordinators: Barbara P.

Buttenfield (Initiative Leader), Catherine Dibble (Graduate Rapporteur), National Center for Geographic Information and Analysis, 301 Wilkeson, SUNY-Buffalo, Buffalo, New York 14261, e-mail: babs@geog.buffalo.edu, phone: (716) 645-3834 or 645-2545, fax: (716) 645-2329.

Geoscience Information Society Annual Meeting

Finding and communicating geoscience information

The Geoscience Information Society (GIS) will hold its 28th annual meeting in Boston, Massachusetts, from October 24-28, 1993. The meeting will be held in conjunction with the annual meeting of the Geological Society of America (GSA). In keeping with GSA's theme of "Charging into the Future," the Geoscience Information Society is sponsoring a symposium on "Finding and Communicating Geoscience Information" on Tuesday October 26th, from 8 am until noon. The symposium will highlight the rapidly changing world of publishing and dissemination of earth science and environmental information. It will also explore the advances and challenges of new technological access to geological information.

Conference registrants can also attend an Intermediate/Advanced GeoRef Workshop, a Digital Database Forum and an interactive INTERNET demonstration featuring earth science resources. In addition there will also be a technical and poster session. Registrants for the GIS Conference are welcome to attend the GSA sessions. For further information, contact Connie Wick, GIS Vice-President, Kummel Library, Harvard University, 24 Oxford Street, Cambridge, MA 02138; phone (617) 495-0791; fax: (617) 495-4711.

GIS in Business '94 Conference & Exposition

GIS World, Inc. has announced that the GIS in Business '94 Conference and exposition will be held June 5-8, 1994, in San Francisco at the San Francisco Hilton and Towers. The conference, which focuses on the business applications of geographic information systems (GIS) technology, will open with GIS-related workshops and formal vendor presentations on Sunday, June 5. Conference sessions begin on Monday, June 6, with speakers from major business players showing how they benefit from GIS technology. An extensive exposition will feature products and services from industry vendors. For more information on attending, speaking or exhibiting, call GIS World, phone: (303) 223-4848.

EVENTS CALENDAR 1993-94

October 18-19: **The Map Library In Transition.** Library of Congress, Washington, D.C. Contact: Gary Fitzpatrick, Geography and Map Division Library of Congress, Washington, DC 20540-4761, e-mail: gfit@seq1.loc.gov, fax: (202) 707-8531, phone: (202) 707-8542.

October 20 - 23, 1993
**XIII Annual Meeting of the
 North American
 Cartographic Information
 Society**

Silver Spring, Maryland

For more information contact
 Charles Harrington
 NACIS Program Chair
 10904 Kingstead Rd.
 Damascus, MD 20872
 (301) 443-8360
 see preliminary program on
 pages 29 - 31

October 24- 27: **Specialist Meeting of the NCGIA Research Initiative 8.** SUNY-Buffalo University Conference Center, Buffalo, New York. Contact: Barbara P. Buttenfield (Initiative Leader), Catherine Dibble (Graduate Rapporteur), National Center for Geographic Information and Analysis, 301 Wilkeson, SUNY-Buffalo, Buffalo, New York 14261, e-mail: babs@geog.buffalo.edu, phone: (716) 645-3834 or 645-2545, fax: (716) 645-2329.

October 24-28: **Geoscience Information Society Annual Meeting.** Boston, Massachusetts. Contact: Connie Wick, GIS Vice-President, Kummel Library, Harvard University, 24 Oxford Street, Cambridge, MA 02138; phone: (617) 495-0791; fax: (617) 495-4711.

October 30 - November 1: **XI International Symposium on Computer Assisted Cartography (Auto-Carto-Eleven).** Minneapolis, Minnesota. Contact: Robert B. McMaster, University of Minnesota, phone: (612) 625-9883 or Marc P. Armstrong, University of Iowa, phone: (319) 335 -0153.

November 2-4: **GIS/LIS '93.** Minneapolis, Minnesota. Contact GIS/LIS '93, 5410 Grovenor Lane, Ste. 100, Bethesda, MD 20891-2122, phone: (301) 493-0200.

1994

June 5-8: **GIS in Business '94 Conference & Exposition.** San Francisco Hilton and Towers, San Francisco, California. Contact: GIS World, phone (303) 223-4848. □

NACIS news

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cartographic perspectives Back Issues

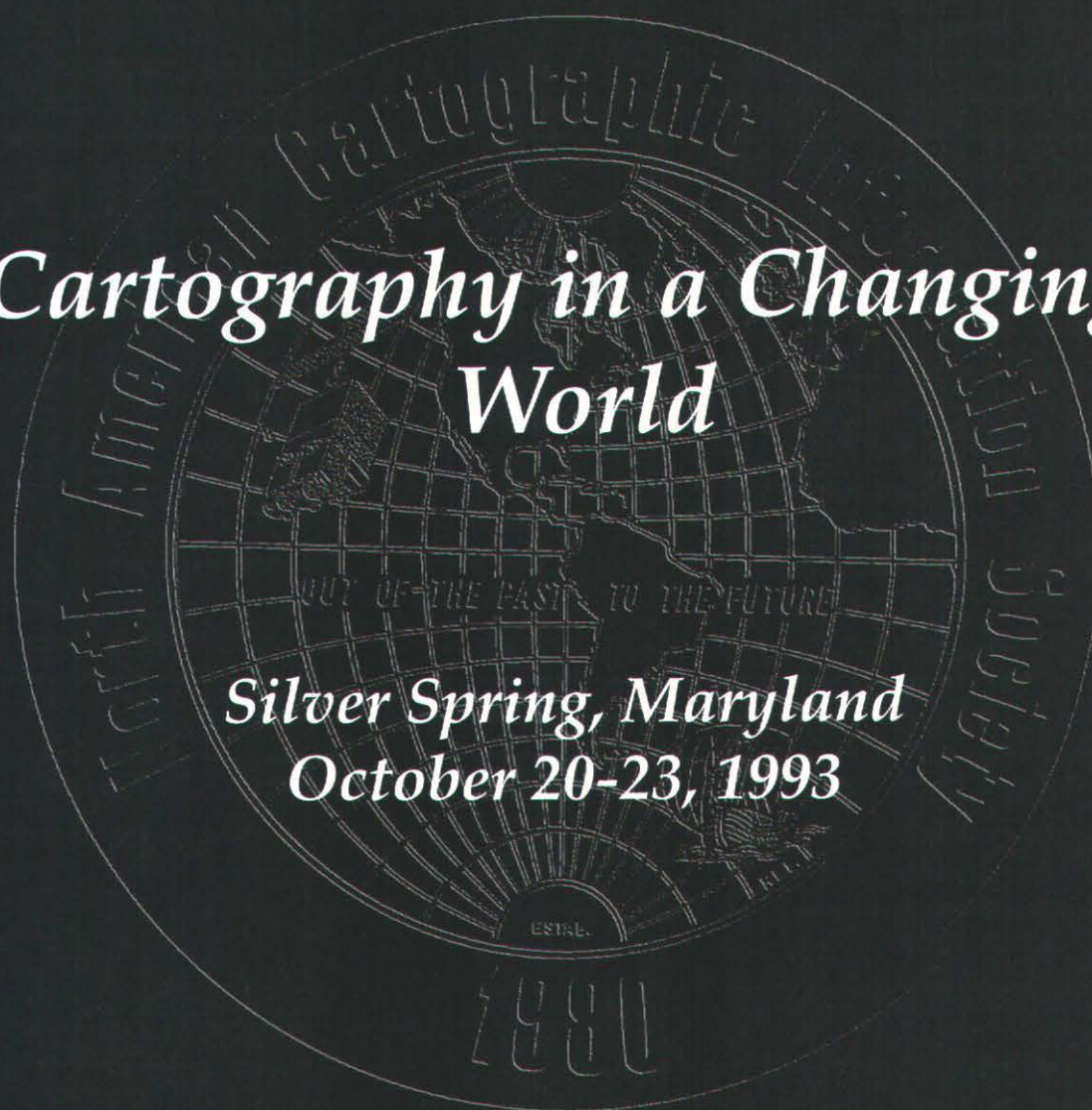
The first issue of Cartographic Perspectives was published in March 1989. Back issues (for all issues) are now available at a cost of \$10 per issue. Please specify the issue numbers (1-15) when ordering. Makes checks or purchase orders payable to NACIS and send your back issue requests to:

Edward Hall, Treasurer
410 McGilvrey Hall
Kent State University
Kent Ohio 44242-0001

NACIS XIII

*Cartography in a Changing
World*

*Silver Spring, Maryland
October 20-23, 1993*



PRELIMINARY PROGRAM

Wednesday, October 20

2:00 - 7:00 pm *Registration and Exhibits/Poster Setup*

2:00 - 7:30 pm *NACIS Board Meeting Opening Session*

Keynote Speaker:
Richard Furno
Washington Post

9:00 - 11:00 pm *Exhibits/Poster Session & Reception*

Organizer: Donna G. Schenström, Univ. of Wis.-Milwaukee, and Howard Danley, C & GS

Thursday, October 21

8:00 am - 7:00 pm *Registration*

8:30 am - Noon *Exhibits/Posters Open*

8:30 - 10:00 am *CONCURRENT SESSIONS*

SESSION A: Animation in Cartography
Orientation Biases and Animated Maps

Robert Lloyd and Rex Cammack
University of South Carolina
Conceptualization and Planning of Map Animations
Daniel Etter, GeoSystems and
Martin von Wyss,
Penn State University

Map Animation: The Dynamic Variables Extended
Alan M. MacEachren, Penn State University

SESSION B: Cartographic Serendipity

Differences in Epistemological Beliefs and Map Interpretation

Julio C. Rivera, University of Wisconsin-Milwaukee

Categorizing the Cartographic Representation of Time

Irina Vasiliev, SUNY College at Geneseo

Education in a Multi-Disciplinary Environment

Kit Foster, U.S. Geological Survey

10:00 - 10:30 am *BREAK*

10:30 - Noon *CONCURRENT SESSIONS*

SESSION C: Cartographic Data and Map Librarians

Evaluation of Programs for the Storage and Retrieval of Cartographic Data.

Lisa A. Recuperio, University of Missouri, Rolla

Outreach Programs for Map Librarians

Andrew Johnson, Free Library of Philadelphia

SESSION D: Electronic Chart Display & Information Systems

Opening Remarks

Captain Leo J. Black, U.S. Coast Guard

History of ECDIS and International Scope

Mortimer Rogoff, Radio Technical Commission for Maritime Services

U.S. Coast Guard and ECDIS

Lee Alexander, U.S. Coast Guard

U.S. Corps of Engineers and ECDIS

Tony Niles, U.S. Corps of Engineers

Legal Aspects and GIS Applications

Fred Ganjon, Coast & Geodetic Survey

Noon - 1:00pm *LUNCH*

1:15 - 5:00pm *TOURS*

- NOAA/Coast & Geodetic Survey/Aeronautical Charting Division
- National Geographic Society
- National Archives

ANNUAL BANQUET

6:30 - 10:00 pm

Speaker: Dr. William B. Wood
The Geographer
Department of State

Friday, October 22

8:00am - Noon *Registration*

8:30am - Noon *Exhibits/Posters Open*

8:30 - 10:00am *CONCURRENT SESSIONS*

SESSION E: Cartographic Collage

A Decade of Transition for Academic Cartographic Facilities

Claudia James and Joseph Stoll,
University of Akron

How Practical are Minimum-Error Map Projections?

John P. Snyder, U.S. Geological Survey (ret.)

Cartography's Response to Changing Needs

Grady B. Meehan, George Mason University

SESSION F: Computer Cartography 1

The Digital Base Map: Automating Cartographic Data for a GIS User Community

Margit L. Crowell, Southwest Florida Water Management District

The Cartographic Challenges of Air Traffic Control Graphics for the Advanced Automation System

Ronald M. Bolton, NOAA/Coast & Geodetic Survey

Automated Terrain Shading for Microcomputer-Based Cartography: A Report

James L. Sloan II, Penn State University

10:00 - 10:30 am *BREAK*

10:30 - Noon

SESSION G: Panel Discussion on the Map Librarian's Challenge with Service and Digital Data

Organizers: Jim Minton, University of Tennessee
John Sutherland, University of Georgia

Noon - 2:00 pm **LUNCH & ANNUAL BUSINESS MEETING**

2:00 - 3:30 pm *Exhibits/Posters Open*

2:00 - 3:30 pm **CONCURRENT SESSIONS**

SESSION H: Computer Cartography 2

Congressional District Atlas: Production of a Digital Map Image

Connie Beard, U.S. Bureau of the Census

Automated Scaling and Insetting: A Conceptual Approach

Gregory Yapundich, U.S. Bureau of the Census

Visualizing the Health of Chesapeake Bay; Constructing an Interactive Interface

David Howard and Alan M. MacEachren, Penn State University

SESSION I: Historical Cartographic Perspectives

Power and Maps: A New Interpretation of the Maps in "The Gazetteer of Jiankang Prefecture" (1261 A.D.)

Bangbo Hu, University of Wisconsin-Milwaukee

Cartography in Colonial Mexico and Guatemala: Making Maps Amidst Cultural Change

Alex Tait, Equator Graphics

New Tools for the Study of Old Maps

David W. Tilton, University of Wisconsin-Milwaukee

4:00 - 6:00 pm *NACIS Board Meeting*

7:30 - 10:00 pm *Reception and Tour, Library of Congress, Geography and Map Division*

Saturday, October 23

8:30 - 1:00 pm FIELD TRIP - Ron Grim, Library of Congress

Bus trip to Mount Vernon, Virginia and lunch at Gadby's Tavern, Alexandria, Virginia

2:00 - 4:30pm Workshop "Separated at Birth? Caricaturing and Cartographic Generalization" - producing distinctive computer graphic representations

Henry W. Castner, Dept. of Geography, Queen's University

(Additional workshops may be offered)

7:30 - 10:30pm *Social (Hors d'oeuvres and Dancing)*

Hotel Accommodations

**Quality Hotel
Silver Spring, Maryland**

To make hotel reservations and receive a complimentary breakfast buffet with each night's stay, please contact the Quality Hotel at (301) 589-5200. It is important that you mention NACIS when you register.

Room Rates (not including 12% tax):
Single (1 Adult) - \$69.00
Double (2 Adults) - \$77.00

Each additional person - \$10.00

Reservations received after September 17, 1993 will be accepted on a "space available" basis.

For program and local arrangements information contact:

Charles Harrington,
NACIS Program Chair
10904 Kingstead Road
Damascus, MD 20872
(301) 443-8360

For registration information contact:

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P.O. Box 399
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FEATURED PAPERS

Each issue of *Cartographic Perspectives* includes featured papers, which are refereed articles reporting original work of interest to NACIS' diverse membership. Papers ranging from theoretical to applied topics are welcome. Prospective authors are encouraged to submit manuscripts to the Editor or to the Chairperson of the NACIS Editorial Board. Papers may also be solicited by the Editor from presenters at the annual meeting and from other sources. Ideas for special issues on a single topic are also encouraged. Papers should be prepared exclusively for publication in *CP*, with no major portion previously published elsewhere. All contributions will be reviewed by the Editorial Board, whose members will advise the Editor as to whether a manuscript is appropriate for publication. Final publication decisions rest with the Editor, who reserves the right to make editorial changes to ensure clarity and consistency of style.

REVIEWS

Book reviews, map reviews, and mapping software reviews are welcome. The Editor will solicit reviews for artifacts received from publishers. Prospective reviewers are also invited to contact the Editor directly.

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Literature cited should conform to the Chicago Manual of Style, 13th ed., University of Chicago Press, Chapter 16, style "B." Examples of the correct citation form appear in the feature articles of this issue. Authors of Featured Papers should submit four printed copies of their manuscript for review directly to Dr. Michael Peterson, Chair of the *CP* Editorial Board, Department of Geography, University of

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PostScript graphics generated with *Adobe Illustrator* or *Aldus FreeHand* for the Macintosh or *Corel Draw* for DOS computers are preferred, but generic PICT or TIFF format graphics files are usually compatible as well. Manually produced graphics should be no larger than 11 by 17 inches, designed for scanning at 600 dpi resolution (avoid fine-grained tint screens). Continuous-tone photographs will also be scanned.

Materials should be sent to: Dr. Sona Karentz Andrews, Editor- *Cartographic Perspectives*, Department of Geography, 3413 N. Downer Avenue, University of Wisconsin-Milwaukee, Milwaukee, WI 53211; (414) 229-4872, fax (414) 229-3981; e-mail: sona@csd4.csd.uwm.edu.

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The North American Cartographic Information Society (NACIS) was founded in 1980 in response to the need for a multidisciplinary organization to facilitate communication in the map information community. Principal objectives of NACIS are:

- § to promote communication, coordination, and cooperation among the producers, disseminators, curators, and users of cartographic information;
- § to support and coordinate activities with other professional organizations and institutions involved with cartographic information;
- § to improve the use of cartographic materials through education and to promote graphicacy;
- § to promote and coordinate the acquisition, preservation, and automated retrieval of all types of cartographic material;
- § to influence government policy on cartographic information.

NACIS is a professional society open to specialists from private, academic, and government organizations throughout North America. The society provides an opportunity for Map Makers, Map Keepers, Map Users, Map Educators, and Map Distributors to exchange ideas, coordinate activities, and improve map materials and map use. *Cartographic Perspectives*, the organization's Bulletin, provides a mechanism to facilitate timely dissemination of cartographic information to this diverse constituency. It includes solicited feature articles, synopses of articles appearing in obscure or non-cartographic publications, software reviews, news features, reports (conferences, map exhibits, new map series, government policy, new degree programs, etc.), and listings of published maps and atlases, new computer software, and software reviews.

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