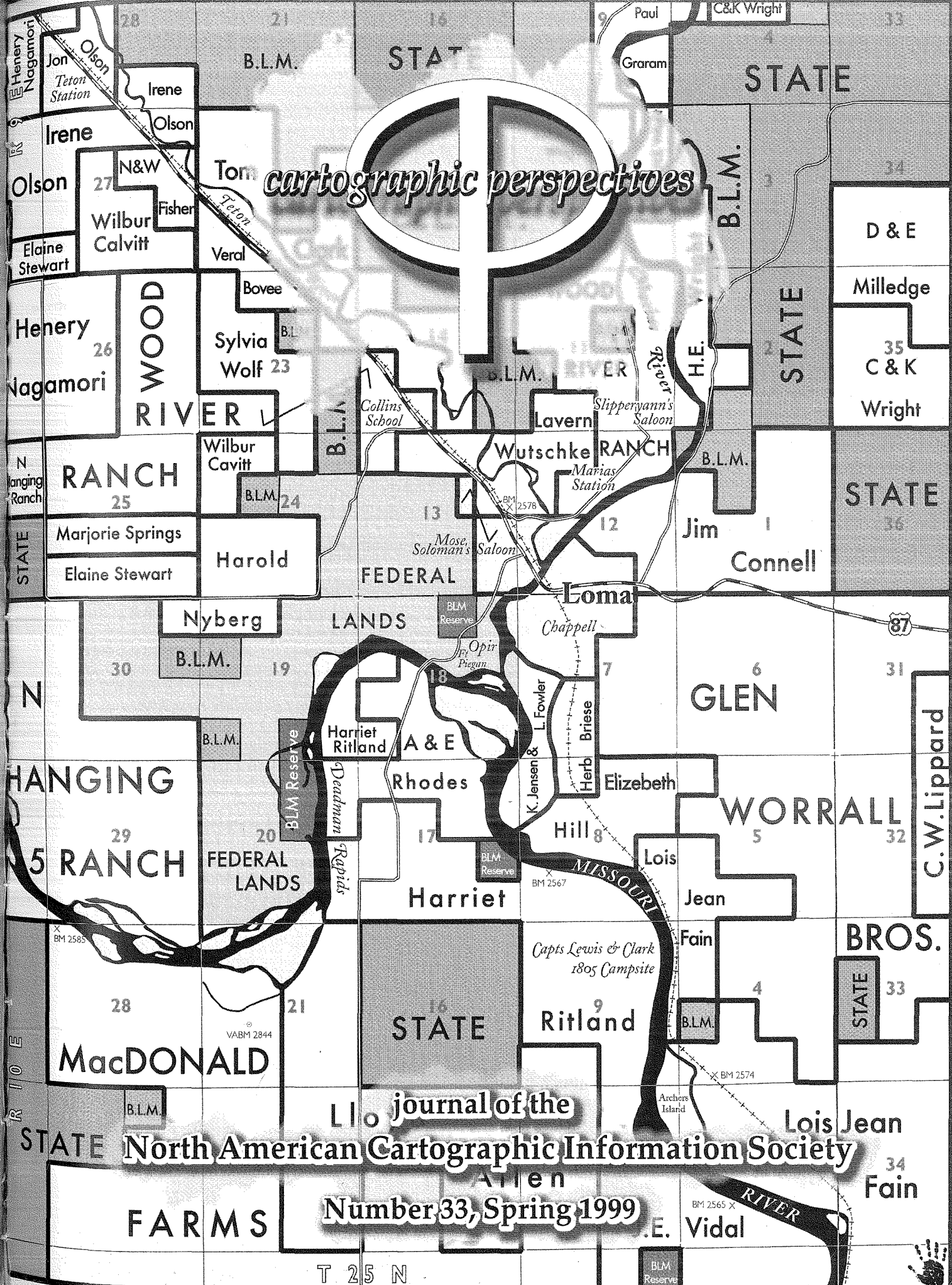


*cartographic perspectives*



Journal of the  
North American Cartographic Information Society  
Number 33, Spring 1999



# cartographic perspectives

Number 33, Spring 1999

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## message from the guest editor

The three articles which comprise this issue of *Cartographic Perspectives* all were presented at NACIS' 1998 annual conference in Milwaukee. While each of the papers deals in some way with maps and education, the similarity among them ends there. So different are the topics, in fact, that I do not even consider this issue of *CP* to be a "theme" issue. Jeff Patton surveys the historical evolution of the American school atlas throughout the nineteenth century, while Adele Haft shows how four modern poets have incorporated maps in their writings. Such poetry can broaden our approach to teaching geography, as well as expand our vision of what maps are and how they function. Finally, Karen Trifonoff discusses the integration of art, maps, and creativity in a workshop designed for elementary and middle school teachers. The papers in this issue, then, should appeal to

(continued on page 3)

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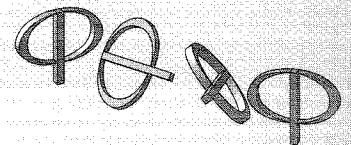
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*about the cover*



The cover design was created by Steven R. Holloway. Steven is with the Department of Geography at the University of Montana in Missoula, Montana.

The cover map is the second in a series of four reflecting on North 47° 56' West 110° 30', the juncture of the Missouri and Marias Rivers near present day Loma, Montana. Cover scale remains approx 1:46,200 with a west orientation. In 1805 Capts. M. Lewis and Wm. Clark trespassed on Harriet Ritland's riverfront property, in 1850 settlement by steamboat up the Missouri River was underway at Opir, by 1920 the homesteading boom was over and the careful lines of ownership laid down; present day records are based on the Choteau County Ownership map in Ft. Benton.

a diverse set of readers with a basic interest in maps.

It has been a few years since I was responsible for editing a journal, and the experience of editing this issue has reminded me of several things that I used to know but which had dimmed in my consciousness. In thinking about the health and viability of this and other cartographic journals, I would like to share - briefly - one aspect of my reflections with you: the importance of reviewers in the publication of a journal.

It takes several categories of people to publish an academic journal, of course - authors, editors, reviewers, and production staff, to name the most obvious ones. Of these, the authors and editors are the most visible, but academic journals depend equally on the more-or-less invisible reviewers, two or three of whom must pass judgment on every manuscript

submitted for publication. Which of us, as either author or editor, has not felt a rush of gratitude at receiving a thorough, insightful, and timely review of a paper? On the other hand, most of us have probably also experienced the helpless frustration that accompanies a reviewer's unmet assurances that the review will be done "soon" or - worse - utter silence. Production deadlines are missed; authors are forced to wait many months, at times, to receive feedback on their work (which is especially unfair to young scholars facing tenure decisions); and editors howl at the moon. Almost as disappointing are reviews that are done so cursorily that they are virtually worthless.

Those of us who write for (and edit) academic journals can thank anonymous reviewers for making possible the publication of each manuscript. And in return, I believe, we have a professional responsibil-

ity to serve as a reviewer for other scholars at times. As trite as it may sound, the publication process depends on qualified people doing their part in the review process as well as the writing process.

The fact that the papers in this issue of *Cartographic Perspectives* are being published less than a year after their first submission attests to the hard work done by the authors, reviewers, and production staff of the journal. I'd like to say thanks to all of them, and to Mike Peterson, our regular editor, welcome back!

Patricia Gilmartin  
Guest Editor  
Professor, Department of Geography  
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### *message from the assistant editor*

The Fall 1998 issue of *Cartographic Perspectives* (Number 31) was guest edited by Trudy Suchan. Her name was inadvertently omitted from the guest editor message at the beginning of the issue. Trudy is a graduate of the Pennsylvania State University and is currently with the U.S. Bureau of the Census.

NACIS is very appreciative of the contribution that guest editors make to *CP*. My apologies to Trudy for this omission.

## The American School Atlas: 1784 – 1900

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At the end of the eighteenth century, American school atlases and geographies were created by individual authors who would search for a printer willing to publish their work. By the middle of the nineteenth century, millions of school atlases were being produced by large mapping corporations with sophisticated marketing strategies. This paper discusses the forces which influenced the evolution of the American school atlas and geography text between the years 1784 and 1900, including changes in printing technology and paper, the competitive commercial market, prevailing pedagogies of the American educational system, and the rise of thematic mapping. Elements of cartographic design which were typical of American school atlases are also examined. These include data symbolization, level of generalization, and choice of projection.

**Keywords:** school atlases, cartographic history, map design

### INTRODUCTION

This paper presents a brief overview of the publication history and design of maps found in American school atlases and geographies from 1784 to 1900. Apart from the Bible, the most widely read books of the nineteenth century were schoolbooks, and among the most common of these were school atlases and geographies (Elson, 1964).

Virtually any atlas could be used as a school atlas; however, for this study the only atlases reviewed were those which stated explicitly in their title or preface that the intended audience was school children. Many school atlases were reprinted year after year with only minor changes, yet listed as a new edition. For example, Jesse Olney's *School Atlas to Accompany the Practical System of Geography for Schools and Families* went through 91 editions between 1829 and 1860. As a marketing tool, publishers often produced "state editions" of their standard school atlas by simply appending a few pages of text and a map or two concerning an individual state. For the purpose of this study, state or new editions of an atlas were reviewed only when there appeared to be significant changes from earlier versions. Biblical and historical atlases, though frequently used by the schools, were not considered. In all, 148 school atlases or geography texts with maps were examined. Almost all of the atlases evaluated are part of the collections of the Newberry Library in Chicago, the New York Public Library, or the Library of Congress.

For each atlas, the number and size of maps, areas of the world portrayed, types of non-map illustrations, method of printing, and the intended audience were all recorded. Map themes and cartographic design elements, including methods of data symbolization, choice of projections, and level of generalization, were examined. Also noted was the inclusion of map skill exercises, question sets, glossaries, and advice to teachers or students on using the atlas.

In general, school atlases were inexpensive, of moderate dimensions, had a limited number of pages and were cheaply reproduced and bound. They were in no way reflective of the highest form of the atlas makers craft. However, it could be fairly argued that the school atlas influenced how the average citizens of our nation came to know the world to a much greater degree than did the large masterpieces of the nineteenth century American atlas makers.

*"... it could be fairly argued that the school atlas influenced how the average citizens of our nation came to know the world to a much greater degree than did the large masterpieces of the nineteenth century American atlas makers."*

Prior to the American Revolution, all geography texts which circulated in the American colonies were published in Europe. One of the most popular for young children was an English translation of Jean Marie Bruyset's *Atlas des Enfants* (1774), while Englishman William Guthrie's geographies (1770 and 1780) were widely used for the instruction of older students. After the Revolution, a fledgling publishing industry began in the former colonies, with centers in Boston, New York, Hartford, and Philadelphia. The first geography text published in the United States was Jedidiah Morse's *Geography Made Easy*. Morse published the small volume while he was a student at Yale University in 1784. According to the prefatory advertisement of his first edition, he originally intended it "... as a manuscript only, for the use of schools under his immediate instruction". However, after showing the work to several "worthy gentlemen" he was induced to refine the work and make it generally available (Carpenter, 1963). The book gained rapid acceptance and for over a quarter of a century remained the most popular geography text on the market. *Geography Made Easy* contained only two maps, one of the world and one of the United States. In later editions the map of the United States was replaced by a map of North America. The maps, 7 3/8 inches by 5 3/4 inches, were folded and tipped into the small volume (Figure 1). Their design and content was essentially the same as maps produced for adult geographies of the day. In spite of its popularity, the Morse text was widely criticized for the number and quality of its maps, a criticism that Morse himself shared.

In the same year that Morse's geography first appeared, Mathew Carey immigrated from Ireland and established a publishing house in Philadelphia. Unlike the European cartographic houses of the same period, Carey subcontracted virtually all phases of map production, including compilation, design, and engraving—a model that would be emulated by many others in these early days of American cartographic publishing (Harley, 1977).

In 1794, Carey published an American edition of Guthrie's *Modern Geography* as a "present" to his new homeland. In his preface to the new edition Carey wrote:

An American edition of this work had long been wanted: and the publisher was of the opinion, that he could not give a more useful or acceptable present to the citizens of the United States. But, upon close examination, he very soon discovered, that the grammar, which had been so long, and so loudly celebrated, united in many passages, almost every fault that can disgrace a literary composition. The book was exactly calculated to flatter the grossest prejudices of the English nation at the expense of every other part of the human species.

Carey attempted to remedy the failings of Guthrie's version of geography. He reduced the section on England from 205 to 130 pages, and still apologized for its length. As for Guthrie's review of the United States, Carey stated that it was so filled with errors that "It would have been more for the honour of the work, had the account of the United States been omitted altogether" (1794, preface). To rectify this slight to his new homeland, Carey wrote an entirely new and much longer section on the United States. In the end, Carey's edition of *Modern Geography* so differed from Guthrie's original and held such a decidedly democratic view of the world that it should be considered among the first truly American geographies, even though it retained Guthrie's name as author.

PUBLICATION HISTORY OF THE  
AMERICAN SCHOOL ATLAS,  
1784-1900

*"The first geography text published in the United States was Jedidiah Morse's Geography Made Easy."*

*"... Carey subcontracted virtually all phases of map production, including compilation, design, and engraving—a model that would be emulated by many others in these early days of American cartographic publishing."*

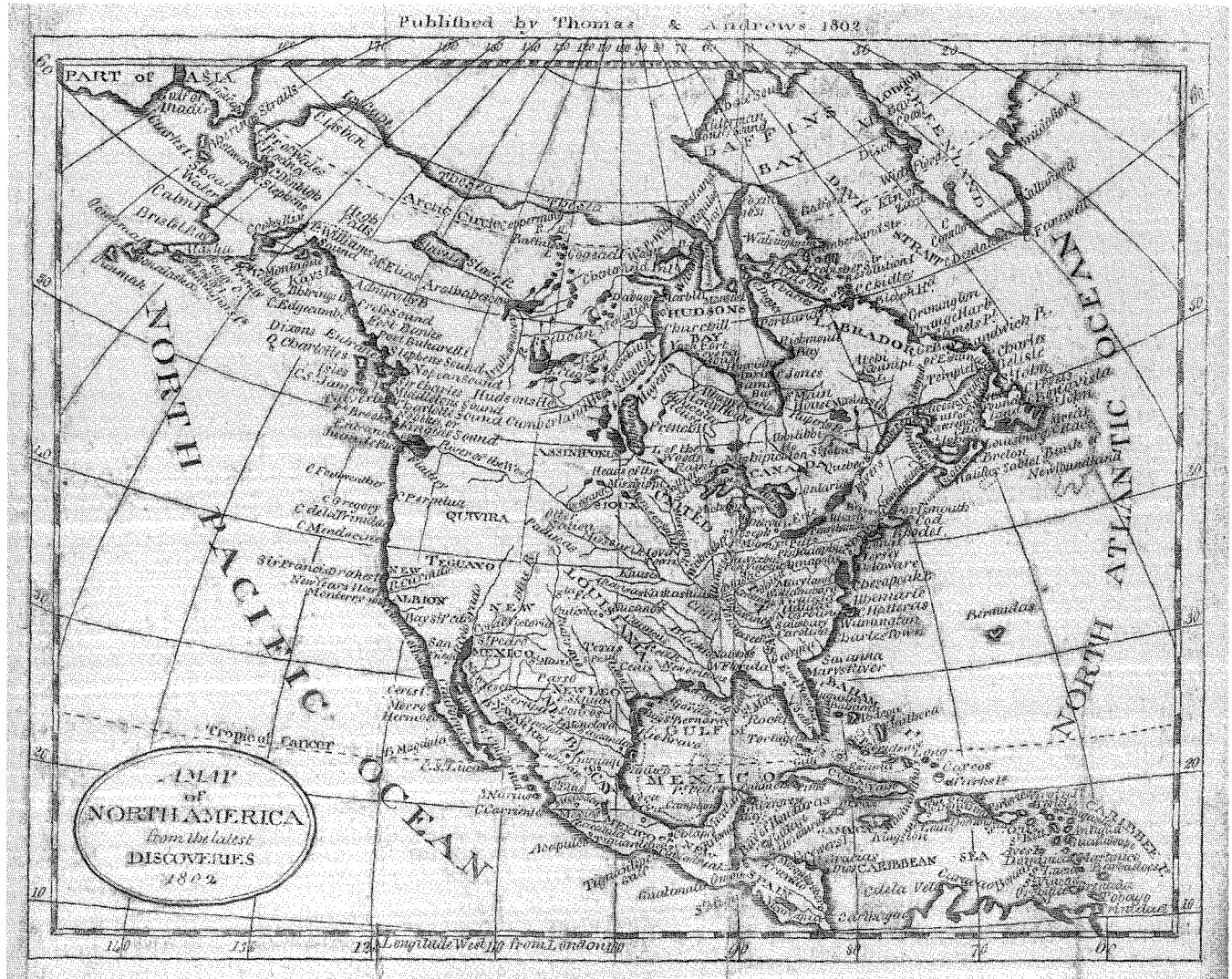


Figure 1. One of two maps found in Jedidiah Morse's *Geography Made Easy* (1802). The map, 7 3/8 by 5 3/4 inches, was folded and tipped into the text. In design the map appears similar to adult maps of the same period.

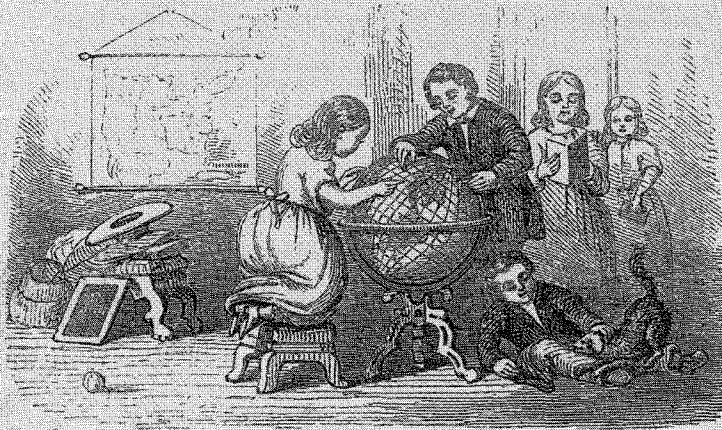
*"The practice of reissuing the same map in a variety of formats has a long history in cartographic publishing, but nowhere was it so widely used as in the production of nineteenth century school atlases."*

Like Morse, Carey recognized that the maps in his geography were unsatisfactory in both quantity and quality. His solution was to publish a separate atlas to accompany the textbook. In 1795 the first American school atlas, *The General Atlas for Carey's Edition of Guthrie's Geography Improved*, was published. Many of the maps in this atlas had been published earlier in atlases Carey had marketed to adults. As Harley (1977) noted, "Carey became a master in the art of packaging the same maps for reissue in several of his publications" (p.769). The practice of reissuing the same map in a variety of formats has a long history in cartographic publishing, but nowhere was it so widely used as in the production of nineteenth century school atlases.

Two much shorter texts, one by Nathaniel Dwight (1795) and the other by Henry Patillo (1796), were also available by the end of the eighteenth century. They presented an outpouring of factual geographical information in the catechetical style of short questions and answers. A sort of "Cliff Notes" version of the longer geographies, they were designed, as Henry Patillo (1796) wrote in the preface to his text, "... not for the learned or wealthy, but to assist those who have neither Maps nor Gazetteers and for

12

## LESSON VI.



- Q. What is Geography?
- A. A description of the Earth's surface.
- Q. What is the Earth?
- A. The planet or body on which we live.
- Q. What is the shape of the Earth?
- A. Round, like a ball.
- Q. Of what is the Earth composed?
- A. Land and water.
- Q. What is a Continent?
- A. The largest division of the land.
- Q. How many Continents are there?
- A. Two; the Eastern and the Western.
- Q. On which Continent do we live?
- A. On the Western Continent.

Figure 2. A lesson using the catechetical or question and answer method, from James Monteith's *First Lessons in Geography*, published in 1871.

the farmer who wishes to understand something of the works of God around him."

The catechetical style was quite popular in early textbooks. According to Neitz (1961) this was a result of many authors modeling their books on the catechetical section of the *New England Primer*. Throughout the first half of the nineteenth century, the question and answer format was widely used in the geographies designed for students of all ages (Culler, 1945). However, after the Civil War, the catechetical style was found only in geographies designed for the very youngest children (Figure 2).

Due primarily to the high cost of paper, early textbooks were almost always quite small. Sahli (1941) measured 49 geographies published between 1784 and 1840, and found that the average size was 4.3 x 6.5

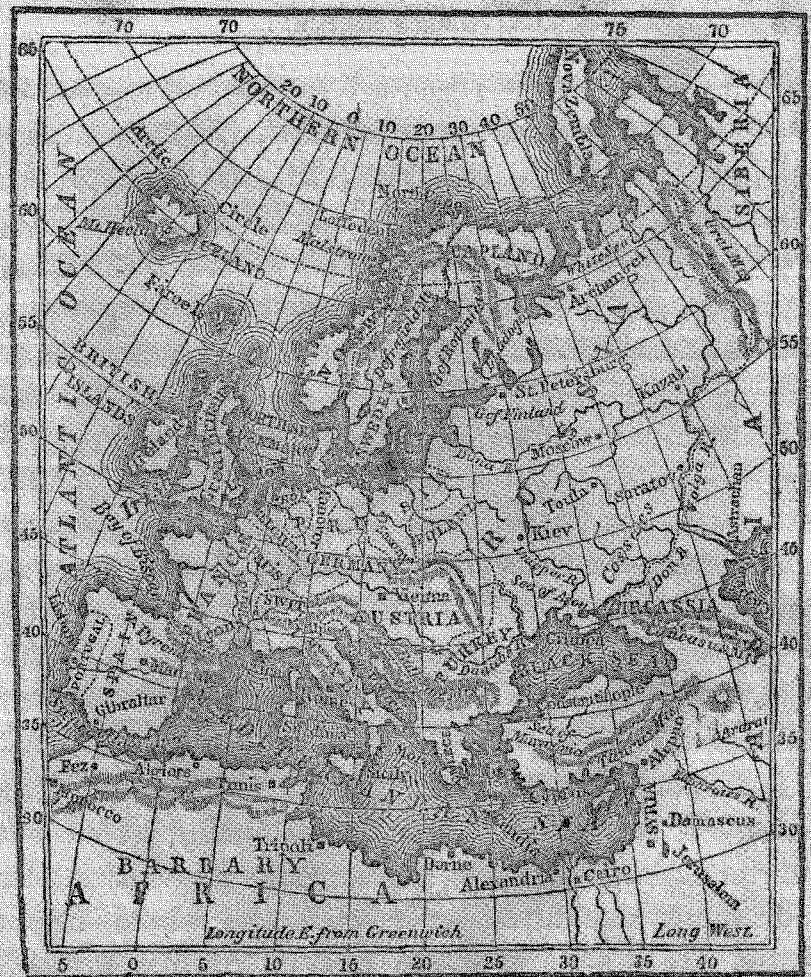
*"Throughout the first half of the nineteenth century, the question and answer format was widely used in the geographies designed for students of all ages."*

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*"The diminutive size of the books presented few good options for map design. Many geographies had no maps or other illustrations; some authors included a few small maps, printed using wood-cut blocks. These maps were either quite simplistic or nearly unreadable (Figure 3). A handful of geographies, such as the Morse geographies, included larger maps which were folded and "tipped" into the text by hand. This was an expensive step not well suited to schoolbooks, as the delicately tipped maps could not long withstand the harsh handling of young children. To overcome the "map problem," as Jedidiah Morse referred to the difficulty of including appropriate maps for student*

inches (28.9 square inches). Jacob Cummings' popular *First Lessons in Geography and Astronomy*, first published in 1818 and running through numerous editions, was a Lilliputian 5 square inches! The diminutive size of the books presented few good options for map design. Many geographies had no maps or other illustrations; some authors included a few small maps, printed using wood-cut blocks. These maps were either quite simplistic or nearly unreadable (Figure 3). A handful of geographies, such as the Morse geographies, included larger maps which were folded and "tipped" into the text by hand. This was an expensive step not well suited to schoolbooks, as the delicately tipped maps could not long withstand the harsh handling of young children. To overcome the "map problem," as Jedidiah Morse referred to the difficulty of including appropriate maps for student



QUESTIONS ON THE MAP OF EUROPE.—What sea lies to the west of Europe? To the south? What continent lies to the south? Where is Madrid? Vienna? St. Petersburg? Paris? Rome? Nova Zembla? Direction of Great Britain from Spain? Of Austria from Sweden? Where is the Black Sea? The Straits of Gibraltar? Iceland? Sardinia? Sicily?

Figure 3. This map is typical of early American wood-cut block maps appearing in geographies (Goodrich, 1866). Lettering was visually quite mechanical or "blocky," and the information was poorly separated into visual hierarchical layers.

use (Brown, 1941), several geography authors, including Morse, commissioned separate atlases to accompany their texts. These atlases were of a much larger format than the geographies, often 8 x 10 inches or more. To keep down the cost, they seldom had more than twenty-five pages.

Initially, school atlases, such as the one produced by Mathew Carey, were simply abbreviated versions of a publisher's adult atlas. However, by the early 1820s, school atlases that were clearly designed for children were beginning to appear (Figure 4).

The second half of the nineteenth century saw several technical innovations that radically changed the look of school atlases and geographies. The introduction of cheap wood pulp paper allowed for books with more and larger pages (Figure 5). The invention of cerography (wax engraving) provided publishers a way to print text and detailed maps using the same printing press, thus eliminating the need to print maps on one press and "tip" them into a book printed on a second press. Woodward (1977) points out another important design change that was a by-product of the technological innovations:

The use of wax-engraved plates on power presses fed with cheaper paper released a large amount of money to be channeled to other destinations. While several of these destinations were undoubtedly the pockets of printers and publishers, it can also be stated that the map buyer began to receive more for his retail dollar. One such benefit appears to have been the frequent addition of color to wax-engraved maps (p. 120).

The result is that the school child of the second half of the nineteenth century saw a very different geography text than had the child of the first half of the century. No longer were separate "accompanying" atlases necessary. The new generation of integrated texts was much larger and contained numerous illustrations, including a variety of full color maps. While much of the change in the look of geography textbooks can be attributed to technological advances, the intense competition among textbook publishers was responsible for the rapid incorporation and innovative use of that technology.

At the beginning of the nineteenth century, geography texts were the products of individual authors who sought out a publisher willing to print their book or simply printed it themselves. After the Civil War, most geographies were being compiled and published by major corporations including Mitchell, Colton, Rand McNally, The American Book Company, and George F. Cram. These companies produced a wide range of educational materials including wall maps, globes, teacher's manuals, and outline maps. However, the most profitable items for the educational divisions of these companies were their age-graded series of geography texts. Typically, these series included a primary, elementary, and high school geography (Kaimovitz, 1998). In addition, the major geography publishers also marketed state or regional editions of their texts. Typical was the *Kansas Edition of the Rand McNally Grammar School Geography* (Bowen 1894) in which Rand McNally simply appended an eight page account of the state to the end of their standard grammar school text. The account summarized the physical, social and economic condition of Kansas, and included a full color, double page map of the state, as well as a dozen illustrations of important buildings and scenic views.

Attempts to open previously untapped markets led publishers to commission translations of their more popular geographies (Kaimovitz, 1998).

*"Initially, school atlases, such as the one produced by Mathew Carey, were simply abbreviated versions of a publisher's adult atlas. However, by the early 1820s, school atlases that were clearly designed for children were beginning to appear."*

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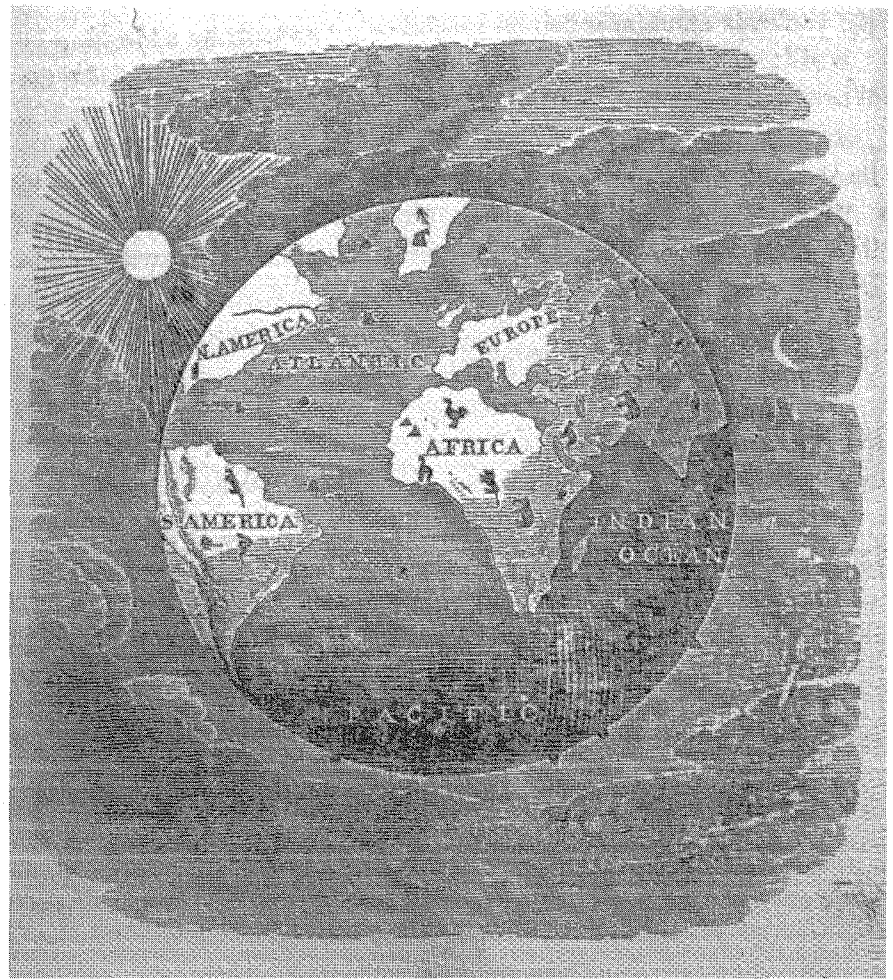


Figure 4. This view of the world was clearly intended for a very young audience (Goodrich, 1836). A "picture" of the world hanging in space became a mainstay of primary and elementary level geographies throughout the nineteenth century. Courtesy Jackson Library, University of North Carolina-Greensboro.

*"During the second half of the nineteenth century the large commercial publishers began to employ noted geography and educational scholars to write and review their books."*

THE CARTOGRAPHY OF THE  
AMERICAN SCHOOL ATLAS,  
1784-1900

American geographies were produced in French, Spanish, the Hawaiian language, and the language of the Dakota Sioux. *Maka-oyakapi*, Arnold Guyot's elementary geography in the Dakota Sioux language, was published, ironically in 1876, the same year as the Battle of Little Big Horn (Riggs and Riggs, 1876).

In many of the of the early school geographies, the written text was often lackluster or even mind-numbingly repetitive. During the second half of the nineteenth century the large commercial publishers began to employ noted geography and educational scholars to write and review their books. The accuracy of the information, level of explanation, and the style in which the material was presented improved greatly. Most notable were the series of geography books carrying the names of Matthew Maury, Arnold Guyot, and Alexander Frye—all of whom had developed international reputations as scholars before writing school geographies.

At the end of the eighteenth century, maps, including school maps, were primarily concerned with the "accurate" delineation of territory and the establishment of possession—"Where is this territory?" and "to whom does it belong?" Great emphasis was placed on the "new" knowledge that a map portrayed. Maps often included a prominent description noting that they

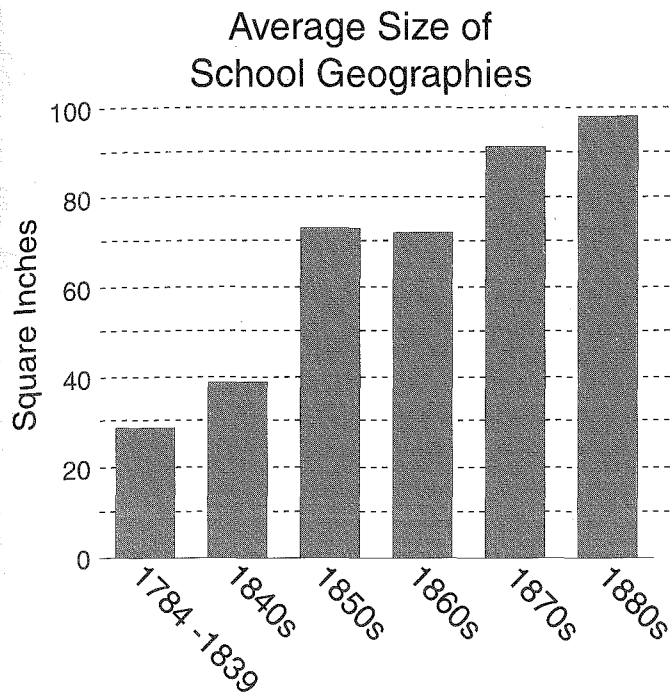


Figure 5. The average size of school geographies increased dramatically with the introduction of inexpensive wood-pulp paper in the 1840s. By the end of the century the average text was more than three times the size of the earliest texts. Data from Sahli (1941) and Culler (1945).

were drawn based on information from "the most recent discoveries" or that they were derived from "the best authorities."

By the early part of the nineteenth century, with the exception of the Arctic and Antarctic regions, the level of geodetic knowledge was such that only minor differences can be found between the outlines of the world's large land masses in school atlases of 1830 and those of today.

This new level of geodetic accuracy may have led map readers, and even some map makers, to conclude that while the population of Boston would change, the coastline of Massachusetts had been determined and was essentially fixed. This attitude is often expressed today by the general public in statements like "hasn't every place been mapped?"

A notable exception to the attempts at portraying geodetic accuracy were the maps produced for very young children. Students just learning to read were taught the basic shapes of continents, and intricate detail was often abandoned in favor of an appealing design (Figure 6). Simplification was seen as the key to making maps appropriate for the youngest children. In the preface to his *First Lessons in Geography*, James Monteith (1871) extolls the virtue of his book because, "The Maps are free from all meridians, parallels of latitude, and any superabundance of names . . ."

During the 1800s a new function was added to the role of maps; not only could maps be used to show the location of places, but also what those places were like. This new function was best met with a new cartographic form, the thematic map. Robinson (1982) states that the "... development of thematic mapping in the Western world ranks as a major revolution in the history of mapmaking. Its intellectual and conceptual consequences are comparable to those that followed upon the spread of the concepts in Ptolemy's *Geography* some three centuries earlier" (p. 17). In advertisements for school atlases, maps were championed for the selection of data that they portrayed and their ease of use in instruction. Claims that the maps were

*"During the 1800s a new function was added to the role of maps; not only could maps be used to show the location of places, but also what those places were like. This new function was best met with a new cartographic form, the thematic map."*

#### THEMATIC MAPS

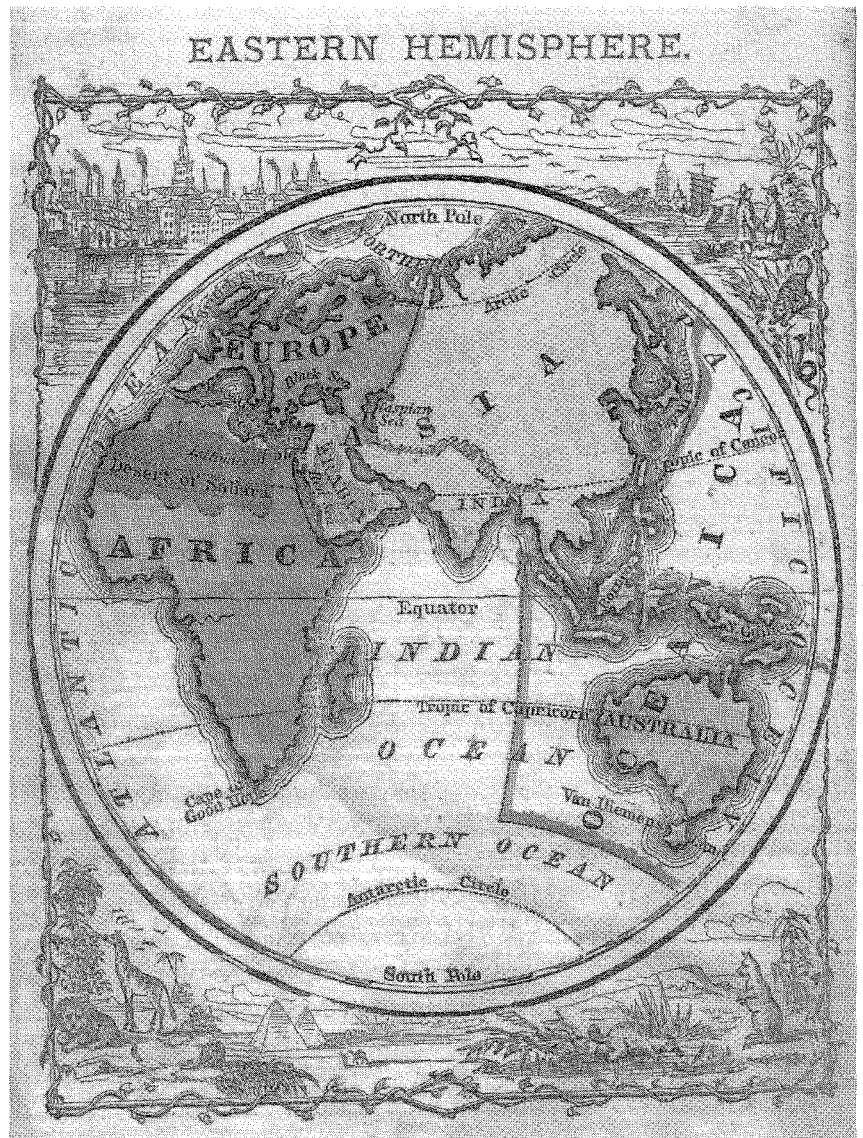


Figure 6. This map portrays a highly generalized, almost "cartoon-like" view of the outlines of the major land masses. The small, corner views of the four continents of the Eastern Hemisphere were clearly designed for young children (Monteith, 1871).

*"... based upon the "best authorities" no longer referred to surveyors and explorers; rather, the new authorities were educators and geographers."*

*"Woodbridge's atlas may represent the earliest use of isotherms in American map making."*

based upon the "best authorities" no longer referred to surveyors and explorers; rather, the new authorities were educators and geographers.

One of the more remarkable series of school atlases to appear in the early nineteenth century were those of William Channing Woodbridge. Woodbridge was active in educational societies on both sides of the Atlantic and quick to incorporate the latest scientific and educational ideas into his school atlases. His 1826 *School Atlas designed to accompany Woodbridge's Rudiments of Geography* included not only reference maps, but also three thematic maps: "A Moral and Political Chart of the World," "A Chart of the Principal Animals of the World," and "An Isothermal Chart or View of Climates and Productions."

Woodbridge's atlas may represent the earliest use of isotherms in American map making (Robinson, 1982). Woodbridge included a prominent acknowledgment on his Isothermal Chart to the noted German geographer, Alexander Von Humboldt, with whom he corresponded. It is Humboldt who is generally credited with being the first to use isotherms to map

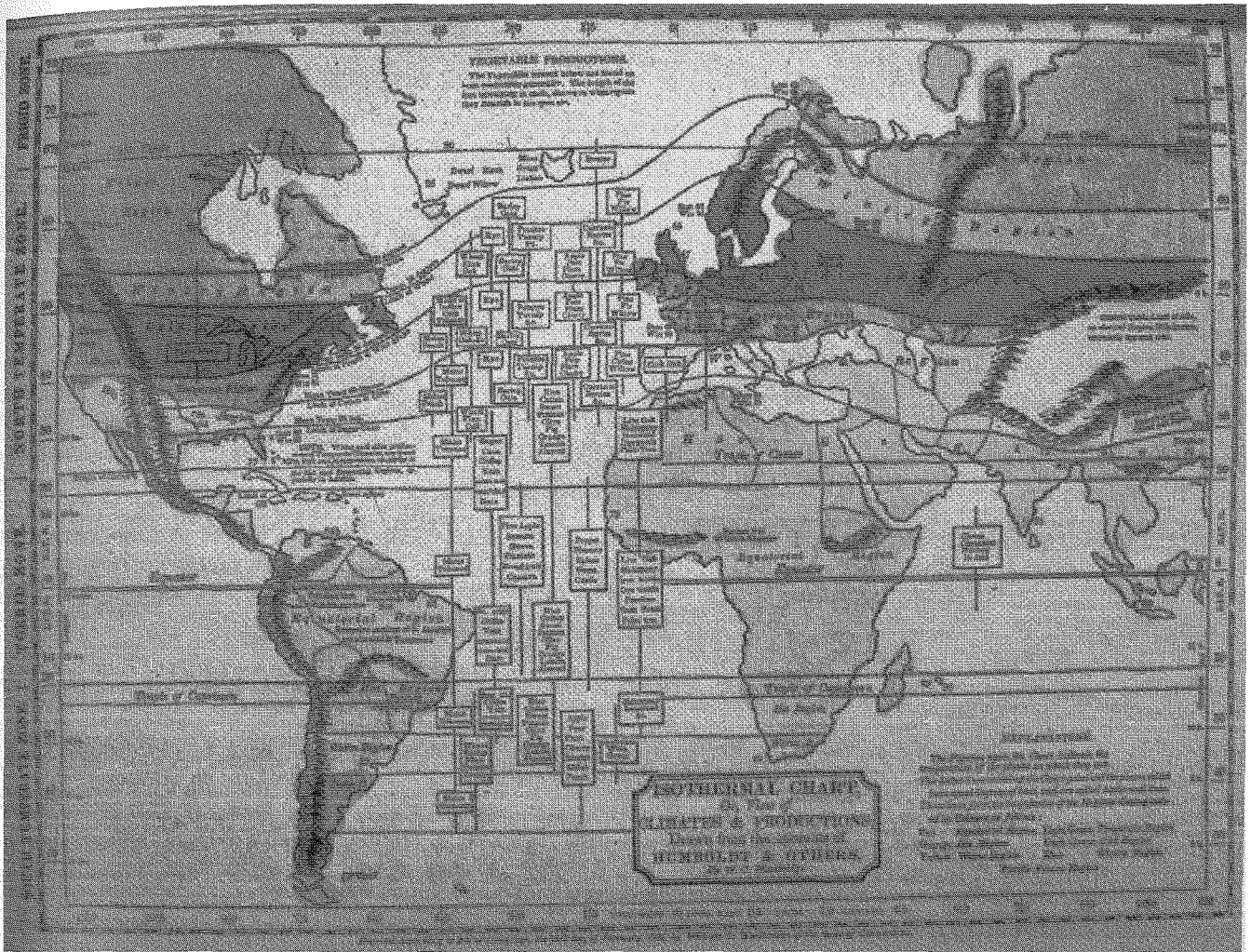


Figure 7. A portion of Woodbridge's "Isothermal Chart or View of Climates and Productions" from the 1831 edition of his school atlas. Courtesy of the New York Public Library.

temperature. The map correlates the range of a variety of productive plants to temperature as noted by the isotherms. As can be seen in Figure 7, Woodbridge chose to include very little general reference information. The result is a map with a focus clearly on the thematic information, unhindered by a great deal of visual clutter. The color scheme he uses for showing temperature is spectral, grading from blue to red, still the most common color scheme used to portray temperature on maps.

Woodbridge's second thematic map was a display of various animals of the world (Figure 8). Sixty-two animal portraits as well as several views of human hunters are found on the map. Each of the animals is identified by a number which corresponds to both the legend on the map and to an accompanying table of longer descriptions. As on the isothermal chart, Woodbridge removed much of the general reference information that had been the mainstay of world maps. With the exception of the equator, even latitude and longitude markings are missing from his map. Woodbridge showed little concern for geodetic accuracy when he clipped off parts of the Arctic, Antarctic, Western North America, and the Far East, and moved Australia westward, all in order to maximize the size of the area of interest on the page. The resulting view is clear and uncrowded, and "It is easy to imagine that this map, with its delightful illustrations of both familiar and

*"The color scheme he uses for showing temperature is spectral, grading from blue to red, still the most common color scheme used to portray temperature on maps."*



Figure 8. A portion of Woodbridge's "A Chart of the Principal Animals of the World" from the 1833 edition of his school atlas. Courtesy of the Newberry Library.

*"Woodbridge's "Moral and Political Chart" categorized the countries of the world based upon their degree of civilization (Figure 9). As his measure of civilization, he used what he considered to be the condition and status of women."*

exotic animals, would be quite popular among school children of the day" (Patton, 1997).

Woodbridge's "Moral and Political Chart" categorized the countries of the world based upon their degree of civilization (Figure 9). As his measure of civilization, he used what he considered to be the condition and status of women (Elson, 1964). His lowest levels of civilization, "primitive" and "barbarous," he refers to as "pagan societies," where women are no more than domestic animals; in the next stage, "half civilized," women are slaves to be bought and sold, but they may be given a rudimentary domestic education. The highest two levels, "civilized" and "enlightened," were reserved for Christian nations. In "civilized nations," women were recognized to possess immortal souls and were afforded respect equal to that of men, and in countries attaining the "enlightened" state:

... the status of women is perfectly satisfactory and nothing more remains to be done: *England, Scotland, and the United States* appear to be the only countries in which attention is generally paid to the intellectual improvement of females; and the general standard of purity in morals and manners, is more elevated than in any other nations.

(Woodbridge and Willard, 1824, p. 212)

From the standpoint of design, Woodbridge's use of a graded series of gray shades to portray ordinal level data, such as the degree of civilization, was fairly effective. The bright radiant pattern used to denote the enlightened nations, reminiscent of light emanating from a lamp, must have seemed particularly appropriate. In historical hind-sight it is easy to see the underlying sexist, racial, and cultural biases of this classification system. At the time, however, it was readily accepted and copied by other geographers.

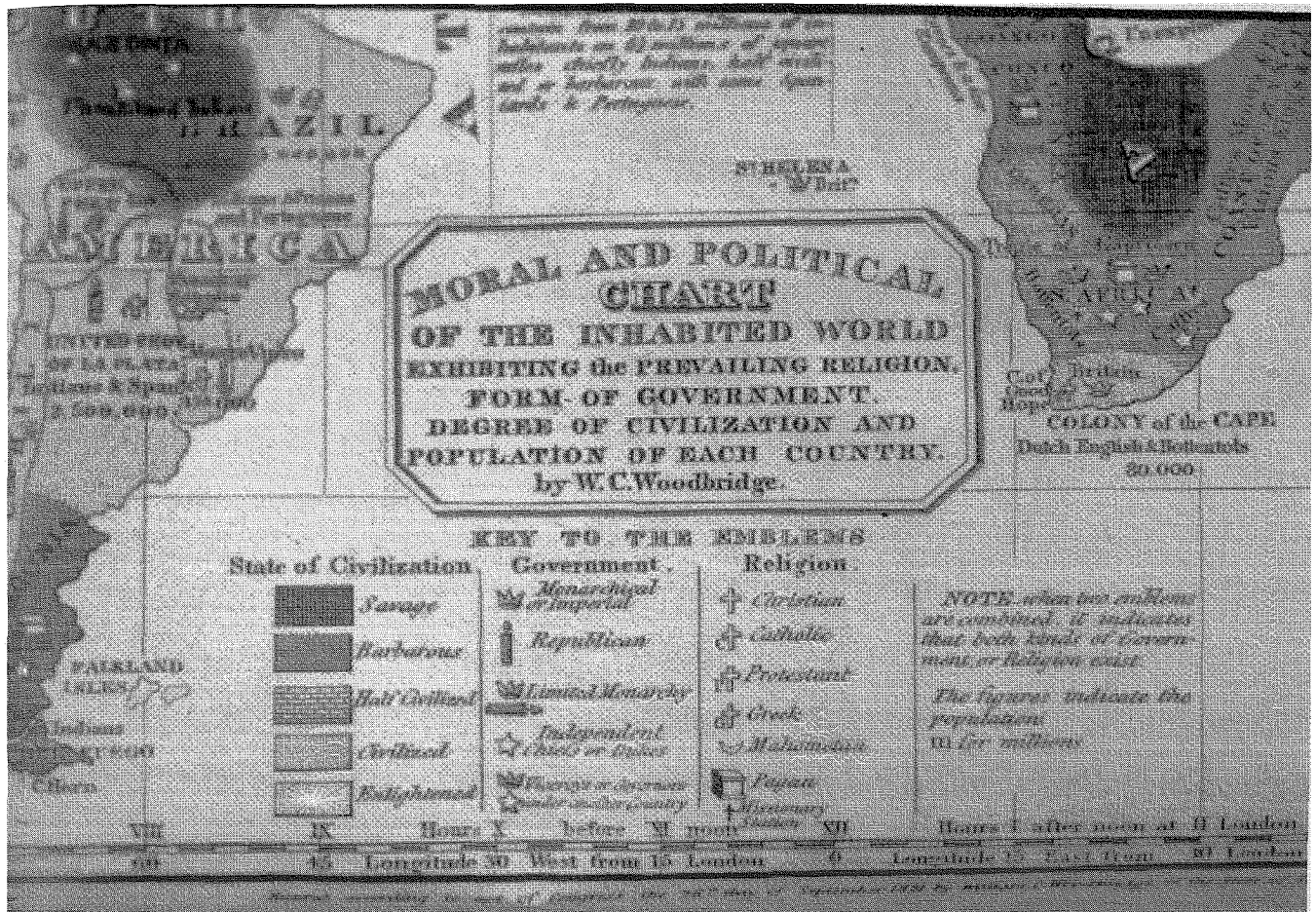


Figure 9. A portion of Woodbridge's "A Moral and Political Chart of the World" from the 1831 edition of his school atlas. Courtesy of the New York Public Library.

Throughout the nineteenth and well into the twentieth century, some variation of this classification scheme of the world's inhabitants was frequently found in children's school books. Starting with Woodbridge, then, thematic maps quickly became a staple of school atlases. It is not that they replaced the general reference map in school atlases; instead, both were now included.

While Woodbridge's thematic maps appear to have been effective visual devices, this was not always the case among early thematic maps found in school atlases. Problems often arose when authors tried to combine detailed reference information with their thematic data. As Robinson (1982) noted:

The natural tendency among map makers is to try and make their maps as useful as possible, but unfortunately the objectives of portraying clearly the geographical structure of a distribution while providing a goodly amount of reference data seem to be essentially antagonistic (Robinson, p. 17).

R. C. Smith's 1839 "Map of the World" is an excellent example of the antagonistic relationship recognized by Robinson (Figure 10). Smith attempted to portray a variety of information including the size of each nation, the population of each nation and region, form of government, dominant form of religion, location of Protestant missionaries, and the state of civilization, all upon the backdrop of a general reference map. The

*"Starting with Woodbridge, then, thematic maps quickly became a staple of school atlases. It is not that they replaced the general reference map in school atlases; instead, both were now included."*



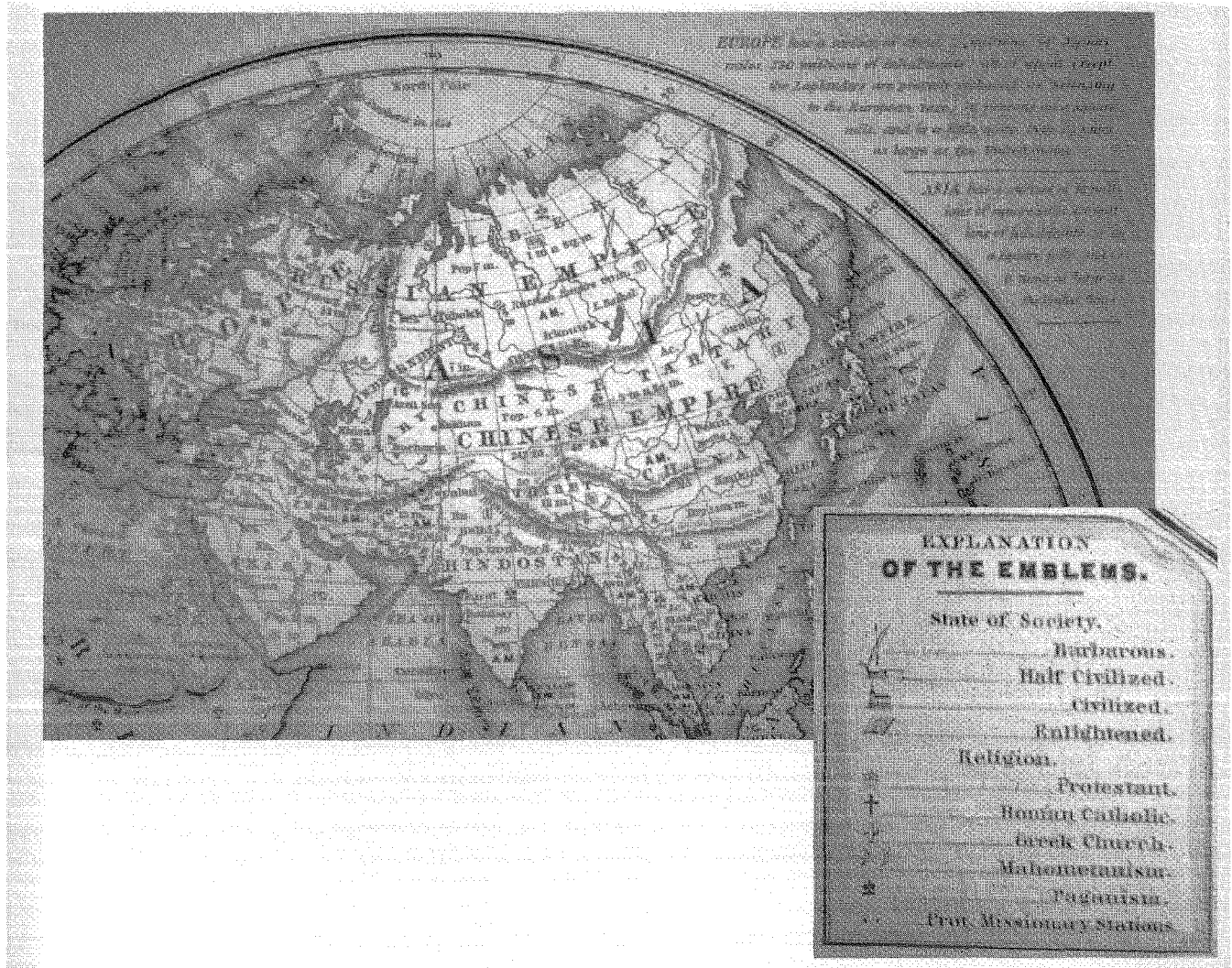


Figure 10. A portion of Roswell C. Smith's 1839 "Map of the World." In addition to the symbols used to show the "State of Society" and dominant form of religion, within each country are small numbers representing the total number of inhabitants, density of population, and size of each nation. Small letters represent the form of government and the various ethnic groups. Courtesy of the New York Public Library.

*"... Smith's maps were data depositories, analogous to a dictionary; when a student wanted to know a specific piece of information, they could go to the map and "look it up."*

effectiveness is questionable at best, as the small letters, numbers and symbols used get lost among the general text of the map.

The popularity of maps like this one by Smith may indicate a very different philosophy concerning the purpose for including maps in school books. Woodbridge's maps were graphic devices which revealed the general pattern of data distributions. They were visual explanations of information, while Smith's maps were data depositories, analogous to a dictionary; when a student wanted to know a specific piece of information, they could go to the map and "look it up."

Fewer thematic maps were included in texts for the youngest children. Those that are found invariably utilized pictorial symbols to convey the thematic information. It is clear that iconic symbols were thought to be appropriate for young children, as it is difficult to find any maps that used abstract symbols, such as squares, triangles, circles, etc.

While point phenomena could be portrayed in a pictorial fashion rather easily, areal phenomena provided greater challenges. Continuous data, such as land cover or topography, was particularly difficult to display pictorially on small scale maps. One approach was to paint a series of vignettes on the map, in a sense using large point symbols to represent

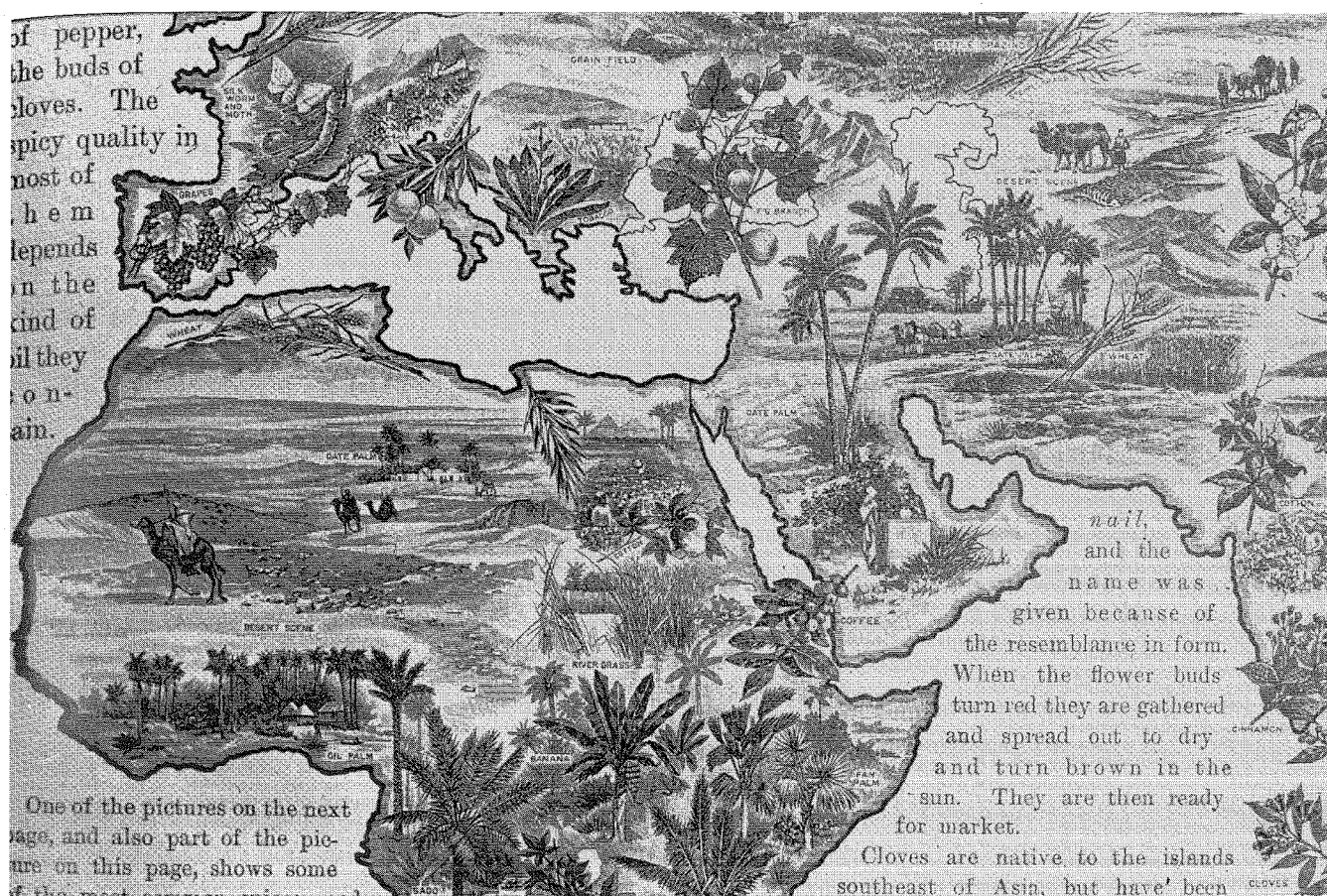


Figure 11. Alexis E. Frye (1895) created unusual and graphically appealing images for his geography texts, which spanned the last two decades of the nineteenth and the first two decades of the twentieth centuries. Here he represents broad geographic regions of the world by using vignettes of landscapes drawn at a local scale. Weaving the text through the map was also a novel design strategy.

areas (Figure 11). Toward the end of the century there were many attempts at representation of the earth's surface in "natural color" and by sophisticated plastic shading (Figures 12 and 13). Some of these illustrations were quite lovely and must have been very appealing to students of all ages. It is interesting that these illustrations were typically referred to as "pictures" of the world and not as maps.

Due primarily to the wide acceptance of wax engraving and embedded type by commercial map publishers in the United States, the American school atlas was not nearly as beautiful as its delicately engraved, copper-plate European cousins. The lettering was stiffly mechanical, the coloring when done by hand, was often quickly and carelessly applied; if the coloring was mechanically applied, there were often registration problems. The overall effect of the maps was somewhat "flat," as if they had no depth (Woodward, 1977). Referring to commercial atlases produced between 1870 and 1930, Woodward states:

... that the character of the American map publishing industry was far more industrialized or organized on mass production lines than its European counterpart; that the quality of the product suffered in this mass production atmosphere; and that the European map publishing houses placed more emphasis on the artistic aspects of cartography,

#### THE LOOK OF THE AMERICAN SCHOOL ATLAS

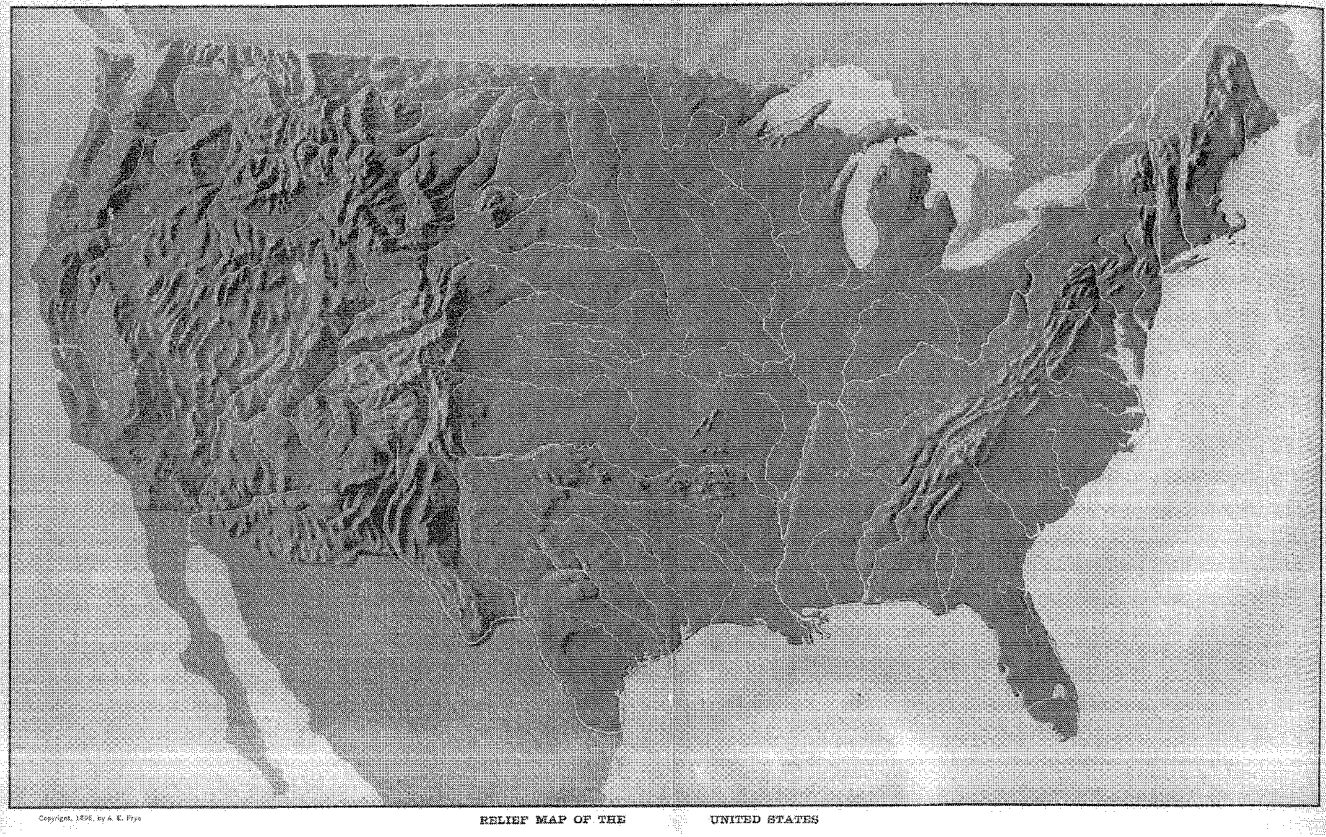


Figure 12. Frye (1895) was an avid supporter of having students create their own 3-D models of the landscape. His texts include numerous plastic relief maps like this view of the United States.

which they considered could be attained more easily by traditional processes (p. 48).

While the aesthetic appeal of American school atlases seldom matched that of European atlases, there were normally a great number of maps and they were large, clear, and almost always in color. The non-map illustrations were typically black and white, but undoubtedly were the most exciting aspect of the book for the children. Fiery volcanic eruptions, natives hunting ferocious beasts, exotic veiled women, and black whirling tornadoes, are found on virtually every page (Figure 14).

#### MAPS AND PEDAGOGY

One of the strongest and most enduring forces shaping the design of maps during the nineteenth century was the prevailing educational pedagogy based on memorization. At the end of the eighteenth century, Charles Smith (1795) wrote in the preface that the purpose of his school geography was:

... to give young minds a general idea of geography is the purport of this publication. It contains a comprehensive view of the several parts of the globe and a general description of the countries belonging to each part, alphabetically arranged. To make it of easy access to the memory of young persons, the author has reduced the information to as great a degree of simplicity as possible without omitting anything necessary, to a general knowledge of the world.



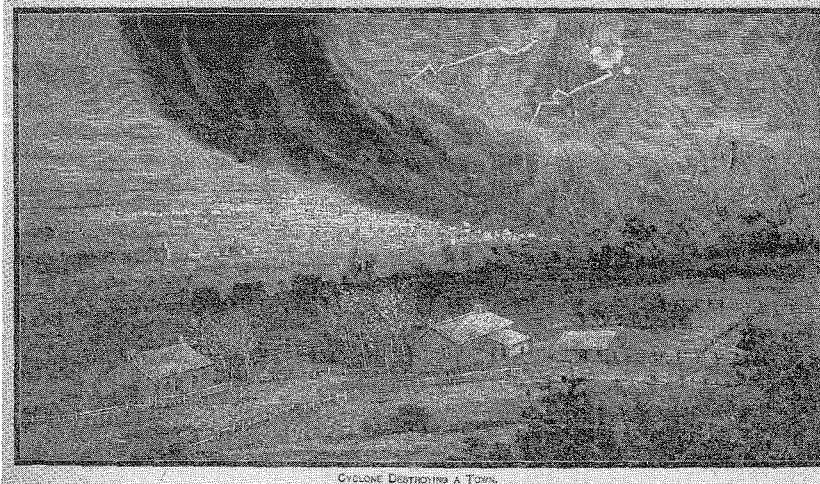
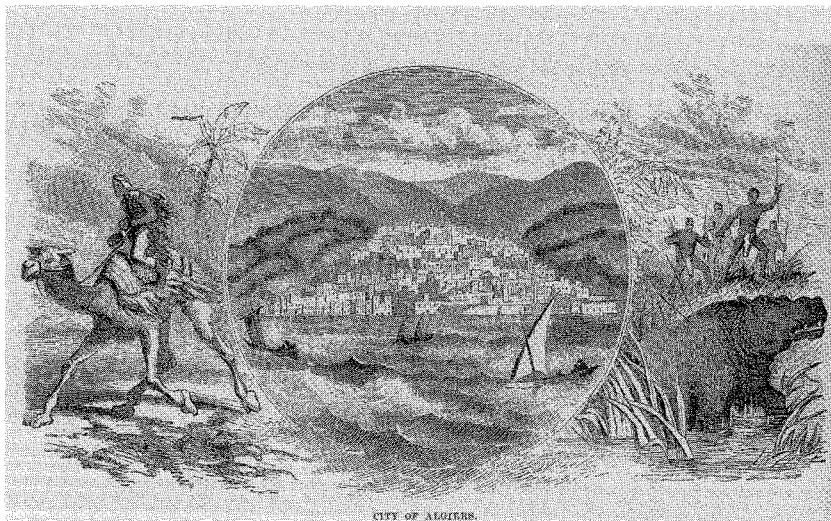
Figure 13. This beautiful view of the globe was colored in rich greens, browns, and blues (Monteith, 1885). It was intended to portray how the earth would look from space. In the corners are portraits of representatives of the various "races of mankind" and scenes of their homelands.

Nearly 100 years later at the very end of the century, in the preface to Rand McNally's *Primary School Geography* (1894), this advice to teachers was given, "All practical educators agree upon one point. That the young pupils in geography, using a textbook, should be assigned the task to memorize."

While it may be an oversimplification, an argument could be made that the pedagogy for the teaching of geography in the nineteenth century could be summarized in a single word, memorization. It is clear that this was a common and widely praised practice, and that maps were seen as ideal vehicles for the task. On the other hand, it is important to note that many educators, particularly in the last half of the nineteenth century, decried the reliance on memorization. C.T. Richardson, president of the Oswego, New York, Board of Education wrote in his 1861 annual report:

Usually a child is taught as a vessel is laden at the wharf, in bulk, facts are thrown in loose without any regard to the fitness of the child's faculties to receive them, and when a certain amount has been committed to memory the child is considered educated.

*"... "All practical educators agree upon one point. That the young pupils in geography, using a textbook, should be assigned the task to memorize.""*



*The Anaconda, (Guiana.)*



*"An interesting inclusion by many authors were "horror" stories that modern educators would find unsuitable for young children."*

Figure 14. Illustrations often appealed to the adventurous spirit of children. Exotic places, such as the view of the city of Algiers (American Book Co. 1894), animals (Cornell, 1855) and violent weather (Rand McNally, 1894) were frequent themes. An interesting inclusion by many authors were "horror" stories that modern educators would find unsuitable for young children. For example, the small wood-cut block print of a rider being pulled from his horse by an Anaconda snake in Guiana (Woodbridge, 1823).

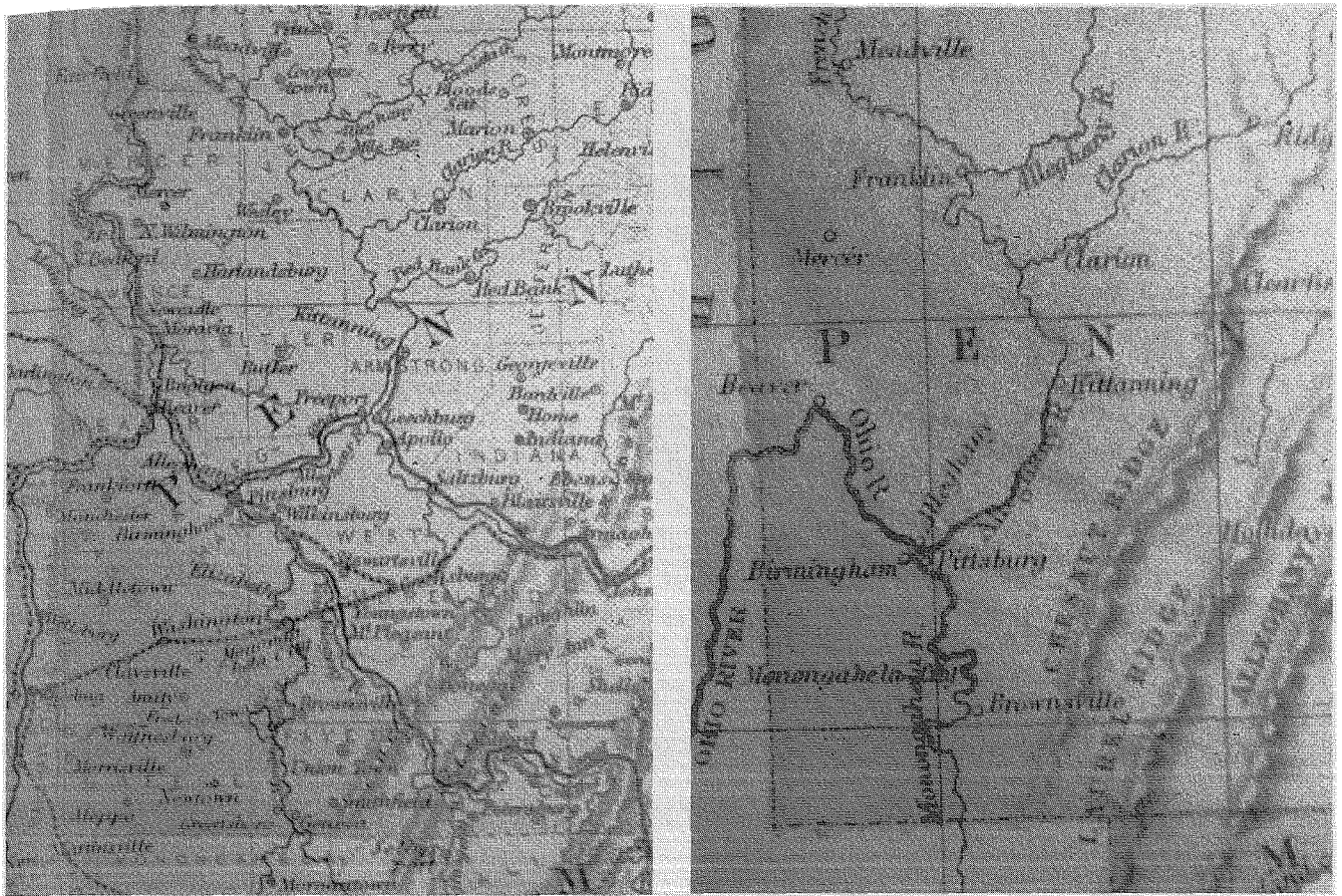


Figure 15. For each major region of the world or grouping of U.S. states Sarah Cornell (1857) included two maps. One map had a great number of place names which could be referred to as needed while the other labeled only those places which the student should commit to memory. Shown here are portions of her "Middle States" maps.

Referring to the common practice of memorizing rules and facts, Francis Parker wrote in 1876:

How would a child learn to talk, if the same abominable system of mnemonics were practiced in the nursery as in the primary school? Fortunately the child has five or six years of wholesome instruction to prepare for the ordeal.

While more enlightened educators may have railed against a pedagogy rooted in rote memorization, atlas makers tailored their products to the majority of teachers who utilized the methodology. School atlases often were marketed on the idea that their maps had been carefully edited to include only those features and places appropriate for memorization. Sarah Cornell (1857) recognized that not all places should be committed to memory, so she created school atlases containing two maps of every region, one detailed map for reference and a less detailed map containing only those places that should be committed to memory (Figure 15).

Samuel Mitchell (1839) produced a series of outline maps for the purpose of having students write in place names so as to make memorization easier. And Rand McNally developed a graded series of maps drawn on the same base, but as one progressed from primary to grammar school, the number of place-names increased (Figure 16).

*"School atlases often were marketed on the idea that their maps had been carefully edited to include only those features and places appropriate for memorization."*

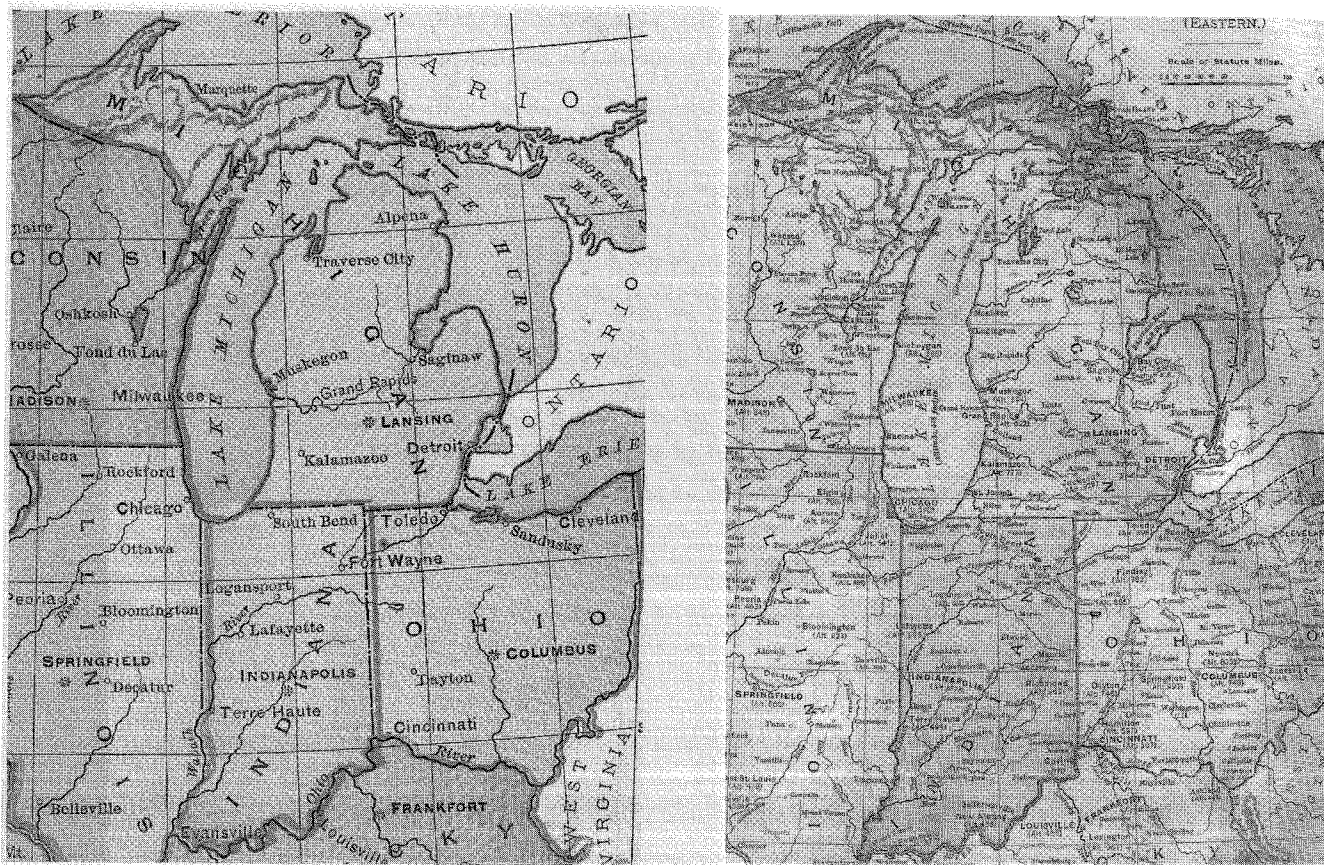


Figure 16. Map on the left is from Rand McNally "Primary School Geography" (1894) and the map on the right is from their "Grammar School Geography" (1894). The most common method for making maps grade appropriate was by regulating the number of place names.

"... in Van Waters' book, the definitions of terms and geographical descriptions of the states and nations of the world were all presented in rhyme:"

One of the most novel methods for helping young students to learn and memorize geography was George Van Waters' *Poetical Geography* (1851). The book covers the same material as other geographies of the day, but in Van Waters' book, the definitions of terms and geographical descriptions of the states and nations of the world were all presented in rhyme:

#### Maps

A Map's a picture, of the whole or part,  
Of the earth's surface, to be learned by heart.  
The top is North, while South points to your breast;  
The right hand's East, the left hand's always West.  
More Maps than one, bound up for school or college,  
Is called an Atlas, and contains much knowledge.

#### Volcanoes

Volcanoes, from their craters, vomit fire  
And smoke and lava, in a steam, most dire

#### South Carolina

Columbia stands upon the *Con-ga-ree*;  
And Georgetown dwells upon the *Great Peedee*, —  
As Charleston lives just seven miles from sea.  
Hamburg, by the *Sa-van'-nah*, keeps her station,  
Just at the head of steamboat navigation.

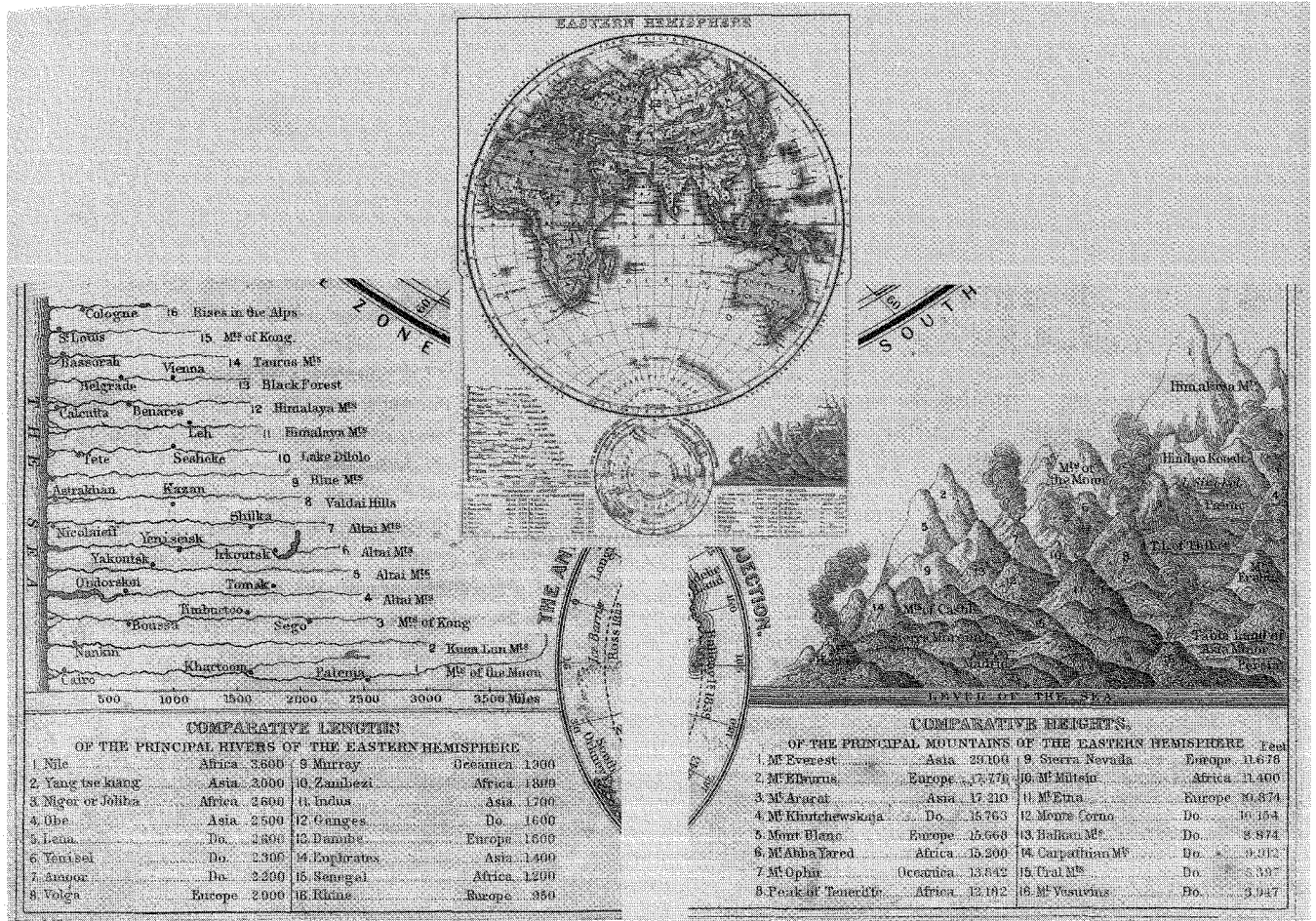


Figure 17. The widely used globular projection left large spaces in the four corners of the page. A common practice was to include a comparative chart of river lengths and mountain heights. Note the inclusion of the legendary Mountains of the Moon on this chart from an 1875 Mitchell school atlas.

At the end of *Poetical Geography* Van Waters appends the rules of arithmetic, including how to multiply and divide decimals, determine cube roots, and calculate compound interest—all in rhyme! In a review of *Poetical Geography*, the New York Evening Post wrote, "It will prove as effectual in fastening the principal facts of Geography upon the memory, as the common verse of 'Thirty days hath September, &c.' is in fixing the days of the month" (quoted on the back cover of the *Poetical Geography*).

The memorization pedagogy may have been seen as particularly appropriate for the teaching of geography, as geography in the nineteenth century was viewed as a mainly descriptive science. Especially useful, then, were the comparative charts which portrayed the highest mountains, longest rivers, greatest islands, etc. It is interesting that what is often considered the fundamental underpinning of maps, spatial relationships, is missing from these diagrams. Lake Victoria could be situated next to Lake Superior and Mt. Everest flanked by Kilimanjaro and Rainier, in a sort of geographic disembodiment. Here also, the artistic ability of the cartographer could and did shine (Figure 17). Some of the comparative charts were exquisitely engraved, but in fact a simple bar chart may have been more effective if one simply wanted to show the length, size, or height of geographic phenomena.

The ideas of the noted Swiss educator, Johann Pestalozzi (1746-1827) began to gain acceptance by a number of American geographical educators

*"Lake Victoria could be situated next to Lake Superior and Mt. Everest flanked by Kilimanjaro and Rainier, in a sort of geographic disembodiment."*



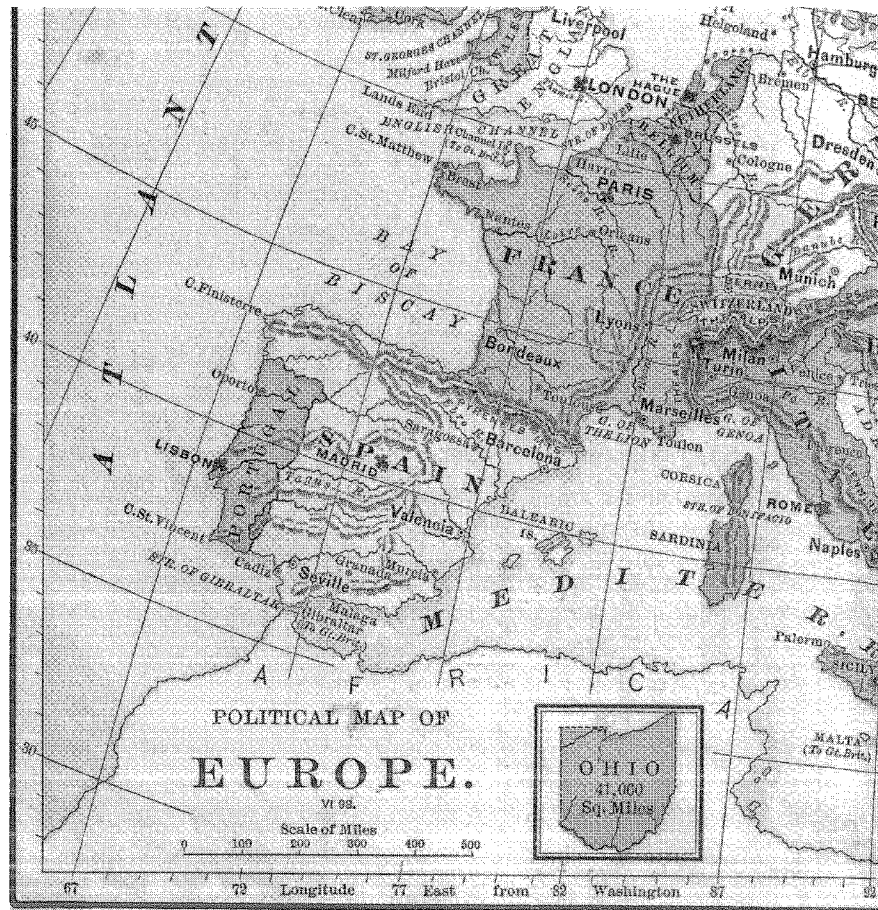


Figure 18. Including a map of a familiar state as a visual scale of size was a common practice toward the end of the nineteenth century. The portion of the map shown here is from Harper's School Geography (American Book Co, 1894).

“... “Instead of commencing the study of maps with the map of the world, which is the most difficult to understand, the pupil here begins, in the most simple manner imaginable, to draw the map of his own town.””

during the 1820s. Especially popular was what he called the “Home Geography” approach to teaching geography (Nietz, 1961). Emma Willard (1826) summarized this approach in the preface to her *Geography for Beginners* saying, “Instead of commencing the study of maps with the map of the world, which is the most difficult to understand, the pupil here begins, in the most simple manner imaginable, to draw the map of his own town.” The idea of this inductive method of teaching was to compare the known to the unknown. An interesting manifestation of this concept found on many school maps was the superposition of a map of some familiar area onto a map of a part of the world with which the child was not familiar. For instance, in *Harper's School Geography* (American Book Co., 1894), a map of Ohio is found on each of the maps of the various continents. Ohio is drawn at the same scale as the continental maps, so that a child could easily see how large the countries of that continent were in comparison to a state with which they were familiar (Figure 18). Figure 19 also illustrates the idea of comparing the familiar to the exotic; in this case, various countries and islands of the world are compared to individual states or groups of states.

## PROJECTIONS

By 1800, over thirty unique projections had been developed, with about a dozen of those being used by map publishers (Snyder, 1993). However, only two projections were widely used in nineteenth century school atlases for portraying the entire world—the globular projection and the Mercator. Few issues have fanned such passion among present day cartographers as the

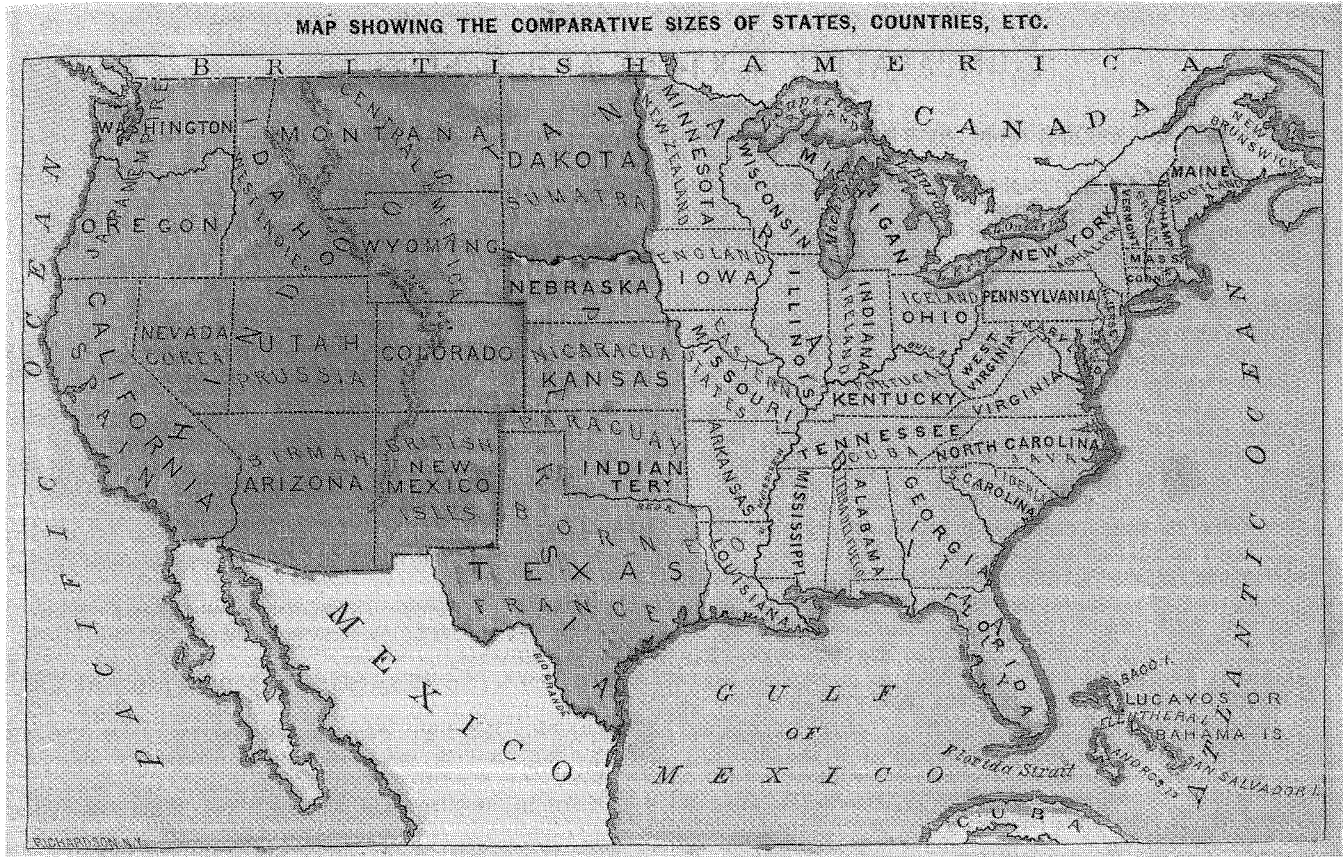


Figure 19. A map showing various countries or islands having areas roughly equal to that of the state(s) in which their names appear (Monteith, 1866).

claim of Arno Peters that the widespread use of the Mercator projection, particularly for school maps, was motivated by a desire to show European dominance of the Third World (Loxton, 1985). As measured by the number of pages and maps allocated to European nations in nineteenth century American school atlases and geography texts, there is little doubt that the European continent was viewed as the most important. As Samuel Gummere wrote, "Europe, though inferior in size to either of the other three grand divisions of the earth, is at present considerably the most important . . . In Europe almost every art and science has been carried to much greater perfection than in any other part of the world." (1821, p.145). Gummere's comments were echoed in many of the geography texts reviewed, particularly in those written during the first half of the nineteenth century.

Given such a climate, it may be somewhat surprising to find that the Mercator projection, while frequently used during the nineteenth century, was not the primary projection used for world maps; that role was filled by the globular projection. The globular projection (developed by the Islamic scholar, al-Birini, about 1000 AD, reinvented by Nicolosi in 1660, and actively promoted by the English cartographer Aaron Arrowsmith in 1794) was the preferred projection for general and school atlases throughout the nineteenth century (Snyder, 1993). (See Figure 20.) In my review of nearly 150 nineteenth century school atlases and geographies with world maps, I found only four which did not utilize the globular projection for general world reference maps. In addition, almost half of the books examined included at least one world map on the Mercator projection, primarily for thematic maps.

*" . . . it may be somewhat surprising to find that the Mercator projection, while frequently used during the nineteenth century, was not the primary projection used for world maps; . . ."*

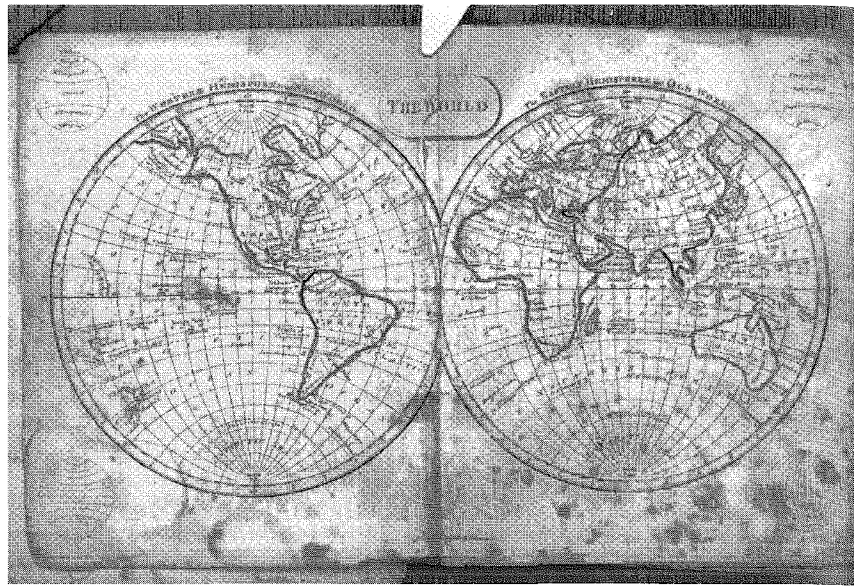


Figure 20. Globular projection of the world from *Atlas to Adams Geography for the Use of Schools and Academies* (Adams 1816). Courtesy Jackson Library, University of North Carolina-Greensboro.

*"A major advantage of the globular projection for use with young school children is that it shows the world as being round."*

*"... by the 1860s, the Mercator projection was used almost exclusively for world thematic maps."*

A major advantage of the globular projection for use with young school children is that it shows the world as being round. It is a compromise projection which does a remarkably good job of minimizing distortion in areal relationships without too greatly distorting the shapes of land masses. It may be overly speculative, but its widespread use may have been because it visually matched what many educators considered a logical way of organizing the world—that is, into the Old and the New—Europe and Asia on one side and the Americas on the other, with only the most tentative connection holding them together. Its major drawbacks are its inefficient use of the space on the page and its interrupted design.

Today the advantages of using the Mercator projection for school maps seem minimal, and the disadvantages overwhelming. So why was it used? There are several possible answers. Its rectangular shape fits nicely on the page and it is uninterrupted. It was extremely important for nineteenth century navigation, so atlas and chart makers would have "grown up with it;" thus it may have become the expected view. It is interesting to note that many school atlases referred to the globular projection as a "map" of the world, and to the Mercator projection as a "chart" of the world. Finally, the Mercator projection appears to have become associated with "science". This may be related to the rise of the nationally-sponsored scientific expeditions of the nineteenth century. These expeditions were funded to travel to all parts of the world and were charged with scientifically recording the flora, fauna, weather, geology, and ethnography of the inhabitants whom they encountered. Often the expeditions relied upon naval officers for plotting the precise trace of their travels, and quite naturally they utilized Mercator's projection. These field maps were often incorporated into the official reports.

For whatever reason, by the 1860s, the Mercator projection was used almost exclusively for world thematic maps (Figure 21). Clearly, atlas makers were aware of the impact that the choice of projection had on how a child would see the world. In order to offset the distorted areal relationship of the Mercator projection, many school atlases included a diagram which purported to show more accurately the relative sizes of the world's land masses (Figure 22).

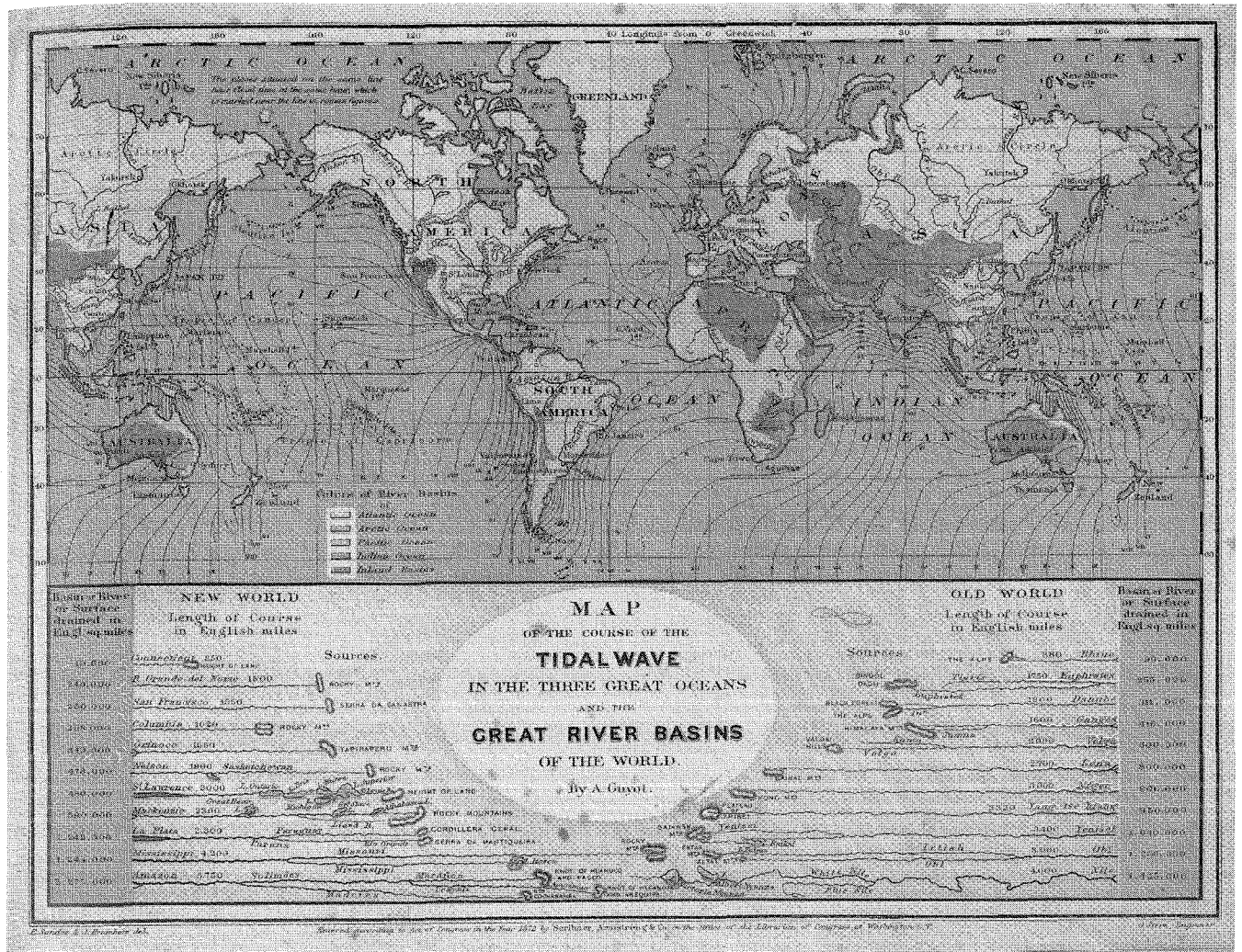


Figure 21. "Map of the Course of the Tidal Wave in the Three Great Oceans and the Great River Basins of the World". Like most thematic maps, especially those displaying quantitative or scientific data, this map by Arnold Guyot (1873) utilizes the Mercator projection. Map courtesy Chris Schierkolk.

For today's cartographers, what occurred during the first few decades of the nineteenth century should seem remarkably familiar. Scientific exploration and surveying of the world brought a new level of geodetic accuracy to nineteenth century maps, much as digital data bases, GPS, and satellites have at the end of the twentieth century. Like inexpensive computer software, color printers, and, most of all, the Internet, nineteenth century advances in printing technology, the introduction of cheap wood pulp paper, and compulsory education, resulted in an explosion in the number of maps and a democratization of access to geographic information. At the beginning of the nineteenth century, the publishing of geographies and atlases was an urban "cottage" industry operating on shoestring budgets; by the middle of that century, maps and textbooks had become a lucrative, intensely competitive business dominated by a handful of large corporations, the historic equivalent of the ESRI, ERDAS, or Intergraph story. Perhaps the most important parallel is that during both time periods, the nature and functions of maps was forever altered. The intellectual opportunities afforded to nineteenth century geographers, educators, and students by the embracing of thematic mapping may have been as great as those

FINAL COMMENTS

*"At the beginning of the nineteenth century, the publishing of geographies and atlases was an urban "cottage" industry operating on shoestring budgets; . . ."*



Figure 22. A portion of a chart from the Atlas to Accompany Smith's New Geography (Smith, 1839). It was included so students would be aware of the "true" sizes of the world's great land masses.

*"... the objectives of thematic cartography and the graphic means to meet them had nearly all come into being by about the mid-nineteenth century"*

*"... the second half of the century saw the consolidation of cartographic empires ..."*

being afforded by geographic information systems and scientific visualization to today's geographers.

A remarkable aspect of the introduction of thematic maps was the rapid rate with which new graphic techniques to portray data were developed and refined. These included the choropleth, dasymetric, proportional symbol, isopleth, and dot map. As Robinson notes, "... the objectives of thematic cartography and the graphic means to meet them had nearly all come into being by about the mid-nineteenth century" (1982, p.26).

While the first half of the nineteenth century saw the introduction of a new mapping paradigm, thematic maps, and great technological advances in printing, the second half of the century saw the consolidation of cartographic empires, the refinement of technology leading to less expensive maps that could be quickly and more easily updated, and map design driven by an educational methodology based on memorization. Many of the companies that started in the second half of the nineteenth century would continue to dominate well into the twentieth. The small print shop opened in Chicago by William Rand, and renamed Rand McNally when Rand made his printer, Andrew McNally, a partner, would become the largest commercial publisher of maps and atlases in the world, a position they still hold today.

The purpose of this paper was to broadly identify the development and characteristics of maps in early American school atlases. Each of the forces covered in this paper that shaped the American school atlas should be examined in more depth and linked to the broader social, cultural, economic, pedagogic, and technologic landscape that was nineteenth century America. As Norman Thrower (1972) reminded us over twenty five years

ago, "the map is a sensitive indicator of the changing thought of man, and few of his works seem to be such an excellent mirror of culture and civilization" (p.1). School atlases are perhaps a unique and unclouded "mirror." The material found on their pages was presumably carefully considered and reviewed, so that the selected information was that which one culture believed its children should come to know. During the nineteenth century, tens of millions of school atlases were sold and generations of American school children came to know their world as it was presented between the scuffed covers of their Mitchell, Cornell, Rand McNally, or Colton school atlases.

I want to thank Nancy Kandoian and Alice Hudson of the New York Public Library, James Akerman of the Newberry Library, and Ron Grim of the Geography and Map Division of the Library of Congress. This research would not have been possible without the guidance that they so graciously provided to their wonderful collections. I am also grateful to the National Endowment for the Humanities for the support which allowed me to participate in the Summer Institute in Cartography held at the Newberry Library where this research began.

## ACKNOWLEDGMENT

Adams, Daniel. 1816. *Atlas to Adams' Geography, for the Use of Schools and Academies*. Boston: Lincoln & Edmands.

## REFERENCES

American Book Co. 1894. *Harper's School Geography*. New York: American Book Co.

Bowen, James, 1894. *The Rand McNally Grammar School Geography, Kansas Edition*. Chicago: Rand McNally & Co. (Some material published by Crane and Co., Topeka, KS).

Brown, Ralph. 1941. "The American Geographies of Jedidiah Morse," *Annals of the Association of American Geographers*, Vol. 31, pp. 145-217.

Bruyset, Jean Marie. 1774. *Atlas Des Enfans ou Nouvelle Methode Pour Apprendre La Geographie*. Lyon: Chez Jean Marie Bruyset, pere & fils.

Carey, Mathew. 1794. *A New System of Modern Geography: or, A Geographical, Historical, and Commercial Grammar; and Present State of the Several Kingdoms of the World by William Guthrie Corrected, Improved, and Greatly Enlarged*. Philadelphia: Mathew Carey Publishing.

Carey, Mathew. 1795. *The General Atlas for Carey's Edition of Guthrie's Geography Improved*. Philadelphia: Mathew Carey Publishing.

Carpenter, Charles. 1963. *History of American School Books*. Philadelphia: University of Pennsylvania Press.

Cornell, Sarah. 1855. *Cornell's Intermediate Geography*. New York: D. Appleton and Co.

Cornell, Sarah. 1857. *Cornell's Companion Atlas to Cornell's High School Geography*. New York: D. Appleton and Co.

Culler, Ned. 1945. *The Development of American Geography Textbooks from 1840 to 1890*. Pittsburgh: Unpublished Ed.D dissertation, University of Pittsburgh.

Cummings, Jacob. 1818. *First Lessons in Geography and Astronomy*. Boston: Cummings and Hilliard.

Dwight, Nathaniel. 1795. *A Short but Comprehensive System of The Geography of the World*. Boston: David West.

Elson, Ruth. 1964. *Guardians of Tradition: American Schoolbooks of the Nineteenth Century*. Lincoln, NE: University of Nebraska Press.

Frye, Alexis. 1895. *Complete Geography*. Boston: Ginn and Company.

Goodrich, S.G. 1836. *Peter Parley's Method of Telling About Geography to Children*. Philadelphia: Desilver, Thomas.

Goodrich, S.G. 1866. *Peter Parley's Universal History on the Basis of Geography*. New York: Ivison, Phinney, Blakeman, and Co.

Gummere, Samuel. 1821. *Elementary Exercises in Geography for the Use of Schools*. 4th edition. Philadelphia: Kimber and Sharpless.

Guthrie, William. 1770. *A New Geographical, Historical and Commercial Grammar; and Present State of the Several Kingdoms of the World*, illustrated with a new and correct set of maps, engraved by Mr. Kitchin. London: J. Knox.

Guthrie, William. 1780. *A New System of Modern Geography: or, A Geographical, Historical, and Commercial Grammar; and Present State of the Several Kingdoms of the World*. The astronomical part by James Ferguson, F.R.S.: London, C. Dilly [etc.]

Guyot, Arnold. 1873. *Physical Geography*. New York: Scribner, Armstrong, and Co.

Harley, J. Brian. 1977. "Atlas Maker for Independent America," *Geographical Magazine*, Vol. 49, No.12, pp. 766-771.

Kaimovitz, Jeffrey. 1998. "American School Atlases and Geographies with Maps in the Barnard Collection," *Meridian*, No. 14, pp. 13-22.

Loxton, John. 1985. "The Peters Phenomenon," *The Cartographic Journal*, No. 22, pp. 106-108.

Mitchell, Samuel. 1839. *Atlas of Outline Maps*. Philadelphia: S.A. Mitchell Co.

Mitchell, Samuel. 1875. *Mitchell's Modern Atlas: Drawn to Illustrate Mitchell's New School Geography*. Philadelphia: J.H. Butler and Co.

Monteith, James. 1866. *Monteith's Physical and Intermediate Geography*. New York: A.S. Barnes and Co.

Monteith, James. 1871. *First Lessons in Geography on the Plan of Object Teaching*. New York: A.S. Barnes and Co.

- Monteith, James. 1885. *Barnes Complete Geography*. New York: American Book Co.
- Morse, Jedidiah. 1784. *Geography Made Easy*. New Haven, CT: Meigs, Bowen & Dana.
- Morse, Jedidiah. 1802. *Geography Made Easy*. 8th edition, Boston: I. Thomas and E.T. Andrews.
- Nietz, John. 1961. *Old Textbooks*. Pittsburgh: University of Pittsburgh Press.
- Olney, Jesse. 1860. *Olney's School Atlas to Accompany the Practical System of Geography for Schools and Families*. 91st edition. New York: Pratt, Oakley, and Co.
- Parker, Francis. 1970 (1876). "Report of the School Committee of the Town of Quincy, for the School Year 1875-1876," in *Reading in the History of Education*, Harry Sicheluff, ed. Berkeley, CA: McCutchan Publishing Corporation.
- Patillo, Henry. 1796. *A Geographical Catechism*. Halifax, NC: Abraham Hodge.
- Patton, Jeffrey. 1997. *Nineteenth Century Images of the World for American School Children*. Slide Set Commentary, No. 20, Chicago: Newberry Library.
- Rand McNally & Co. 1894. *The Rand McNally Primary School Geography*, Chicago: Rand McNally & Co.
- Richardson, C.T. 1970 (1861). "Remarks from the Eighth Annual Report of the Board of Education, of the City of Oswego, for the Year Ending March 31, 1861," in *Reading in the History of Education*, Harry Sicheluff, ed. Berkeley, CA: McCutchan Publishing Corporation.
- Riggs, S.R. and Riggs, A.L. 1876. *Maka-oyakapi: Guyot's Elementary Geography in the Dakota Language*. New York: Scribner and Armstrong for the Dakota Mission.
- Robinson, Arthur. 1982. *Early Thematic Mapping in the History of Cartography*. Chicago: University of Chicago Press.
- Sahli, John. 1941. *An Analysis of Early American Geography Textbooks from 1784 to 1840*. Pittsburgh: Unpublished Ph.D dissertation, University of Pittsburgh.
- Smith, Charles. 1795. *Universal Geography Made Easy*. New York: Wayland & Davis Co.
- Smith, Roswell. 1839. *Atlas to Accompany Smith's New Geography*. New York: Paine and Burgess.
- Snyder, John. 1993. *Flattening the Earth: Two Thousand Years of Map Projection*. Chicago: University of Chicago Press.
- Thrower, Norman. 1972. *Maps and Man*. Englewood Cliffs, NJ: Prentice Hall, Inc.



Van Waters, George. 1851. *The Poetical Geography, to which are added the Rule of Arithmetic in Rhyme*. Cincinnati: Sold by subscription only.

Willard, Emma. 1826. *Geography For Beginners, or the Instructor's Assistant*. Hartford, CT: Oliver D. Cooke and Co.

Woodbridge, William. 1823. *Rudiments of Geography*, third improved edition. Hartford, CT: Oliver D. Cooke and Sons.

Woodbridge, William. 1826. *School Atlas Designed to Accompany Woodbridge's Rudiments of Geography*. Hartford, CT: Oliver D. Cooke and Co.

Woodbridge, William. 1831. *School Atlas Designed to Accompany Woodbridge's Rudiments of Geography*. Hartford, CT: Oliver D. Cooke and Co.

Woodbridge, William. 1833. *A Modern Atlas on a New Plan*. Hartford, CT: Oliver D. Cooke and Co.

Woodbridge, William and Willard, Emma. 1824. *Universal Geography, Ancient and Modern*. Hartford, CT: Oliver D. Cooke and Sons.

Woodward, David. 1977. *The All-American Map: Wax Engraving and Its Influence on Cartography*. Chicago: The University of Chicago Press.

## The Poet and the Map: (Di)versifying the Teaching of Geography

This paper focuses upon four twentieth-century poets who write about maps. Spanning three generations and countries, they offer lessons on geography to children (John Fuller, May Swenson) and reminisce about their own geography classes (Don Gutteridge, Fiona Pitt-Kethley). Since their poems have much to teach regarding the meanings and uses of maps, this paper suggests that we introduce students to their verses and apply their ideas to (di)versify the way we teach about maps and geography.

**Keywords:** Poetry about Maps, Map / Geography Education, Children's Verse

Aristophanes' *Clouds* provides a comical glimpse at one map in an Athenian classroom during the late fifth century BCE. When the dull-witted hero, Strepsiades, is confronted for the first time with a map of the world, he protests that Socrates' students have placed Athens *much too close* to her enemy, Sparta (Aristophanes 1924, 1:282-83, lines 214-17). Twenty-five centuries later, poets are still reflecting on the map's role in education. Today, widely-read geographers and educators recognize that poetry is a memorable and unique way to teach maps. While writing a book on twentieth-century poems about maps, I have collected thirty that provide instruction or focus upon a student's view of maps. I wish to introduce four of the most engaging to further the dialogue between scientists and humanists that began in ancient Greece.

Each of these poems offers a different experience of maps. We begin with the two that appear in children's collections—John Fuller's "Geography Lesson" and May Swenson's "The Cloud-Mobile"—since both are accessible, on some level, to every reader. This is particularly true of "Geography Lesson," the only one of the poems to be illustrated by a map. Fuller's work highlights the peculiar relationship between text and image: it teaches us as much about translating maps into verse as about translating poetry into graphic form. But like the quote from Aristophanes above, "Geography Lesson" has a political lesson lurking behind its satire. May Swenson, on the other hand, prefers the subtlety of nature's riddles and discards the static map entirely. In "The Cloud-Mobile," she conjures up a map of time and change that can be used as an elegant introduction to physical geography. Don Gutteridge's "My Story: Maps" and Fiona Pitt-Kethley's "Geography" are complex autobiographies. In his five-part poem, Gutteridge employs a variety of maps to situate, decenter, and simultaneously recover the places of childhood. The focus of "My Story: Maps" becomes our sense of where we fit—or don't fit—on a map. Pitt-Kethley's acerbity contrasts with Gutteridge's nostalgic memory of the way he was taught geography in school. Recalling her boredom in "Geography," Pitt-Kethley urges us to find maps that fire a child's imagination, whether they be medieval representations of the world or maps of classic adventure stories. Her suggestions, in turn, act as springboards to other captivating texts, maps, and poems.

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*"Twenty-five centuries after Aristophanes, poets are still reflecting on the map's role in education. Today, widely-read geographers and educators recognize that poetry is a memorable and unique way to teach maps."*

ANTHROPOMORPHIC MAPS  
AND POLITICAL SATIRE

English poet John Fuller (1937- ) first published "Geography Lesson" in his collection of children's verse *Come Aboard and Sail Away*. Accompanied by Nicholas Garland's delightful anthropomorphic map, "Geography Lesson" (Figure 1) nevertheless conveys a serious message—that England is a poor nurse to baby Ireland (1983, 8-9: reprinted by permission of John Fuller):

With Highland hair and arms of Wales  
Reaching for Ireland, England trails  
A lonely distance behind Europe  
Trying impossibly to cheer up:  
A sloppy nurse who hopes that maybe  
No one will see she's dropped her baby  
Splash into the Irish Sea  
While bouncing it upon her knee.

With hips of Norfolk, bum of Kent,  
Her posture's more than strangely bent.  
Yorkshire gives backache with its Ridings.  
The Midlands, full of railway sidings,  
She blames for burps of indigestion.  
Her Birmingham has got congestion.  
Her Derbyshire is full of holes.  
London's asleep at the controls  
And her subconscious shifts the worry  
Out to Middlesex and Surrey.

Yet Devon's a comfortable shoe  
From which old Cornwall's toes peep through.  
On Lleyn, sedately, Anglesey  
Is balanced like a cup of tea,  
While clucking in her tea-time mirth  
Her mouth's the open Solway Firth  
Ready to swallow if she can  
The little cake of the Isle of Man.

Even asleep she falls apart:  
Dreams of the Orkneys make her start  
And stitches of the Isle of Wight  
Drop off from Hampshire in the night.  
With bits of knitting in the Channel,  
Most of East Anglia wrapped in flannel  
And snores exhaling from Argyll,  
The dear old lady makes you smile:  
What can you do with such a creature  
To whom each county lends a feature?  
She'll still be there when I am gone.  
Through all *your* lives she'll shamble on,  
Grubby, forgetful, laughing, hatless—  
The silliest country in the atlas.

*"By converting countries and islands into figures, Fuller pokes fun at England's penchant for tea, nannies, wool and dowdy clothes. And by associating geographical regions with places on a nurse's body, Fuller transforms into a mischievous game the exercise of locating places on an ordinary map."*

"Geography Lesson" cleverly conceals its instruction in an appealing package. As its title indicates, Fuller's poem teaches the various "parts" of the British Isles. By converting countries and islands into figures, Fuller pokes fun at England's penchant for tea, nannies, wool and dowdy clothes. And by associating geographical regions with places on a nurse's body, Fuller transforms into a mischievous game the exercise of locating places on



Figure 1. Nicholas Garland's illustration of "Geography Lesson" by John Fuller. Reprinted by permission of Nicholas Garland from *Come Aboard and Sail Away* by John Fuller (Edinburgh: The Salamander Press, p. 8). Copyright ©1983 John Fuller (text) and Nicholas Garland (illustrations).

an ordinary map. Here he follows a tradition dating back to another of Aristophanes' plays, the bawdy *Lysistrata*. After its heroine's pan-Hellenic sex-strike abruptly ends the Peloponnesian War, the inebriated Athenian and Spartan ambassadors skirmish over the scantily clad Reconciliation, whose desirable parts the ambassadors identify with strategic sites lost in the war (Aristophanes 1924, 3:110-111, lines 1162-1170; Parker 1984, 447-49 and 467).

If Aristophanes' *double entendres* and comic performance emphasized his political message, Nicholas Garland's illustration of "Geography Lesson" certainly adds to the pleasure and understanding of Fuller's poem. One might wish that his labels were placed more accurately ("Yorkshire," "Kent"), that the boundary between England and Scotland were less ambiguous, or that more of Fuller's place-names appeared on the map. Yet all maps are generalized, simplified, and selective views of the world. In focusing on the memorable image of nurse and child, Garland highlights England's policy towards Ireland—a detail that otherwise could be lost as the poem progresses.

Fuller, an erudite poet and Oxford don, is known also for his interest in nineteenth-century England (Hulse 1986). So it is no wonder that "Geography Lesson" vividly evokes the anthropomorphic cartoon-maps so popular

"Fuller, an erudite poet and Oxford don, is known also for his interest in nineteenth-century England. So it is no wonder that "Geography Lesson" vividly evokes the anthropomorphic cartoon-maps so popular from the late eighteenth to the early twentieth centuries."

*"Garland, obliged to make Ireland look like a baby in his illustration, plays with scale and shrinks the island considerably.*

*For him, the clarity of the human figure takes precedence over geographical accuracy and detail. But by representing Ireland as much smaller than Great Britain, Garland's map seems to reinforce the notion of dependence."*

ANIMATED MAPS, NATURE'S  
RIDDLES, AND SCIENTIFIC  
THEORIES

from the late eighteenth to the early twentieth centuries (see Hill 1978). Fuller's poem and Garland's illustration are inspired by at least two of these maps—both of which depict Ireland as a caricatured peasant woman with her baby. Robert Dighton's *Geography Bewitched! or, a droll Caricature Map of Ireland* represents Ireland as John Bull's wife "Lady Hibernia Bull" carrying an infant on her back (Bowles and Carver, London, c. 1794; see Rose 1981, 63). And the illustration William Harvey ("Aleph") made for his *Geographical Fun: Being Humorous Outlines of Various Countries* shows Ireland as a woman laden with goods for the market. Tied to her back, a child of indeterminate age clutches a herring and gazes not at the reader, as in the Bowles and Carver map, but at Protestant England and Scotland (Harvey 1868; and see Yale University Map Collection).

Fuller is obviously not the first to portray Ireland as a child dependent on England. Like William Harvey, he and Garland have made geography appealing to children, in part by depicting Ireland as a youngster. Yet each conveys subliminal messages. Harvey imagines the Irish as servants to stately England (Lewes 1999, 39). Garland, obliged to make Ireland look like a baby in his illustration, plays with scale and shrinks the island considerably. For him, the clarity of the human figure takes precedence over geographical accuracy and detail.<sup>1</sup> But by representing Ireland as much smaller than Great Britain, Garland's map seems to reinforce the notion of dependence. Furthermore, despite Fuller's criticism of the way England has handled Ireland, the England of his "Geography Lesson" has "usurped" Welsh Anglesey and Llyn as well as the Scottish Orkneys and Argyll. Substituting "Britain" for the metrically equivalent "England" would have resolved the problem. Yet Fuller's poem is ultimately about his country's "Englishness".<sup>2</sup> In spite of England's repeated failures in Northern Ireland and her Celtic neighbors' nationalistic movements during the 1970s, she remains for him "the dear old lady who makes you smile." However self-mocking the tone, Fuller's "Geography Lesson" invites analysis of cultural stereotypes and personal biases inherent in verse and on maps.

Offering another playful map-poem for readers of all ages is May Swenson (1913-1989). An American poet and MacArthur Fellow, Swenson published "The Cloud-Mobile" in 1958 (Swenson 1958, 28). With its disarming simplicity and wonder, this poem earned a place in her children's book, *Poems to Solve* (Swenson 1966, 29), and later in the collection from which our version derives, *The Complete Poems to Solve* (Swenson 1993, 41: reprinted with the permission of Simon & Schuster Books for Young Readers, an imprint of Simon & Schuster Children's Publishing Division. Copyright © 1993 The Literary Estate of May Swenson):

Above my face is a map  
where continents form and fade.  
Blue countries, made  
on a white sea, are erased;  
white countries are traced  
on a blue sea.

It is a map that moves  
faster than real  
but so slow;  
only my watching proves  
that island has being,  
or that bay.

It is a model of time;  
 mountains are wearing away,  
 coasts cracking, the ocean  
 spills over, then new  
 hills heap into view  
 with river-cuts of blue between them.

It is a map of change:  
 this is the way things are  
 with a stone or a star.  
 This is the way things go,  
 hard or soft,  
 swift or slow.

May Swenson enjoyed riddles. Although her verses capture the ephemeral motion of clouds, Swenson allows only the title to give her subject away. Within the poem, she refers to maps and models—to representations of clouds rather than to clouds themselves.

By comparing a sky filled with clouds to a map of continents and countries, Swenson calls attention to a map's most basic characteristics. Her description of clouds as "white countries...on a blue sea" accords with our cultural stereotypes of an icy white Antarctic and blue seas, in nature and on our maps. But the initial shock of "blue countries...on a white sea" makes us re-evaluate our assumptions about mapped space. Historically, maps have shown water as white—and a host of other colors besides blue (Ehrensverd 1987, 123-46; Woodward 1987, 326-27; Wood 1992, 99 and 121-22). Just as the sky's shifting pattern of clouds alters our perspective, so a reader's view of a map determines, from minute to minute, whether land or water is the figure or the ground (Wood 1992, 140). "The Cloud-Mobile" also reverses the normal way we look at a map, forcing us to lie on our backs to look at a map over our heads. Yet her map, while alluding to its paper cousins flattened in atlases or behind glass frames, has a vitality that technology could not match until computers began generating animated maps (see Hall 1992, 264).

Fascinated by "form as it *becomes* what it is" (Howard 1980, 604), Swenson moves us onto her map of time. Not only are clouds subject to change, but so are the mountains and continents that appear so securely moored beneath our feet, and on our maps. Rivers, ice and wind build up the earth's surface and erode it away again. Oceans reclaim land exposed during colder periods; waves shatter and reshape coastlines; rivers excavate valleys. In addition to these external forces, "The Cloud-Mobile" suggests some of the internal processes at work in landform development. From the late 1950s through the mid-1960s, as Swenson was writing and republishing her poem, new evidence concerning the earth's magnetic patterns and the mid-Atlantic Ridge broadened interest in the theory of continental drift, an idea hotly debated since the German meteorologist Alfred Wegener detailed it in his 1915 study, later translated as *The Origin of Continents and Oceans* (Wegener 1924; see LeGrand 1988 and Stewart 1990). As elaborated in the current theory of plate tectonics, all the earth's landmass at one time formed a single supercontinent that Wegener named Pangaea ("all-lands"). Pangaea began to split apart some 200 million years ago, as the plates under the continents shifted, dividing Laurasia in the north from Gondwanaland in the south. These massive continents split in turn about 100 million years ago, creating the continents whose shapes and positions appear so familiar on our maps. Yet our continents continue to drift. Within 50 million years the Mediterranean will disappear as Africa collides with

*"... Swenson's map, while alluding to its paper cousins flattened in atlases or behind glass frames, has a vitality that technology could not match until computers began generating animated maps."*

THE MAP AS "GRAPHIC  
AUTOBIOGRAPHY"

*"Opening A True History of  
Lambton County, Gutteridge's  
poem tells how one teacher in  
southern Ontario taught him, at  
the age of twelve, to view his  
native Lambton County."*

Europe. Only the earth's inevitable cooling will end the continents' cloud-like motion on convection currents within our planet (McKnight 1992, 26, 63, and Scotese 1999, for illustrations). Swenson's "Cloud-Mobile," in other words, helps us visualize the forces that continually reshape our earth over the vastness of geologic time, and challenges us to continually re-examine our scientific explanations for such changes.

Canadian poet Don Gutteridge (1937-) reminisces about his childhood geography class in "My Story: Maps." Like the Fiona Pitt-Kethley poem that follows, "My Story: Maps" appears in a collection for adults, yet is accessible and comprehensible to younger readers. Opening *A True History of Lambton County*, Gutteridge's poem tells how one teacher in southern Ontario taught him, at the age of twelve, to view his native Lambton County (1977, 5-9). For brevity, section 3 of "My Story: Maps" has been removed and ellipses indicate verses I've omitted at the end of sections 1 and 4 (excerpt reprinted from *A True History of Lambton County* by permission of Oberon Press):

1  
SS No.12  
Sarnia Township: 1948  
map of our county  
etched in smoke  
on the blackboard

looks like Labrador  
north and remote  
edged in blue  
never-ending on the  
corner-globe . . .

2  
In class we chant  
the townships' names,  
the song of the shape  
that holds us in:

Lambton County: Bosanquet  
Sarnia Moore and Sombra  
Plympton Enniskillen Dawn  
and Warwick Brooke Euphemia

*Louder now!*

Lamb tun Coun tee bows an kay  
Sarn ya Moor an Som bra  
Plim tun En askill an Don  
an War wic Brook you feem ya

A dance, a riddle:  
sidewalk skipping-song  
with no meaning at all—  
but leave it out  
and nothing works

4

Today we add the creeks  
the Plank Road to Petrolia,  
Highway 22 zig-zag at Warwick,  
the London Road drifting  
at the border . . .

my map's bones are  
bloodied with  
indelible veins, the  
looped intestines  
of a mythical beast—  
home-grown, lurking  
behind the white page,  
ready to charge the  
second we say the  
password, sketch in  
the crucial line . . .

5

We add the towns,  
a circle for Petrolia  
at the dead-centre: a  
drop of perfect oil,  
pencil-smudges for  
Watford, Wyoming,  
balmy Port Lambton—  
Sarnia is an ink-blob  
oozing at the page—

the Point is a  
dot, a blink in  
somebody else's eye

I am ashamed:  
demand bigger maps  
Miss Kernohan draws down

Neilson's [sic] Mercator Projection of the World  
and shames us all . . .

For over sixty years, Don Gutteridge has not strayed far from "the Point"—his nickname for Point Edward, the village where he was raised in Sarnia Township. Now Professor Emeritus in the Faculty of Education at the University of Western Ontario, he lives only an hour from Point Edward (Atherton 1997). Gutteridge's proximity to Point Edward reflects a profound attachment to his childhood home. A eulogy to the place of his youth, "My Story: Maps" also reveals his interest in pedagogy.

Framing the poem and its classroom are the corner-globe and Mercator Projection of the World, published by Thomas Nelson and Sons (Gunn 1931, 2-3). On the blackboard, the class busily maps Lambton County. To reinforce its visual image, Miss Kernohan teaches her class to chant the names of its townships. A map of Lambton County shows the order of these names within the song (Figure 2). Bosanquet ("bows an kay") leads as the most northerly of the townships. Next come, from north to south, the three



GENERAL DESCRIPTION

- TOWNSHIP BOUNDARIES
- MAIN HIGHWAYS
- MAIN HIGHWAYS AND TOWNSHIP BOUNDARIES
- RAILWAYS

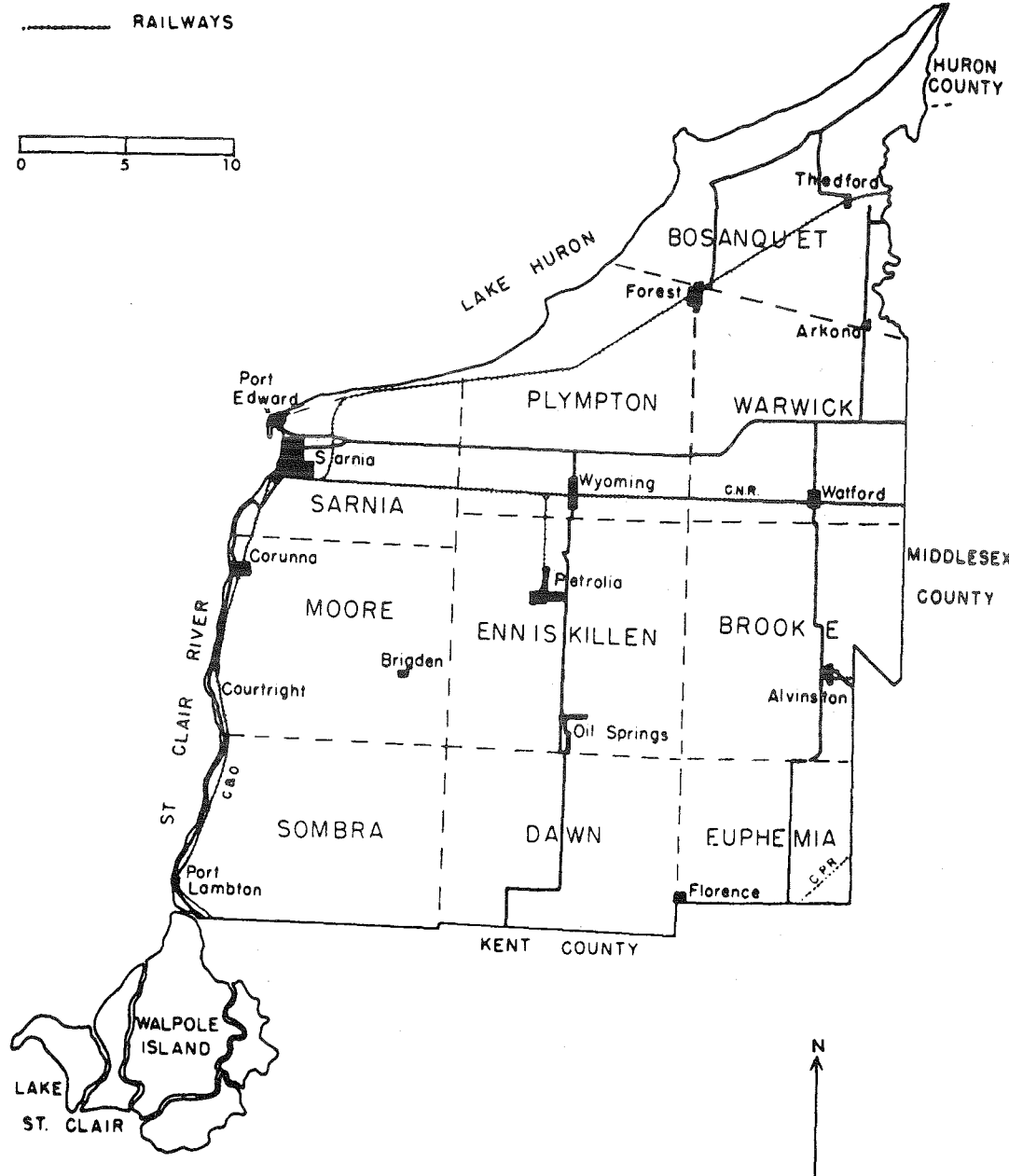
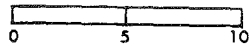


Figure 2. "General Description" of Lambton County, Ontario. Reprinted by permission of the Lambton County Historical Society, from A Physical and Cultural Atlas of Lambton County by Frank G. Higgins and Michael R. Kanouse (Sarnia, Ontario, p. 2). Copyright ©1969 The Lambton County Historical Society.

townships bordering the St. Clair River; the three directly to their east; and last, the three bordering on Middlesex County.

The Lambton County song is a verbal map. Gutteridge's ability to recall the words thirty years later indicates how tenaciously a familiar verse can lodge in our memory. As a poet and educator, Gutteridge is concerned with intersections of place, identity, and verse: for him, a map—whether verbal or graphic—becomes memorable when a person discovers how to read his own experience in it. From the Lambton County song, the boy learns not only his county's townships but that language is "a riddle," a code like the symbols on his map.

"My Story: Maps" is about making sense of the world and one's place in it. On the blackboard, the map of Lambton County reminds the boy of Labrador. The association is particularly Canadian. With a coast extending nearly 700 miles and an area of over 100,000 square miles, Labrador dwarfs Lambton County. Yet his comparison has merit. In terms of shape, Gutteridge's county is a mirror image of Labrador. And while the coast of Labrador forms a section of Canada's eastern boundary, the western edge of Lambton County forms part of the boundary between Ontario and Michigan, dividing Canada from the U.S. along its sixty-mile border. To a child raised beside the heavily trafficked St. Clair and the immensity of Lake Huron, even his township's ten miles of lakeshore and motley collection of villages must have seemed like a world barely explored, especially since his distances were traversed on foot.

Yet by the end of the poem, the childish illusion that his home is the world shatters. Some Lambton County towns, like Petrolia, boast symbols of respectable size. Its "circle at the dead-centre: a drop of perfect oil," reminds us that Lambton County gained prominence as Canada's first oil capital and home to Imperial Oil. But Gutteridge's Point Edward is only a dot on the map of Lambton County. And the village disappears entirely on the world map his teacher displays.

"My Story: Maps" ends with the shame Gutteridge felt at the absence of Point Edward on the authoritative "Mercator Projection of the World." The way Gutteridge has overcome his childhood dilemma is to create maps of his own. Throughout his works, he recognizes the power of maps to document an era and the mind of their creator. For over twenty-five years now, he has turned his once rural Canadian village into the subject of a multi-volume epic spanning two centuries. *A True History of Lambton County* is the second volume of *Time is a Metaphor* (1974-), which Gutteridge envisions as a large-scale map of the people and events that have shaped Lambton County and his own life.

Into volumes 5 and 6, he has inserted large-scale maps depicting Point Edward and Lambton County during the late nineteenth century, a period he depicts in novel form (Gutteridge 1987b and 1988). Gutteridge modeled his maps on *Belden's Illustrated Historical Atlas of the County of Lambton, Ontario, 1880* (Phelps 1973), one of the thousands of county atlases sold by subscription to local residents during the second half of the nineteenth-century (Conzen 1984). By recovering authentic maps of individual towns and landholdings, Gutteridge—in his own words—"reconstructs history-as-art" (Gutteridge 1987a, 255).

But what animates "My Story: Maps" is the relationship between maps and the viewer's personal history. In this respect, Gutteridge's poem has much in common with J. B. Harley's breathtakingly poetic article "The Map as Biography." Reflecting on the power of one Ordnance Survey map to evoke the most poignant memories of his own life, Harley concludes (Harley 1987, 20):

*"The Lambton County song is a verbal map. Gutteridge's ability to recall the words thirty years later indicates how tenaciously a familiar verse can lodge in our memory. As a poet and educator, Gutteridge is concerned with intersections of place, identity, and verse: for him, a map—whether verbal or graphic—becomes memorable when a person discovers how to read his own experience in it."*

*"... what animates "My Story: Maps" is the relationship between maps and the viewer's personal history."*

The map has become a graphic autobiography; it restores time to memory and it recreates for the inner eye the fabric and seasons of a former life . . . Till other landscapes and their maps crowd it out, this will remain my favourite map.<sup>3</sup>

MAPS THE FIRE THAT  
IMAGINATION

English poet Fiona Pitt-Kethley (1954-) is more critical of her youthful education. "Geography," published in her first collection *Sky Ray Lolly*, slangs the Philips' Atlas she was required to read in her English public school and suggests that medieval world-maps or Mark Twain are more exciting ways to teach geography (1986, 60-61: reprinted by permission of the poet, ©Fiona Pitt-Kethley from *Sky Ray Lolly*, Chatto and Windus, 1986).

Each year they passed out Philips' Atlases  
full of unmeaning maps I'd try to read—  
first the Political—bright pastel rags  
of land with river veins—the Physical,  
earth colours, yellow, brown and green. I'd scan  
the sticky label in the front to see  
the book's lineage of fellow-sufferers.  
If there were many there, I'd garnish it,  
anthropomorphise coastlines—put eyes  
in inlets, nostrils in peninsulas.

I used to do my homework lying by  
the pale gas fire for warmth. Visitors would  
step over me. One trod right on the map  
I'd drawn. Miss Foxton, a walking advert  
for the role of shoe-adviser, her own  
brown leather lace-ups polished like conkers,  
thought Africa no place for that grubby  
Man-Friday-print and gave me 'E'—a grade  
used only for those beyond redemption.

I think I could have liked the subject in  
the Middle Ages; but modern textbooks  
lack wonder and humanity—*précis*  
of *précis*, their glossy pages never  
show monopods or anthropophagi.  
Their servant-teachers are not Mandevilles,  
nor like eighteenth century gentlemen,  
who, when in Rome, got out their tape measures  
to find the truth about St Peter's dome.

Outside school walls, my mind could travel to  
Haggard's poetic Zululand, Mark Twain's  
fanatically detailed microcosm  
of the Mississippi, Verne's islands, ice,  
lighthouses and subterranean wonders.  
And I was angered for the dynasty  
of navy-ink strangers in my Atlas,  
who, in the name of learning, signed to hear  
the world chewed up, spat out in terms of tons  
of jute, asbestos, cocoa crops and tin.

One glance at a *Philips' New School Atlas* convinces us that Pitt-Kethley has a point. Published by the firm of George Philip and Son, founded in

1834, the atlas boasts a distinguished pedigree. It is, in fact, the twentieth-century descendant of the school atlases produced by George Philip to fill a niche in Great Britain's national system of elementary education (Philip 1934, 38-89). The fifty-fifth edition appeared in 1967, the year that Pitt-Kethley turned thirteen. It is a slim volume containing 64 pages of maps, 6 pages of climate graphs, and 23 pages of index. Mingled with the physical and political maps are other maps with such disheartening titles for children as "Rainfall, Isobars and Winds" or "The British Isles—Climate, Population, Agriculture and Industries" (Fullard 1967).

Looking back at her childhood, Pitt-Kethley understands that there are ways to entice youngsters to fall in love with geography. One is to introduce them to medieval maps and travelogues. For those taught that maps are merely static expositions of geographical facts plotted on a grid at a particular scale, the *mappaemundi* or medieval "maps of the world" are a revelation. Hand-painted on parchment or vellum, they reveal the humanity of their artists. On the majority, the earth appears as a circle of land comprising Europe, Asia and Africa—all surrounded by a circumfluent ocean. Crowded inside are illustrations of Biblical stories, myths inherited from Classical antiquity, and novelties from travelogues (Woodward 1987). Many maps depict the monstrous races thought to exist on the earth's unexplored extremities (Friedman 1981; Haft 1995). The fourteenth-century *Travels of Sir John Mandeville*, based on accounts like Marco Polo's, popularized such creatures as *anthropophagi* or "man-eaters" and the Ethiopian *monopods*, whose "single foot" was used for shade as well as speed (Pollard 1964, chpts. 17, 20-21). Didactic guides for the faithful, *mappaemundi* and travel tales inspired "wonder" at the variety of God's creation and man's history in a transient world saturated with meaning. The glossy political maps of the *Philips' New School Atlas*, by contrast, emphasize the unstable barriers between nations and peoples, while its physical maps broadcast man's exploitation of the earth.

Another way of hooking children on geography, Pitt-Kethley suggests, is to base lessons on the adventure stories they are already reading "outside school walls." Each of the four authors referred to in her poem—Daniel Defoe (1660-1731), Sir Henry Rider Haggard (1856-1925), Mark Twain (1835-1910), and Jules Verne (1828-1905)—offers a unique view of the world's geography and of "civilization's" effect upon even the most remote places and peoples.

The disgruntled teenager was ahead of her time. Beginning in the 1970s, the way geography was taught underwent a small revolution. Out of that period came texts that would have appealed to Pitt-Kethley. Closest to her interest is *An Atlas of Fantasy* compiled by J. B. Post, the former map librarian for the Free Library of Philadelphia (Post 1973, 1979). With over one hundred maps from works of literature and science fiction, *An Atlas of Fantasy* enchants every student introduced to it. *The Dictionary of Imaginary Places* also acquaints readers with places-that-never-were on earth: utopias and magical lands mingle with Mandeville's legendary lands, Crusoe's island near the mouth of the Orinoco River, Haggard's fictitious Kukuaneland in central-southern Africa, and Verne's "mysterious island" (Manguel and Guadalupi 1987).

Equally noteworthy is *Landscape in Literature: A Geographical Analysis*, published by the Association of American Geographers. Packed with quotations from Twain and other regional authors, this guide for teaching geography declares (Salter and Lloyd 1977, 1):

Landscape in literature should not be thought of as a substitute for the more conventional modes of geographical study, but rather as a supple-

*"Looking back at her childhood, Pitt-Kethley understands that there are ways to entice youngsters to fall in love with geography. One is to introduce them to medieval maps and travelogues. For those taught that maps are merely static expositions of geographical facts plotted on a grid at a particular scale, the mappaemundi or medieval 'maps of the world' are a revelation."*

*"Another way of hooking children on geography, Pitt-Kethley suggests, is to base lessons on the adventure stories they are already reading 'outside school walls.'"*

mental and special source of landscape insight, one which has remained largely untapped until now.

A decade later, English professor William Mallory teamed with geographer Paul Simpson-Housley to compile a series of essays entitled *Geography and Literature* (Mallory and Simpson-Housley 1987). Meanwhile, in Great Britain, Herbert Sandford focused on "the psychological aspects of school atlas design and presentation" (Sandford 1984, 173). And Denis Wood, with his usual hyperbole, lambasted the conventional "reference" atlases given to children, and labeled them nothing but "emptiness and lies" (Wood 1987, 37-38).

In their place, Wood recommends narrative atlases that "speak" to young people: e.g., Michael Kidron and Dan Smith's *The War Atlas* (1983) or Norman Myers' *Gaia: An Atlas of Planet Management* (1984, 1993). College students are instantly engaged by Wood's own *Power of Maps* (Wood 1992). And John Kerrigan suggests even more recent postmodern studies (Kerrigan 1998), like *Reading Human Geography: The Poetics and Politics of Inquiry* (Barnes and Gregory 1996) or Franco Moretti's *Atlas of the European Novel* (1998).

Fiona Pitt-Kethley certainly would applaud such efforts.

#### CONCLUSION

"... Pitt-Kethley's "Geography" urges us all to find some map that engages us, that opens up an alternative world, so that in the end we can view our maps and our world more objectively—and, perhaps, make them both more vibrant."

So how can these poets help us to teach our students? "The Cloud-Mobile" encourages each of us to reevaluate our basic assumptions about mapped space, including color and perspective. May Swenson's emphasis on the mutability of clouds suggests the more gradual movements of continental plates, the buildup and erosion of the earth's surface, and the advantage of animated maps for demonstrating their theoretical course over time. John Fuller, along with illustrator Nicholas Garland, contributes to one of the most playful and enduring graphic forms, the map made to resemble a living being. Yet to be successful, it must blatantly exhibit the very qualities that remain most opaque to untutored map-readers: the interests and biases of the mapmaker and his society. Don Gutteridge's autobiographical poem focuses on scale, setting the regional map into the context of national and world maps, and looks back at childhood from the vantage point of a forty-year-old, self-confessed "maker of maps" (Gutteridge 1977, 30). And Fiona Pitt-Kethley's "Geography" urges us all to find some map that engages us, that opens up an alternative world, so that in the end we can view our maps and our world more objectively—and, perhaps, make them both more vibrant.

Together, these poems link map-appreciation with playfulness and surprise. It can mean discovering unexpected shapes in the map: Fuller's nurse and baby, Gutteridge's "mythical beast," or Pitt-Kethley's deliberately "anthropomorphise[d] coastlines." It can entail the exoticism of faraway places, of monstrous races, of ethereal cloud formations. Yet the poems also emphasize that true understanding comes with the ability to read one's own experience in the map. And *any* map can become autobiographical.

The four poems that comprise this paper are, of course, just a beginning. In my book on maps in twentieth-century poetry, I will present many others that relate to the way we teach about maps. Gutteridge's poem, for example, is influenced by fellow Canadian James Reaney's "The School Globe," in which another first-person narrator flashes back to what he was once taught in the classroom (Reaney 1949, 30-31). For the disillusioned Reaney, however, the now "wrecked blue cardboard pumpkin" of his school globe represents the lost paradise of childhood. English poet Sir Stephen Spender focuses on the effects of poverty in London during the Great Depression. In "An Elementary School Classroom in a Slum," Spender's urgent appeal for

aid, the impoverished children find nothing of their own lives in the "open-handed map" of the "belled, flowery, Tyrolese valley" (Spender 1939, 28-29). For them, the classroom map and globe are "lies": no other world exists beyond the "slag heap" outside their school window.

On a lighter note, ten-year-old Nathalia Crane is concerned with the maps that children make. In "The Map Makers," the Brooklyn-born Crane compares a professional star-chart to her friend's "map" of a Brooklyn boulevard from Prospect Park to Sheepshead Bay (Crane 1924, 42). Written at a time when it was stylish to publish poetry by children, "The Map Makers" reveals how differently two children answer the question "What is a map?"—a question researchers still grapple with today (Downs, Liben, and Daggs 1988; Patton and Ryckman 1990). Finally, Karl Kirchwey's "The Geographer's Line" tells of the American poet's teenage years in London with his dysfunctional family (Kirchwey 1990, 60). The poem describes how he once labored over a map of "the continental United States in 1803," and compares his imminent growth with the westward expansion of the United States in the nineteenth century following the celebrated Lewis and Clark Expedition. "The Geographer's Line" conveys the almost magical belief of one child that he can control his own destiny—if he can get the map's "boundaries right somehow." For Kirchwey's youthful alter-ego, the map becomes prophetic of his future.

Perhaps there is no more valuable lesson that a map can offer.

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I dedicate this paper to my remarkable father-in-law, George Zinovich.

Aristophanes. *Comedies of Aristophanes*. 1924. 3 vols. Loeb Classical Library.

Atherton, Stan. 1997. Don Gutteridge. In *The Oxford Companion to Canadian Literature*. 2nd ed., ed. Eugene Benson and William Toye, 505-506. Toronto: Oxford Univ. Press.

Barnes, Trevor, and Derek Gregory, eds. 1996. *Reading Human Geography: The Poetics and Politics of Inquiry*. Oxford: Oxford Univ. Press.

Conzen, Michael P. 1984. The County Landownership Map in America. *Imago Mundi* 36:9-31.

Crane, Nathalia. 1924. *The Janitor's Boys and Other Poems*. Introduced by William Rose Benét and Nunnally Johnson. New York: Thomas Seltzer.

Downs, R. M., L. S. Liben, and D. G. Daggs. 1988. On Education and Geographers: The Role of Cognitive Developmental Theory in Geographic Education. *Annals of the Association of American Geographers* 78,4:680-700.

"Kirchwey's "The Geographer's Line" conveys the almost magical belief of one child that he can control his own destiny—if he can get the map's "boundaries right somehow.""

ACKNOWLEDGMENTS

REFERENCES

- Ehrensward, Ulla. 1987. "Color in Cartography: A Historical Survey." In *Art and Cartography: Six Historical Essays*, ed. David Woodward, 123-146. Chicago: Univ. of Chicago Press.
- Friedman, John Block. 1981. *The Monstrous Races in Medieval Art and Thought*. Cambridge: Harvard Univ. Press.
- Fullard, Harold, ed. 1967. *Philips' New School Atlas*. 55th ed. London: George Philip and Son.
- Fuller, John. 1983. *Come Aboard and Sail Away*. Illustrated by Nicholas Garland. Edinburgh: The Salamander Press.
- Gilmartin, Patricia. 1994. Terrae Animatae: Metamorphic Maps on Post-cards. *The Map Collector* 86 (Autumn):2-11.
- Gunn, John, ed. 1931. *Nelson's World Gazetteer and Geographical Dictionary*. London and Toronto: Thomas Nelson and Sons.
- Gutteridge, Don[ald George]. 1977. *A True History of Lambton County*. Ottawa: Oberon Press.
- \_\_\_\_\_. 1987a. Old Photography and the Documentary Imperative, *Canadian Literature* 113-114 (Fall):253-258.
- \_\_\_\_\_. 1987b. *St. Vitus Dance*. London, Ontario: Drumlin Books.
- \_\_\_\_\_. 1988. *Shaman's Ground*. London, Ontario: Drumlin Books.
- Haft, Adele. 1995. Maps, Mazes, and Monsters: The Iconography of the Library in Umberto Eco's "The Name of the Rose." *Studies in Iconography* 14:9-50.
- Hall, Stephen S. 1992. *Mapping the Next Millennium*. New York: Random House.
- Harley, J. B. 1987. The Map as Biography: Thoughts on Ordnance Survey Map, Six-Inch Sheet Devonshire CIX, SE, Newton Abbot. *The Map Collector* 41:18-20.
- Harvey, William. 1868. *Geographical Fun: Being Humourous Outlines of Various Countries*. London: Hodder and Stoughton.
- Higgins, Frank G, and Michael R. Kanouse. 1969. *A Physical and Cultural Atlas of Lambton County*. Sarnia, Ontario: Lambton County Historical Society.
- Hill, Gillian. 1978. *Cartographical Curiosities*. London: The British Library.
- Howard, Richard. 1980. *Alone With America*. 2nd ed. New York: Atheneum.
- Hulse, Michael. 1986. The New Zest in British Poetry: The Influence of John Fuller. *Quadrant* 30 (November):70-74.
- Kerrigan, John. 1998. The Country of the Mind: Exploring the Links Between Geography and the Writer's Imagination. *Times Literary Supplement*, 11 September, 3-5.

- Kidron, Michael, and Dan Smith. 1983. *The War Atlas*. New York: Simon & Schuster.
- Kirchwey, Karl. 1990. *A Wandering Island*. Princeton: Princeton Univ. Press.
- LeGrand, H. E. 1988. *Drifting Continents and Shifting Theories*. Cambridge: Cambridge Univ. Press.
- Lewes, Darby. 1999. The Female Landscape. *Mercator's World*. 1 (January / February):34-41.
- McKnight, Tom L. 1992. *Essentials of Physical Geography*. Englewood Cliffs, NJ: Prentice-Hall.
- Mallory, William E., and Paul Simpson-Housley, eds. 1987. *Geography and Literature*. Syracuse, NY: Syracuse Univ. Press.
- Manguel, Alberto, and Gianni Guadalupi. 1987. *The Dictionary of Imaginary Places*. 2nd ed. San Diego: Harcourt Brace Jovanovich.
- Moretti, Franco. 1998. *Atlas of the European Novel 1800-1900*. New York: Verso Books.
- Myers, Norman. 1993. *Gaia: An Atlas of Planet Management*. rev. ed. New York: Anchor Books.
- Parker, Douglass, trans. 1984. *Four Plays by Aristophanes*. New York: New American Library.
- Patton, Jeffrey C., and Nancy B. Ryckman. 1990. Maps in Children's Literature. *Cartographic Perspectives* 6(Summer):3-12.
- Phelps, Edward, ed. 1973. *Belden's Illustrated Historical Atlas of the County of Lambton, Ontario, 1880*. Sarnia, Ontario: Edward Phelps.
- Philip, George. 1934. *The Story of the Last Hundred Years, 1834-1934: A Geographical Record*. London: G. Philip and Son.
- Pitt-Kethley, Fiona. 1986. *Sky Ray Lolly*. London: Chatto and Windus.
- Pollard, A. W., ed. 1964. *The Travels of Sir John Mandeville*. New York: Dover Publications.
- Post, J. B., ed. 1979. *An Atlas of Fantasy*. rev. ed. New York: Ballantine Books.
- Reaney, James. 1949. *The Red Heart*. Toronto: McClelland and Stewart.
- Rose, Dennis. 1981. *Life, Times and Recorded Works of Robert Dighton (1752-1814)*. Salisbury, Wiltshire: Dennis Rose.
- Salter, Christopher L., and William J. Lloyd. 1977. *Landscape in Literature*. Resource Papers for College Geography Series, no. 76-3. Washington, DC: Association of American Geographers.
- Sandford, Herbert Adolphus. 1984. "A New Analysis and Classification of School Atlases." In *International Yearbook for Cartography* 24:173-196.



Scotese, Christopher R. 1999. PaleoMap Project, as of 6 January 1999. <http://www.scotese.com>

Spender, Stephen. 1939. *The Still Centre*. London: Faber and Faber.

Stewart, John A. 1990. *Drifting Continents and Colliding Paradigms*. Bloomington: Indiana Univ. Press.

Swenson, May. 1958. *A Cage of Spines*. New York: Rinehart.

\_\_\_\_\_. 1966. *Poems to Solve*. New York: Charles Scribner's.

\_\_\_\_\_. 1993. *The Complete Poems to Solve*. New York: Simon & Schuster.

Wegener, Alfred. 1924. *The Origin of Continents and Oceans*. London: Methuen.

Wood, Denis. 1987. Pleasure in the Idea: The Atlas as Narrative Form. *Cartographica* 24, no.1 (Spring): 24-45.

\_\_\_\_\_, with John Fels. 1992. *The Power of Maps*. New York: Guilford Press.

Woodward, David. 1987. "Medieval Mappaemundi." In *The History of Cartography*, vol. 1: *Cartography in Prehistoric, Ancient, and Medieval Europe and the Mediterranean*, ed. J. B. Harley and David Woodward, 286-370. Chicago: Univ. of Chicago Press.

Yale University Map Collection. Specialty Maps. <http://www.library.yale.edu/MapColl/special/html>

#### FOOTNOTES

<sup>1</sup>For anthropomorphic maps generally, see Gilmartin 1994.

<sup>2</sup>One anonymous reader suggests that "The Geography Lesson" may echo Seamus Heaney's "Act of Union." Published in his politically charged *North*, this poem describes the aftermath of the unsuccessful 1798 Irish rebellion. For Heaney, a Catholic from Northern Ireland, England's abolition of the Irish Parliament in 1800 and enforced legislative union with Ireland was an act of rape, in which England (the male speaker) impregnates Ireland with the violent and "parasitical" child, Northern Ireland (1975, Oxford: Oxford University Press, 49-50). While Fuller does not present colonialism as rape, "Geography Lesson" reveals the biases of its own poet even as it satirizes the inequitable relationship between England and Ireland.

<sup>3</sup>Patricia Gilmartin told me that uses Harley's article as the basis for a class assignment: she asks students to choose a map that is meaningful to them and then has them write an essay about it. Gutteridge's "My Story: Maps" might encourage our students to compose a poem instead.

## Creativity, Art and Cartography in Geographic Education

Elementary children can learn about maps, but what they do learn depends in large part on the background and training of the teacher. Teachers who engage in mapping activities often lack training in the technical aspects of map making, along with a lack of knowledge of the role of art, design, and creativity in the cartographic process. An activity designed to help elementary and middle school teachers integrate artistic perspectives and mapping is outlined. The workshop proved to be an effective vehicle for increasing teachers' knowledge of both map making and art and gave them an outline for a map making activity that could be adapted to any grade level.

Keywords: children and mapping, thematic maps, map design

How children use and make maps have been topics of concern for geographic educators and cartographers for many years. There has been considerable debate about what children can learn and when they can process and interpret spatial information (Downs, Liben, Daggs, 1988; Blaut, 1991). It is generally accepted that children between the ages of 5 and 12 can learn about maps, but much depends on how and when they are exposed to maps. The development of map skills in children depends on, "...what children can learn, what children should learn and what children typically do learn, at particular ages, in a particular culture" (Petchenik 1984, p.801). What children do learn is often a result of the background and training of the elementary and middle school teacher and the map materials available. To ensure that children receive appropriate mapping experiences we need to provide these teachers with information on the nature of maps and mapping, if not in the undergraduate educational experience, then in other settings, such as in-service training and workshops.

Maps are more than static presentations of the world, "... Maps break down our inhibitions, stimulate our glands, stir our imagination, loosen our tongues." (Sauer 1956, p. 289). Maps also require imagination and creativity in the design and production process if they are to adequately communicate information (Robinson and Petchenik 1976, p. 19). Introducing teachers to map making expands their ideas and perceptions of maps and makes them aware of the steps in the cartographic design process. Imagination and creativity in map making can then become key elements of the teachers' lesson plans.

The two goals of this paper are: first, to explore the nature of cartography as an art and a science and to investigate the role of creativity in the cartographic design process. Second, it encourages elementary and intermediate school teachers to integrate artistic perspectives and creativity into classroom mapping activities by providing an outline of an activity to expand the teachers' and students' ideas of maps and mapping.

Many textbooks, articles and research into the nature of cartography often describe it as being both an art and a science. (Dent 1999, p.4; Muehrcke and Muehrcke 1998, p.11). The word "science" implies exact rules and formulas, while "art" implies a pleasing design. The scientific component is one that

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### INTRODUCTION

*"It is generally accepted that children between the ages of 5 and 12 can learn about maps, but much depends on how and when they are exposed to maps."*

### BACKGROUND

is necessary if we are to accurately represent our world. Courses offered in geography programs for those focusing on a career in geography provide many opportunities to gain proficiency in the scientific realm. Typical activities range from making measurements and calculations from topographic maps, to developing map projections using trigonometry. There is also a scientific component to thematic mapping, where students work with a base map and statistical table. The specifying of color systems can become a numerical activity. Modern developments in surveying, global positioning systems, and satellite technology bring more science into the map making process and are important and necessary elements.

*"The design component relates to aesthetics and the creation of a pleasing map display, something necessary not only in maps for adults but in maps for children as well."*

The elements included in the artistic component are perhaps less well-defined or agreed upon. At the university level, geography programs do provide courses and activities related to design for those focusing on a major or career in geography. These courses focus on many important topics: balance, harmony, symbols, classification, color, multimedia and interactive maps. Individuality, uniqueness and creativity are components of the art of cartography that are associated with cartographic design. The design component relates to aesthetics and the creation of a pleasing map display, something necessary not only in maps for adults but in maps for children as well.

In a map experiment designed to test children's understanding of map symbols, a second grade subject was asked which of four types of symbols portraying numerical or statistical information was the best. She indicated that they were all good, and perhaps her answer meant that the science part was correct: that the maps conveyed the meaning accurately or made it possible to determine correct answers to a series of questions. But she put an artistic qualifier on her statement. She said if you want people to remember the information better, then the "prettiest map" was best because people will like looking at it, and she thought the map that used color was the prettiest (Trifonoff 1995, p. 373). So an artistic or aesthetically pleasing design is a necessary component of map design for all grade levels.

*"In recent years advances in technology indicate that the scientific component is accelerating beyond the art component."*

In recent years advances in technology indicate that the scientific component is accelerating beyond the art component. MacEachren summarizes both sides of this issue in *How Maps Work* (1995). He suggests that as cartography emerged as a specialized field of study in the 1950s the focus on functionality and communication relegated the art of cartography to a somewhat minor role. He notes,

A new view of the role of art and science in cartography is clearly needed. It is probably a mistake to view maps as objects that contain varied amounts of scientific or artistic content for which we must determine an appropriate balance.... Instead, it makes more sense to consider complementary artistic and scientific approaches to studying and improving maps, both of which can be applied to any given cartographic problem. The artistic approach is intuitive and holistic, achieving improvements through experience supplemented by critical examination.

(MacEachren 1995, p.9)

For this viewpoint, MacEachren considers art, "... in a broader sense of grappling with emotions, prompting subjective responses, contemplating aesthetics, along with concerns for the production of pleasing designs," while science involves "... following methods that involve systematic progress through: observation, theory development, test of theory empirically, and modification of theory in response to results" (MacEachren 1995, pp. 16-19).

Cartographers are comfortable working with both the scientific and artistic components, and we provide our majors with experience in both realms. But one of the questions facing geographic educators and cartographers today is how to convey this information to young children, or more specifically, to the teachers of young children. In many preservice programs for elementary education and elementary social studies teachers, only minimal course work in geography is required. Any map instruction received is usually in the context of a general geography course focusing more on map use than map making and map design. Cartography courses are not part of the normal fare in the elementary education curriculum. This limited exposure of the teacher to the map making and design process has a direct bearing on what children learn about maps. Since teachers are not educated in map making and map design they do not realize that imagination and creativity are important parts of the cartographic design process. We need to find other opportunities, such as in-service training, to expose elementary teachers to the concepts and principles of cartographic design. By providing instruction in cartography to elementary teachers we can guide them through the steps of making aesthetically pleasing maps, and also foster activities that encourage them to bring more creativity to the mapping process.

Creativity is often mentioned when discussing map aesthetics and design, but the term is used rather freely and the meaning is unclear, not only in cartography, but in psychology and art as well. The dictionary defines creativity as the act of producing something new through imaginative skill, and making or bringing something new into existence. Psychologists expand on this definition, with some viewing creativity as nothing more than releasing impulses or relaxing tensions, while others see it as the process of change, development, and evolution in the organization of subjective life (Kneller 1965, pp. 1-2). A synthesis of the research on creativity within psychology has resulted in a more comprehensive definition: "Creativity seems to involve certain mental abilities. These include the ability to change one's approach to a problem, to produce ideas that are both relevant and unusual, to see beyond the immediate situation, and to redefine the problem or some aspect of it" (Kneller 1965, p.13).

Artists view creativity as the process of taking familiar things which belong to the culture and using them in individual ways, resulting in images that are often novel and unique (Wilson and Wilson 1982, p. 77). Creativity is also viewed as part of a process that combines the uniqueness of the individual, along with the materials, events, people or circumstances, and results in the emergence of a novel product (Rogers 1971, pp. 3-4). When viewed in this way, creativity is therefore not unconscious, but an intentional process and activity that involves the rearrangement of existing knowledge and allows for expansion of that knowledge, appropriate to a given situation, that can result in solving a problem.

Cartographers often use the term "creative" when referring to aesthetics or map design, but seldom provide a complete explanation of its meaning. In a report on the role of cartography in liberal education, Robinson states that cartography has "... a wide range of qualitative aspects, such as symbolism, design, creativity - and even decoration;" (Robinson, 1965). He notes that aesthetics, art and creativity are all related and essential to the communication process, but does not define creativity. A more specific explanation is provided by Castner, who suggests creativity can be viewed in two ways: first, as the complete freedom to think up something and to provide a product in the absence of constraints, and secondly, where the materials are constrained and the student is given a specific goal (Castner,

*"This limited exposure of the teacher to the map making and design process has a direct bearing on what children learn about maps."*

#### CREATIVITY AND CARTOGRAPHY

*"Cartographers often use the term "creative" when referring to aesthetics or map design, but seldom provide a complete explanation of its meaning."*

*"... cartographers can challenge conventional perceptions by giving a world map a southern orientation instead of the traditional view with north at the top."*

*"Two workshops were conducted to introduce map design principles to elementary and middle school teachers."*

#### TEACHER WORKSHOPS

1990, pp. 117-118). Creativity from a cartographic perspective involves systematic thinking where students and / or cartographers create unique maps that express some idea or experience of their world (Castner 1998). If this definition and viewpoint are accepted by cartographers, then we need to provide students at all levels with situations and experiences that will foster constructive creativity.

In his textbook, *Cartography, Thematic Map Design*, Borden Dent (1999) mentions several activities that can encourage new ways of thinking in the process of transforming real world data into a map presentation (Table 1). This is not a list of steps to become creative, but rather a list of approaches or perspectives that through gradual practice and incorporation into various problem solving situations will lead a person to creative interpretations. For example, cartographers can challenge conventional perceptions by giving a world map a southern orientation instead of the traditional view with north at the top. With North and South America reversed from their normal representation, students and teachers can gain a fresh view of the world.

Two workshops were conducted to introduce map design principles to elementary and middle school teachers. The objectives were to encourage them to bring imagination and creativity to the map making process, both the artistic and scientific components, and to have the teachers recognize patterns of spatial data, look at maps in new ways, challenge old assumptions, and construct a network for asking questions, exchanging ideas and providing encouragement to each other.

A workshop called "The Art of Mapping" was presented at the North East Intermediate Unit (in Archbald, north of Scranton, Pennsylvania). The workshop had two presenters, a cartographer and an artist, who worked

#### CREATIVE ACTIVITIES

1. Challenging assumptions - daring to question what most people take as truth.
2. Recognizing patterns - perceiving significant similarities or differences in ideas, events, or physical phenomena.
3. Seeing in new ways - looking at the commonplace with new perceptions, transforming the familiar into the strange, and the strange into the familiar.
4. Making connections - bringing together seemingly unrelated ideas, objects, or events in ways that lead to new concepts.
5. Taking risks - daring to try new ways, with no control over the outcome.
6. Using change - taking advantage of the unexpected.
7. Constructing networks - forming associations for the exchange of ideas, perceptions, questions, and encouragement.

Table 1. List of creative activities. (From: Dent 1999, p.238)

together to develop a presentation integrating thematic mapping concepts with aesthetic and design principles. The insights into aesthetics, design and creativity provided by the artist were a valuable component of the workshop. The participants were all active teachers, most in the elementary and middle grades; each taught a variety of subjects and all but one had participated in previous geography workshops. Twenty of the twenty-six had taken a geography course as part of their degree work, while only fifteen had taken an art course.

**Procedures**

The workshop began with an explanation of current trends in geography and art education. This required a review and listing of the standards and themes in geography and the visual arts (Tables 2 and 3). Many of the workshop participants were familiar with the geography standards, but not those of the visual arts. The emphasis was on discovering the elements common to both disciplines: both geography and art are concerned with space and spatial representation, but geographic space is often constrained by location (Table 4). For example, in a map of the United States, the states cannot be moved around individually in order to provide a better balance for the design. There are also certain conventions, such as the creation of perspective or three dimensional views, which are common to both areas.

*"The insights into aesthetics, design and creativity provided by the artist were a valuable component of the workshop."*

*"Many of the workshop participants were familiar with the geography standards, but not those of the visual arts."*

**THE SIX GEOGRAPHIC ELEMENTS AND SELECTED STANDARDS**

Elements	Standards
The World in Spatial Terms	How to use Maps
Places and Regions	The physical and human characteristics of place
Physical systems	The physical processes that shape the patterns of earth's surface
Human systems	The characteristics, distribution, and complexity of earth's cultural mosaic
Environment and Society	How human actions modify the physical environment
The Uses of Geography	Interpret the past, the present Plan for the future
Geographic Skills:	Asking geographic questions Acquiring geographic information Organizing geographic information Analyzing geographic information Answering geographic questions

Table 2. National Geography Standards. (From: Geography Education Standards Project 1994, pp.34-35)

### THE NATIONAL VISUAL ARTS CONTENT STANDARDS AND SELECTED ACHIEVEMENT STANDARDS FOR K-4

Content Standard	Achievement Standard
Understanding and applying media, techniques, and processes	Students describe how different materials, techniques, and processes cause different responses.
Using knowledge of structures and functions	Students know the differences among visual characteristics and purposes of art in order to convey ideas.
Choosing and evaluating a range of subject matter, symbols, and ideas	Students select and use subject matter, symbols, and ideas to communicate meaning.
Understanding the visual arts in relation to history and culture.	Students demonstrate how history, culture, and the visual arts can influence each other in making and studying works of art.
Reflecting upon and assessing the characteristics and merits of their work and the works of others.	Students understand there are various purposes for creating works of visual art.
Making connections between visual arts and other disciplines	Students identify connections between the visual arts and other disciplines in the curriculum.

Table 3. Visual Art Standards. (From: Fredrich and Fuller 1996, p. 255)

*"The teachers indicated they used traditional wall maps frequently, with little or no thought given to how or why these maps were created or why certain elements were included."*

*"... the navigation maps provided in elementary texts, which have the student determine the best route to take from a specific house to the school or park, were the limits of how the teachers thought maps could be used in geography lessons."*

From an education perspective, both cartography and art can be used in situations to enhance critical thinking and problem-solving, and both also have individualistic components. Finally, a map or a work of art can be perceived or interpreted differently by each individual.

Once the framework for mapping and art was established, the teachers were asked for examples of the types of maps they used in the classroom. The vast majority were location and reference maps, and the teachers' perception was that these were rigid and fixed representations - more a work of science than art. The teachers indicated they used traditional wall maps frequently, with little or no thought given to how or why these maps were created or why certain elements were included. Likewise, the navigation maps provided in elementary texts, which have the student determine the best route to take from a specific house to the school or park, were the limits of how the teachers thought maps could be used in geography lessons. Most of these teachers had attended other workshops regarding the geography standards and implemented many of the ideas from these workshops into their geography lessons. Despite this fact, the maps for

### COMMON THEMES IN MAPS AND ART

Space and spatial representation

Content and elements

Cartographic and artistic filters and conventions

Education perspective: student acquisition of ideas, concepts,  
knowledge;  
problem-solving, critical thinking

Individualistic components: Perception and interpretation

Table 4. Common themes in maps and art.

these lessons were still primarily used only for location and navigation situations, and not to show human-environment interaction or geographic patterns and distributions.

In order to encourage the teachers to be more creative in their approach to mapping and to expand their view beyond general reference maps, thematic maps were chosen as the focus of the workshop. A special purpose or thematic map representing a specific data set poses a very different set of map making strategies and techniques than a reference map (Castner 1983, p. 88-89). Thematic maps can be integrated into all of the geography standards and help explain patterns, distributions and the relationships between variables. Children have exhibited success with maps in general, and expanding to maps other than those involving navigation seems realistic. Bartz notes,

More often they (children) should have to map things themselves; not just the schoolyard or the classroom or the route home, but the conversion of observations or numerical data into spatial form. The child could convert rainfall figures into a simple map, or try to think of ways to show different sizes of cities on a population map... Making one map like this is far more valuable than just looking at dozens of population maps... (Bartz, 1970, p. 24).

Examples of thematic maps from the local to global scale were presented, and experiences with such maps in books, newspapers, magazines were noted. Once discussion started, the teachers realized they had been exposed to thematic maps, but had not formalized them as a specific type of map. A broad set of guidelines was given for them to create their own thematic map, with directions purposefully kept to a minimum to see what they would come up with on their own (Table 5). The objective was to design an original base map of a neighborhood, develop a quantitative data set, and then symbolize the data with the appropriate visual variable. For the data set, traditional examples, such as population density and median income were given, with the teachers encouraged to make their base map and data different from the examples. Since the base maps were maps of hypothetical neighborhoods, the data sets were also hypothetical, with each group encouraged to brainstorm and come up with an individual and unique map. Their final products included base maps and symbols that were

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*"Thematic maps can be integrated into all of the geography standards and help explain patterns, distributions and the relationships between variables."*

*"The objective was to design an original base map of a neighborhood, develop a quantitative data set, and then symbolize the data with the appropriate visual variable."*



### QUANTITATIVE SYMBOLIZATION NEIGHBORHOOD SCALE

Base map:	10 to 20 houses; 5 streets
Data set:	numbers (quantitative)
Representation:	symbolization visual variables: size, tone, texture
Medium:	paper, crayons, markers, colored pencils
Map elements:	parts common to all maps
Communication and design considerations:	"showing continuity of data using tone and texture."
Critique:	display and discussion symbol conventions in cartography aesthetics suggestions for change

Table 5. Directions for making the quantitative map.

*"One of the most important parts of the exercise was the critique session in which the participants were asked to evaluate the effectiveness of their own and others' maps."*

*"The afternoon session followed a similar outline, only this time the task was to make a map at the national scale containing categorical information."*

completely different from the grid street map example with generic houses. The data sets generated ranged from the number of fish caught in each home in a native American village, to the amount and type of body piercing occurring in each neighborhood or region.

The teachers worked in groups and were given a little less than two hours to complete the task. One of the most important parts of the exercise was the critique session in which the participants were asked to evaluate the effectiveness of their own and others' maps in terms of communication of the purpose of the map, general legibility and design. It was at this point that the teachers began to see the connection between data and symbols and design; between the science and the art, and much value was gained "... through experience supplemented by critical examination" (MacEachren 1995, p. 9).

The afternoon session followed a similar outline, only this time the task was to make a map at the national scale containing categorical information (Table 6). The medium was also changed. Students used fabric scraps, cardboard food and beverage boxes, pieces of metal and wood, and other materials to create their unique map representations. One group made their United States map on a 4' by 6' piece of cardboard, representing the physiographic regions with cut up pieces of food and beverage boxes.

A second workshop was conducted with 30 teachers enrolled in a two week course at a summer geography institute. The thematic map workshop was on the second day, after teachers had been exposed to themes and standards, and was confined to a 3 hour morning session instead of an all-day session. The procedures followed were the same, with the critique session once again proving to be a most valuable component of the activity. For this workshop, the second maps created integrated many of the ideas discussed in the first critique session.

### QUALITATIVE SYMBOLIZATION NATIONAL SCALE

Base map:	United States
Data set:	Categorical (qualitative) Real or hypothetical data
Representation:	symbolization visual variables: shape, color, pattern
Medium:	fabric, cardboard, miscellany
Map elements:	parts common to all maps
Communication and design considerations:	showing contrast versus showing continuity use of fabric and other materials

Table 6. Directions for making the qualitative map.

#### Implications for future workshops

The workshop was balanced between two components: content regarding thematic mapping and design, and the hands-on activity. The content presented focused on the development of symbols from the primary graphic elements or visual variables and data classification. For the primary graphic elements, particular attention was given to the distinction between symbols used for qualitative and quantitative data. Examples using many different types of symbols were given, but participants were reminded that each map represented only one of the many solutions possible for each map. By having two presenters for the workshop, both the cartographic and artistic components received equal weight. The artist's viewpoint or explanation of graphic elements, such as tone or value, was well received by the participants.

Evaluations of the workshop indicated that the teachers also found the information on data classification useful. The equal interval, equal observation and natural breaks methods were explained in detail and a bibliography provided (Robinson, et al 1995; Dent 1999; and Slocum 1999). Teachers viewed the development of data classes as an excellent way to integrate math concepts with mapping.

The 50 teachers who participated in the two workshops were enthusiastic and willing to accept new ideas and perspectives. They incorporated Dent's list of creative activities into the map design process. The ideas presented and activities performed were new to them and opened their eyes to possible ways of integrating the new techniques into not only geography lessons but other areas of the curriculum, including history, mathematics, science and literature. Combining literature with geography was the most common example given by teachers as to what they already do with the integration of geographic themes. Many novels incorporate the geographic setting into the story line, and *Out of this Furnace* by Thomas Bell (1976) was identified by the teachers as a volume appropriate for a mapping activity.

*"Examples using many different types of symbols were given, but participants were reminded that each map represented only one of the many solutions possible for each map."*

*"Teachers viewed the development of data classes as an excellent way to integrate math concepts with mapping."*

#### CONCLUSIONS

"One way to encourage students to create new and innovative map presentations is through competitive events."

"The International Cartographic Association (ICA) sponsors the worldwide Barbara Petchenik Children's Map Competition for students ages 5 to 16."

"[www.library.carleton.ca/madgic/maps/children/winners/index.htm](http://www.library.carleton.ca/madgic/maps/children/winners/index.htm)"

This book discusses the rise of the steel industry in the valley of the Monongahela River, and variables such as the number of factories, the tons of steel produced, the number of employees and the ethnicity of the workers were identified as potential map themes. Another area seen as having great potential was the use of data classification to integrate mathematics concepts with geography. The comparison of the different classification methods and their effect on the look of the final map intrigued many of the workshop participants.

One way to encourage students to create new and innovative map presentations is through competitive events. Geography Awareness Week provides an ideal setting for teachers and schools to conduct geography fairs and map competitions that require creative map solutions to a well-defined problem. The International Cartographic Association (ICA) sponsors the worldwide Barbara Petchenik Children's Map Competition for students ages 5 to 16. For the 1999 competition in Ottawa, the students were asked to draw a map of the world on any theme of interest to them. Directions were kept to a minimum, except to state that maps should be of a certain size and "creative". Preparing students to enter such a competition requires that teachers be willing to help their students look for new ways to represent the earth. The ICA has a website where past winners are displayed ([www.library.carleton.ca/madgic/maps/children/winners/index.htm](http://www.library.carleton.ca/madgic/maps/children/winners/index.htm)). The maps from this site can be used by students and teachers to generate a discussion of the elements that make the maps "creative". Cartographers need to be more aware of the needs of elementary teachers and provide opportunities for them to explore the creative aspects of the map making process and pass this knowledge on to their students.

#### REFERENCES

- Bartz, Barbara S (1970). Maps in the Classroom, *Journal of Geography*, vol. 79, no. 1, pp. 18-24.
- Bell, Thomas (1976). *Out of This Furnace*. Pittsburgh, Pennsylvania: The University of Pittsburgh Press.
- Blaut, James M (1991). Natural Mapping, *Transactions of the Institute of British Geographers*, vol. 16, pp. 55-74.
- Castner, Henry W (1998). The Nature of Creativity in Cartographic Design, paper presented at NACIS XVIII, October 7-10, 1998, Milwaukee, Wisconsin.
- Castner, Henry W (1990). *Seeking New Horizons. A Perceptual Approach to Geographic Education*. Montreal: McGill-Queens University Press.
- Castner, Henry W (1983). Research Questions and Cartographic Design. In *Graphic Communication and Design in Contemporary Cartography*, edited by D.R.F. Taylor, pp. 87-113. New York: John Wiley and Sons.
- Dent, Borden (1999). *Cartography, Thematic Map Design*, 5th edition. Boston: WCB/McGraw-Hill.
- Downs, Roger M., Liben, Lynn S., and Daggs, Debra G (1988). On Education and Geographers: The Role of Cognitive Development Theory in Geographic Education, *Annals of the Association of American Geographers*, vol. 78, no. 4, pp. 681-700.

Fredrich, Barbara and Fuller, Karyl (1996). Linking Geography and Art: Inness' "The Lackawanna Valley", *Journal of Geography*, vol. 95, no 6, pp. 254-262.

Geography Education Standards Project/ National Council for Geographic Education (GESP/ NCGE) 1994. *Geography for Life: National Geography Standards 1994*. Washington, D.C.: National Geographic Society.

Kneller, George F (1965). *The Art and Science of Creativity*. New York: Holt, Rinehart and Winston, Inc.

MacEachren, Alan (1995). *How Maps Work. Representation, Visualization, and Design*. New York, The Guilford Press.

Muehrcke, Phillip C., and Muehrcke, Juliana O (1998). *Map Use: Reading, Analysis, and Interpretation*, 4th edition. Madison, Wisconsin, JP Publications.

Petchenik, Barbara Bartz (1984). Facts of Values: Basic Methodological Issues in Research for Educational Mapping, *Technical Papers of the twelfth Conference of the ICA*, vol. 1, pp. 788-804. (Published by the 12th ICA Conference Committee).

Robinson, Arthur H (1965). The Potential Contribution of Cartography in Liberal Education, in *Geography in Undergraduate Liberal Education*, pp. 34-47. Washington, D.C.: Association of American Geographers.

Robinson, Arthur H., Morrison, Joel L., Muehrcke, Phillip C., Kimmerling, A. Jon, and Gupstill, Stephen C (1995). *Elements of Cartography*. Sixth edition. New York: John Wiley and Sons.

Robinson, Arthur H., and Petchenik, Barbara Bartz (1976). *The Nature of Maps*. Chicago: The University of Chicago Press.

Rogers, Carl R (1971). Toward a Theory of Creativity, pp. 2-12, in *The Creative Encounter*, edited by Rosemary Holsinger, Camille Jordan, and Leon Levenson. Glenview, Illinois: Scott, Foresman and Company.

Sauer, Carl (1956). The education of a geographer, *Annals of the Association of American Geographers*, vol. 46, no. 2??, pp. 287-299.

Slocum, Terry A (1999). *Thematic Cartography and Visualization*. Upper Saddle River, New Jersey: Prentice Hall.

Trifonoff, Karen M (1995). Going Beyond Location: Thematic Maps in the Early Elementary Grades, *Journal of Geography*, vol. 94, no. 2, pp. 368-374.

Wilson, Marjorie and Wilson, Brent (1982). *Teaching Children to Draw: A Guide for Teachers and Parents*. Englewood Cliffs, New Jersey: Prentice-Hall Publishers.

## cartographic techniques

### Designing Dynamic Maps

by Nicholas Springer

The visual limitations of the computer monitor are immediately apparent when compared with a finely printed image. With the evolution of maps into the digital realm, the cartographer has had to embrace new techniques and overcome these limitations by seeking solutions through innovative map design. Until computer screens get closer to producing images as fine as on paper, we cannot ignore the need to adapt and in some cases compromise. There are design techniques we can employ now to overcome some of the restrictions of digital map display.

A good image manipulation application like Adobe Photoshop can produce fine-looking maps even in the low-resolution environment, using anti-aliasing techniques for text, impressive blending, and overprinting effects as well as realistic relief shading. However, producing these kinds of fine digital images requires many hours of work for each one, which is not feasible for a dynamic map system. Maps in a dynamic map system can be panned and zoomed to an infinite number of views and scales. The maps need to be drawn on the screen automatically from a GIS library, using a set of rules for the design elements. That gives the designer little control over the look of any individual map view, meaning that the design rules have to be very carefully thought out.

The automatic nature of the map drawing in a dynamic map system means that anti-aliasing, dithering, and blending all significantly slow down the application performance. A slow and unresponsive dynamic map interferes with the exploration of the data being presented. To keep

things fast means drawing the maps at low resolution and with no interpolation of colors or pixels.

While most desktop computer systems are capable of displaying 1024 by 768 pixels with 8-bit color, the default settings on these machines out of the box is usually 800 by 600 or even 640 by 480. The average user will not change the monitor resolution and it is difficult to change it through programming, so we are forced to design digital maps with the low-resolution user in mind. With limited resolution, many designs can end up looking clunky and heavy-handed.

Thoughtful use of line symbology, typography, and color can minimize some of these problems along with concise data selection.

### Line symbology

One of the graphic limitations of low-resolution mapping is that there is very little subtlety when it comes to line weights. Even a 1-pixel line looks heavy and dominating on a map, especially when combined with many others, as in a detailed road map. Giving the line a color that is close in value to the background color can create an illusion of a thinner line (fig. 1A). Likewise, bordering a polygon on the map with a line that is just slightly darker than the fill color adds just enough of an edge to allow the fill color to be very close in value to the

background, allowing the element to recede visually (fig. 1B).

### Typography

Sending some objects to the visual background is very useful for many of the low-resolution issues, and works equally well to minimize the dominance of type and symbols. Typography has its own problems in the digital medium. Most fonts designed for output to a printer don't render well on a screen at small point sizes. Anti-aliasing can be very slow and tricky to generate on the fly so it tends to not be a good option for dynamic mapping.

In standard computer system fonts such as Times, Arial and Helvetica, the bitmap, or screen font sizes are designed letter by letter to maximize their legibility at sizes as small as 8 or even 6 point. These fonts also have the benefit of being installed on almost every desktop machine, meaning that the maps will look the same on the most systems without installing custom fonts. Picking a specific screen font, rather than one rendered from an outline, will always give predictable results at a given size. Since the designer cannot see every label being created in dynamic mapping system, it is important to preview the entire alphabet in a given font and size to make sure all the letters are legible.

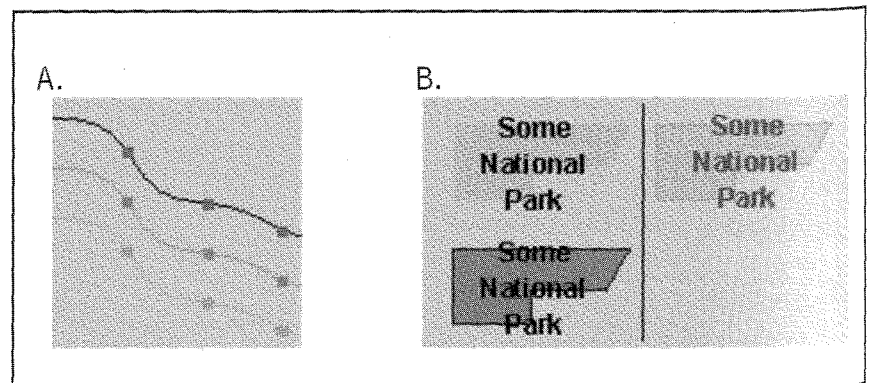


Figure 1.

## RGB color and palettes

Computer monitors are poor imitations of nature. The additive color space of RGB does not come close to covering the gamut of colors perceivable to the human eye. It is difficult to produce on a computer screen some of the softer natural hues we see every day. Printing CMYK inks on paper can achieve some of these tones, but RGB is limited by the inherent brightness of the Cathode Ray Tube (CRT). When not limited by low bit-depth or specific palette issues, many subtle and subdued shades of color can be produced in the RGB space. Reducing saturation goes along way to making RGB colors more appealing. Try picking and adjusting colors with Hue, Saturation and Value (HSV) scales in Photoshop or another graphics utility and then convert to RGB.

Digital map design usually does require some kind of color palette constraint. Maybe it's because the maps are being viewed on the wide world web, or the application drawing the map restricts the maximum number of colors. Most likely, the users system is set to a low bit depth. Most maps can be drawn nicely with fewer than 256 unique colors except when showing high-resolution raster images. The main problem is when the set of 256 colors is constrained to a specific group, defined by criteria other than the map, such as the application's user interface or the need to use an operating system palette. Web maps should use the 216 browser-safe colors to be sure that they will look the same on all platforms. While palette constraints usually mean compromising on design to some degree, these restrictions may even encourage better map designs, as more careful thought is given to color selections.

As mentioned before, many computer systems are set to 8-bits of color depth by default. As long as a design has fewer than 256 indi-

vidual colors, it should look fine on an 8-bit system, although you may have some palette flashes when switching between programs. Some systems will dither the colors if you have more than 256, which might look fairly good, but others will start replacing colors with the nearest match and you will start to see banding or worse.

The best solution is to always use as few unique colors as possible, or use whatever palette is being used by the system displaying the map. Designs should be previewed at various resolutions and bit depths, and when possible on different monitors. Many monitors are darker or lighter, either due to the users preference or poor monitor adjustment. A small difference in the brightness and contrast of a monitor can cause dramatic shifts in colors. Also, the exact same color on a Mac will look very different on a PC, so cross-platform designs should be viewed on both. Make sure to view any screen design on a system that has specifically been set to only display 256 colors. This should make any palette problems obvious.

When designing maps for the web, there is the added constraint of the browser-safe palette. This set of colors was not chosen because of their aesthetic value, but by a mathematical formula, combining multiples of 51 (e.g. 102, 255, 153 or 204, 51, 0). This system was originally designed by programmers to be consistent and ordered, with no thought given to the resulting colors. These 216 colors are therefore common to both the PC and Mac system palettes, so web images using them will look the same in the cross-platform world of HTML. A quick survey of the resulting colors shows that there are very few subtle, muted colors suitable for making attractive maps. So why use this palette? Not using the web browser-safe colors will cause unpredictable dithering on the web, although this may not look so bad.

Lynda Weinman's books and her web site provide excellent examples of how to use the web palette successfully (<http://www.lynda.com/hex.html>).

One work around for creating more subtle colors out of the browser-safe set is to dither them together manually (see sidebar). By alternating pixels of two colors near in value, the bit pattern will not be visible and optically they will produce a third color. Try alternating the palest yellow (255, 255, 204) with white (255, 255, 255) to produce a color that is very nice for map backgrounds. Adding the nearest browser-safe gray to a color will result in a much more muted tone (look at the color 255, 204, 255 and then alternate it with 204, 204, 204).

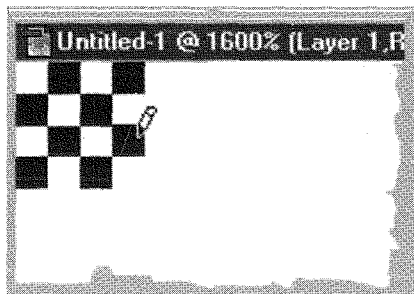
If the design is constrained to the browser-safe palette, the same color rules apply as with an unlimited palette. As much as is possible, try to find muted or light colors. Do not feel the need to use black for all labels; try a dark maroon or a muted dark blue instead. Use colors close in value to each other to make some map elements recede to the background. Look for colors in the same basic hue range to tie themes together. Avoid saturated colors of different hues that are close in value, as they will produce visual vibration.

### Data Selection

Overall the best way to make digital maps clear and readable is to reduce clutter of the map elements. Make sure you understand the use of the map, and only present the necessary data. With dynamic mapping the user can zoom in on the map if more information is desired, so the cartographer should not be tempted to show all of the data possible at a given view. The cartographer's job here is not to generalize individual map elements, but to generalize the map as a whole without losing the salient details.

### Creating manual dithers in Adobe Photoshop:

1. Create a new document using white for the contents and in RGB mode. Keep it small, maybe 64x64 pixels.
2. Add a new layer and zoom in to at least 400%. With the pencil tool set to the one-pixel brush, add a set of an even number of alternating pixels:



3. Make the background layer invisible and then select the new layer again.
4. Select just this group of pixels and from the Edit menu choose "Define Pattern."
5. Now select the entire area of the new layer, and from the Edit menu choose "Fill..."
6. In the Fill dialog, select "Pattern" from the "Contents" drop-down and click "OK."
7. The new layer should now be filled with an alternating pattern of transparent and non-transparent pixels. Deselect all.
8. In the layers palette, click on the new layer and check the "Preserve Transparency" checkbox. Make the background layer visible again.
9. Now to experiment with dithering combinations, just fill the background layer with one web color, and the new layer with another (the "preserve Transparency" option will allow you to color only the non-transparent pixels with the "Fill" command/
10. At 100% zoom, you should not see any pixels with a good combination of colors.

### Concluding thoughts

At its most basic level, designing maps for computer screens is no different than designing for paper. There must be a well thought out plan from the beginning and a careful execution that considers all the limitations of the medium. Every design task has its restrictions and it is just a matter of learning how to work around those constraints. Dynamic mapping is a new way for people to use maps and therefore cartographic designers must incorporate new and creative design solutions to meet the needs of this new medium.

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MapPoint 2000 -

<http://www.microsoft.com/mappoint>

Streets & Trips 2000 -

<http://www.microsoft.com/expedia>

Expedia Maps -

<http://www.expdiamaps.com>

Encarta Virtual Globe -

<http://encarta.msn.com/evg>

### Map Design Enhancement for Terrain Visualization by Army Aviators

Wiley C. Thompson and  
A. Jon Kimerling

#### Introduction

The objective of this study was to determine if a non-traditional relief shading method can be used to redesign a 1:50,000 scale military topographical line map (TLM) in a manner that allows the Army aviator to more easily "read" the terrain in "3-D" while viewing the map under Night Vision Goggle (NVG) compatible blue-green lighting. This study is not in response to a crisis, but rather an exploration into a possible cartographic solution to a problem perceived by surveyed Army aviators. The aviator is a highly skilled map reader, but any advance that can help reduce the stress of the task-intensive NVG cockpit (Figure 1) should be explored.

While conducting map navigation at night with NVGs, Army aviators, as navigators, must create a "3-D" mental image of the terrain each time they look at the map. The navigator will then match this image to the corresponding terrain seen through the NVGs. The aviator currently must build this image under dim, blue-green lighting on a non-shaded map. A method that allows the aviator to visualize the terrain on the map and more quickly return his attention outside the cockpit where he can scan for wires, enemy, and other hazards will enhance the safe operation of the aircraft. Even a tenth of a second reduction in the time required to visualize terrain and look back outside could be the difference between spotting a hazard and falling victim to it.



Figure 1. Army aviator in UH-60 Blackhawk helicopter cockpit. Pilot is wearing a lighthouse.

## Background

There has been work in the past dealing with enhancing topographic map products through means of relief shading, layer tinting, contoured elevations and combinations of these methods. Various methods have been tested with regards to accessibility of information and visualization of terrain. These studies include: *Some Effects of Layer Tinting of Maps* (Kempf and Pooch 1969); *The Effect of Shaded Relief on Map Information Accessibility* (Delucia 1972); *Some Objective Tests of the Legibility of Relief Maps* (Phillips et al. 1975); and *An Approach to Assessment of Relief Formats for Hardcopy Topographic Maps* (Potash et al. 1979).

While previous studies demonstrate that there are differences between time required to read the map and the accuracy of results when supplementing contour lines with other relief formats, the map scales, task conditions, and study populations have varied. It would be interesting to see the results of these studies if a population of aviators (experienced map readers) were tested, and darkened conditions

with only monochromatic (blue-green) lighting were used.

Relief shading of terrain is an accepted method of increasing the map reader's ability to perceive terrain relief. Traditionally, cartographers have used gray scale values to shade their maps. This method works well in most situations, but reading maps in a dimly lit cockpit, with only monochromatic (blue-green) light available, is not a normal situation. Gray shading remains a constant "darkness" when illuminated with white or monochromatic light. This holds true regardless of lighting intensity and may not be desirable when using a dimmer, monochromatic lighting source.

Since NVG flight created the requirement for a specific spectrum of supplemental lighting, aviators have experimented with using other contrasting colors to highlight features of importance on their maps. A popular method of highlighting features such as wires or aviation routes is the standard pink highlighter (yellow highlighters are also used). The highlighter shows up extremely well when illuminated with blue-green lighting and

does not opaque background features. Drawing attention to a feature without opaquing the background information is the thought behind using colored, non-gray relief shading.

## Concept

All colored light is lacking some portion of the visible color spectrum. If a green object is viewed under red light, it appears black, as its reflectance spectrum contains none of the wavelengths present in the red light source. Conversely, a red object when viewed under a red light source appears "white" as its reflectance spectrum contains all of the wavelengths present in the red light source (Erickson 1991).

The composite diagram (Figure 2) illustrates the interaction of the blue-green lighting, the reflectance of the spectrum of the colored shading, and the sensitivity of the eye as it occurs in the NVG cockpit. In the diagram, the blue-green light curve peaks in the blue portion of the visible spectrum and tapers towards the red portion. The shaded area, representing the blue and green portion of the relief shading color would, using Erickson's analogy, not be visible as its reflectance spectrum closely matches the spectral signature of the incident light. The red shaded portion of the relief color would show up in a dark, shadow-like manner, as the blue-green light source contains little red light and would therefore be mostly absorbed. The small amount of reflected red light would be perceived, as the red cone is the numerically superior cone in the retina (Hunt 1987). The net result is terrain enhancing relief shading with little of the user information being placed in the visual background. Under white light or day conditions, all relief shading colors would reflect their full spectrum of light - providing effective shading for day use.



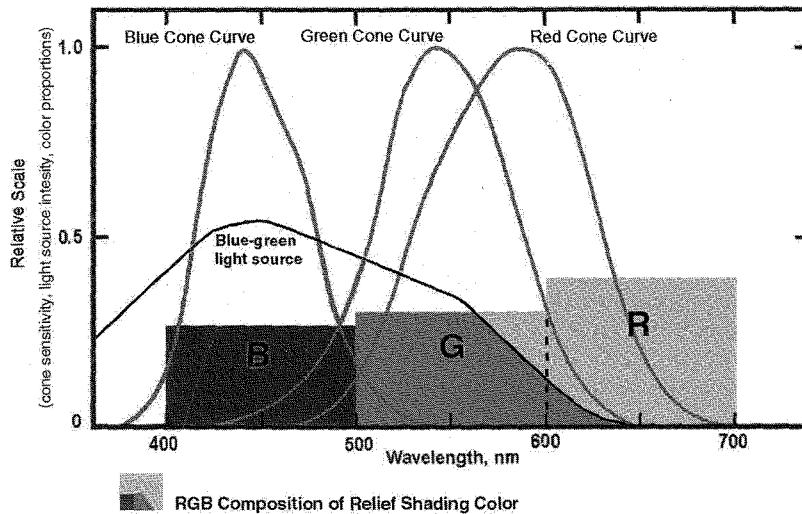


Figure 2. Composite of eye, blue-green light and shading interaction. (See <http://terra.geo.orst.edu/users/kimerlia/pinkshad> for a full color image)

A goal of this project was to create a relief shaded 1:50,000 scale military TLM from existing digital products, providing enhanced map terrain depiction under NVG compatible monochromatic light sources. Study maps of Stone City, Colorado and Ammonia Tanks, Nevada were created from National Imagery and Mapping Agency (NIMA) Compressed ARC Digital Raster Graphics (CADRG) CD-ROMs and United States Geologic Survey (USGS) 7.5 minute (30 meter) digital elevation models (DEM).

The base maps were created from the CADRG format using NIMAMUSE 2.1 software. They were saved as an RGB bitmap file. After importing the bitmap into an

Adobe Photoshop™ layer they were converted to CMYK. The standard gray relief shaded DEM was contrast stretched (1%) to improve contrast and then also imported into Adobe Photoshop™. The relief shading was then multiplied by a magenta-yellow screen to create "pink". The yellow component was added to give the shading a browner, more natural appearance. This shading was layered over the base map to create a magenta, relief-shaded map (Figure 3).

The opacity of the relief shading (Figure 4) was varied to create a map with light shading (50% layer opacity), medium shading (75% layer opacity), and dark shading (100% layer opacity).

## Evaluation

An evaluation procedure was developed to determine if the contour map with relief shading treatment as a method for enhancing the aviator's ability to visualize the terrain was an improvement over the contour-only base map. Additional information sought during the evaluation was which level of shading opacity the user preferred. The population for this survey consisted of volunteers from aircrews in Army rotary-wing (helicopter) aviation units.

Survey participants were asked if they were better able to visualize the terrain using the relief shading enhanced map product or the standard base map under daylight and NVG conditions. Each participant was given an evaluation folder with an instruction sheet, an answer sheet, and two sample maps. On each map sheet was an unshaded base map with three other shaded maps (See <http://terra.geo.orst.edu/users/kimerlia/pinkshad> for sample evaluation maps). The aviators were instructed to evaluate the map products in a darkened area, which closely matched ambient lighting conditions of the NVG aircraft cockpit environment. They were also instructed to illuminate the maps with whatever NVG compatible lighting device they normally used when flying with NVGs.

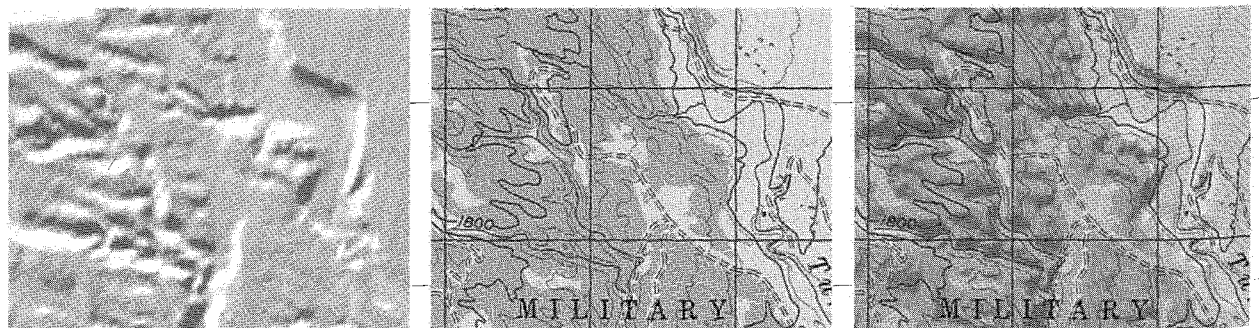


Figure 3. "Pink" shading, Un-shaded Base Map, and Composite Shaded Map (See <http://terra.geo.orst.edu/users/kimerlia/pinkshad> for color maps)

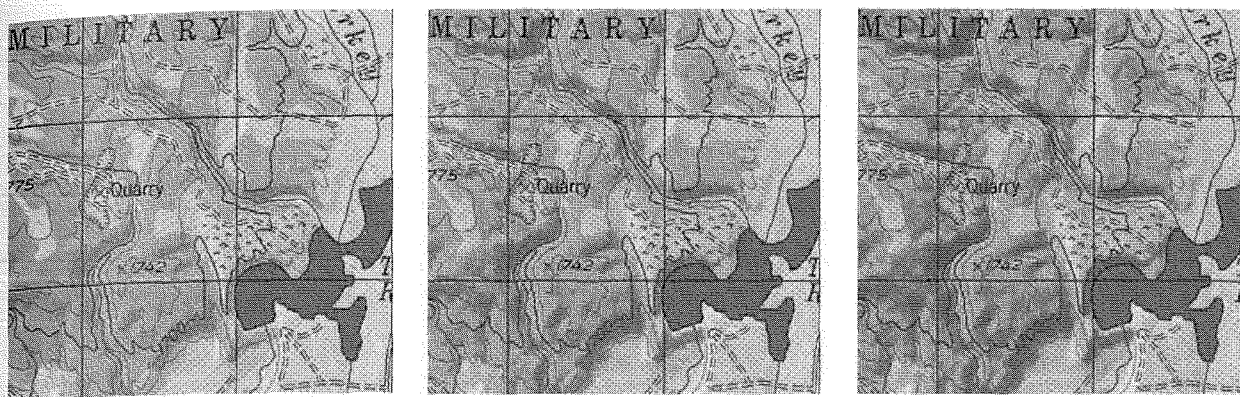


Figure 4. Shading at 50%, 75%, and 100% opacity (See <http://terra.geo.orst.edu/users/kimerlia/pinkshad> for color maps)

The survey results were positive in favor of the shading treatment being a method of enhancing the aviator's ability to visualize the terrain on the map (Table 1).

A general preference for the level of shading seemed also to be apparent. Responses generally appeared to favor the 75% or medium shading for both map areas (Table 2). One respondent made no choice, one other chose both 50 and 75%.

An initial hypothesized result of the shading preference was that aviators using the "dimmer" lighting devices such as the LED lip-light would prefer a lighter level of shading and that those using an brighter light source such as the Army flashlight with blue filter would prefer a darker level of shading. The evaluation results actually showed that mean lip-light preference was 78.4%. Those using the Army flashlight with blue filter had an 82.5% mean preference. Al-

though this fits the initial hypothesis, the difference is not statistically significant.

**Conclusion**

This study confirms that enhancing or redesigning the relief shading holds promise to increase the aviator's ability to visualize terrain maps in 3D. The results of this study may prompt those concerned with aviation safety to further explore the study of enhancing the readability of maps or to even explore the feasibility of implementing the colored relief shading treatment examined in this paper. Additionally, this technique of relief shading may prove valuable to any user that required to read a map under non-white light conditions. Applications of this technique could find use in maritime operations, law enforcement or forestry service, to name a few.

The design techniques developed in this study are by no means intended to be a definitive solution to the problem of terrain visualization on TLMs. This study is intended to raise the consciousness of the aviation community to an often-neglected issue and suggest future work in that area. A review of known principles of visual cognition and cartography, combined with modern computing capabilities, have provided a promising solution for a unique application with important safety implications. Increasing efficiency of terrain visualization from maps is a critical matter to the Army aviator - it can be a question of life or death.

**Acknowledgements**

A special note of thanks must be extended to CPT Saul Herrera, 4<sup>th</sup> Squadron, 3<sup>rd</sup> Armored Cavalry Regiment, CPT James Jones, A Co., 2-501st Aviation Regiment and CW3 William Ferguson, C Co., 1<sup>st</sup> BN 160th Special Operations Aviation Regiment (Airborne). Without their help this study would not have been possible.

The conclusions are based on the research conducted in a volunteer status by aircrews interested in improving cockpit map visualization, and do not represent the findings of any Department of Defense agency or contractor.

	Significant Improvement	Improved	No Improvement	Worse	Significantly Worse
Stone City	10	9	0	1	0
Ammonia Tanks	7	12	0	1	0

Table 1. Survey Results (improvement)

	100%	75%	50%
Stone City	7	9	2
Ammonia Tanks	5	9	5

Table 2. Survey Results (level of shading preference)

## References

- DeLucia, A. 1972. "The effect of shaded relief on map information accessibility." *Cartographic Journal*, 9:14-18.
- Erikson, C. 1991. *The Perception of Colored Lines Under White, Red, Blue and Bluegreen Lighting Conditions*. Unpublished Master of Science Thesis, Department of Geography, University of Wisconsin-Madison.
- Farrell, J.P., Potash, L.M., and Jeffrey, T. E. 1979. *An Approach to Assessment of Relief Formats for Hardcopy Topographic Maps*. Technical Paper 356, U.S. Army Research Institute for the Behavioral and Social Sciences.
- Hunt, R.G.W. 1987. *Measuring Color*. Halsted Press, New York.
- Kempf, R., and Poock, G. 1969. "Some effects of layer tinting on maps." *Perceptual and Motor Skills*, 29:279-281.
- Phillips, R., DeLucia, A. and Skelton, N. 1975. "Some Objective Tests of the Legibility of Relief Maps." *Cartographic Journal*, 12:39-46.
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## online mapping

### World Wide Web Mapping and GIS: An Application for Public Participation

John Krygier  
Ohio Wesleyan University  
Department of Geography

The World Wide Web (WWW) has garnered far ranging interest from those of us interested in the representation and analysis of geographic information. The WWW is seen as an exciting medium for numerous reasons: it can be accessed by a global audience, on almost every computer platform, and does not require expensive software nor specialist training to use. The multimedia capabilities of the WWW have made it a medium in which visual representations - images, maps, diagrams, graphs - are as easy to implement as text. Five or so years back, cartographers and others began using the WWW to display static maps, and some low levels of interactivity could be added to the maps by using 'image maps' - click-sensitive areas of the map which could hyper-link you to other maps or materials. Alas, this relatively low level of interactivity did not match the complex, interactive maps available in Geographic Information Systems (GIS) and geographic visualization software packages. This situation has, of course, changed. In the last few years a series of technologies has matured to the point where interactive, WWW-based mapping and GIS are now commonly found on the WWW.

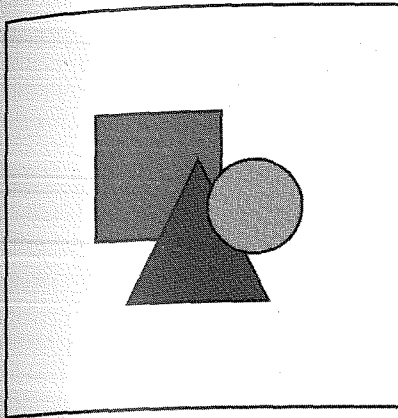
Numerous different methods exist for providing more sophisticated mapping and GIS capabilities via the WWW. It is relatively simple to make spatial data and analytical software available over the WWW; users can download the software and data and perform their own analysis on their own computer. A more sophisticated method is to use a map generator, where WWW users set the parameters of a map or GIS analysis on a WWW-based form. This form is passed to a map or GIS server, which generates a map or series of maps, then posts the results on the WWW page. The U.S. Census Bureau's Tiger Mapping Service is a good example of this type of technology. Real-time

map browsers, such as ESRI's Map Objects and Internet Map Server provide similar functionality in a package explicitly aimed at component- and WWW-based GIS developers. Map Objects (and other similar packages) are aimed at software developers who want to cobble together customized GIS packages for specialized uses. For example, a developer, using component GIS software, can create a GIS that includes the limited GIS and mapping functions necessary for realtors searching for particular houses for clients. This customized, component GIS can function on the WWW with the addition of Internet Map Server software.

My own experiment with Map Objects and the Internet Map Server was funded by a small grant which allowed me to pay a graduate student to develop an interactive mapping and GIS site aimed at enhancing public participation in issues concerning housing in an inner-city Buffalo neighborhood. The set of WWW-based maps generated in this project are prototypes with limited functions, intended to assess the capabilities of the software. The process behind this project has been described in the master's thesis of K. Chang and is available at the WWW site where the Public Participation mapping and GIS application is running. Other background information on the application and some of the conceptual and theoretical ideas are available at the site. From this page, a link takes you to a series of three Map Objects maps.

These options consist of three different map scales: a local, neighborhood scale map, a city of Buffalo map, and a US and World map. The focus of the project was the neighborhood scale map.

This map has a series of basic GIS functions, including zoom in and zoom out from map, re-center the map, and 'hot-links' to additional information. A park on the map may be linked to the appropriate



ate information about that park on the City of Buffalo WWW site, for example. More sophisticated functions include identify and add information to the map and database.

Identify is a simple function which allows a user to get the name of a building owner or the address by clicking on the lot of interest on the map. A related function allows the site user to find a lot or building owner. Future development of the site will include additional categories of information, such as building violations, and tax status.

A comment function allows users to comment on a lot or building.

These comments are then posted to the WWW page. This feature was incorporated as neighborhood residents wanted a way of compiling information on problem houses and lots - including simple violations (such as junk in the yard) or bigger problems such as abandonment and drug activity. There are, obviously, some problematic issues raised by such anonymous, public postings of alleged housing problems. However, these are the types of issues that will have to be confronted as such publicly accessible WWW-based GIS and mapping sites become available. An elaboration on the comment function is even more problematic: users of the WWW site can actually change the database, which is linked, to the neighborhood map.

The ability to change the database behind the map could be restricted to 'master users' such as a

community planner, who could sift through information from the comments page and select appropriate changes to the database. The planner could also add any new or changed information from the city. However, the prospects of an 'open database' are being discussed. Such an open database would serve to collect 'local knowledge' and information about the neighborhood. Obviously, there are some benefits to this type of data collection, and some big disbenefits.

In sum, the interactive mapping and GIS site designed as a prototype reveals that WWW-based mapping is certainly possible given adequate resources. The software for creating such maps is mostly reasonable, except for the Internet Map Server component (although many educational institutions have access to the IMS software). The student who programmed the site did not know Map Objects but had a moderate knowledge of Visual Basic and object oriented programming, and it took him approximately 250 hours to create the site (including digitizing the neighborhood maps). Creating such a site also requires a NT server, and it is extremely useful to have the server devoted to development of Map Objects applications. My general assessment is that many of the technological problems of providing interactive mapping and GIS via the WWW have been solved, although a reasonable investment in money and time is required to get such applications working. The real issues concern the impact of such applications to more sophisticated mapping and GIS tools, and the problems and possibilities of 'open databases.' It is these more academic questions which will occupy our attention in the near future.

## software news

### MAPublisher Version 3.5 for Windows/Mac Freehand 8.0 and Version 3.5 for Windows/Mac Illustrator 8 from Avenza

MAPublisher is a suite of GIS and cartographic plug-in tools that allows the import of top GIS and CAD file formats into high-end graphics and illustration environments with all the attribute databases intact and ready to use.

- Improved file import that more effectively imports common GIS file formats (ARC/INFO Generate, ArcView Shapefile, MapInfo MID/MIF, AutoCAD DXF, and USGS DLG and SDTS formats) into the vector graphics environment with all database attributes intact.
- Table management tools that allow the import of external database tables for merging and linking to existing map layers as well as creation, editing and deletion of separate data tables.
- Automated raster image registration.
- Automated labeling based upon attribute data.
- Export to MapInfo MID/MIF and ArcView Shapefile formats.
- Map projection and scale transformations (over 100 projections and 40 ellipsoids available).
- Automated grid and scale bar generation.
- Export to intelligent, data-rich pdfPLUS containing searchable and queryable data tables.
- Search, query and select by data attribute.
- Joining of vectors based on simple or attribute values.
- Automated legend creation based upon attribute data that enables automated legend value assignment for multiple legend

elements based on either unique values or a user-controlled value range.

- Automated scale conversion from native co-ordinate system to various traditional scales.
- JAMBuddy export replaced with new pdfPLUS export.
- Correction of several legacy problems with previous versions.

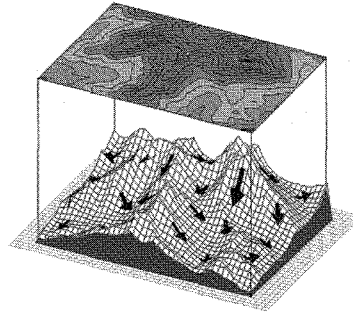
For further information please contact Avenza at (905) 639-3330, [info@avenza.com](mailto:info@avenza.com) or visit the company's website at <http://www.avenza.com>

### Surfer® Version 7 Golden Software, Inc.

Golden Software, Inc. announces the release of Surfer(r) version 7, a contouring and 3D mapping software package with variogram modeling capabilities. Surfer is a 32-bit program and operates under Windows 95/98, NT 4.0, or higher. It accurately transforms XYZ data into contour, wireframe, vector, image, shaded relief, base, and post maps.

Vector maps are a new map type in Surfer. They instantly show the orientation and inclination of a slope with scaled vectors. Referring to the seven map types available in Surfer, combined with the ability to overlay different map types, Patrick Madison, the President of Golden Software, says that Surfer "has proven to be very versatile in the customization of data presentation."

New, sophisticated gridding filters in Surfer allow the user to accurately grid XYZ data and to easily exclude unwanted or duplicate data when creating grid files. Variogram modeling has been added to help spatially assess the data and to choose the most accurate gridding method for the specific data. A report of gridding parameters and statistics is automati-



Create and overlay any number of maps in Surfer. In this example, a vector map is overlaid on a 3D wireframe map with a contour map.

cally generated when data are gridded.

Surfer 7 supports more file formats. The list of export options in Surfer now includes SHP, PNG, and 3D DXF file formats. Use USGS SDTS DEM and DLG files in their native formats in Surfer. SDTS DEM files are treated as any other grid file and any grid operation can be performed on the SDTS DEM file.

The new macro system makes the automation of repetitive tasks easier and more versatile in Surfer. Use Visual Basic, C++, Perl, or any ActiveX Automation compatible language to write scripts. Other improvements to the user interface include an object manager, tabbed dialog boxes, and floating toolbars.

A free, full working demo is available on the web page. Contact Golden Software for more information on Surfer version 7.

Golden Software, Inc  
809 14th Street Golden, CO 80401  
800-972-1021 or 303-279-1021  
<http://www.goldensoftware.com>  
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## NACIS news

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vasiliev@geneseo.edu

**PRELIMINARY PROGRAM NACIS XIX**  
*The Nineteenth Annual Meeting of the  
North American Cartographic Information Society*  
*www.nacis.org*

**October 20-23, 1999**  
**Williamsburg, Virginia**

**WEDNESDAY, OCTOBER 20**

**REGISTRATION**  
2:00-7:30 PM

**NACIS BOARD MEETING**  
3:00-5:30 PM

**OPENING SESSION (SPEAKER TO BE ANNOUNCED)**  
7:30-9:00 PM

**POSTER SESSION/ EXHIBITS/RECEPTION**  
9:00-11:00 pm

**THURSDAY, OCTOBER 21**

**Session A HISTORICAL CARTOGRAPHY I**  
8:00-10:00 am

*"A Countrie so Faire" The Mapping of Colonial Virginia*  
Richard Stephenson, Winchester, Virginia

*From Battle Plans to Tourist Maps: The Role of the Federal  
Government in Preserving the Cartographic Heritage of the  
Williamsburg-Yorktown Area*  
Ronald Grim, Library of Congress

*The Promotional Cartography of Captain John Smith*  
John H. Long, The Newberry Library, Chicago

**Session B CARTOGRAPHIC METHOD AND THEORY**  
8:00-10:00 am

*The Basic-level of Cartographic Maps*  
David K. Patton and Anthony B. Spehar, Slippery Rock Univ.

*Visual Perception of Oriented Point Symbols for Mapping*  
Maureen Ann Kelley, San Jose State University

*Color Schemes for Visualizing Climatological and Other  
Continuous Data*

Aileen R. Buckley, Patrick J. Bartlein, and  
Adam Light, University of Oregon

*Feeling it Out: The Use of Haptic Visualization for Exploratory  
Geographical Analysis*

Amy L. Griffin, Dept. of Geography, Pennsylvania State Univ.

**Session C HISTORICAL CARTOGRAPHY II**  
10:30 am-Noon

*Out of bounds, Mapping Over the Edge-A Look at the English  
View of the Middle Atlantic Colonies*  
Alice C. Hudson, Map Division, NYPL

*Where You Are Is Where You Are Not: Mapping the American Civil War*  
Earl B. McElfresh, McElfresh Map Co.

*Colonial Maps and GIS: Creating a Database for the Guilford Courthouse National Military Park*  
Roy Stine, University of North Carolina Greensboro

**Session D DRAWING SOFTWARE SHOOT-OUT: ADOBE ILLUSTRATOR vs. CORELDRAW vs. MACROMEDIA FREEHAND**  
10:30 am-Noon

Organizer: Tom Patterson, U.S. National Park Service  
Panel: Greg Chu, University of Wisconsin-La Crosse  
Richard Furno, Washington Post  
Dave Nelson, Mapping Services

**LUNCHEON AND ANNUAL BUSINESS MEETING**  
Noon-1:30 pm

**Session E PANEL DISCUSSION: CARTOGRAPHIC AND GIS EDUCATION, PREPARING STUDENTS FOR THE WORKFORCE**  
1:45-3:15 pm

Organizer: Susan N. Mulene, Avenza, Inc.  
Panel: Tanya Allison, Montgomery College  
Jim Meacham, University of Oregon  
Charles Rader, University of Wisconsin-River Falls  
Charlie Frye, ESRI  
Chris Baker, Magellan Geographics

**Session F UNDERSTANDING MAPS AND DATA**  
1:45-3:15 pm

*Re-visiting the Problems of Cartographic Design for Route-based Mapping*  
Gordon Kennedy, Washington State Dept. of Transportation

*The Use of Grid Cell Maps in School Demography*  
Richard Lycan, Portland State University

*Results and Experiences of Using Focus Groups to Evaluate the U-Boat Narrative: A Data Exploration System for the U-Boat War 1939-1945*  
Fritz C. Kessler, University of Kansas

**Session G TERRAIN PRESENTATION PRACTICUM**  
1:45-3:15 pm

*MapRender3D Pro from Digital Wisdom, Inc.*  
David Broad, Digital Wisdom Inc.

*Relief Presentation at The National Geographic Society: A Digital Demonstration*  
John Bonner, National Geographic Society

**Session H PARK AND TOURIST MAPPING**  
3:30-5:30

*A Brief History of National Park Service Visitor Maps*  
Nancy Haack, U.S. National Park Service

*The Power of Maps In Resource Management Decision-Making*  
Jean E. McKendry, University of Idaho Cooperative Park Studies Unit and National Park Service Social Science Program

*Tourism Maps and the Amish: Technological Discrepancies in Lancaster County*  
Alison E. Philpotts, Shippensburg University

*GIS at Wind Cave National Park: Status, Prospects, and Opportunities*  
Ed Delaney, University of Wisconsin-River Falls

**Session I UNIVERSITY ACTIVITIES**  
3:30 -5:30

*Introductory Cartography Reconfigured*  
Charles Rader, University of Wisconsin-River Falls

*The Colorado Landscape Project: Reflections from the Cartography/Gis and Classroom/Library Interfaces*  
Karen S. Cook and George F. McCleary, University of Kansas

*Development and Maintenance of the University of Oregon's Campus Mapping Program; Integrating Map Publishing, GIS, Facilities Mapping, and Architectural Building Floor Plans*  
James E. Meacham, Department of Geography, Univ. of Oregon  
Andrea C. Ball, Department of Geography, Univ. of Oregon

*South-East Toronto Health Data Mapping System: Community-University Collaboration as a Methodology for Design of a User-driven Mapping Design*  
Byron Moldofsky, University of Toronto

**CARTOGRAPHIC CONVERSATIONS WHAT CAN WE LEARN FROM EUROPEAN CARTOGRAPHY?**  
7:30-9:00 pm-Hospitality Suite  
Hosted by Greg Chu and Mike Peterson

**POSTERS AND EXHIBITS**  
7:00-11:00 pm

**FRIDAY, OCTOBER 22**

**Session A EARTH SCIENCE INFORMATION CENTER (ESIC)**  
8:00-10:00 am

*Just Ask Us*  
Diane Brittle, U.S. Geological Survey, Reston, VA

*On-line and Outreach: the Delaware Geological Survey Earth Science Information Center in the New Millennium*  
William S. Schenck, Delaware Geol. Survey, Univ of Delaware

*Land Boundary Information System: A Comprehensive Website for the Distribution of Florida Geographic Data*  
Jim Anderson and Louis Cross, FREAC, Florida State University

*National Datasets Incorporating the National Spatial Data Infrastructure Framework Criteria: The National Hydrography Dataset and the National Elevation Database*  
John C. Fouke, U.S. Geological Survey, Rolla, Missouri

**Session B PREPARATION AND DISSEMINATION OF GEOGRAPHIC INFORMATION**  
8:00-10:00 am

*The History and Development of Online Mapping and Distributed GIS*  
Jeremy W. Crampton, George Mason University

*Producing "Good" Maps when Non-Cartographers Control Design*

Trudy A. Suchan, Population Division, U.S. Census Bureau

*Map Design for High Volume Automated Mapping at the US Census*

Andy McIntire, US Census Bureau

*Public Access to Digital Data at Fairfax County Virginia GIS and Mapping Services*

Robert M. Shankman, Fairfax County, Virginia

**Session C SMALL BUSINESS CARTOGRAPHY  
ROUNDTABLE, KEEPING UP WITH THE  
SOFTWARE AND DATA EXPLOSION: EXPERIENCES AND  
STRATEGIES**

10:30 am-Noon

Organizer: Alex Tait, Equator Graphics, Inc.

Panel: Dennis McClendon, Chicago Cartographics

Dan van Dorn, free-lance cartographer

Tom Patterson, U.S. National Park Service

**Session D ATLASES**

10:30 am-Noon

*Developing a Socioeconomic Atlas Series for National Parks*

Jean E. McKendry, University of Idaho Cooperative Park Studies Unit and National Park Service Social Science Program

*Atlas of Antarctic Research*

Cheryl A. Hallam, U.S. Geological Survey

*America's Online, Interactive Atlas: The National Atlas of the United States of America*

Brigitta A. Urban-Mathieux, U.S. Geological Survey

**Session E EXPLORING ANIMATION AND 3D**

1:30-3:00 pm

*The Influence of Verbal Commentary on Fly-By Animated Terrain Maps*

Keith Rice, University of Wisconsin-Stevens Point

*Animated Series to Demonstrate the Distortion of Map Projections*

Claudia James, University of Akron

*3D Visualizations of the Prehistoric Olduvai Gorge*

Hassan S. Hodges and Michael J. Medler, Dept. of Geography, RutgersUniversity

**Session F CARTOGRAPHIC CHALLENGES AND CHANGES**

1:30-3:00 pm

*Cartography in a Class Action Suit: Himelrigh v. PPG*

Joe Stoll, University of Akron

**Repositioning Eastern Europe: Political Cartography after the Cold War**

Donald J. Zeigler, Old Dominion University, Norfolk, Virginia

*Developments at MapQuest.com*

Dan Etter, MapQuest.com

**Session G FEDERAL AGENCIES**

3:30-5:30 pm

*CIA Cartography: Past, Present, and Future*

Jerry Fields and Doug Stiles, Central Intelligence Agency

*Cartographic Information at the Department of State: International Boundaries, Sovereignty, Place Names, and GIS*

Leo Dillon, Office of the Geographer and Global Issues, U.S. Department of State

*The United States Board on Geographic Names Toponymic Standards for Cartographic Application*

Roger L. Payne, USBGN, U.S. Geological Survey

**Session H NEW PERSPECTIVES**

3:30-5:30 pm

*Molecules, Metaphors and Maps*

Joseph Poracsky, Portland State University

*Poems Shaped Like Maps: (Di)Versifying the Teaching of Geography, II*

Adele J. Haft, Hunter College: City University of New York

*Parallel Atlas, 38 00N: A Transboundary Cartography for Korea's Evolving Demilitarized Zone (DMZ)*

Deborah Natsios, Natsios Young Architects, NY, NY

*In Maps the Story Unfolds through Space not Time*

Steven R. Holloway, Oikos Work Arts, Missoula, MT

**NACIS BOARD MEETING**

3:30-5:30 pm

**ANNUAL BANQUET**

6:30-10:00 pm

Speaker: Barbara J. Ryan, Associate Director for Operations, U.S. Geological Survey

**SATURDAY, OCTOBER 23****WORKSHOPS***3D Landscape Visualization with Questar's World Construction Set 4.5*

Ev Wingert, University of Hawai'i and Pacific Mapping

8:30 am-5:00 pm

*Animated and Interactive Cartography with Macromedia Director*

Mark Harrower, Pennsylvania State University

8:30 am-Noon

**Making Web Maps Interactive**

Mike Peterson, University of Nebraska-Omaha

1:00 pm-5:00 pm





# NACIS

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## Student Web Map Contest 1998-1999

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Geography Library  
University of Wisconsin - Madison  
280 Science Hall  
550 N. Park Street  
Madison, WI 53706-1491

### A New Map Contest!

The North American Cartographic Information Society (NACIS) is pleased to announce the launching of the NACIS Student Web Map Contest for 1998-99. It is a completely new kind of map contest that recognizes the importance of the Internet, new media, and interactivity in geo-information sciences today. The purpose of the contest is to encourage student map design excellence and promote the innovative use of new technology.

### About the Contest

- Like the maps to be judged, the contest itself will be administered entirely on-line. A panel of cyber judges will evaluate student map entries by going to url's submitted via an automated entry form.
- There is no entry fee. The contest is open to North American students.
- Maps may be submitted between now and September 17, 1999.
- All contest finalists will receive award certificates. Top prizes of \$500 will be awarded in two categories: Map Animation and Interactive Maps.
- The winners will be announced on October 22, 1999 at the NACIS XIX meeting at Williamsburg, Virginia.

To learn more about the contest visit the NACIS web site at:  
**[www.nacis.org](http://www.nacis.org)**

Please Enter Your Map!