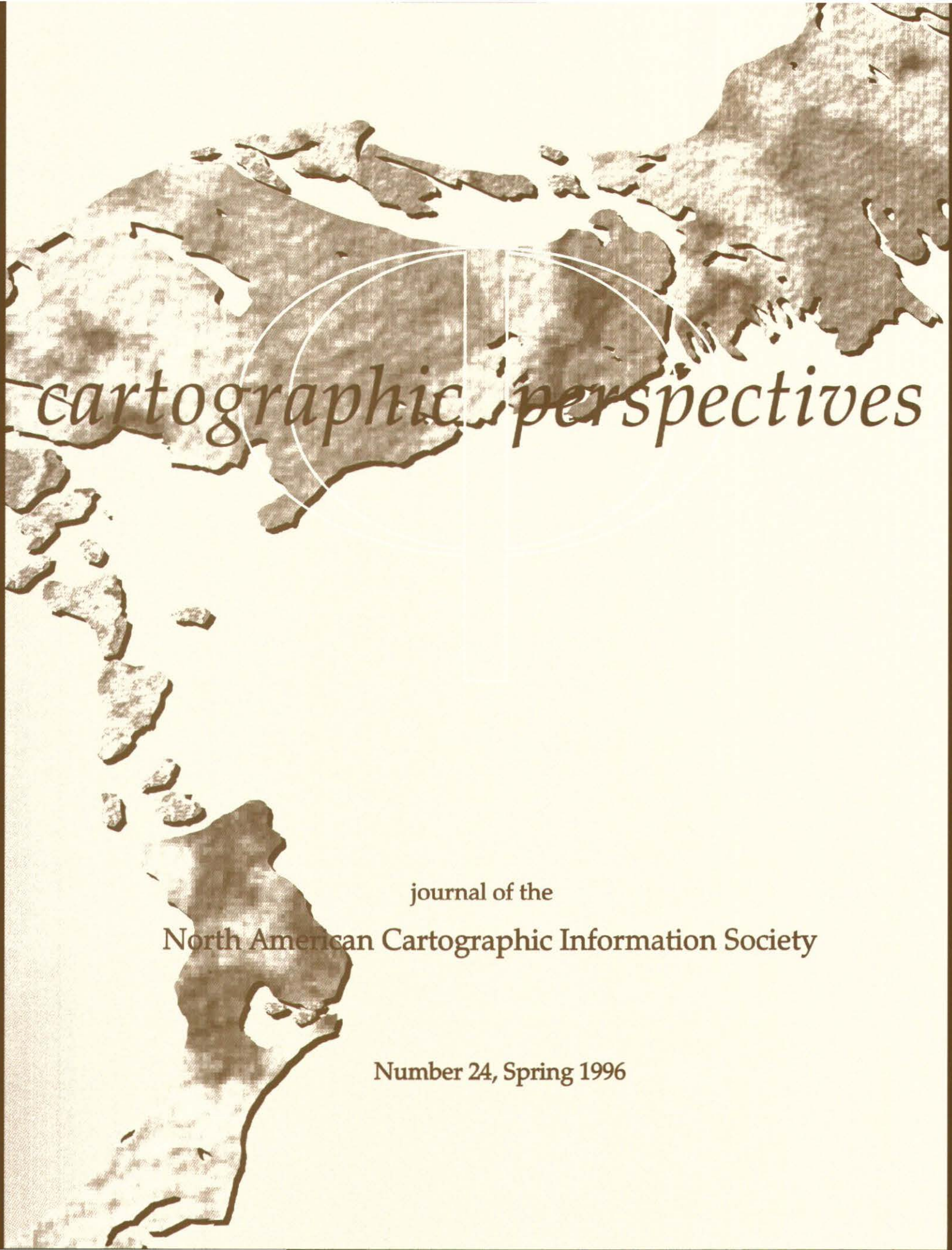

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in this issue

messages

MESSAGE FROM THE EDITOR

Why is it that we are always amazed at how fast time flies by? Projects and manuscripts that we said would be done by the end of the month, end of the semester, or end of the year often times are still on our TTD list (list of Things To Do) at the end of the month, end of the semester, or end of the year. And we find ourselves often saying "Gee, I thought I would be done with this by now"—and we are generally disappointed that we have not finished the task.

Well, it has been almost a year since I notified the NACIS Board of Directors that I would be ending my term as Editor of *Cartographic Perspectives* with the Spring 1996 issue. And, as with many things, the time has flown by. But I must admit that I am a bit of disappointed that my job as editor is finally done. Don't get me wrong, there is a huge part of me that feels a sense of relief (and satisfaction) at completing my four year tenure as editor. But I cannot deny that part of me that looks back on this experience and acknowledges that I will truly miss it.

I have contemplated for some months now on what I would say in this, my final column. Would I make some profound statements

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or observations about the discipline of cartography? Would I be reflective? Would I try to predict the future? Would I pontificate my own views on the prosperity or demise of cartography, its relationship to GIS, or other topics?

I suppose I could. As editor of a journal you have almost total control over what eventually gets published. Who could stop me from writing anything? After all, I am the person who hands over to the printer the digital files for each issue and I am the one who gets to check the press proofs before the job is set to press. And anyway, this is my last issue—what can they do, fire me?

You will be relieved to know that I will not do any of the following. Instead I would like to thank all of the individuals who have made my job as editor of *Cartographic Perspectives* a rewarding and delightful experience.

As editor, I have had the privilege of receiving manuscripts from some of the brightest and creative minds in our field. Individuals who were willing to share their ideas and theories with their colleagues. Individuals who have worked hard to make cartography an interesting and lively discipline. Individuals who took the risk of subjecting their work to peer review and realized that getting ideas out there is an important means of ensuing that we have lively debates within the discipline.

I have also had the privilege of working with members of an Editorial Board who where committed to the same. They have spent their time reviewing manuscripts, writing, and taking responsibility for the Bulletin Board columns. Over the years, many of our NACIS members have served in this capacity. I would, however, like to extend a special thanks to three of them. One is Jim Anderson. Jim has been responsible for the Cartography Lab Bulletin Board column in *Cartographic Perspectives* ever since I have been editor. He has worked hard to ensure that the bulletin board was present in every issue and that it contained information of interest to our readers. Not only that, but Jim consistently meet every deadline I gave him, even the most herculean ones.

Another individual deserving of great thanks is Michael Peterson. Michael has been chair of the NACIS Editorial Board (again for as long as I have been editor). The Editorial Board Chair is a thankless job. You do a lot of work but do not receive the recognition that others, like the editor, get. Michael has been a tremendous help in ensuring that the manuscript review process has moved along efficiently and that the Editorial Board functioned as it should.

The last person I wish to give special thanks to is David Tilton. When I first took on the editorship of *CP* I asked Dave if he was willing to help out as Assistant Editor. He agreed without really knowing what that would entail. I remember our first issue—neither one of us new a thing about desktop publishing and it was a miracle that the issue (ironically #13) ever made it to the printer. Over the years we have had our share of trying to figure out how to handle incompatible file formats or deciding what to do when we get a call from the printer saying that the job is on press "but there seems to be a little problem with . . ." Through all of it, Dave has always been of great help and willing to spend what ever time it has taken to get the issue out (and usually out on time!).

In closing, I would like to thank NACIS for the opportunity given to me to be such a part of what goes on in our discipline. I wish my predecessor as much enjoyment as I have had in being able to see the best our discipline has to offer and for the fun I have had as *CP* Editor. Thanks.

Sona Karentz Andrews
Editor, CP

about the cover

The cover was produced & designed by Daniel Weber, a graduate student in Geography at the University of Wisconsin-Milwaukee. The map is a portion of western Providenciales, North Caicos, and Middle Caicos in the Turks & Caicos. It was digitized using AtlasGIS and then imported into CorelDRAW! where it was resized, rotated, and skewed to its present view. The islands were given a texture fill using Rock-Fractal-Cracked 2C of texture # 19702 with a density of one and a light intensity of 40%. The map is oriented with Northeast approximately at the top of the page.

Maps, Text, and Seventh-Graders: A Study of Spatial Learning

The research reported here examines the effectiveness of maps in geography text for seventh grade students by asking them to study either the text alone or the text with maps and then answer questions about the material. We also investigate the influences on students' performance of gender, time of testing (immediate or delayed), and kind of knowledge required (memorization versus inference). Results reveal a consistent advantage associated with the presence of maps but not at levels which are statistically significant. Other findings include a slight advantage of females over males (again, not significant), the fact that inference questions are more difficult to answer than those requiring simple memorization, and (not surprisingly) that students' performance declines over time. We offer possible explanations for our findings, including some related to the research design and the fact that our subjects were seventh-graders.

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INTRODUCTION

For more than two decades now, researchers in various disciplines have explored the relationship between text and accompanying illustrations. For cartographers, a better understanding of the interaction between text and maps offers theoretical insights into spatial communication processes, in general, and also may suggest ways of improving the design of maps embedded in text. Although considerable attention has been focused on the topic of maps and text, there are still many aspects of the issue which are not well understood due to differences among previous studies in methodologies, tasks, and subject groups.

The study reported here contributes to the overall fund of knowledge about maps and text by investigating whether a specific subset of map readers, seventh-grade students, are able to use maps to enhance learning from textbook-style geographical descriptions. In the study we examined the effects of four variables: 1) the presence or absence of maps in a geographical text; 2) the kinds of knowledge acquired by the subjects (simple memorization or the ability to make inferences from the learned material); 3) the sex of the subjects; and 4) how well the learned material is retained in memory after a week's time.

Maps are a common feature of social studies textbooks. For example, one survey found 993 maps in 26 social studies textbooks for children in kindergarten through eighth grade, with the majority of the maps provided at the fourth grade and higher (Young 1994a, 16-19). If one looks more specifically at geography and history texts at the secondary school level, the number of maps per textbook is even higher: an average of about 70 in each of the eight texts reviewed by Young (1994b, Figure 7). Given the additional production and printing costs associated with including maps in textbooks, publishers and authors must believe that those maps serve some useful purpose. The advantages attributed to illustrations are numerous, including helping to organize the textual material, decorating or enlivening the pages of text, engaging the reader's attention, enhancing retention of the material, and augmenting verbal

explanations by presenting material in a different (graphic) mode (Duchastel 1978, Gilmartin 1982, Kulhavy et al. 1993, Levie and Lentz 1982, Willows and Houghton 1987). Stock et al. (1995) state unequivocally that, " . . . people who study maps recall more facts than people who study unstructured arrays of landmarks, lists of landmark labels and/or icons, of [sic] fact texts alone . . . [P]eople who reproduce maps accurately recall more facts than people who don't . . ." (238).

On the other hand, some authors have found that maps either have no effect (Davis 1971) or may actually hinder learning from text by focusing readers' attention on map- related information at the expense of non-map-related text (Scevak et al. 1993,402). And Young has argued that maps in children's social studies texts, in general, are undervalued and fail to promote learning (1994b). Thus, although a fair amount of effort has been devoted to understanding the relationship between maps and text, there is still a great deal to be learned about the subject.

REVIEW OF RELATED RESEARCH[1]

Empirical studies aimed at measuring how the presence of maps in texts affects the information gathered by readers span almost thirty years. In one of the earliest such reports, Davis and Hunkins (1968) concluded initially that the presence of a map along with text did help junior high school students learn the geography of India. Davis later recanted that conclusion, however, after re-analyzing the data using the "more powerful" analysis of covariance instead of the univariate statistics originally employed (1971). The revised analysis, which controlled for differences in subjects' IQ and reading achievement scores, showed that students who were given both a map and text to study scored no higher on subsequent tests than students who had read the unillustrated text alone.

In contrast to Davis' conclusions, Gilmartin (1982) found a clear advantage for the use of maps with text in both immediate and delayed test conditions. The author asked college students to study either an unillustrated geography narrative, the same narrative with maps, or the narrative with maps and captions. The students were tested on their knowledge of the geographic material both immediately after having studied it and again a week later; in both cases those who read text with maps achieved significantly higher scores than students whose text contained no maps. In addition, Gilmartin found differences in the performance of men and women. Based on reading text without maps, men scored significantly higher than women; when maps were present, however, scores for women and men were almost identical.

More recent research with high school students has highlighted the importance of map use instruction . . .

More recent research with high school students has highlighted the importance of map use instruction in enhancing the effectiveness of maps in text (Scevak, Moore, and Kirby 1993). After having received thorough training in using maps strategically as text organizers, students scored significantly higher on recall tests of textual material than subjects in a control group which received no such training.

In addition to the studies cited above, an extensive series of experiments involving maps and text has been conducted by psychologist Raymond Kulhavy and his associates. (For a cumulative review of this set

1. Numerous studies have been conducted to investigate the effect of non-cartographic illustrations, such as photographs, diagrams, and pictorial drawings, with text. Because maps are unique in symbolizing geographic relationships among phenomena - whereas these other kinds of illustrations are not primarily spatial representations - the relevance of such studies to the present one is limited and, thus, they will not be reviewed here. (However, see reviews of such articles by Samuels (1970), Levie (1987), Levie and Lentz (1982), Willows and Houghton (1987).)

of research, see Kulhavy et al. 1993.) These researchers, whose primary purpose is to investigate cognitive theories of how people encode and recall information, have concluded that a robust facilitative relationship exists between maps and text. Unfortunately, however, although Kulhavy's investigations have contributed significantly to our theoretical understanding of the interaction between maps and text, the practical relevance of the studies for geographers and cartographers is limited by certain characteristics of the experimental designs. First, in most instances, the tasks required of participants in the studies involve no explicitly spatial (geographic) learning. Rather, learning is usually measured either by counting how many events, activities, or adjectives subjects can free-recall from a text or by sentence completions involving recalling names of features, landmarks, objects, and the like. (For example see Kulhavy et al. 1985, Kulhavy et al. 1992, Peterson et al. 1991, and Schwartz and Kulhavy 1981). Even in the infrequent research design in which some spatial information is obtained, it is not the focus of analysis. For example, in a study by Kulhavy et al. (1993), which was published in a cartographic journal, the researchers measured subjects' cognizance of the map's spatial structure but used that measure as an independent variable to analyze recall of facts ("current and historical events" [153]) presented in the text. The authors found that ". . . the better people encode the structural characteristics of the map, the higher the probability of recalling text facts extrinsic to the map" (155) (our emphasis).

. . . the practical relevance of the studies for geographers and cartographers is limited by certain characteristics of the experimental designs,

Second, in many of their experiments the authors first provided a map to their subjects to study and then read a narrative to them– sometimes with and sometimes without the map still being present. (For example see Amlund and Kulhavy 1985; Kulhavy et al. 1985, Kulhavy et al. 1992, Peterson et al. 1991). While this procedure is appropriate in the context of the authors' main purpose–to investigate theoretical models of encoding and memory operations–it is not necessarily the best procedure to evaluate the pedagogical value of maps in a textbook or article. In actual application, such text is read much more often than heard, and the map is present continuously on the page; readers may peruse it before, during, or after reading the text or not at all.

The investigations of Kulhavy and his colleagues are valuable for having demonstrated that people's cognitive processing of maps and text supports Paivio's dual-coding model of cognition (Clark and Paivio 1991, Kulhavy et al. 1993, Paivio 1986). Dual coding theories assume, in general, that verbal material (text) and visual images (maps) are encoded and stored in memory in functionally distinct codes which can operate independently as needed. The theories assume, further, that there are associative connections between the verbal and nonverbal units, so that they are not limited to independent operations. Activation of one code may also invoke the other if relevant information exists in both stores. This model of cognitive functions provides a theoretical explanation for how maps in text might help readers learn and remember the textual material: the ability to encode and store information in either of two distinct modes, based on which mode is more appropriate for the kind of data involved, is more effective than encoding all data, regardless of their properties, in a single mode (Kulhavy et al. 1993, Paivio 1986).

The dual coding hypothesis would argue against one explanation that has been offered to explain any facilitative relationship between maps and text: that it is the repetition of material, rather than any unique advantage offered by maps, which results in increased learning. That is to say, subjects have two learning opportunities when they encounter the same material in both text and maps, compared to only one opportunity when

they simply read or hear text. Thus, perhaps the same improvements could be achieved without maps if the verbal material were presented to subjects more than once. The few researchers who addressed this possibility in their studies reported that the combination of prose and illustrations was more effective than two presentations of the verbal material (Kulhavy et al. 1985, Levin et al. 1976, Purnell and Solomon 1991, Schwartz and Kulhavy 1981). Nevertheless, because of differences in methods and goals between the study reported here and those studies cited above, we chose to offset any possible disadvantage created by a single text presentation by balancing the presence of maps in text with extra repetitions of the relevant material in the text without maps.

In spite of the numerous studies involving maps and text which Kulhavy and other psychologists have conducted, many issues remain unresolved for cartographers, geographers, and educators, for whom students' acquisition of spatial knowledge is of considerable interest. The following study was designed to address some of those questions.

RESEARCH METHODS AND MATERIALS

The purpose of this study was to determine what effect, if any, the inclusion of maps in text has on seventh graders' learning. We also looked for any influence due to time of testing (immediate versus delayed), gender, and kind of learning (memorization versus inference), resulting in a 2 (maps present/absent) X 2 (time of testing) X 2 (gender) X 2 (question type) design.

Subjects. Subjects in the experiment were 123 seventh grade students, 60 males and 63 females, enrolled in a public school in Columbia, South Carolina. Average age for the group was 12.7 years. Previous research has shown that children of this age and much younger are able to comprehend basic reference and thematic maps (Boardman 1990, Kulhavy et al. 1985, Trifonoff 1995). Seventh graders at this school are required to enroll in a World Geography class; in addition, about 90% of the subjects reported that they had received map-reading instruction as part of their normal schooling. Thus, the subjects were quite familiar with the type of material used in this study, which was administered late in the school year. The tests were given to students during their regular World Geography classes, resulting in six groups of about twenty each administered at various times throughout the day. The six classes were later collapsed into two experimental groups based on whether they had been given text and maps to study (referred to hereafter as Group A) or only text (Group B).

Previous research has shown that children of this age and much younger are able to comprehend basic reference and thematic maps.

Materials. Material for the experiment consisted of geography texts, five maps, a set of questions with an answer form, and a questionnaire requesting demographic information. All were composed and revised in collaboration with the seventh grade geography teachers who cooperated in the study; they approved all material before it was used. In addition, we conducted a pre-test with nine students (who did not participate in the final research) in order to establish reasonable time limits for tasks and to verify that the test materials and instructions were clear and appropriate for seventh grade students.

The text described the regional geography of an imaginary island-country, Grand Isle. Topics included climate, topography, economy, landuse, and descriptions of important cultural and physical features such as cities, rivers, mountains, and the like. For the reasons discussed earlier, the basic text was modified for the non-map group so that each fact about which they would be questioned appeared twice within the narrative, versus once for the subjects whose text included maps.

The maps were simple black and white reference and thematic maps (see Figure 1) whose subject matter reflected the content of the text. The

maps were about 9 cm square and were placed as close to the relevant text as possible (always on the same page). References within the text prompted subjects to refer to the appropriate maps.

Text and maps or text alone were compiled into test booklets, on the covers of which were printed instructions outlining the procedures and time limits for the experiment. Instructions for subjects who received the text with maps included specific directions to study the maps as well as the narrative.

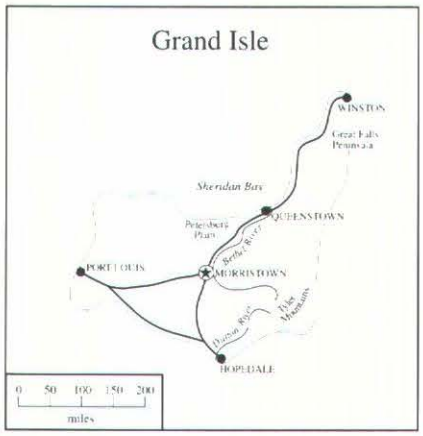
Questions about Grand Isle were of three different types: non-spatial, spatial-memory, and spatial-inference. Three questions referencing non-spatial information in the text were included so that we could compare the overall reading comprehension of subjects in the two experimental conditions (maps-no maps). That is, we wanted to be sure that any significant differences found in subjects' performance on spatial questions would not be confounded by differences in basic reading comprehension between Groups A and B. Spatial-memory questions, of which there were six, referred to spatial locations or relationships specifically described in the text (and depicted on maps for Group A). The six spatial-inference questions addressed spatial information not stated directly but which could be inferred from the information provided. All questions were of the multiple choice format. Examples of the three types are:

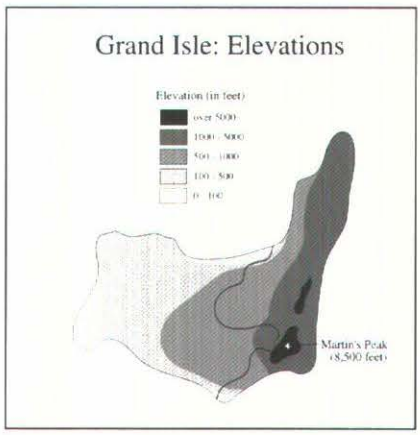
Sample non-spatial question:
What percent of the population of Grand Isle lives in urban areas?

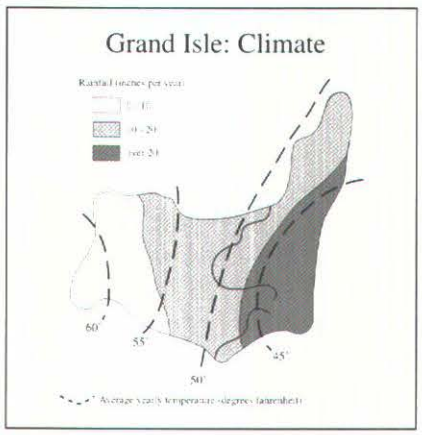
Sample spatial-memory question:
Which city is located on Sheridan Bay?

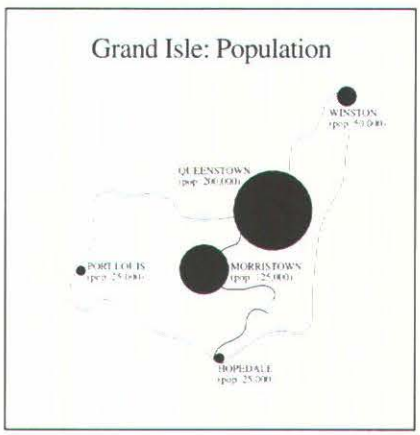
Sample spatial-inference questions:
What type of land-use is found along the Bethel River?

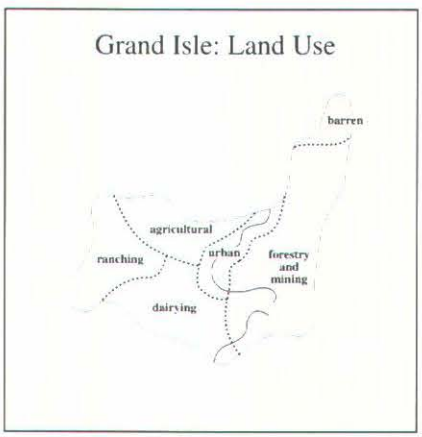
Figure 1. The five maps used in the study (reproduced here at 60% of original size).











Procedures. A general introduction and description of the project were read to the participants, and they were then asked to fill out a questionnaire asking for their age, sex, and some information about their map-use experience. When those forms were completed, they were given a test booklet containing either maps and text or text only about Grand Isle. The written instructions appearing on the cover of the booklet were read aloud to the students and they were given an opportunity to ask questions about anything they did not understand. When instructed to do so, students opened the booklets and were given 15 minutes to study the material, after which all reading material was collected and question and answer sheets were distributed. Participants had five minutes to answer the 15 multiple choice questions.

In order to assess any effects of maps on memory for spatial information, the same experiment was repeated using the same procedures and subjects one week later. Seven students were absent at the time of the re-test, resulting in 116 responses (56 from males and 60 from females) for that part of the study.

ANALYSES AND RESULTS

Answers to all questions were scored manually, with one point given for correct and zero points for incorrect answers. These data were then entered into the SAS statistical analysis package for further summaries and analyses.

Univariate statistics were calculated and the means used in Tukey's method of "outer fences" to identify and eliminate "extreme" values in the data set (Tukey 1977). These are individual scores that lie so far away from the mean for the group (i.e., beyond Tukey's outer fences) that their inclusion in the overall analysis might skew the results. This procedure eliminated five subjects, leaving 118 in the first test and 111 for the re- test.

Next, in order to determine whether Groups A (text and maps) and B (text only) represented the same population in terms of basic reading ability for the narrative used in the study, we compared the scores for the two groups on the non-spatial questions. The mean percent correct for Group A was 48.6 percent and for Group B, 53.2 percent, a difference which was not statistically significant ($Pr > F = 0.3348$). Thus we could then proceed to analyze the scores for the spatial questions.

Univariate statistics and analyses of variance (ANOVA) were calculated for the 2 (text/map condition) X 2 (spatial question type) X 2 (gender) X 2 (time of test) data model. A repeated measures analysis of variance was used to compare scores in the immediate versus delayed test condition.

Table 1 summarizes the mean percent correct for all independent variables in the study. As is evident from this table, in general, Group A scored higher than Group B, females performed better than males, inference questions were more difficult to answer than memory questions, and (not surprisingly) scores were lower on the delayed test. The only exception to this pattern is for gender on inference questions in the delayed test for Group B, where males scored just slightly higher than females: 21.1 percent correct compared to 19.9 percent.

Although there are clear overall patterns in the scores, as summarized in Table 1 and noted in the preceding paragraph, few of the

Table 1. Mean percent correct for all variables in the study.

		Immediate Test			Delayed Test		
Group	QT	Male	Female	Mean	Male	Female	Mean
A	Memory	40.0	43.0	41.5	34.5	38.9	36.7
	Inference	37.8	40.3	39.1	27.0	30.6	28.8
	Mean	38.9	41.7	40.3	30.7	34.7	32.7
B	Memory	37.4	38.1	37.7	34.0	36.5	35.3
	Inference	27.0	29.2	28.1	21.1	19.9	20.5
	Mean	32.2	33.6	32.9	27.6	28.2	27.9

differences reached the Pr > F =.05 level of statistical significance, either for main effects or for interactions. Table 2 shows the ANOVA results for the immediate and delayed tests. Only one main effect was significant: the higher scores for memory questions (36.0 percent) compared to inference questions (24.6 percent) on the delayed test.

The repeated measures ANOVA, comparing the scores for the same subjects between the immediate and delayed tests, reveals that only the main effect was significant (36.6 percent on the immediate test vs. 30.3 percent on the delayed test). (See Table 3.) Somewhat surprisingly, the interaction between question type and time of test did not reach the probability criterion of 0.05.

To summarize the results of this study, the only significant differences found were in the scores for the delayed test, which were lower than on the immediate test, and for the question-type in the delayed test, where students answered memory questions more accurately than inference questions. The other differences in scores (Group A higher than Group B, females outscoring males, and memory questions answered more correctly, overall, than inference questions) did not reach significance at alpha = 0.05, probably because of the amount of variation in the data, even though five extreme observations were omitted from the analysis.

DISCUSSION OF RESULTS

Certain results of the study were quite predictable. It is logical that scores would decline on the re-test, administered a week after the students had read the text. We also anticipated that scores would be lower for inference questions than for memory questions, simply because inference requires reasoning and more depth of understanding. We were more uncertain about what to expect from gender

Source			Immediate Test Mean	Immediate Test Pr > F	Delayed Test Mean	Delayed Test Pr > F
Group		A	40.3		32.7	
				0.1547		0.2458
		B	32.9		27.9	
Gender		M	35.5		29.2	
				0.6798		0.5782
		F	37.6		31.5	
Question		Mem	39.6		36.0	
				0.2411		0.0089 *
		Inf	33.6		24.6	
Group	A	M	38.9		30.7	
		F	41.7		34.7	
x				0.8965		0.6877
Gender	B	M	32.2		27.6	
		F	33.6		28.2	
Group	A	Mem	41.5		36.7	
		Inf	39.1		28.8	
x				0.4839		0.4110
Question	B	Mem	37.7		35.3	
		Inf	28.1		20.5	
Gender	M	Mem	38.7		34.2	
		Inf	32.4		24.1	
x				0.9629		0.7764
Question	F	Mem	40.6		37.7	
		Inf	34.7		25.2	

Table 2. Results of ANOVA for main effects and two-way interactions for immediate and delayed tests.

source	Pr > F
time	0.0059 *
time x group	0.5633
time x gender	0.9641
time x question type	0.2295

Table 3. Results of repeated measures ANOVA for immediate and delayed tests.

because the results of related studies have been so ambiguous, if not downright contradictory. The fact that females in this study scored somewhat higher than males in every category except one (but not significantly so) is interesting and suggestive but not a basis from which to draw clear conclusions. Such results may say as much about differences in the seriousness with which females and males approached the task as about their abilities to learn spatial information from maps and texts.

. . . what we were really most interested in was the effect on spatial learning–and any interactions with the other independent variables–of maps embedded in a regional geography text, compared to an unillustrated text.

But what we were really most interested in was the effect on spatial learning–and any interactions with the other independent variables–of maps embedded in a regional geography text, compared to an unillustrated text. Based on the statistical analyses of the results, we must conclude that there is no effect. Nevertheless, it is difficult to ignore the 7.4 and 4.8 point advantage, overall, for Group A on the immediate and delayed tests, respectively, and the much better performance on inference questions when maps were present (34 percent) than when they were not (24.3 percent). Although these differences were not large enough to be statistically significant, they do represent a pattern of better performance with maps which holds across all interactions with question type, sex, and time of test. It seems unlikely that such a consistent pattern occurred by chance.

Recall, also, that for the purposes of this experiment, the unillustrated text was composed so that the information on which the subjects would be tested appeared twice within the text. This technique would not be a practical alternative in actual textbooks, however, because it would double the length of the book and be very tedious for students to read. Differences between Groups A and B probably would have been greater if this procedure had not been followed (i.e., if the information had been presented only once rather than twice in the text). As noted earlier in this paper, several researchers have found in studies designed to address the issue directly that the inclusion of maps with a narrative is more effective than repetitions of text alone. Our findings are consistent with their conclusions, differing only in degree (significance), not in direction.

Further comparisons between the results of this study and those of other researchers are difficult. As discussed earlier, the experiments by Kulhavy and his associates (1993) measured primarily non-spatial learning and used quite different methodologies than were used here. Gilmartin's methodology was similar, but her subjects were university students and the non-illustrated text did not contain redundant information. Scevak et al. (1993) used 11th graders as subjects but gave them extensive instruction on how to use maps strategically to organize text, resulting in subjects' higher learning from text with maps. The early research by Davis and Hunkins (1968) and Davis (1971) is probably the most closely comparable to this study: the subjects were junior high school students, the experimental design was similar except for the redundancy built into the text for this study, and those researchers, too, found no significant differences in subjects' scores based on reading text with maps versus text alone.

. . . it seems certain that junior high students are capable of comprehending maps such as those used in this study.

In light of previous research related to children's map-reading abilities, it seems certain that junior high students are capable of comprehending maps such as those used in this study. Yet, as was the case with Davis' (1971) junior high students, they did not use them to their greatest advantage in studying a geographic text, at least not to levels of statistical significance. Perhaps students at this grade level need further instruction and/or prompting to take advantage of maps' capacity to communicate spatial material efficiently. And, as Kulhavy and his associates have shown, maps can enhance the learning of non-spatial information in text also.

Although the participants were told explicitly to attend to the maps, there is no way to know how many actually did. It is the opinion of the first author, who administered the experiment, that a number of students were quite disinterested in the task and were not really trying to learn the material. Perhaps this problem could be ameliorated in future research by testing students individually or in small groups or by offering an incentive for high scores. Such measures might also reduce the variation in responses and make results such as we found here statistically significant.

Geographers, psychologists, and educators all have an interest in understanding the pedagogic relationship between illustrations and text. Most prior research indicates that the presence of maps enhances learning from text, and our findings were consistent with that generalization but not at statistically significant levels. We have suggested some factors that may have affected our results, but further research will be needed to investigate those ideas. In the meantime, based on our experience and on evidence from other studies, it seems likely that one effective way to increase students' learning from maps and text is simply to teach them that maps are tools which can help them understand and recall spatial locations and relationships.

. . . one effective way to increase students' learning from maps and text is simply to teach them that maps are tools which can help them understand and recall spatial locations and relationships.

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❑

Copyright and Cartographic Multimedia

Maps are just one of many resources used in multimedia by cartographers. Increasingly complex copyright issues are developing around single media and their compilation in multimedia productions. This paper describes US copyright law and practices as they apply to multimedia works. The paper is directed to cartographers working in multimedia, and therefore, cuts a narrow path through the vast array of issues and information on this subject. It introduces legitimate ways to use copyrighted resources, as well as the process of copyrighting one's own work and includes recognition of ambiguities inherent in copyright law applied to any creative work.

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INTRODUCTION

Multimedia is "the combined use of various media such as text, graphics, photos, video and sound in computer presentation and/or stand alone application" (Andrews and Tilton 1993, 349). Conventional copyright practices pertaining to standard media, including maps, apply to multimedia because multimedia involves the combined use of conventional media, albeit in wide variety and great volume.

Multimedia has been used by cartographers as a vehicle for visualization of environmental problems such as urban air pollution (Koussoulakou 1994); as a research tool/archive of historical American Indian maps (Andrews 1994); and in the classroom for geography education (Krygier et al. 1995). It has also been used as a tool for representing a geographic region as in *ExplOregon* (Loy and Searl 1995) and to facilitate collaboration in public land-use meetings for "what-if" scenarios (Shiffer 1993). Cartographers have also made multimedia map contributions to commercial products such as multimedia encyclopedias (see DiBiase 1994).

Cartographers developing multimedia work need some understanding of copyright issues. The issues discussed in this paper are organized into four sections: an introduction to copyright law; information for copyright compliance; new copyright issues as highlighted by ambiguities inherent in new expressions of creativity, i.e., multimedia works, and questions of copyright relevance. Readers should note that the information presented here pertains to United States copyright laws only and that there is considerable international variation in copyright practices and laws.

COPYRIGHT LAW, TERMS, AND PRACTICES[1]

US copyright law first was enacted in 1790 under authority granted in Article I of the Constitution. The first version of copyright law applied to printed matter—books, maps, and charts. Elaborations on copyright have entered the law books at an increasing pace over time as attempts are made to account for emerging tangible forms of expression beyond

1. Information about copyright compliance including topical circulars and forms is available from the Copyright Office on the World Wide Web at http://lcweb.loc.gov/copyright/. A web site that provides links to federal government information resources, including the Library of Congress, and also provides links to directories of intellectual property attorneys is http://www1.backboard.com/legal.html. Http://www.ilt.columbia.edu/projects/copyright/index.html includes links to Lexis/Nexis and Westlaw on-line services. Topics at the site are still under development, but promise to incorporate multimedia examples. Http://www.benedict. com, "The Copyright Website," covers copyright thoroughly, and includes as one topic, "Bleeding Edge: Internet Issues."

Selected Changes in Copyright Law

1831	Music added to protected works
1865	Photographs added to protected works
1870	Registration centralized in the Library of Congress
1909	General revision of the copyright law, including coverage of some unpublished works
1912	Motion pictures, previously registered as photographs, added as a separate class of protected works
1947	Copyright law entered as US Code Title 17
1953	Recording and performing rights extended to nondramatic literary works
1972	Limited copyright protection extended to sound recordings
1976	General revision of the copyright law. Revisions effective in 1978. This Act attempted to cover ongoing technology developments
1988	Law explicitly includes idea from the courts (begun in the 1950s) that copyright pertains to expression of ideas, not ideas themselves
1980s	Escalating number of amendments and revisions to copyright law, dealing with issues including piracy and counterfeiting, rent and lease of sound recordings, TV and satellite transmission
1992	The *Audio Home Recording Act of 1992* exempts video and audio recording for private use from copyright infringement

Figure 1: Selected Changes in Copyright Law (Library of Congress 1977, 1993a).

printed matter. A selected series of changes in the law, recognizing emerging forms of creative works relevant to multimedia production as content, is shown in Figure 1. The formalization in copyright law often lags behind artistic practice. Photography, for example, was invented in the 1820s, was in commercial use by about 1840, but wasn't incorporated in copyright law until 1865.

Copyright is the exclusive right to publish, reproduce and distribute copies, prepare derivatives, perform or display publicly, sell or license, control or disseminate a literary or artistic work (Figure 2). Copyright applies to the expression or representation of an idea, not the idea itself. A patent is granted for an invention or discovery of a new and useful process or machine, and pertains to a device embodying a new idea (Black 1990; Mellinkoff 1992).[2] Copyright law, as opposed to patent law, applies to multimedia works since the components of a new work (text, graphics, photos, video, sound) are governed by copyright law, and since the kind of multimedia product under discussion here is an artifact of ideas suitable for publication rather than a device or process that would be patented.

In examining traditional cartographic interests, copyrights are more common than patents. A map produced by a non-government organization or individual is copyrighted under United States law.[3] Some or all of the underlying information may be public, but the unique representation can be copyrighted. It should be noted that patents are not unrepresented in cartography—projections, because they are mathematical

2. Both copyrights and patents, plus trade secrets, are encompassed by intellectual property, "a catchall label for property that is recognized in works of the mind" (Mellinkoff 1992, 320–321).

3. Data and documents produced by the US Government are in the public domain and are not copyrightable.

designs are patented (Snyder 1993) and a patent was issued on Moellering and Kimerling's color slope-aspect display process applied to terrain modeling (Moellering and Kimerling 1990; Moellering and Kimerling 1994). Copyright, however, is the more prevalent issue.

Duration of copyright; ownership and transfer. The earliest copyright protection extended for 14 years with one 14-year renewal term. The duration of copyright has been revised numerous times and the term of a copyrighted work will vary depending on creation date, date first published, and/or date registered. Works created on or after January 1, 1978 are copyrighted from the time of creation through the life of the author plus 50 years. Whether registered formally or not, some copyright protection begins when a work is created in fixed form. The Copyright Office, part of the Library of Congress, registers claims to copyright, that is, makes them part of the public record. It does not "grant" or "issue" copyrights (Library of Congress 1992).

Initially, the author of a work holds the copyright. If the work is made by an employee, however, the employer owns the copyright (this differs for work performed by an independent contractor). In the academic venue, this may mean that the academic institution has rights to the work. If a publisher serves as intermediary to the marketplace, the author may be required to assign copyright to the publisher. Ownership of the copyright is separate from ownership of the material object (Brinson and Radcliffe 1994).

Public access. User rights are expressed in the law as limitations on the authors' rights. One example of user rights expressly allowed in the law is loan of copyrighted work for nonprofit purposes (Library of Congress 1993a).

A major hedge designed in the law to benefit the public is the doctrine of fair use. *Fair use* means that the work or copies of work can be used "for purposes such as criticism, comment, news reporting, teaching (including multiple copies for classroom use), scholarship, or research" (*Copyrights*, 17 USCS §107 [1994]). Legitimate fair use is dependent on particular circumstances of an instance of use. Stowe (1995) argues that fair use rights are being eroded, and that academics should be principled yet aggressive in their exercise of fair use rights.

§ 102. Subject matter of copyright: In general

(a) Copyright protection subsists, in accordance with this title, in original works of authorship fixed in any tangible medium of expression, now known or later developed, from which they can be perceived, reproduced, or otherwise communicated, either directly or with the aid of a machine or device. Works of authorship include the following categories:

(1) literary works;
(2) musical works, including any accompanying words;
(3) dramatic works, including any accompanying music;
(4) pantomimes and choreographic works;
(5) pictorial, graphic, and sculptural works;
(6) motion pictures and other audiovisual works;
(7) sound recordings; and
(8) architectural works.

(b) In no case does copyright protection for an original work of authorship extend to any idea, procedure, process, system, method of operation, concept, principle, or discovery, regardless of the form in which it is described, explained, illustrated, or embodied in such work.

§ 103. Subject matter of copyright: Compilations and derivative works

a) The subject matter of copyright as specified by section 102 includes compilations and derivative works, but protection for a work employing preexisting material in which copyright subsists does not extend to any part of the work in which such material has been used unlawfully.

(b) The copyright in a compilation or derivative work extends only to the material contributed by the author of such work, as distinguished from the preexisting material employed in the work, and does not imply any exclusive right in the preexisting material. The copyright in such work is independent of, and does not affect or enlarge the scope, duration, ownership, or subsistence of, any copyright protection in the preexisting material.

Fair use is a fluid mix of the copyright owner's legal rights and economic interests (would the new use adversely affect the copyright holder's market?), the nature of the new use, and the relative amount of original work proposed for new use (there is no allowable smallest unit of copyright-free borrowing). Note, also, that *fair use* is not necessarily *free use*.

Author control; copyright registration process. Copyright law provides several benefits to an author. The registration process enables others to locate a copyright holder. The law also establishes author rights in the courts. The Copyright Office facilitates registration so that it is easier for others to locate authors and obtain permissions for use, but it is the courts that provide author protection.

An author's rights are protected even without visible notification on the work, but an obvious claim of authorship makes for a stronger claim in court.

An author's rights are protected even without visible notification on the work,[4] but an obvious claim of authorship makes for a stronger claim in court. Claims may be substantiated with visible notification and without formal registration but are more substantial if the work is registered with the Copyright Office. Registration is required before a claim can be filed in court (Brinson and Radcliffe 1994).

Copyright registration requires submitting a fee, registration form, and depository copies of the work. The registration fee currently is $20. Significantly more onerous than the fee is ascertaining, for mixed media creations, what portion of the work (and in what media) will be submitted as the depository copy.

COPYRIGHT LAW APPLIED TO MULTIMEDIA

Registering a multimedia work. The primary format of the multimedia work (such as a print, audiovisual product, phonorecord, or machine-readable copy) dictates the form of registration. One registration covers all copyrightable elements of a multimedia work so long as the person claiming copyright is the same for each element (Library of Congress 1992).

The last major revision to copyright law was written to accommodate future forms of creative products. The Copyright Office, however, currently cannot examine materials on all kinds of digital media. If the work is on CD-ROM it is submissable in that form. It is possible to submit work on videotape, supplemented by hard copy (Vankevich 1995). The prevailing stance is that the multimedia work must be converted into a "kit" of conventional components—scripts, outlines, photos, hard copy text, audiotape or audiodisk, and printed copy of computer-program source code. This would include components that have non-copyrightable parts such as materials obtained in the public domain or copyrighted materials used by permission. Where the work encompasses change—a part of work where the next displays are dependent on user action—a sample illustrative sequence of stills is submitted. One complete multimedia kit is deposited (Library of Congress 1992; Vankevich 1995).
For example, a short multimedia work including a modest assembly of media would be prepared for copyright registration as follows:

- *Background texture that is original art, used throughout the presentation* – submit color hard copy
- *Original text* – submit printed copy of each frame
- *Maps based on US Bureau of the Census and Department of Agriculture data* – include in registration kit, but explain on the registration form the source of the base map, and that the base data is in the public domain

- *Photos with implicit copyright, used with photographer's permission, combined in displays with original art and text* – include full image, explain on the registration form that photos are pre-existing material for which the author is not claiming copyright

- *Short routine written in Macromedia Director's scripting language, Lingo, to capture user comments input as text* – send printout of Lingo script

Some suggestions that could ease compliance with copyright registration of a multimedia work are provided below.

Source materials. From the outset in designing and assembling a multimedia work, if others' copyrighted material is included in the work, the author should keep source records. If the status of work under development changes from private to commercial, or the work is distributed (published according to the Copyright Office),[5] the author will need to review previously-obtained copyright permissions. Allowable uses and fees change as the work changes from private to commercial distribution. Clip art (commercially-available collections of graphic components intended for re-use), for instance, may include tiered permissions: the purchase price of a clip-art CD-ROM may grant personal use but use for distribution or profit as part of a multimedia work will require additional licensing and payment.

From the outset in designing and assembling a multimedia work . . . the author should keep source records.

Maps as creative content. Maps and charts were awarded early coverage under US copyright law. Still, ambiguities persist, as sparsely evidenced in the cartography literature concerned with copyright issues. Cerny (1978) argued that US courts did not provide enough copyright protection to maps. By viewing maps as mere compilations of data from multiple sources, rather than appreciating the selection, generalization, and other cartographic transformations that add up to the look of a map, the courts confused original information with original expression of that information, the latter the proper object of copyright protection. Robinson et al. (1995, 444) indicate that the courts have come around to Cerny's point of view, such that copyright now applies to most maps and they instruct students about obtaining permission to reproduce other's "pictorial graphic expressions" or "selection, coordination, or arrangement" of facts. Andrews (McHaffie, Andrews, and Dobson 1990, 9) prescribes that "Cartography instructors should . . . take the responsibility of teaching their students about the ethical issues involving map copyright."[6] Dobson, in the same article, diagnoses copyright as "the single greatest ethical problem" in the cartography industry, where commercial cartographers are victims of copyright infringement (McHaffie, Andrews, and Dobson 1990, 5).

4. The usual notification is ©, date, and author name.

5. The Copyright Office defines publication very broadly, as offering copies by sale, rental, lease, or lending, where the intent is to further distribute, publicly perform, or publicly display the work (Library of Congress 1993a). Handing out one or two copies can constitute publication, unless the author makes it clear to the recipients that further distribution is not allowed (Strong 1993).

6. *Cartographic Perspectives* in 1990 reflected a flurry of interest in copyright. In addition to McHaffie, Andrews, and Dobson (1990), Gersmehl (1990) included copyright and clearance in a glossary of map-animation terms, and Loy (1990-91) indicated how copyright issues can be handled with clients of a cartography lab.

Maps are like other creative content because what is copyrighted is the graphic representation and not the underlying information.

Maps are like other creative content because what is copyrighted is the graphic representation and not the underlying information. Maps are different than other creative content because even a copyrighted map is compiled, at least in part, from maps or data in the public domain. A new, copyrightable map can be compiled from several different sources, applying creativity in generalization and symbolization (Monmonier 1993). Compilation of maps on CD-ROM and the Internet are subject to the same copyright issues as printed maps, although the issues are greatly exacerbated by the ease of copying when in digital form. Like printed maps, such sources are likely to be a mix of public information and creative re-expression of the non-copyrightable sources.

Other creative content. Each of the contributing media industries—publishing, photography, movies, music—has their own established copyright procedures for controlling use of creative products. A media-specific clearing house acts as advocate for content producers, collects revenue for each use, and attempts to limit the number and use of copies. For example, the music industry has service agreements managed by Broadcast Music Inc. (BMI) and the American Society of Composers, Authors, and Publishers (ASCAP) that limit where and how music will be performed.[7] Obtaining rights to all source materials on a media-by-media basis requires knowledge of a variety of these industry-specific procedures.

Alternatives more congenial to the multimedia authors are appearing. Some clearing houses now represent work from many media. Stock-film and stock-photo agencies, which in the past had standard use fees, now may charge fees on a variable scale, taking into account the relative role of any single component in a multimedia work.

Aids to ease copyright compliance, particularly for digital resources, are being developed. "Publishers Depot" is an on-line service with a searchable database of images. Once an image is selected, rights can be acquired on-line and publication-quality digital images downloaded over the Internet. "NetRights" provides the means through software for customers to preview source materials, track sources, obtain rights, and properly attribute source materials (Weiss 1995; Picture Network International Ltd. 1996; NetRights 1996).

Implied consent cannot be assumed simply because the copyright notice is absent.

An alternative to the pursuit of permissions to use copyrighted materials is to use public-domain materials. The author needs, however, to be confident about the legitimacy of source materials. Implied consent cannot be assumed simply because the copyright notice is absent. If one is unsure of the status of materials in traditional media they should consult the *Catalog of Copyright Entries* (Library of Congress 1906-); or the Copyright Office will perform a search of its records at $20 per hour. Whether materials are or are not in the public domain remains a sensitive issue for material obtained from the Internet.

Another alternative to obtaining permissions is affordable replacement, which means creating original material that makes an impression like a similar, copyrighted source. With caution, ideas may be borrowed; the artifact not the idea is copyrighted.

Some material is free for use because it is not copyrightable. Material not subject to copyright includes words and short phrases, blank forms,

7. Permission to perform is not the same as permission for use in multimedia work. For that, another kind of license is needed, obtained from other sources (see Brinson and Radcliffe 1994; Weiss 1995).

and works consisting entirely of information that is common property. Names of products, slogans,[8] titles of works, and pseudonyms are examples of words and short phrases that cannot be copyrighted. Bank checks and scorecards are examples of blank forms. Calendars, schedules of events, and tables taken from public documents or other common sources are examples of common-property information (Library of Congress 1993b, 1994).

UNRESOLVED ISSUES OF COPYRIGHT AND MULTIMEDIA

Unresolved single-media copyright issues carry over to multimedia. For example, easy electronic copying of sound and graphic media came about with widespread use of cassette tape recorders and photocopiers respectively, well in advance of multimedia. In the cartography literature Davies (1982) expressed concern with who can and will control reproduction of copyrighted maps in an era of easy copying. More generally, in the latest extension of easy electronic copying, it has been succinctly noted that "The Internet is the world's biggest copy machine" (Peters 1995, 59).

New copyright issues accrue as well in multimedia production. First, the variety of materials employed define multimedia. The sheer volume of material needed for an effective multimedia presentation can consume time and money in obtaining permissions to the extent that it is dourly predicted, ". . . the success or failure of multimedia may be driven less by technology than by the economics of authoring" (Adam 1993, 31).[9] A second new copyright issue, and one more distinctly associated with multimedia, is its reliance on interaction—ability to be changed—for its claim to effectiveness. Together, variety and changeability can make copyright registration and protection of a multimedia work problematic.

Together, variety and changeability can make copyright registration and protection of a multimedia work problematic.

Copyright and change—multiple meanings. Change challenges copyright law interpretation. Current copyright law attempts to account for change that occurs at a point in time between two fixed, definable states. In one meaning, change may shift the fixed form of information from the public domain to the private sector and to copyrighted status.[10] This happened in the case of satellite imagery when the Landsat program shifted from government to private management in 1985. Another kind of public-to-private shift is illustrated with Bureau of the Census TIGER files: they remain in the public domain, but are obtained at little cost, enhanced, copyrighted, and sold as a value-added product by commercial entities.[11] Even a representative of a private-sector venture that produces such value-added products, however, is hard pressed to define where public data ends and *value-added* begins. A fairly clear instance of value-added product is the combination of two public-domain data sets, e.g., census boundaries and zip codes. The result may be copyrighted. Less clear is application of expertise to simply translate government data into a more palatable form, perhaps by geographic or thematic segmentation, or otherwise making parts of the data set more user-friendly without further enhancement (Jeppesen 1995).

8. Some product names, mottoes, or slogans may be registered as trademarks and subject to trademark laws, which protect an owner's right to use a character in connection with goods or services. If another use does not cause confusion among consumers, the trademark may be usable—but dilution laws may, then, provide protection (Brinson and Radcliffe 1994).

9. A CD-ROM project with some 500 items to clear may cost $200,000 to $275,000 (Weiss 1995).

10. We also can theorize a change from private copyright to public domain—upon expiration of a copyright—but with the term of copyright on a newly-created work lasting about 75 years, this theorizing is not very helpful in legitimately obtaining resources for use in multimedia work.

11. While such enhanced data are readily available from libraries, the scope and cost of legitimate re-use beyond fair use is unresolved. Explicit permission from the vendor for use of such materials in a published or commercial work is suggested (Lamont 1995).

In another meaning of change, consider the case of substantial alteration of existing work. If a copyrighted work is altered substantially, the user may not be infringing on the original author's rights. A key to copyright infringement is whether the original work is recognizable. Like fair use, this is laden with circumstantial considerations.

Change and multimedia. The examples above are variants on change that already have precedent in copyright history. A third meaning of change, and a significant copyright issue for multimedia, is how the law can accommodate interactive capability and the results of interaction, that is, change to the multimedia work itself. Copyright currently pertains to a work in fixed form. A work can be registered for copyright only when in tangible, fixed form. The fixed state is, however, problematic with interactive multimedia designed to change with each use. The copyright office advises the author to refile the copyright when he or she has changed the work "enough." With multimedia, when is a change enough?

The fixed state is, however, problematic with interactive multimedia designed to change with each use.

The latest (1992) version of Copyright Office Circular 55, *Copyright Registration for Multimedia Works*, lists ten hypothetical multimedia products and suggested depository materials. Only one of the examples includes interactive capability (more typical examples of multimedia deposits are slides-plus-booklet, or manuals-plus-identifying material for a computer program). A key element of multimedia, however, is that the user interacts with, and changes, the information and form of presentation. The current official approach to this changeable nature of multimedia is to declare that multimedia works are like video games, whose "fixed" nature has already been settled in court (Information Infrastructure Task Force 1995).

Within the definition of copyright, an author holds the right to prepare derivatives of his or her original work. If user-induced change is one of the author's design goals, where does the author's right to the benefit from derivatives intersect with a user's right to claim creation of a new work based on substantive change to the author's work?

RELEVANCE OF COPYRIGHT

Some copyright topics can be discussed with relative certainty—as in the case of copyright practices that have accrued around conventional media. Ambiguities become apparent, however, even in copyright basics, and they are intensified when considering copyright for multimedia. The current broad debate questions whether copyright law is even relevant anymore.

Opinions expressed cover the gamut of positions on whether current copyright law is sufficient as is, needs reinterpretation, needs to be completely rewritten, or is completely hopeless in meeting the needs of multimedia authors (Samuelson 1994). The conservative economic view of copyright law is that the law is necessary to promote the dissemination of creative work. The recent report from the President's Information Infrastructure Task Force (IITF) Working Group on Intellectual Property Rights says that without legal protection intellectual property owners will not make their works available to the public. Legal protection of intellectual property owners is necessary for "customers" (the public) to benefit from new technology. The Working Group advocates clarification and adaptation of existing law. For instance, the term "copies," explicitly defined in current copyright law, should be retained but simply be more broadly defined to include electronic transmissions (IITF 1995). At the other extreme to the IITF's conventional, institutional approach is Barlow (1994), who believes that copyright law is useless and that the market alone will protect—read economically reward—authors.

Samuelson (1995, 17) notes that "copyright is a social construct . . . that should be tailored to achieve the purposes we have for it." Rights protected by copyright law cover economic gain or loss, but also have a moral component. It may be true that "laws ratify already-developed social consensus" (Barlow 1994, 88). Indeed, this seems to be borne out by the example of private taping of music and movies. Daly (1990) noted the ubiquitous occurrence of home taping in 1990. Today such copying often is legal under the *Audio Home Recording Act of 1992* (17 USCS §1001 [1994]).[12]

Does the author desire copyright protection? Desirable is a personal philosophy that embraces both an economic and moral stance. Economic gain is not a big impetus in academic work. As Samuelson (1995, 110) expresses it, "Most authors of scholarly materials want the 'mind-share' arising from free access to their work." An author may choose to distribute copies of his or her own work freely or parsimoniously. The ethical issue arises, however, when distributed work includes the work of others—text, graphics, photos, video, or sound included in the multimedia compilation.

To reiterate the economic/moral duality of copyright compliance, note that, while it takes time and money to legitimately obtain copyrighted material for multimedia use, current social mores tacitly allow copyright infringement, so speedy and cheap resources are at hand for many uses, including multimedia. The multimedia author chooses whether to comply with copyright laws in an attempt to respect other authors and to secure ownership for their own product, or to use and distribute work freely regardless of explicit or implicit ownership. Ultimately, we as authors decide a comfort level in using what is available and in the extent to which we disseminate our own work.

CONCLUSION

The value of copyright may be expressed either as protection accrued to a copyright owner, or as the ready availability of creative sources to a wide audience. It may be perceived as protecting—or curbing—economic and ethical rights to creative work. Authors and artists working in conventional media are confronted by these dualities of copyright law. In multimedia (by definition a form of publication that is varied in resources and is resource-intense), single-media copyright issues are already compounded. Copyright issues will increase in complexity and ambiguity as experience, imagination, and technology allow authors to exploit fully the capabilities of multimedia for interaction and change.

Copyright issues will increase in complexity and ambiguity as experience, imagination, and technology allow authors to exploit fully the capabilities of multimedia for interaction and change.

By no means is the information presented in this paper to be construed as legal advice;[13] rather, it is offered because cartographers should understand copyright law and practices as a base for choosing a reasonable level of risk when assembling creative resources for a multimedia work. Familiarity with the law also allows the author to choose the level of control over distribution of his or her own work. Further, such awareness allows cartographers to take a position in the broad copyright debates.

12. The home-videotaping decision is based on copying for noncommercial, time-shifting purposes, so doesn't extend to use in multimedia work (Brinson and Radcliffe 1994).

13. The author, a Ph.D. candidate in geography with academic aspirations, notes that intellectual property lawyer currently is one of the topten career fields, while college professor is one of the ten "career fields to dump" (Kelly 1996, A1).

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cartography bulletin board

CARTOGRAPHY AT THE 1996 ASSOCIATION OF AMERICAN GEOGRAPHERS MEETING

by Jim Anderson, Director
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The 92nd Annual Meeting of the Association of American Geographers recently concluded in Charlotte, North Carolina. There were 13 sessions sponsored by the Cartography Specialty Group, 10 sessions by the Geographic Information Systems Specialty Group, and 16 other sessions with some reference to cartography or GIS in their title. Session topics covered a wide range of cartography related topics including History of Cartography, Teaching of Cartography, Spatial Cognition, Multimedia Cartography, Map Use, and Atlas Projects.

In addition to formal paper sessions, there were 8 workshops with a cartographic theme: Hands-on Overview of the World Wide Web, Introduction to GPS for GIS Data Capture, ArcView for Geographic and GIS Education, Mapping with the Macintosh Computer, Map Design Production with CorelDraw, How to Teach GIS Using Mapitude, Electronic Atlas of New Hampshire and Vermont: A Teaching Tool, and Cartography and the World Wide Web. Scheduled poster sessions also provided the opportunity for several cartographic presentations.

An overflow crowd attended the Presidential Plenary Session titled "Has GIS Killed Cartography?" NACIS member Alan MacEachren from Penn State University gave his views on the condition of the discipline and possible future directions, Michael Goodchild from the University of California, Santa Barbara spoke on GIS, and Eric Sheppard from the University of Minnesota concluded the session with observations on both cartography and GIS.

In reviewing the abstracts of papers presented at the meeting, it was interesting to note some of the keywords that authors selected from their abstracts. The word "cartography" was used alone 21 times and also as cartographic education, cartography-historical, cartography-automated, cartography-cognitive, cartography-color, cartography-design history, cartography-education, cartography-history, cartography-map legends, cartography-multimedia, cartography-production, cartography-reliability representation, cartography-visualization, computer cartography, history of cartography, telecartography, and therapeutic cartography.

The word "map" appeared in many forms: cartography-map legends, children's mapping, cognitive maps, difference mapping, early maps, ecosystem mapping, expertise-map reading, feng-shui maps, map making, map reading, map reading skill, map scale, map tasks, map use, map-reading, mapping, mapping in culture, mapping technology, maps, maps-ethnographic, outline maps, risk map, tactile maps, thematic mapping, topographic maps, transmittable map, vegetation mapping, and weather maps.

The varied topics suggested by these keywords demonstrates not only that cartography is alive and well, but that there are numerous research and production opportunities available. Next year's meeting of the AAG will be held in Ft. Worth on April 1-5, 1997. Contact the AAG (gaia@aag.org) or the Cartography Specialty Group of the AAG if you are interested in participating.

THE WORLD WIDE WEB

The World Wide Web is no longer a novelty or a computer network that has limited use or application. NACIS soon hopes to establish a home page to disseminate information to members and others in the cartographic community. Of the 15 workshops held at the AAG meeting, eight were related to cartography and two of those dealt with the world wide web.

Cartography labs are involved in the design and maintenance of web pages as well as the use of other sites for their production activities. Several sites are available that might be of interest to cartographers. Jeremy Crampton maintains an excellent site at George Mason University titled Cartography Resources (http://geog.gmu.edu/gess/jwc/cartogrefs.html) which provides links to numerous public and private cartography related sites. The AAG Cartography Specialty Group can be found at http://everest.hunter.cuny.edu/csg/csg.html.

Most government agencies are now represented on the Web. Some of interest to cartographers include: U.S. Geological Survey (http://www.usgs.gov), U.S. Geological Survey Earth Science Information Center (http://www-nmd.usgs.gov/esic/esic.html), NOAA (http://www.noaa.gov), NASA (http://www.nasa.gov), Bureau of the Census (http://www.census.gov), and U.S. Fish and Wildlife Service National Wetlands Inventory (http://enterprise.nwi.fws.gov). ❑

map library bulletin board

MAPS AT DUKE UNIVERSITY

by Margaret Brill
Reference Librarian
Perkins Library, Duke University

The mission of the Map Collection in the Perkins Library is to support the programs and research at Duke, a private research university. The Map Collection is part of the Public Documents and Maps Department. As such, it is open most evenings and weekends–something which would not be possible if the maps were housed separately. The entire staff of the Public Documents and Maps team has been trained to provide map reference service, and when unable to answer a question, they refer it to the map specialists. Staff who work primarily with maps include a Librarian (currently a vacant position), a half-time Library Assistant, and two student assistants. Most of the maps, such as the United States Geological Survey series, are acquired through the Depository Library Program, however, there is also an annual budget of over $3,000 to purchase maps and reference books. An Area Studies funds is also used to purchase maps.

The Collection houses 126,000 paper maps. Space is at a premium–a medium-sized collection has been fitted into a room more appropriate for a small-sized one. However, due to a careful arrangement of the map cases and no wasted space, the Collection is not cramped. The major constraint caused by lack of space is that there is no room for the piles of maps waiting to be put away and/or processed. As a result, all new maps are cataloged immediately (the depository maps are included on the Marcive tapes which are loaded in the on-line catalog). A project to catalog the older maps is about halfway complete. The cataloging project also involves checking and updating the shelf-list (previously the only way to find maps which are not in major series) and the card catalog includes shelf-list and subject cards. All maps not in major series are assigned Library of Congress call numbers despite the fact that Duke is a Dewey library.

The Collection's strengths are in DMA maps from World War II, North Carolina, and the Canadian depository map collection. Rare and antique maps are housed in the Special Collections Library. Map purchase priorities are given to the research and instructional focus of the Duke faculty. Since there is no other map collection on campus, the Collection is heavily use by the Geology Department and School of the Environment. With no geography department, the map collection has been described as the "geographical presence at Duke" and the map librarian regularly teaches class sessions on the use of maps at the invitation of faculty.

The Collection's computer mapping dates back several years to the distribution of the TIGER Files on CD-ROM and it provides patrons with the ability to combine the Census maps with the data from the 1990 Census CD-ROMs to produce demographic maps. This project has been very successful and uses MapInfo software to produce the maps and a conversion program to convert the TIGER Files to MapInfo format. The terminal is accessible to the public, and training is available by appointment. The menu provides access to some ready-to-use local maps. Over the years, more products have been added to the system, notably ArcView, thanks to the ARL GIS Literacy Project (Association of Research Libraries). Easy-to-use, popular mapping programs available to patrons from two terminals include StreetAtlas with MapExpert, Global Explorer, and Centennia. Users come from a wide range of Duke departments, as well as from the general public. The librarian also acts as a liaison with departments who maintain GISs.
You are invited to visit the Maps Homepage (part of the Perkins Library web pages) at http://www.lib.duke.edu/pdmt/maps.html.

UNIVERSITY OF VIRGINIA GEOGRAPHIC INFORMATION CENTER: THE FIRST YEAR

by Denise Stephens
Geographic Information Coordinator
University of Virginia Library

The Geographic Information Center at the University of Virginia seeks to encourage greater awareness and broader utilization of GIS and related spatial tools among the Library's clientele. The Center (GIC) was created in the spring of 1995 by merging of the Library's GIS Laboratory and its Maps Collection. GIC has begun an ambitious program of service integration, resource-building, and outreach to facilitate its objective: To make spatially-driven technology and information as accessible and as useful as possible, regardless of format. In its initial year, the Center has already begun to see the positive results of its 'holistic' approach to service. While the environmental sciences once dominated the GIS laboratory's user group profile, the new GIC has experienced growing interest and use generally from the social sciences, as well as from the

professional schools and the humanities.

The previous GIS Laboratory was a successful service point for those Library users knowledgeable in UNIX and full GIS packages (ArcInfo and Grass). Having eliminated its Geography department, the University had no single lab capable of supporting the exploding interest in GIS. The Library site provided both a rapidly automating facility and a central location. Its proximity to the Map Collection and Government Information division provided rich source material for students and others who where comfortable utilizing the resources available. Advanced researchers and faculty had also begun to approach the lab to assist in their projects. In addition, the lab's close relationship with the University's GIS community as a teaching site made available a rich pool of well-trained assistants eager to acquire marketable experience. In the new configuration, GIC has retained its close working relationship with faculty who teach GIS and it is still the site for laboratory-based GIS courses. The Center has also moved to serve a more diverse user group by enhancing its UNIX-based services with a robust PC service configuration and the building of a functional spatial data library.

Like its five sister Library electronic centers, GIC is committed to integrating non-traditional services into the mainstream of service activities. Thus, the Center has chosen to democratize access to GIS technology by placing less emphasis on it as a highly specialized system. The introduction of additional personal computers and a variety of more approachable PC-based viewing/mapping software has lessened the initial hesitation evident in most first-time Center users. The acquisition of ready-to-use spatial coverages (either purchased commercially, or developed in-house by lab assistants) has reduced the staff time committed to coverage generation and has increased the time available to mediate the table-linking and related tasks involved in most user applications.

The introduction of Internet/World Wide Web services has greatly aided in the delivery spatial information to remote Library users. The Virginia Atlas Project is the Center's primary initiative designed to integrate GIS technology and the growing wealth of public-domain spatial information into Library services (http://viva.lib.virginia.edu:gic/vatlas.html). Census Bureau TIGER data (basemap coverage of the U.S. in county units) is hardly useful to most Library clientele in its raw form. By tapping the skills of talented lab assistants, GIC has created WWW-based, custom county mapping using the same data, while requiring no technical expertise of users.

The Virginia County Interactive Mapper (http://ptolemy.gis.virginia.edu:1080/tiger.html) has enjoyed a successful year. A project initiated under the previous GIS lab, the Mapper is now one of several Virginia Atlas Project services. Another WWW-based service provided is the Virginia GNIS (Geographic Names Information System). A subset of the national GNIS database for Virginia locations have been marked up using SGML and made fully searchable via an easy-to-use interface. The resulting geographic reference data may then be illustrated with original reference graphics (http://viva.lib.virginia.edu:gic/VA_locator/locator.html) In addition, a selection of more than 50 original map images depicting various 1990 Census social and economic variables for Virginia have been made available in the Virginia Digital Map Library (http://viva.lib.virginia.edu:gic/maps.html). Perhaps most beneficial has been the full integration of the Center's resources into the Library bibliographic catalog. Data, image, and software records are treated as all other library resources. Also, custom maps and other information produced by the Center for its World Wide Web service pages are cataloged and accessible in the same manner as traditional library resources. Thus, whether looking for a paper map of Virginia, the digital orthophoto of Washington, D.C., or an original map showing Virginia demographic variables, a researcher browsing the electronic catalog will be directed to the Geographic Information Center.

Building a library of ready-to-use spatial resources is another element in GIC's service strategy. Currently, the vast amount of public-domain spatial data available in the Center are still in raw format and is generally not useful to mainstream library users. Converting these materials into useful, generally accessible information is a high priority in the support of a growing user group. Developing original state-level coverages and the large-scale digitizing of historic, public domain mapping is under way. In the mean time, and to support emerging PC- based services, GIC is locating and acquiring commercial spatial data compatible with its desktop software packages to support the occasional map-maker. A library of manuals and how-to guides is growing quickly, as a larger number of users are curious to try their hands at the technology. Finally, GIC staff provide mediation where needed. It has been somewhat surprising that a significant number of persons with some degree of experience have come into the Center ready to do work.

Outreach had been major factor in the Center's growth during its first year. To further its goal of

integrating GIS-related technology and spatial resources into the total library service environment, educating the Library community is crucial. GIC participates in the library's User Education Program, providing short courses on the potential applications of spatial operations in the Social Sciences and the Humanities. The visibility of the Center in the library's promotional activities has also helped to educate potential users. Descriptive articles in the library newsletter, as well as guest lectures in key academic departments about GIC's services and resources have had quickly-realized benefits. Many new users in the last year have heard about the Center in their class setting. Finally, the participation of GIC in regional consortia and in the University's GIS user group activities has helped maintain its status as a key player in shaping the future development of GIS technology and resource delivery at the University of Virginia.

The first year for the Center has been quite successful. Use of GIC resources and services has clearly diversified. Historians, archaeologists, political scientists, and other social sciences scholars now comprise the largest user group. Humanities scholars, particularly in English, have also grown in number and have produced several imaginative GIS applications.

The best indicator of the program's achievement in its initial year is the general increase in geo-information resource utilization. A clear demand for desktop resources has required the addition of more personal computers. Simultaneously, browsing and circulation of paper maps has significantly increased over previous years.

Future activities of the Geographic Information Center involve the expansion the Virginia Atlas Project components with additional map layers and more regional coverages for use by remote browsers. GIC has also begun work on the Historic Map component of the existing Virginia Digital Map Library. A key objective in the coming year is the full integration of our existing WWW resources with more interactive search, retrieval, and display capabilities. Flexibility and creativity will certainly be key elements in the Center's future service activities. Rapidly changing, more intuitive, technology and the continued growth of both public-domain, and value-added commercial source material will likely make spatial resources, services, and technology generally expected by library users. Our challenge is to define our role with ambition, while maintaining consistent, quality service to the University community. ❑

reviews

BOOK REVIEW

How Maps Work: Representation, Visualization, and Design
Alan M. MacEachren. New York: The Guilford Press, 1995. 526 pages, 221 maps and illustrations, bibliography, author index, subject index. $42.00, hardbound. (ISBN 0-89862-589-0).

Reviewed by Elisabeth S. Nelson
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San Diego State University

If you are searching for a detailed guide to contemporary cartographic research issues, *How Maps Work* is the book you need. This encyclopedic volume covers many of the major ideas currently being examined by academic cartographers. The goal of the book, as stated by MacEachren, is to provide a basis from which cartographers might begin to build an understanding of how maps work. As he clearly points out in the preface "Understanding how and why maps work (or do not work) as representations in their own right and as prompts to further representations, and what it means for a map to work, are critical issues as we embark on a visual information age" (p. v).

To accomplish this daunting task, MacEachren has constructed a view of spatial representations that consists of multiple levels and has organized his book around this structure. *How Maps Work* consists of three main sections: *How Meaning is Derived from Maps, How Maps are Imbued with Meaning,* and *How Maps are Used: Applications in Geographic Visualization.* The first two sections of the book consider cartographic research from two complementary perspectives: a private/perceptual-cognitive view

and a public/social view. The former is concerned primarily with how we "see" maps and how we derive meaning from them; the latter employs semiotics to develop logical symbolization systems and provide a framework for understanding how we interpret and assign meaning to map symbols. The final section provides a case study, geographic visualization (GVIS), through which this multiple-level approach is applied.

Part I, *How Meaning is Derived from Maps*, consists of three chapters that outline an information-processing approach to vision and visual cognition and discuss its potential application for the study of maps. In Chapter Two, *An Information-Processing View of Vision and Visual Cognition*, MacEachren begins by describing David Marr's information-processing model of vision. He then offers Steven Pinker's theory of graph comprehension as an example of an information-processing approach to visual cognition, and discusses the work of several cartographers who have developed similar, but less formal models.

In Chapter Three, *How Maps are Seen*, MacEachren provides a detailed synthesis of the eye-brain system and examines its limitations for processing information about the basic visual variables used in cartographic representation. Much of this chapter is devoted to the research that has been conducted on low-level visual processes, with an emphasis on how they affect cartography's use of visual variables in the design of maps. Here, MacEachren has pulled together research from a variety of disciplines ". . . to build an understanding of how maps are seen that can serve as a framework for research on and guidelines for map symbolization and design" (p. 147). Processes that are discussed include Gestalt grouping principles, selective attention theory, visual search models, perceptual categorization, and depth perception. MacEachren also provides several examples of the application of these principles in cartographic research and testing.

The emphasis on low-level perceptual processes in Chapter Three sets the stage for Chapter Four, *How Maps are Understood*. In this chapter, it is the interaction between the visual descriptions of maps, which result from how we "see" maps, and our existing knowledge that is stressed. MacEachren uses the mechanism of knowledge schemata as a way of linking these visual descriptions with our existing knowledge. Discussion begins with the topic of mental categorization, since categories underlie our ability to form schemata. Aspects of categorization that are detailed include prototype theory, family resemblance, fuzzy categories and basic-level theory. MacEachren then examines the issue of general knowledge representation and highlights the basic theories (propositional, analogical, and procedural) that attempt to describe the structures used in long-term memory representation. He proposes three types of schemata as linking mechanisms between these long-term representations and visual descriptions: propositional, image, and event schemata. Details of each of these schemata are complemented with examples of how they might be used in a cartographic context. The chapter ends with an exploration of issues related to the development of cognitive map schemata. Using an isarithmic representation of terrain as an example, MacEachren generates hypotheses for how map schemata develop, how they are selected for specific map tasks, and how they are used in interpreting spatial information.

Part Two, *How Maps are Imbued with Meaning*, uses a semiotic perspective in considering the public/social aspects of cartographic representation. According to MacEachren, "Cartographic inquiry can profit from a semiotic. . . approach for two reasons. First, semiotics provides a conceptual framework for developing a cartographic representation logic that can take advantage of what we know about cognitive representations, mental categories, and knowledge schemata. Second, aspects of semiotics that deal with meaning offer a way to integrate approaches to map representation that emphasize both explicit and implicit meaning, logical and expressive meaning, denotation and connotation, and more" (p. 214). Chapter Five, *A Primer on Semiotics for Understanding Map Representation*, is the first of three chapters in this section and is essentially a primer on the semiotic concepts relevant to cartography. MacEachren begins the chapter by establishing some basic terminology and then proceeds to examine two fundamental semiotic issues: the relationships between map marks and their referents, and the relationships among map signs. Examples of topics that are covered include: Peirce's typology of signs in which the relationship of the sign-vehicle to the referent is explored from the viewpoint of the interpretant; Morris' typology of discourse that examines how signs influence behavior; and Morris' three dimensions of semiosis–syntactics, semantics, and pragmatics. Also examined are a number of cartographic efforts to adapt these concepts to spatial representations.

In Chapter Six, *A Functional Approach to Map Representation*, the focus is on the categorization of "stand-for" relationships in mapping (mapping semantics) and sign system specification (mapping syntactics). The sections dealing

with map semantics consider individual sign relations from the perspective of a triadic model. Using this model of signs, MacEachren shows how separate perspectives can put emphasis on particular cartographic issues, such as the link between symbol and meaning or the role of map signs in promoting understanding between the cartographer and the map user. He then discusses the syntactics of mapping, an area in which cartographers have worked to develop typologies of symbol categories and rules for matching these categories to those of geographic features. His example for this section examines the most fundamental cartographic typology, the level of visual variables. Here, he introduces the reader to Bertin's original set of graphic variables, outlines a number of extensions for that set, and then suggests a mapping syntactic that is based on their logical application.

Chapter Seven, *A Lexical Approach to Map Representation*, provides a complementary perspective to the one taken in the previous chapter. The emphasis is on explaining how map users interpret symbols and symbol groups on maps, as well as entire maps themselves. In organizing this chapter, MacEachren has chosen to address meaning and map representation from two perspectives: meanings *in* maps and meanings *of* maps. Meaning in maps is defined as those denotative meanings that are directly specified on a map, such as in the map legend. MacEachren covers several issues related to this type of meaning, the most important of which is a basic taxonomy that categorizes meaning *in* maps into three levels: meanings about space, space-time, and attributes in space-time. Other issues examined include the specificity of signs, the concreteness of signs, and how the meaning *of* map signs changes across cultures and across time. Meaning of maps, on the other hand, are connotative meanings. The difference between the two can be thought of as the difference between ". . . knowing what things are (explicitly) versus what they stand for (implicitly)" (p. 331). MacEachren describes this idea by examining a typology of connotation and by exploring various types of connotations on maps, such as those of veracity, integrity and power.

The last section of *How Maps Work* is titled *How Maps are Used: Applications in Geographic Visualization*. This section also has three chapters, each devoted to exploring how the multi-perspective approach of Parts I and II can be applied to GVIS. In Chapter Eight, *GVIS: Facilitating Visual Thinking*, the emphasis is on the application of these approaches to a low-level task, feature identification. MacEachren begins the chapter by presenting and elaborating on a model for feature matching. He then uses this model to integrate some of the ideas discussed in the first two sections of the book. The reader's attention is directed to several cognitive concepts, such as attention and categorization, that are related to functional representations in the GVIS environment. Related topics that are covered include the position of space and time in perceptual organization, the role of scale and resolution in GVIS displays, the influence of static graphic variables on the emergence of pattern, and the role of schemata in defining what is "seen."

Chapter Nine, *GVIS: Relationships in Space and Time*, extends the approach taken in Chapter Eight to more complex tasks such as spatial comparisons across multiple features or multiple times. Highlighted here are the attempts of several researchers to build the tools necessary to make such comparisons in a GVIS environment. Sections are included on the use of space, orientation, color, time, focus, and sound as potential GVIS tools. Also discussed in this context are space-time processes, which present yet another level of complexity.

The final chapter, *GVIS: Should We Believe What We See?*, concludes the book with a discussion of how to judge truth in GVIS and how to determine what truth means in a visualization environment. The discussion here revolves around two questions: How can truth be judged in the displays that GVIS provides? and What is truth in the context of GVIS? The first question is addressed both at the level of individual signs as well as at the level of the map itself. The answer to the second question, MacEachren contends, depends on the questions the user is trying to answer. As such, he poses answers for two fundamental categories of uses: those in the private realm and those in the public realm.

How Maps Work is a comprehensive account of recent issues being explored in cartographic research. It is clear, concise, and well-written. MacEachren has integrated research from several highly respected and well-known researchers from a diversity of fields. He has taken their results and established clear links from their research to issues that are also of importance to the study of maps. He consistently supports his contentions and ideas with a variety of cartographic examples designed to emphasize these links. One weakness in the subject matter is the necessity of the reader to overcome jargon associated with some topics. Although MacEachren clearly made an effort to minimize this problem, there are still some sections that will be difficult to comprehend without a more thorough background in the specific subject area.

How Maps Work is a gold mine of information and well-worth the sticker price. While not appropriate for introductory or intermediate level cartography classes, it would serve well as a basis for graduate research seminars and is an excellent reference source. Every cartographic researcher should own a copy. ❑

BOOK REVIEW

Editing Early and Historical Atlases
Joan Winearls, Ed. Toronto: University of Toronto Press, 1995. 196 pages, 18 figures, 4 tables. $39.95, cloth (ISBN 0-8020-0623-X).

by Dalia Varanka
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This book is a collection of seven contributions on the history of and historical atlases. The material was originally presented as papers at the Twenty-ninth Annual Conference on Editorial Problems, held at the University of Toronto on November 5-6, 1993. The issues the conference focused upon included text and cartographic authorship, atlas editorial content, and production editing. These published chapters, however, expand the intentions of the conference, as stated in the introduction by the editor, to examine both the nature and history of atlas evolution and the atlas as a systematic and structural text.

The chapters are written from different viewpoints, settings, and time periods. Their arrangement in the book as a whole begins first with works of broad overview by James R. Akerman and Walter A. Goffart. Akerman writes about atlases in their most general conception while Goffart focuses on the development of historical atlases. Taken in its most broad sense, that the atlas has an author or editor which consciously structures the work into a compendium according to an idea, Akerman digs deep into the past to trace such books or sets of maps. He focuses most on the uniformity of format and standardization of editions which are the characteristics of atlases in modernity, and also on the authority of an author. Despite the fact that the idea or narrative of the atlas is Ackerman's criteria of atlas value, the inclusion of all works which fall within general structural terms resembling modern atlases are the consistent focus of his study. The wide variety of possible editorial decisions is less developed. Goffart's classification of early historical atlases (gathered from various places) traces the ties of these works to academia, to the study of the classics and their ideals, and to prose texts. Goffart also stresses standards of consistency; world-wide coverage, chronology, and the use of identical base-maps form a threshold in the evolution of historical atlases.

These atlases become a history of our own historiography, and a mirror of the imposition of our own valued ideas upon the past, as in the rise of the depiction of boundaries on historical events (particular to the late eighteenth and nineteenth centuries) where they were most likely ephemeral.

Mary Sponberg Pedley's study of atlases in Enlightenment France provides a complement to these first two studies by presenting a more specific analysis of variations in issues such as maps over text and non-standardized works. These, she argues, are attributable to problems of language, economics, and the demands of science. Forces on atlases in Enlightenment France worked against standardization; the customers were the chief compilers of maps into atlas factice and this practice was protected by law. Engraving and printing practices were also kept separate by law, and in the eighteenth century, scientific standards and the influence and support of the scientific community encouraged the modernization of maps one at a time, making atlases too costly a venture. This situation persisted until the appearance of the *Atlas Universel* in 1758, in which modern principles of atlas publication were explicitly stated and were to include a historical section.

Anne Godlewska's careful analysis of Edme Jomard's facsimile atlas, resembling an atlas factice in that it is a compilation of independently produced maps assembled according to the criteria of an individual, suggests that sets of separately produced maps compiled within the terms of a selection process are rooted and structured by the geographical approach of the compiler, and not necessarily by systematic or scientific standardization. Jomard lived and worked on the threshold of an implied shift in emphasis from the science of positional accuracy in mapping to maps for purposes of spatial analysis. His facsimile atlas, though it was intended as a world history via the map itself, was largely ineffective this way because of Jomard's persistent simplistic view that most problems in general could be analyzed directly by mapping.

William Dean's analysis of two atlas projects, *Economic Atlas of Ontario* and *Historical Atlas of Canada* shows how the movement away from simple and direct expressions of nationalistic interests, as noted by Goffart for example, on the focus of the rise and fall of empires, and toward the study of social factors continued into the proliferation of twentieth-century atlases, beginning, he states, in the 1950s. The two atlases are good choices for a comparative study. *The Economic*

Atlas. . ., exploring and sometimes even restructuring statistical data sources, exemplified modern science as a "search for a more rational ordering" of geographical phenomena. *The Historical Atlas. . .*, in contrast, was more demanding in terms of direction, objectives, and addressing a wide breath of audience. This contrast suggests the conditions behind the scarcity of historical atlases in strongly empiricist England (as was noted by Goffart). Dean's conclusion that the statistically driven economic atlas maintained a direct relationship to and enriched the understanding of social data, but that the design and juxtaposition of thematic maps can further our understanding of phenomena only within primarily spatial terms recalls Jomard's dilemma of exploring scientific patterns through maps.

In the sixth chapter of *Editing Early and Historical Atlases*, R. Cole Harris, editor of *Historical Atlas of Canada Volume I*, shares his thoughts about the atlas as an interpretation of Canadian identity. Despite the clear editorial principles and the management of facts, finances, and an editorial team and network, Canada emerges as the concept that shaped the historical atlas. The atlas is changed by and changes the dialogue of this editorial concept.

Historically we interpret from the evidence transitions from boundaries and nationalism, to social/spatial analysis. The last chapter, written by Deryk Holdsworth, shows us this distinction is an artificial one and is only more complex. Other dialectical differences are also unmasked. The authority of a single author can be established for economic reasons, not solely intellectual, and coexisted with an editorial process shaped by the client. Holdsworth explains what the political issues surrounding the *Historical Atlas of Canada* were and the action taken in response to them, but not what constituted the outcome of these attempts at resolution.

The seven contributions of *Editing Early and Historical Atlases* work together well and build a cohesive history in themselves. Points raised by the authors both logically support what is known about atlases, yet challenges our present history of the genre as a whole. *Editing Early and Historical Atlases* is an excellent contribution–highly readable and well-written–and very welcome in the general history of atlases. It fills a valuable and very lacking need for information to further our understanding of this bibliographic genre, enhancing our appreciation of atlases without destroying the beauty and mystery of these works.

BOOK REVIEW

Proceedings of the Seminar on Teaching Animated Cartography
Ferjan Ormeling, Barend Köbben & Rufino Perez Gomez, editors. Enschede, The Netherlands: International Cartographic Association / Association Cartographique Internationale at ITC. 1996. 113 pages. maps, diagrams, illustrations, screen captures, and a list of participants. $10.00, paper (no ISBN).

Reviewed by Rex Cammack
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The *Proceedings of the Seminar on Teaching Animated Cartography* is a bound collection of papers and abstracts by the participants at an ICA seminar held at Escuela Universitaria de Ingeniera Tecnica Topograpfica in Madrid, Spain from August 30 - September 1, 1995. The seminar was sponsored by various ICA commissions and working groups: the Commission on Multimedia, Commission on Education and Training, Commission on Map Use, and Working Group on Temporal Issues in GIS. The main thrust of the seminar was the teaching of cartographic animation techniques. Like many open invitation seminars, authors interpreted this central theme in their own unique manner and as a result, the proceedings is a collection of papers and ideas covering the broad area of dynamic cartography.

The book is divided into seven parts: *Introduction, Basics of Animated Cartography, Use Aspects and Evaluation, Applications, Present Situation, Future*, and a *List of Participants*. The introduction discusses the historical events leading up to the seminar, the groups involved in its sponsorship, and how the different contributions were categorized. The most exciting aspect of the introduction is the announcement that the material in the book is available on the World Wide Web at http://nvkserver.frw.ruu.nl/ICA/madridiproc.html (Unfortunately, at this writing, the web site has not been completed).

The section on the *Basics of Animated Cartography* has five papers concerned with many different forms of digital cartography. The first paper (by William Cartwright) discusses in detail the issues of computer equipment and staff needed to complete a multimedia title. The next paper (by Michael Peterson) focuses on dynamic mapping over the World Wide Web. The paper covers the basic concept of the Web and plots its growth history. The article also provides numerous Web sites where basic and advanced information about internet resources and animated mapping can be located. The last three papers in

this section depart from the previous two by focusing on the theoretical concepts of hypermedia, instruction, and the integration with Geographic Information Systems (GIS).

In the next section, three separate papers, by Derek Thompson, Ferjan Ormeling, and Menno-Jan Kraak and Arjen Klomp, look at different theoretical aspects of dynamic mapping. Thompson's paper examines the "fusion of hypermedia and geographic information systems technologies in the particular domain of spatial reasoning" (page 15). Thompson's paper works through the use of the toolbox metaphor for both GIS and hypermedia. Ormeling's paper fits best under the title of the book and the seminar. This paper outlines a strong pedagogue by which teachers can teach students about animated mapping. Kraak 's and Klomp's paper places cartographic animations into categories that lead to the development of dynamic maps within a GIS context.

The next section in the book is titled *Use Aspects and Evaluation* and contains five papers. The papers by Henry W. Castner and Jeffrey S. Torguson share the common thread of education and "geographic thinking." Castner's paper lays out two examples for developing geographic thinking while Torguson evaluates the quality of interaction between map users and an electronic atlas. Following in line with the evaluation theme, a paper by Barend Köbben and Mustafa Yaman sets out to evaluate the effectiveness of direct types of visual variables in animated mapping. The final two papers look at the use of animated maps for weather forecasting (James R. Carter) and virtual environments (Olev Koop).

Applications is the title of the next section. The five papers in this section report on developments of different types of animated mapping titles and their use. Three of the papers look at animated application designed for educating the public on issues such as: Cultural Resource Management (paper by Alexandra Koussoulakou), History of Cartography (paper by Auxiliadora Ramos Ruiz & Victor González del Castillo Dacal) and Global Change (paper by Leonard Gaydos). All three of the papers are brief, with the latter two being abstracts for demonstrations at the seminar. The former is also brief except for the 32 screen captures of the title. A paper by Catherine Mey, Lauren Anderson, Janet Murray, Christopher Steere, and Judy Olson, follows the efforts of a group of students in Olson's GEO 823 Automation in Cartography course at Michigan State University to develop a prototype interactive Atlas for the State of Michigan. The authors discuss in detail the methodology and drawbacks to the project. The last paper (by Thomas W. Holder) looks at the process for including choropleth map animation sequences into interactive atlases.

The final two sections in the book are *Present Situation* and *Future*. The former has three papers while the latter has only one. The Present Situation section reports about the development of cartographic animation in England, Russia and Japan. Daniel Dorling discusses the development of a video tape recording to depict the human geography of Britain and the fusion of maps, statistics, and graphics to form an effective means of communicating human geography. The other two papers in this section by Oleg A. Evteev, Vladimir S. Tikunov, and Leniniana F. Yanvareva and one by Kei Kanazawa and Masumi Watanabe look at the development of animated cartography in Russia and Japan. Both papers are a synopsis of the work done presently in both countries. In the *Future* section, Connie Blok develops the concept of scientific visualization. The paper explains the development of a graphical user interface that is cognizant of the current thinking in geographic visualization.

In the context of teaching animated cartography, two papers in the volume provide specific pedagogue for educators. Ormeling does so by suggesting four primary topics to be discussed when teaching cartographic animation: theory, types, design and production and analysis of use. In this approach he connects numerous theoretical works in a manner that is understandable and helpful for students and educators. By interweaving the works of individuals such as Bertin (1967) , DiBiase, et al. (1992), Dorling (1992), Hayward (1984), Koussoulakou (1990), Kraak (1994), MacEachren (1994) and Peterson (1995), Ormeling provides guidelines for instruction in cartographic animation. The second paper that deals with instruction is by Catherine Mey, et al. This paper outlines procedures for developing a multimedia atlas within a graduate class. The paper provides a good course to steer instructors around many pitfalls by providing three specific goals for creating a multimedia atlas: 1) sharpen the planning, execution, skills, and knowledge to complete the task, 2) take advantage of the strengths of individuals involved in the production, 3) produce a prototype to demonstrate the capabilities of the product. By pairing the results in this paper with the system and staff guidelines in Cartwight's paper, an instructor will have a leg up on the task of teaching the production of multimedia titles.

Along with education, several other themes can be identified. One of these is current technology. As mentioned above, Cartwright provides a summary of the hardware, software, and personnel issues for producing multimedia titles. The strength of this paper is the coverage of the hardware

consideration, however, hardware reviews are only good for a short period of time and here the review is still just a synopsis. Readers looking for a detailed discussion of issues such as DVD storage systems will need to seek out trade magazines for in-depth information. In the context of software issues, Koop provides a look at the current method of creating fly-through movies and he discusses the utilities of several programs: Virtus VR 1.0, KPT Bryce, VistaPro 1.0 and Scenery Animator. Koop's paper perfectly illustrates the frustration readers of this publication will face in imagining what the resulting product looks like. This is where the development of the WWW site with some of the examples from the conference will be helpful.

The last theme presented in the publication is the evaluation of cartographic animation. Köbben and Yaman summarize the results of preliminary tests on the perceptual properties of dynamic visual variables. The authors provide justification for the dynamic visual variables of moment, duration, frequency, order, rate of change, and synchronization and why it is important to understand perceptual effects. At the end of the paper is a table comparing the aforementioned dynamic visual variables and perceptual properties of association, order, quantity, and selection. Several of the cells of the table are scored as strong, fair, or weak and is based on the results of a set of experiments conducted in regard to an unnoted MSc-thesis at the Cartography Department of Utrecht University. After reading the methodology and the conclusion, one is not sure how the authors came to their conclusion. A more in-depth discussion of the testing design must be put forth in order to understand the merit of the authors' results. The authors' line of reasoning and questions are good, however, a more in-depth report is in order. In this context, a second paper by Torguson looks at the education value of an electronic atlas as learning tools. The paper is only a brief overview of Torguson's (1993) unpublished dissertation. The research focuses on whether electronic atlases with cartographic animations are better educational tools. The results are mixed, but a number of the author's conclusions provide food for thought.

Though the title of these proceedings focus on cartographic animation, the volume offers insights into many other forms of dynamic mapping: interactive, multimedia, and internet media. The book brings together a set of papers that provoke the reader to consider the current state and the future direction of dynamic cartographic designs, research, and education. Through the contemplation of all these ideas, readers will gain insight that dynamic mapping involves the integration of mapping technology, cartographic principles and human cognition.

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announcements

RELEASE OF ZIA LANDFORM IMAGES CD-ROM

Zia Maps of Boulder, Colorado has released a new CD-ROM of digital base maps called Zia Landform Images (ZLI). The product was created for graphic artists and cartographers using desktop publishing and GIS applications to produce maps.

ZLI features raster color shaded relief base maps with text and line overlays. Included are all 50 United States, and 10 sub regions and the continental USA. A special World Wide Web version (down sampled GIF format) of all the raster images is available for use with home pages. The raster relief base maps serve as the focus and foundation of this product and all are "geo-reference" with UTM, Lat/Long coordinates, and pixel resolution for those using GIS.

Overlaid lines and corresponding text are registered to the relief maps and include; state line, county lines, major drainage/open water, selected city/towns and physiographic features, and significant public parks names. Fully editable file formats for the line and text include Macromedia FreeHand v3.1 and v5.0, Adobe Illustrator v1.1 and v5.0. Raster base maps are in TIFF and GIF and have a printing resolution of 150 lpi at approximately 4x6 inches. There are no royalties, use or registration fees.

The source data and processing was done on USGS digital elevation models, 30 arc second, which were merged, filtered and imaged by CTM of Boulder, CO, using EdWare. They are projected in Albers with each image having its own central meridian. All images have been cartographically altered, correcting original data errors, especially in the coastal regions. USGS DLG (digital line graph) data was merged, layered, and cross reference for text and line placement. Final composition was with Macromedia FreeHand v5.0 and exported to FreeHand v3.1, Adobe Illustrator v5.0 and v1.1. All line and text is grouped by category. Raster image pixel count was selected by weighing the needs of color printing resolution for a 1/3 to 1/2 page size and an opened file size of 2 to 3 megabytes.

Registered purchasers are granted the right to use and modify all image files for almost unlimited commercial and private use. Zia Landform Images can not comprise a primary portion, or focus, of an atlas, clip art collection, CD-ROM multimedia production or any other resale or publicly distributed product. Special agreements for those needs, especially digital products, are available. Purchasers are not allowed to give or sell image files to others in electronic or other format, modified or not, with the exception of images incorporated into a larger body of creative work. No part of these Zia Landform Images can be placed on the Internet or Electronic Bulletin Boards with the exception of the raster image files that are expressly designed for World Wide Web use, (<image name> _WWWW.GIF). For school labs and libraries, use requires only that the purchased disk is registered and that the disk is used in one machine at a time. Labs with networks are required to purchase a site version if the disk is to be on an accessed CD-ROM reader.

Zia Maps encourages use of these products in school labs and library settings. For those using a networked system, Zia makes the registration and compensation easy and very affordable. There are no licensing, royalty or registration fees for use of any Zia Landform Image product.

The CD-ROM version which runs on Mac, DOS/Windows and UNIX is $295. For additional information via FAX or mailing call 1-800-844-9391, Denver metro (303) 444-9391, FAX (303) 444-6910, or e-mail robb@spot.colorado.edu. For a complete file sample and detailed information check the Zia Maps homepage, http://www.gisnet.om/gis/zia.

SPECIAL ELECTRONIC/PAPER ISSUE OF COMPUTERS & GEOSCIENCES ON EXPLORATORY CARTOGRAPHIC VISUALIZATION

The journal, *Computers & Geosciences*, is planning a special issue on "exploratory cartographic visualization." The goal of issue is to provide readers with a coherent set of papers that present research dealing with advances in map-based visualization of geo referenced data. The editors for this issue are soliciting papers that cover three key aspects of this research: (1) theoretical concepts that underpin extension of cartographic principles to dynamic environments for supporting research and decision-making, (2) implementation of concepts in exploratory cartographic tools, and (3) innovative applications of those tools. A second goal (and the goal behind the electronic component of the special issue) is to, for the first time, provide readers with dynamic illustrations that represent the dynamic tools being discussed (and to provide authors with a better way to present their research into dynamic tools). The special issue is being co-edited by Alan M. MacEachren (chair) and Menno-Jan Kraak (co-chair) of the International Cartographic Association Commission on Visualiza-

tion and is a collaborative activity between the Commission and Computers & Geosciences. For those interested in having papers reviewed for possible inclusion, a "working paper" (2000-3000 words) in WWW ready format must be submitted by July 15, 1996. "Submission" of the paper should be made by sending an e-mail message to Alan MacEachren [alan@essc.psu.edu] giving the URL for your working paper. All working papers will be made available through the Commission on Visualization WWW site. The anticipated publication date is May 1997 (in time for Stockholm ICA meeting, June 1997) .

For more information contact Alan M. MacEachren, Professor Geography, 302 Walker, Penn State, University Park, PA 16802 Phone: 814-865-7491; Fax: 814-863-7943 URL: http://www.gis.psu.edu/MacEachren/MacEachrenHTML/MacEachren Top. or html http://www.gis.psu.edu/ica/ICAvis.html.

CALL FOR PAPERS FOR ICC

The Organizing Committee for the 18th International Cartographic Conference (ICC '97), scheduled for 22 - 27 June 1997 in Stockholm, Sweden, invites prospective presenters to submit abstracts for papers they propose to deliver as part of the scientific conference program. Abstracts are due to the Conference Secretariat by October 1, 1996. The address for submission is:

International Cartographic Conference
Swedish Cartographic Society
S-80182 Gavle - Sweden
Voice: +46 26 653425
FAX: +46 26 653106

Authors from the U.S. wishing to be considered for travel support provided by the U.S. National Committee for the ICA (USNC/ICA) should additionally submit their abstracts to the Papers Committee of the USNC/ICA. The Papers Committee will consider the principal author of each abstract accepted by the Conference Secretariat as potentially eligible for partial travel support provided by the USNC/ICA. Some of the available travel funds are typically set aside for young scientists; the USNC/ICA especially encourages those beginning their careers in cartography to submit abstracts. Abstracts should be submitted prior to October 1, 1996 by e-mail to the Chair of the USNC/ICA Papers Committee:

Ms. Leslie Godwin
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U.S. Bureau of the Census
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The conference theme is *Maps and Mapping in the Information Society*. Authors should propose papers that address one or more of the following conference themes:

1. Education and Training in Cartography
2. History of Cartography
3. Cartography for Environment
4. Marine Cartography of the Continental Shelf
5. Generalization of Databases and Maps
6. National and Regional Atlases, Production and Use
7. Maps of Dynamic Processes
8. Cadastral Mapping in Transition Countries
9. Military Mapping
10. Mapping Crossing National Borders
11. Map Production
12. Quality in Cartography
13. Cartography as a Tool in Monitoring Agriculture and Forestry
14. Desk Top Mapping in Media
15. Cartographic Information in Navigation Systems
16. Law and Cartography
17. Mapping of Mountainous Areas
18. Maps for the Handicapped
19. Cartography and Children
20. Gender in Cartography
21. Visualization Techniques
22. Cartographic Theory
23. Standardization
24. GIS and Digital Mapping
25. National Mapping Organizations, Organization and Strategic Programs

Authors should indicate which subject area their abstract addresses. The ICA '97 Organization Committee reserves the right to make final decisions on categorization as part of the acceptance process. The ICA '97 Organizing Committee will notify authors about its acceptance decision by December 1, 1996. The long version (maximum of 8 pages) of accepted papers will be published in the conference proceedings and must be received by the Scientific Programme Committee on or before March 15, 1997. Only papers received by this date are assured publication in the proceedings and final consideration for funding by the USNC/ICA.

The abstract should be 300 to 500 words long and must be in English. Use standard 8 1/2 x 11 inch paper with 1 1/2 inch top and bottom margins and 1 1/4 inch side margins, or use 21 x 29.7 cm paper with 4 cm top and bottom margins and 3 cm side margins. Center the title in bold capital letters as the first item, followed by a vertical space and then the name(s) of the author(s). Type the affiliation address (typed as it should appear on a mailing envelope) immediately below each

author's name. Immediately below the last line, authors are encouraged (but not required) to include a FAX number and/or e-mail address at which interested colleagues can reach them. After skipping two lines, type the body of the abstract with single spacing and no indentation for paragraphs. Use a single vertical space between paragraphs.

General information about ICC '97 is available from:

Alan M. MacEachren
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FAX: (814) 863-7943
http://www.gis.psu.edu/ica/ICAusnc.html

or from the ICC '97 Internet site:
http://www.lm.se/icc97/icc97.html

DEMOGRAPHIC DATA VIEWER ANNOUNCEMENT

The Socioeconomic Data and Applications Center (SEDAC) housed at the Consortium for International Earth Science Information Network (CIESIN) is pleased to announce the release of the Demographic Data Viewer, an interactive mapping tool accessible via WWW browsers. This mapping tool enables users to select geographic areas, specify variables to map, specify map outlay parameters and color assignments. A map image is created on the fly for each query and a descriptive summary statistics report is provided along with the image. The tool can also be used to browse demographic data in tabular format. All products may be downloaded via the browsers upon creation.

DDViewer is available via the public URL: http://sedac.ciesin.org/plue/ddviewer.

The boundary data was derived from the Bureau of the Census TIGER 1992 database. Boundaries are available for states, counties, census tracts, county subdivisions/minor civil divisions, and census blockgroups. One, or a multitude of counties (or entire states) may be defined as the area of interest. Demographic data available for mapping was derived from the Bureau of the Census STF3A 1990. Roughly 225 variables are selectable either for mapping purposes or can be printed in tabular reports. Map layout, colors, legends and titles can be customized by the user. A recoding option is provided enabling the creation of user defined variables.

DDViewer allows the user to:

* create maps at a multitude of geographic resolutions;
* interpret the image using the statistical summary report;
* customize the layout;
* create tabular reports;
* refer to on-line help;
* create simple recodes of variables.

The data underneath this interactive tool are available, along with much more data not used by DDViewer, from The Archive of Census Related Products. You can access this anonymous FTP archive at: ftp ftp.ciesin.orgcd /pub/census; or point your browser to: ftp://ftp.ciesin.org/pub/census.

These services are provided to you by the Socioeconomic Data and Applications Center (SEDAC) housed at the Consortium for International Earth Science Information Network (CIESIN). You are welcome to visit their web site at: CIESIN URL: http://www.ciesin.org/SEDAC URL: http://sedac.ciesin.org/ ❑

cartographic events

July 27 - August 1, 1996
URISA 96
Salt Lake City, UT. Contact: URISA, 900 Second Street, NE, Suite 304, Washington, D.C. 20002, (202) 289-1685, Fax (202) 842-1850, e-mail: training@urisa.ord, http://www.urisa.org.

September 5 - 8, 1996
Second International Symposium on GIS in Higher Education
Columbia Inn Hotel and Conference Center, Columbia, MD. Contact: GISHE Symposium, NCGIA/Department of Geography, University of California, Santa Barbara, CA 93106-4060, Fax (805) 893-8617, gishe@ncgia.ucsb.edu; http://www.ncgia.ucsb.edu/conf/gishe/main.html.

October 2 - 5, 1996
NACIS XVI
San Antonio, Texas
see pages 38-41 for details
or visit our conference homepage
http://maps.unomaha.edu/NACIS/Conference.html

October 24-26, 1996
Maps on the Move: Cartography for Transportation and Travel
Newberry Library, Chicago, IL Contact: James Akerman, Smith Center, Newberry Library, 60 W. Walton Street, Chicago, IL 60610-3380. (312) 255-3523, akermanj@newberry.org.

November 19-21, 1996
GIS/LIS 96
Denver, CO. Sponsored by AAG, AMFM, URISA, APWA, ACSM, ASPRS. Contact: ACSM, 5410 Grovenor Lane, Suite 100, Bethesda, MD 20814-2122. (301) 493-0200, Fax (301) 493-8245. ❑

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PRELIMINARY PROGRAM NACIS XVI

The Sixteenth Annual Meeting of the North American Cartographic Information Society

Visit our progam web site at http://maps.unomaha.edu/NACIS/Conference.html
Conference Registration material will be mailed to all members in early August

Oct. 2-5, 1996
San Antonio, Texas

Wednesday, Oct. 2, 1996
3:00 - 5:30 PM
NACIS Board Meeting

3:00 - 7:30 PM
Registration

7:30 - 9:00 PM
Opening Session Keynote Speaker

9:00 - 11:00 PM
(also 8:00 AM - noon on Thursday and Friday)
Poster Session/Exhibits & Reception. Organizer: Donna Schenström, University of Wisconsin - Milwaukee

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Thursday, Oct. 3, 1996
8:30 - 10:00 AM
Plenary Session: Cartography and the Internet I. Chair: Michael P. Peterson, University of Nebraska - Omaha

Cartography and the Internet: Implications for Modern Cartography
Michael P. Peterson, University of Nebraska-Omaha

The Internet and the National Atlas of the United States
Stephen C. Guptill, U.S. Geological Survey

New Approaches to Data Delivery
Timothy Trainor, U.S. Census Bureau, Washington, D.C.

Thursday, Oct. 3, 1996 10:30 - 12:00 AM

Paper Session B: Cartography and the Internet II. Chair: Jeremy Crampton, George Mason University

USGS Cartographic Data Available Online
John Faundeen, Hughes STX, Reston, VA and Hedy Rossmeissl, U.S. Geological Survey, Reston, VA

The Census Bureau's Geographic Data on the Web
Leo B. Dougherty, U.S. Census Bureau, Washington, D.C.

The Internet - Effects and Chances for Cartography
Georg F. Gartner, University of Technology Vienna

Thursday, Oct. 3, 1996 10:30 - 12:00 AM

Paper Session C: Cartography and GIS Education. Chair: Charles P. Rader, , University of Wisconsin-River Falls

Learning Advanced Mapping Methods in the "Applied Cartographic Design" Course at Penn State
Cynthia A. Brewer, Pennsylvania State University

Life After Lectures: Using the Internet in a Senior Undergraduate GIS Course
Janet E. Mersey, University of Guelph

Teaching Multimedia Map Design and Production: A Comparison of Techniques and Theory
Keith Rice, University of Wisconsin- Stevens Point

Thursday, Oct. 3, 1996 12:00 - 2:00 PM
Luncheon & Annual Business Meeting

Thursday, Oct. 3, 1996 2:00 - 6:00 PM
Tours

Thursday, Oct. 3, 1996 7:30 - 9:00 PM
Cartographic Conversations
George McCleary, University of Kansas
Dennis Fitzsimmons, Southwest Texas State University

Friday, Oct. 4, 1996

8:00 - 10:00 AM

Paper Session D: Cartographic Animation and Visualization. Chair: Terry A. Slocum , University of Kansas

Color Cycling in Map Animation
Mark J. Garey, The University of Georgia

Software for Exploring Temporal Data Associated with Point Locations
Terry A. Slocum and Stephen C. Yoder, University of Kansas

Symbolizing Isarithmic Map Data Reliability: Which Visual Variables are Most Effective?
Keith Rokoske, University of Colorado-Boulder

A Neural Network Approach to Cartographic Visualization
David K. Patton, Slippery Rock University of Pennsylvania

Friday, Oct. 4, 1996 8:00 - 10:00 AM

Paper Session E: Maps, Cognition and Education. Chair: Valerie W. Krejcie

Mapping the Perceived Geopolitical Importance of the Countries of the World
J. Clark Archer, University of Nebraska-Lincoln, Fred M. Shelley, Southwest Texas State University, and Jonathan I. Leib, Florida State University

The Use of Maps in Art: A Preliminary Survey
Ren Vasiliev, State University New York - College at Geneseo

Map Reading Across the Curriculum: Linking Geography to Children's and Adolescent Literature
Joan Maier, University of Houston-Clear Lake

The Effectiveness of Reaction Time and Open-Ended Questions with Early Elementary Subjects
Karen M. Trifonoff, Bloomsburg University

Friday, Oct. 4, 1996 10:30 - 12:00 AM

Session F: Maps, Internet and Multimedia. Chair: Barbara P. Buttenfield, Univ. of Colorado

Genesis of a Map: Portland, Oregon's "Trees of Couch Park"
Joseph Poracsky, Portland State University

Conceptual Design of an Interactive Cartographic Multimedia Information System of Austria
Robert Ditz, University of Technology Vienna

The Human Component of an Internet Digital Map Library: Re-Thinking User Interface Evaluation
Barbara P. Buttenfield, University of Colorado

Friday, Oct. 4, 1996 10:30 - 12:00 AM

Paper Session G: Small Business Cartography in an Era of Downsizing & Outsourcing. Chair: Alex Tait, Equator Graphics

Opportunities for the Small Business Cartographer
Martin von Wyss, Hybrid Designs

Don't Sell the Store! Maximizing Value Through Use and Reuse of Maps for Sale to Multiple Clients
Alex Tait, Equator Graphics

Friday, Oct. 4, 1996 12:00 - 1:30 PM

Cartographic Perspectives, Editorial Board Meeting

Friday, Oct. 4, 1996 1:30 - 3:00 PM

Paper Session H: Maps Design and Production

The Design of Transit Maps
Dennis McClendon, Chicago CartoGraphics

MAPSCO Transitions to Digital Cartographic Production
David D. Halliday and Wayne J. Baird, Mapsco, Inc.

Impact of Modern Automated Cartography and Reproduction Pre-Press Operations on Future Cartographers
Ron Bolton, NOAA

Friday, Oct. 4, 1996 1:30 - 3:00 PM

Panel Session I: Changing Roles of University Cartography Labs. Moderator: Gregory Chu, Dept. of Geography, Univ. of Wisconsin-La Crosse

Observations in the Increasing Complexities in the Management of University Cartography Labs"
Gregory Chu, Dept. of Geography, Univ. of Wisconsin-La Crosse

Friday, Oct. 4, 1996 3:30 - 5:00 PM

Paper Session J: Map Availability, Production, and Use

What Can They Do For You?
Harold C. Boke Bowker, Denver, Colorado

Orienteering in the United States: Geographic Patterns of Participation
Elisabeth S. Nelson, San Diego State University

Friday, Oct. 4, 1996 3:30 - 5:00 PM

Panel Session K:PostScript Mapping Round Table. Moderator: Dennis McClendon, Chicago CartoGraphics

Friday, Oct. 4, 1996 3:30 - 5:30 PM

NACIS Board Meeting

Friday, Oct. 4, 1996 6:30 - 10:00 PM

Annual Banquet
Speaker: Kenneth E. Foote, University of Texas, Austin
Mercator's Laptop: Cartographic Frontiers in Cyberspace?

Saturday, Oct. 5, 1996

WORKSHOPS

All workshops will be held at the Department of Geography and Planning, Southwest Texas State University, San Marcos, TX. Transportation to from the Menger hotel will be provided. The bus will leave the hotel at 7:30 AM.

9:00 AM - 5:00 PM

A) Digital Terrain Modeling Workshop
J. Ronald Eyton, Southwest Texas State University

9:00 AM - 12:30 PM

B) Internet and Web for Cartography and GIS
Kenneth Foote, University of Texas - Austin

9:00 AM - 12:30 PM

C) Stop the Insanity: GIS Import/High Quality MAP Graphics Made Easy — with MAPublisher
Roger Fradgley, Avenza Software Inc.

1:30 - 5:00 PM

D) Creating New Worlds — 3D Cartography with KPT Bryce 2
Tom Patterson, National Park Service, Harpers Ferry, WV

5:30 - 8:30 PM

Barbecue

EXCHANGE PUBLICATIONS

Cartographic Perspectives gratefully acknowledges the publications listed below, with which we enjoy exchange agreements. We continue to seek agreements with other publications.

ACMLA Bulletin. Published triannually by the Association of Canadian Map Libraries and Archives. Offers article, reviews, and news on cartography and map library related issues. Contact: Colleen Beard, Brock University Map Library, St. Catherines, Ontario L2S 3A1 Canada.

ACSM Bulletin. Published six times a year by the American Congress on Surveying and Mapping. Offers feature articles, regular commentaries, letters, and news on legislation, people, products, and publications. Contact: Membership Director, 5410 Grosvenor Lane, Bethesda, MD 20814; (301) 493-0200.

Baseline. Published six times a year by the Map and Geography Round Table, American Library Association. Contact: Editor Nancy J. Butkovich, Physical Sciences Library, 230 Davey Laboratory, Penn State University, University Park, PA 16802; (814) 865-3716; e-mail:njb@psulias.psu.edu

Bulletin of the Society of Cartographers. Published twice a year, the *Bulletin* features articles on techniques and ideas applicable to the Cartographic Drawing Office. Contact: Pamela Spoerry, Department of Geography, University of Cambridge, Dowing Place, Cambridge, CB2 3EN, England.

Cartouche. A quarterly publication offering news and announcements to members of the Canadian Cartographic Association. Contact: Canadian Cartographic Association, c/o Weldon Hiebert, Geography Department, University of Winnipeg, Manitoba, R3B 2E9, Canada; (204) 786-9483; fax (204) 786-1824; e-mail: weldon.hiebert@winnipeg.ca.

Cartographica. A quarterly journal endorsed by the Canadian Cartographic Association/Association Canadienne de Cartographie that features articles, reviews, and monographs. Michael Coulson, Editor. ISSN 0317-7173. Contact: University of Toronto Press Journals Department, 5201 Dufferin Street, Downsview, Ontario, M3H 5T8 Canada; (416) 667-7781.

Cartographic Journal. Biannual Journal of the British Cartographic Society. Includes research articles, 'shorter' articles, official records of the Society, book reviews, and a list of recent cartographic literature. Contact: Hon. Secretary, Charles Beattie, 13 Sheldrake Gardens, Hordle, Lymington, Hants, SO4 10FJ, England.

Cartography. Biannual Journal of the Australian Institute of Cartographers. Each issue contains two parts: the Journal proper and the Bulletin. The Journal contains original research papers, papers describing applied cartographic projects, reviews of current cartographic literature, and abstracts from related publications. ISSN 0069-0805. Contact: John Payne, Circulation Manager, GPO Box 1292, Canberra, A.C.T. 2601, Australia.

Cartography Specialty Group Newsletter. Triannual publication of the Cartography Specialty Group of the Association of American Geographers. Features news, announcements, and comics. Contact: Ann Goulette, Editor, Intergraph Corporation, 2051 Mercator Drive, Reston, VA 22091-3414; (703) 264-7141; e-mail: ann@pluto.ne1300.ingr.com.

Cartomania. The quarterly newsletter of the Association of Map Memorabilia Collectors. Offers a unique mix of feature articles, news, puzzles, and announcements of interest to cartophiles. ISSN 0894-2595. Contact: Siegfried Feller, Publisher/Editor, 8 Amherst Road, Pelham, MA 01002; (413) 253-3115.

Geotimes. Monthly publication of the American Geological Institute. Offers news, feature articles, and regular departments including notices of new software, maps and books of interest to the geologic community. Articles frequently address mapping issues. ISSN 0016-8556. Contact: Geotimes, 4220 King Street, Alexandria, VA 22302-1507.

GIS World. Published monthly, this news magazine of Geographic Information Systems technology offers news, features, and coverage of events pertinent to GIS. Contact: John Huges, Managing Editor, GIS World, Inc., 155 East Boardwalk Drive, Suite 250, Fort Collins, CO 80525; (303) 223-4848; fax: (303) 223-5700.

Information Bulletin. Triannual publication of the Western Association of Map Libraries. Contains features, atlas and book reviews, WAML business, and news. Contact: Mary L. Larsgaard, Executive Editor, Map and Imagery Laboratory, UC-Santa Barbara, Santa Barbara, CA. 93106; (805) 893-4049; fax: (805) 893-8799, 4676, 8620; e-mail: mary@wash.uscdic.ucsb.edu.

Mapline. A quarterly newsletter published by the Hermon Dunlap Smith Center for the History of Cartography at the Newberry Library. This newsletter contains notes, announcements, recent publications, calendar, and short essays on topics of interest to the history of cartography. ISSN 0196-0881. Contact: James R. Akerman, Editor, *Mapline*, The Newberry Library, 60 West Walton Street, Chicago, IL 60610.

Perspective. This newsletter of the National Council for Geographic Education (NCGE) is published five times a year in October, December, February, April and June. News items related to NCGE activities and geographic education are featured. Contact: NCGE, Leonard 16A, Indiana University of Pennsylvania, Indiana, PA 15705; bitnet: clmccard@iup.

FEATURED PAPERS

Each issue of *Cartographic Perspectives* includes featured papers, which are refereed articles reporting original work of interest to NACIS's 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.

TECHNICAL GUIDELINES FOR SUBMISSION

Literature cited should conform to the Chicago Manual of Style, 14th 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 Nebraska - Omaha, Omaha, Nebraska 68182. Manuscripts are reviewed by a minimum of two referees. The recommendations of the reviewers and the Chair of the *CP* Editorial Board are sent to the Editor of *CP*. The Editor will contact all authors to notify them if their paper has been accepted for publication and if revisions are necessary prior to publication. The following technical guidelines should be followed for all accepted manuscripts (these guidelines also apply to book, map, and software reviews).

Material should be submitted in digital form on 3.5" diskettes. Please send a paper copy along with the disk. Text documents processed with Macintosh software such as *WriteNow*, *WordPerfect*, *MS Word*, and *MacWrite* are preferred, as well as documents generated on IBM PCs and compatibles using *WordPerfect* or *MS Word*. ASCII text files are also acceptable.

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, 3210 N. Maryland Avenue, University of Wisconsin-Milwaukee, Milwaukee, WI 53211; (414) 229-4872, fax: (414) 229-3981; e-mail: sona@csd.uwm.edu.

COLOPHON

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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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