Cartographic Perspectives

Journal of the

North American Cartographic Information Society

Number 62, Winter 2009

From the Editor

The calendar tells me that the month is June. A light morning frost, however, is a continual threat throughout most of the month for Western Maryland. By now, a lush thick green carpet of vegetation unfolds throughout this area. Memorial Day has come and passed, unofficially ushering in summer. I hope your summer is off to a good start.

To begin, I need to report on a few changes to personnel on *CP*'s Editorial Board. Hugh Howard has stepped down from the board after one year of service. As a replacement, I want to formally introduce and welcome two new board members: Barbara Buttenfield and Dennis Fitzsimons. Barbara currently teaches at the University of Colorado at Boulder while Dennis teaches at Humboldt State University. Both individuals have considerable expertise and a long history in the cartography field and will serve *CP* well into the coming issues. I would also like to announce that Robert Kibbee, co-section editor of the Cartographic Collections section has formally retired from his position at the University of Columbia's Map Collection and GIS. I thank Robert for all of his hard work with this section and wish him the best in his retirement. Angie Cope will assume full responsibility of overseeing the Cartographic Collections section.

Once again, this issue of *CP* contains a mixture of cartographic writings which I hope you will

(*continued on page 3*)

In this Issue

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(*letter from the editor continued*)

find interesting. The featured content includes a technical piece along with an article on historical cartography. The first article, titled *Data Layer Integration for the National Map of the United States,* is written by Lynn Usery, Michael Finn, and Michael Starbuck. Their article focuses on the problem of integrating various data formats from a variety of sources into *The National Map*. The second article, titled *The Of cial Automobile Blue Book, 1901 – 1929: Precursor to the American Road Map,* is authored by John Bauer. His article examines the evolution of what we commonly refer to as the road map from its humble beginnings as the *Automobile Blue Book*.

The individual sections follow. Inside the Cartographic Collections section, Angie Cope offers an article titled *The American Geographical Society Library at UW-Milwaukee*. In her article, she presents an overview of the American Geographical Society Library. The interesting aspect of her article is the wonderful map she has found for us and discusses, titled *Man of Commerce*. The Mapping Methods and Tips section includes an interesting piece from Nat Case titled *Creating Graphically Complex Indexes with InDesign*. With InDesign, Nat shows us how to use the software to simplify the annotation process when dealing with complex text. The Visual Fields piece is a map by two NACIS members, Michael Hermann (University of Maine) and Margaret Pearce (Ohio University). They present an overview of their recently created map titled ***They Would Not Take Me There; People, Places and Stories from Champlain's Travels in Canada, 1603-1616.***

A few items of note will close out this letter. First, I am very happy to report that the scanning and digitization process of old issues of *CP* has been completed and ready for use. The back issues are available at the NACIS Web site under the *Cartographic Perspectives* main page (http://www.nacis.org/index.cfm?x=28). Special thanks go out to Mark Harrower and Richard Donahue of the University of Wisconsin at Madison for their oversight and seeing this project to completion. There will be a formal unveiling of this online depository of back *CP* issues at the upcoming annual NACIS meeting in Sacramento, CA. Second, as many of you may recall, *CP* carried out its first readership survey in January of this year. There were 230 members of the NACIS community that took time to respond to the survey. Contained within these responses, many interesting and useful comments were offered and will be instrumental in providing insight into ways to shape *CP*'s future. The results have been tallied, and a full report will be presented in the next issue of *CP* as well as the upcoming NACIS conference. Third, article submissions to *CP* this year are pretty slim. In fact, of this writing only one article has been submitted for future publication consideration. While material for the next two or so issues is pretty well laid out, content for later issues is thin, to say the least. The health of *CP* is solely based on continued submissions from the cartographic community and beyond. I encourage each of you to consider *CP* as the publication outlet for your peer-reviewed papers, opinion pieces, information on map libraries, mapping methods and techniques, and visual fields. I know there is much that is happening in the mapping world out there. *CP* and its readership would like to hear about it.

I offer this issue to you for your contemplation and reading pleasure. I welcome your questions, comments, and discrepancies.

The Cover

The Irreverence of Water

2008, 22 ″ x 15″, two-colour stone lithograph with two-colour hand-set letterpress in an edition of 14 on Somerset Velvet Newsprint.

Steven R Holloway

The *Official Automobile Blue Book*, 1901–1929: Precursor to the American Road Map

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Navigating by automobile at the dawn of the twentieth century was difficult because maps appropriate for this new mode of transportation were scarce. An early solution to this problem was the route guide. Listing turn-by-turn directions between various cities, route guides helped early motorists navigate a network of unmarked, local roads. This paper focuses exclusively on the Official Automobile Blue Book, the earliest and most popular of the route guides. It contends that the Blue Book series was a precursor to the American road map because the volumes served two important functions of road maps and did so before road mapping matured into a full-fledged cartographic business. The Blue Book commercialized automobile touring and provided directional information, helping motorists navigate. Twelve Blue Book volumes, covering 1901 to 1929, form the primary sources for this research. After examining the series' use, content, and history, the paper places the Official Automobile Blue Book within the larger context of the history of road mapping. A short review with directions for further research follows as a conclusion.

Keywords: *Official Automobile Blue Book*; Route Guide; Road Map, Automobile Navigation

When Dr. Horatio Nelson Jackson completed the first transcontinental crossing in 1903 by automobile from San Francisco to New York, the United States was still in the golden age of railroads. Automobile travel was in its infancy, and most Americans had never personally seen, let alone driven, one of these new "horseless carriages." Dr. Jackson and his mechanic, Sewall K. Crocker, spent sixty-three days on their historic trip, traveling nearly 6,000 miles (9,656 km). Mostly because of mechanical breakdown, only forty-six days were spent driving. The journey took more than two months because roads at the time were in poor condition at best in some locations and nonexistent in others. In addition, Jackson and Crocker had difficulty navigating because road maps and signs were virtually nonexistent. The doctor and the mechanic found their way by pointing their compass east, following railroad tracks, and asking local people for directions (Duncan and Burns 2003; McConnell 2000).

"The success of Dr. Jackson's transcontinental journey and the publicity that followed thrust the automobile and auto travel into the national public consciousness."

The success of Dr. Jackson's transcontinental journey and the publicity that followed thrust the automobile and auto travel into the national public consciousness. Soon, other adventurous drivers set out on their own journeys across the country, testing their mechanical and survival skills (McConnell 2002, 2000). Many more preferred to visit places in their own state or local region, and thus a new vacation pastime, called automobile touring, was born. After Henry Ford introduced the Model T in 1908,

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which effectively democratized this new form of transportation, automobile ownership and automobile touring soared (Flink 1970; Rae 1971).

With the increasing popularity of automobile touring came a pressing need for navigational aids, because during the early 1900s, geographic route-finding knowledge was primarily local. People knew how to navigate on foot or by horse and buggy within their local town or county using the mental map that they had acquired through experience. Because people relied on mental maps, road signs were not needed; thus signage was rarely a feature in the landscape. If someone wanted to travel farther than a day's carriage ride, he or she usually did so by railroad. There was no need, for instance, to know how to navigate from Chicago to St. Louis because the train did all the navigating and "driving." However, a locally based mental map was insufficient for navigating by automobile. There were no road maps and few road signs, so how would someone know which roads to take? In which direction would one travel? Where would one turn?

"With the increasing popularity of automobile touring came a pressing need for navigational aids, because during the early 1900s, geographic route-finding knowledge was primarily local."

This problem of navigation, or finding one's way, by automobile during the early years of the last century prompted entrepreneurial automobilists to create route guides. These guides helped early automobile tourists navigate through unfamiliar territory by collecting localized directional information and presenting it in a form usable to outsiders. Automobile clubs, highway associations, and other related organizations published or sponsored route guides during these years, which competed with one another in the marketplace. The *Automobile Green Book*, official guide book of the Automobile Legal Association of Massachusetts, *King's Official Route Guide*, published by Sidney J. King of Chicago, Illinois, the *Interstate Automobile Tourists' Guide*, published by F. S. Blanchard and Company of Worchester, Massachusetts, and the *Official Automobile Blue Book*, published by the Automobile Blue Book Publishing Company (ABBPC) of New York, are just four examples of guides that were commonly available between 1900 and 1930.

This paper focuses exclusively on the *Official Automobile Blue Book*, the earliest and most popular of the route guides. It contends that the *Blue Book* series, and in general all route guides, were a precursor to the American road map for two reasons. First, the *Blue Book* series was a commercially oriented travel guide created to foster an increase in automobile touring and tourist-related businesses. Second, the *Blue Book* was a navigational aid and provided directional information. Although the *Blue Book* methods of recording and transmitting this information were different than road maps that came later, they were uniquely suited for navigating the primitive network of local roads that existed prior to the 1920s.

"These guides helped early automobile tourists navigate through unfamiliar territory by collecting localized directional information and presenting it in a form usable to outsiders."

Twelve *Blue Book* volumes covering 1901 to 1929, from both the author's personal collection and the Google Books digitization project, form the primary sources for this research. (See the appendix for a detailed listing of these twelve volumes.) The paper begins by examining the series' use and content. A 1914 volume covering the Middle West illustrates how directional information was recorded and transmitted in the *Blue Book* series. The next section briefly reviews the history of the series, beginning with its origin as a guide to service stations and then tracing its expansion and eventual demise in the late 1920s.

Little has been written about how the routes in the series were first traced. A third section fills this void by examining the role of amateur and professional "pathfinders" who were hired to assemble new automobile routes. Finally, the article places the *Official Automobile Blue Book* series within the larger context of the history of road mapping. A short review with directions for further research follows as a conclusion.

Much has been written about the history and use of road maps, including the origins and popularization of sheet maps like Rand McNally & Company's "Blazed Trails" series, official state highway maps, and the seemingly innumerable "oil company" maps of the post-WWII era (Akerman 1993; Akerman and Block 2005; Bay 1952; Schmiedeler and Perucca 1996). Few works, though, examine route guides, including the *Official Automobile Blue Book* series. The author is unaware of any study devoted entirely to the *Blue Book*. Discussions of this early navigational aid are found in Akerman (2006, 2002), Ristow (1964, 1946), and Schlereth (1990), but their treatments are often brief. The most comprehensive study of road guides in general is an unpublished Master's thesis by McKenzie (1963). This article contributes to our knowledge of the history of road maps by examining *Blue Book* volumes at a detailed level.

"Automobile Blue Book *volumes were intended to be a single source of information for automobile tourists, an authoritative guide on which travelers could reliably depend throughout their entire journey.*"

Using the *Official Automobile Blue Book*

Automobile Blue Book volumes were intended to be a single source of information for automobile tourists, an authoritative guide on which travelers could reliably depend throughout their entire journey. The title page of a 1918 volume explains that *Blue Books*

> tell you where to go and how to get there, giving complete maps of every motor road, running directions at every fork and turn, with mileages. All points of local or historical interest, state motor laws, hotel and garage accommodations, ferry and steamship schedules and rates. A veritable motorist's encyclopedia. (ABBPC 1917, 9)

Even the look and feel of the *Blue Book* spoke of authority (Figure 1). Bound with black leather and embossed with gilt lettering, it was meant to be regarded and used as the automobile tourist "Bible." Measuring approximately 14 x 23 x 4 cm, it consisted of nearly 1,000 pages of thin, onion skin paper.

Contrary to the publisher's statement on their title pages, *Blue Book* volumes did not include "complete maps of every motor road." Highly generalized maps were included in *Blue Books* as indexes to the routes and supplements in urban areas. Figure 2 shows a portion of the index, or "skeleton," map for Illinois from 1914. Each route segment is labeled with an identification number that refers the user to the associated text about that segment. The influence of railroad cartography on these maps is clearly evident (Akerman 2002). Similar to railroad maps from earlier decades, major centers in the network are shown as large circles with minor towns, or "stops," along the way indicated by smaller circles. With only minor exceptions, the individual route segments connecting the towns are depicted as straight lines, giving the impression that the route follows the shortest distance, when in reality it rarely did.

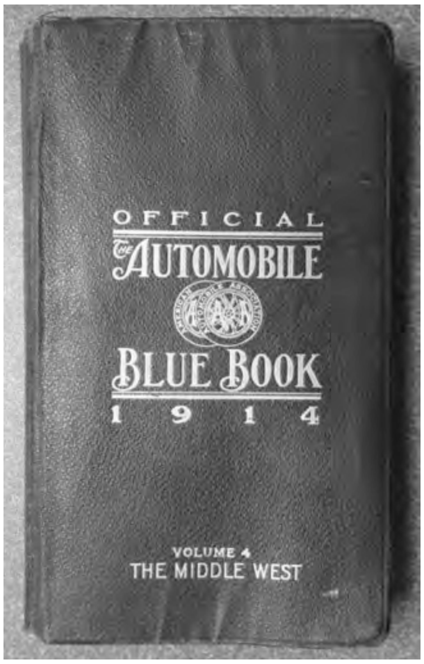

Figure 1. Cover of the 1914 Middle West volume of the Official Automobile Blue Book.

Supplemental maps of major urban areas helped travelers follow routes through cities and showed connecting routes to other destinations (Figure 3). Routes began (and ended) at a major intersection in the central business district, typically adjacent to the courthouse, depot, post office, bank, monument, public square, or other prominent landmark. Like the skeleton index maps, city maps were highly generalized, depicting all streets as straight lines and often omitting smaller side streets. Cartographers labeled only those streets that were called out in the route directions. Like the skeleton index maps, city maps were not intended to be the primary means of navigation.

In *Official Automobile Blue Books*, geographical information was recorded and transmitted in a textual format, written as turn-by-turn directions.

Figure 2. A portion of the skeleton index map for the 1914 Middle West volume.

Single volumes in the series often contained over five hundred routes, requiring eight hundred pages or more to describe. For example, the 1914 volume for the Middle West contains eight hundred routes spread across 932 pages. Because of the guide's format of textual turn-by-turn directions, though, each physical route had to be described twice, once in each direction, so the Middle West volume only contains four hundred origin and destination pairs. The forward and reverse versions of each route consisted of the same landmarks and turns; only the directions were reversed. This obligation increased the bulk of each volume and was cited by Ristow (1964) as a reason for their very thin pages. Reverse routes were indicated on the skeleton index maps (Figure 2) and in the route text.

Figure 4 shows Route 127 from the 1914 Middle West volume, connecting Bloomington and Springfield, Illinois. The entire route comprises thirty-eight individual segments and requires one and a half pages of text to describe. In a fashion that would later be expanded in the *American Guide* series from the Works Progress Administration, a short description of the road conditions and potential points of interest along the way is provided at the beginning.

"Because of the guide's format of textual turn-by-turn directions, though, each physical route had to be described twice, once in each direction . . ."

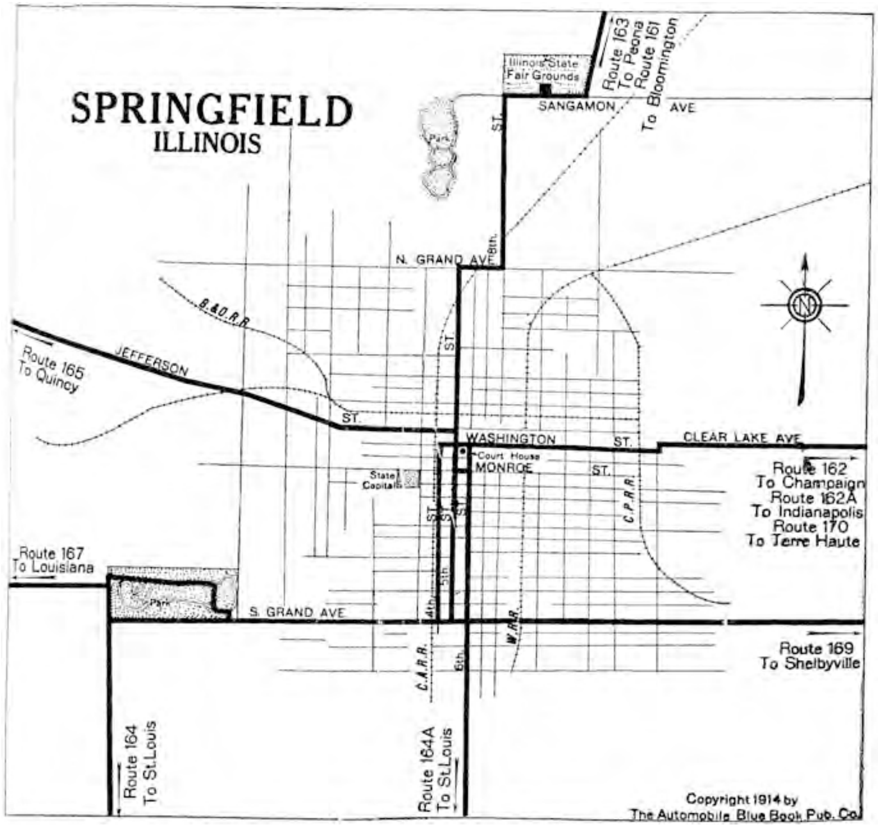

Figure 3. Map of Springfield, Illinois, from the 1914 Middle West volume.

Central to the guide's wayfinding narrative is the use of mileages, both total and intermediate. The distance, in miles, of each turn in the directions from the beginning of the route, plus the distance from the previous turn or directive, is listed along the left-hand side of the route log. Occasionally, additional distances from the route's beginning are indicated within the route's directions. For example, the fifth directive in Route 127 indicates that the route passes Shirley Station at 6.9 miles (11.1 km) and then turns away from the railroad tracks at 9.6 (15.4 km) miles (Figure 4). Users reset their odometers to zero or kept a pencil and paper handy so they could keep track of distances and intermediate mileages. Early automobiles were not equipped with odometers (or speedometers), so automobiles owners had to purchase and install the devices before they could use the *Blue Books*. For this reason, odometers (and speedometers) were prominently advertised throughout each volume.

"Central to the guide's wayfinding narrative is the use of mileages, both total and intermediate."

In addition to distances, landmarks are also at the heart of the route guide's narrative. Not only did prominent landmarks identify the beginning and ending of routes, they identified individual turns or segments along the route. Most commonly, these intermediate landmarks were railroad tracks and power/telephone poles. For example, Route 127 references railroad tracks twenty times and poles eighteen times within its thirty-eight segments (Figure 4). Other popular landmarks were buildings (courthouse, church, school, post office, library, railroad station), bridges (covered bridge, iron bridge, small wooden bridge), businesses (drug store, blacksmith shop, grocery store), trolleys, and parks, including fairgrounds and cemeteries.

"In addition to distances, landmarks are also at the heart of the route guide's narrative."

All of these landmarks were easy to identify from the road. In the case of bridges and railroad crossings, they were unavoidable features in the

Bloomington Section **Route 127**

Route 127—Bloomington, Ill., to Springfield, Ill.—76.5 m.

Route map, page 145 Reverse route, No. 161

Road Conditions—Via Lincoln and Williamsville. Good natural dirt roads in dry weather.

Descriptive Outline—Leaving the city, we pass by Miller Park, with its lake, pavilion and other facilities for amusement. Continuing, follow closely the line of the Chicago & Alton through a very rich farming district. **Lincoln**, laid out as a town in 1853, is the only town in the United States named for Abraham Lincoln during his lifetime with his full consent and acquiescence before he had acquired fame in either the state or nation. In those years Lincoln was a lawyer at Springfield, "riding the circuit," and as such drafted and secured the charter for the town. Lincoln opened his first office for the practice of law in the old Court House, which is still standing. Lincoln College, a Presbyterian institution, founded in 1855, is located here, also the Lincoln State School and Colony for Feeble-minded Children. Three large coal mines are situated near the city. South of Lincoln, at **Elkhart**, is the site of the first settlement in Logan County. Gov. Richard J. Oglesby, three times governor of Illinois and former United States senator, formerly lived here. The old homestead is still standing on the hill.

MILEAGE Total	Intermed.	(For this and other exits, see **city map**, page 144.)
0.0	0.0	**BLOOMINGTON**, Main & Washington Sts. From Court House on right go west with trolley on Washington St.
0.7	0.7	Morris Ave.; turn left around drug store, leaving trolley. Cross RR., going upgrade just beyond.
2.1	1.4	6-corners; bear right with poles.
4.5	2.4	4-corners; turn right with poles and travel.
4.9	0.4	Immediately before RR. turn left along tracks past **Shirley Sta.** 6.9, turning left with road away from tracks 9.6.
14.1	9.2	End of road; turn right past McLean over to right 18.1, crossing RR. 18.2.
20.5	6.4	Turn left with poles across RRs. 22.9 & 24.5.
24.9	4.4	End of road; turn right with poles.
26.4	1.5	Turn left with poles around school.
26.9	0.5	Turn right with poles.
28.0	1.1	End of road; turn left away from RR. and follow poles.
29.5	1.5	End of road; turn right with poles.
30.0	0.5	Turn left with poles, keeping straight ahead where poles divide 31.1.
32.5	2.5	4-corners; turn right, leaving poles.
34.5	2.0	4-corners; turn left with travel.
35.5	1.0	4-corners; bear right with travel, coming along RR. for short distance 37.2.
37.8	2.3	Just beyond coal mine turn left, curving right 37.9; cross RR. 38.2 to Court House,
38.9	1.1	**Lincoln**, Broadway & McLean St. Turn right on Broadway.
39.0	0.1	Cross RR. and immediately turn left around station.
39.2	0.2	Curve right away from tracks; cross trolley 39.8.
40.1	0.9	End of street; turn left across RR. 40.2 and trolley 40.7, winding downgrade through covered bridge 41.0.
41.4	1.3	Curve right with poles and left 41.7.
42.2	0.8	Turn right with poles.
43.2	1.0	Turn left with 4-arm poles, turning right 44.1 to
46.3	3.1	4-corners; turn left with poles to
47.3	1.0	End of road; turn right, curving left with poles 48.5; keep straight ahead where poles leave to right 51.5, curving left with travel 53.2. Cross RR. and trolley at **Elkhart**.
53.5	6.2	End of street; turn right, curving left 53.9.
58.0	4.5	Right-hand road; turn right.
61.4	3.4	**Williamsville**, park on right. Turn left.

Figure 4. Text for Route 127 from the 1914 Middle West volume.

61.6 0.2 End of street; jog right and take first left to
63.9 2.3 End of road; turn right away from poles, curving left with road 64.7.
66.2 2.3 4-corners; turn right around school; cross trolley 67.8 and RRs. 68.0 & 68.1.
69.0 2.8 Turn left around school, picking up heavy telephone line. **Caution** for sharp downgrade across Sangamon River bottoms 70.5, over 3 bridges running upgrade.
71.4 2.4 Curve right and left just beyond, under RR. 72.9.
73.9 2.5 At far side of state fair grounds turn right across tracks on brick pavement.
74.3 0.4 At western edge of fair grounds turn left on 8th St.; cross RR. 75.1 to
75.3 1.0 Grand Ave.; turn right on pavement 3 blocks, recrossing RR.
75.6 0.3 5th St., small church on right; turn left across RRs. 75.7 & 76.3 to Court House,
76.5 0.9 **SPRINGFIELD**, Washington & 5th Sts.
New Leland Hotel, Sixth & Capital Sts.
Auto Inn, 513 So. Fourth St.
For **city map**, see page 201. For diverging routes, see **index map**, page 200.

Figure 4 (continued). Text for Route 127 from the 1914 Middle West volume.

road. Route compilers chose landmarks that were easy to identify but not so abundant that they would cause confusion. Therefore, landmarks such as “house,” “farm,” “barn,” or “silo” almost never appear in route directions.

Compass directions were rarely used in any of the route segments. If they do appear, they often are at the route’s beginning. For example, the first segment of Route 127 says “go west with the trolley on Washington St” (ABBPC 1914,153) (Figure 4). After that initial compass direction, users were expected to travel the next 76.5 miles (123.1 km) by simply watching their odometer and following the text. Directional terms in the route narrative, such as “turn right” and “curve right,” had specific meanings. A “How to Use the Blue Book” section at the beginning of each volume explains that “keep right” means “avoid fork or branch road to left,” “bear right” means “turn slightly to right, as at a fork,” “turn square right” means “to turn at a right angle (90 degrees) to right,” and “turn sharp right” means “to turn more than a right angle to right” (ABBPC 1914, iii).

“Without detailed maps keyed to markings on the ground, routes needed to be flawless and tourists had to follow them precisely.”

This reliance on written directions with mileages, landmarks, and turns made navigation with the *Blue Books* difficult and was cited by Akerman as the route guide’s chief flaw (1993). Without detailed maps keyed to markings on the ground, routes needed to be flawless and tourists had to follow them precisely. For instance, what if the user lost track of his or her mileage, missed a turn, or turned in the wrong direction? Or worse yet, what if a landmark burned down or was destroyed, a road or bridge closed, or the route directions were wrong? It is easy to envision any number of scenarios where tourists find themselves off the route. In these situations they would have to retrace their path until they encountered a familiar place earlier on the route or search out an alternative route.

It was also difficult for travelers to navigate with a *Blue Book* while driving their automobile. Both tasks required concentration and skill, so most often drivers were accompanied by a navigating passenger, or co-pilot, who kept an eye on the odometer, read and followed the written directions, and looked ahead for the next stop or turn. Because speeds faster than thirty miles per hour (48 kilometers per hour) were uncommon due to poor road conditions, legal restrictions, and the limited power of early automobiles, navigators had sufficient time to perform these duties. Even so, driving and navigating demanded constant attention. Because many automobiles at the time were sold without roofs, and some without windshields, users risked damaging their *Blue Books* in the elements while en route. *Blue Book* publishers sold leather holders with clear celluloid faces to aid navigators by keeping the book open, clean, and dry.

When first introduced at the beginning of the twentieth century, the *Official Automobile Blue Book* was marketed toward wealthy automobile owners seeking a leisurely touring trip filled with scenery and adventure. Only wealthy Americans at that time, after all, could afford the high expenses of purchasing and operating an automobile. However, after Ford Motor Company introduced the Model T in 1908, the cost of purchasing and operating an auto declined dramatically, thus bringing this new form of transportation, and its associated pastime of touring, to the middle class.

"When first introduced at the beginning of the twentieth century, the Official Automobile Blue Book *was marketed toward wealthy automobile owners seeking a leisurely touring trip filled with scenery and adventure."*

This shift in appeal from the upper class to the middle class can be seen in the advertisements included in the *Blue Books*. For example, Figure 5 is a full-page advertisement for *Motor Print* magazine from the 1914 Middle West volume. Notice the appearance of leisure, wealth, and sophistication in the artwork. All six travelers are well dressed, and none appears dirty or disheveled from the journey (even though the car is open to the elements and has a short windshield). The advertisement text claims that *Motor Print* "smacks of high character and cleverness from cover to cover" and seeks subscriptions from "every well-to-do motorist" (ABBPC 1914, 969). *Motor Print* was founded in 1906 at a time when automobile ownership was dominated by the wealthy upper class. As automobiles became affordable by the middle class, *Motors Print's* advertising retained its symbolic reference to wealth in an appeal to the aspirations of the less well off. By subscribing to *Motor Print*, middle class motorists that owned and used a *Blue Book* could feel as if they were equal to their wealthier counterparts.

Origins and history of the *Official Automobile Blue Book*

The *Official Automobile Blue Book* was founded by Charles Howard Gillette, a prominent businessman from Hartford, Connecticut. Gillette was involved with automobiles his entire adult life, both professionally and recreationally, until his untimely death in 1914 at age thirty-nine. Before starting the *Blue Book* in 1901, he founded Columbia Lubricants Company, suppliers of oil and grease for automobiles. He was also a cofounder of the Automobile Club of Hartford, Secretary of the American Automobile Association (AAA), and an occasional official starter for the Vanderbilt Cup automobile races (Hart 1919).

"The Official Automobile Blue Book *was founded by Charles Howard Gillette, a prominent businessman from Hartford, Connecticut."*

Gillette's 1901 *Automobile Blue Book* covered the Boston, New York, Philadelphia, Washington, and Baltimore metropolitan areas. Its stated purpose was to promote touring by establishing routes that connected automobile "supply stations." The introduction to the guide explained that

> The Official Automobile Blue Book Company has for the past year been devoting its energies to a plan for increasing touring facilities by means of a system of supply stations, and a book listing these stations and giving information regarding routes, etc. A chain of stations only a few miles apart along every popular touring route, each one offering supplies and facilities for repairs, cannot help but appeal to every automobilist, but also those who contemplate becoming such. (OABBC 1901, 5)

The *Blue Book* placed stations into four categories according to the

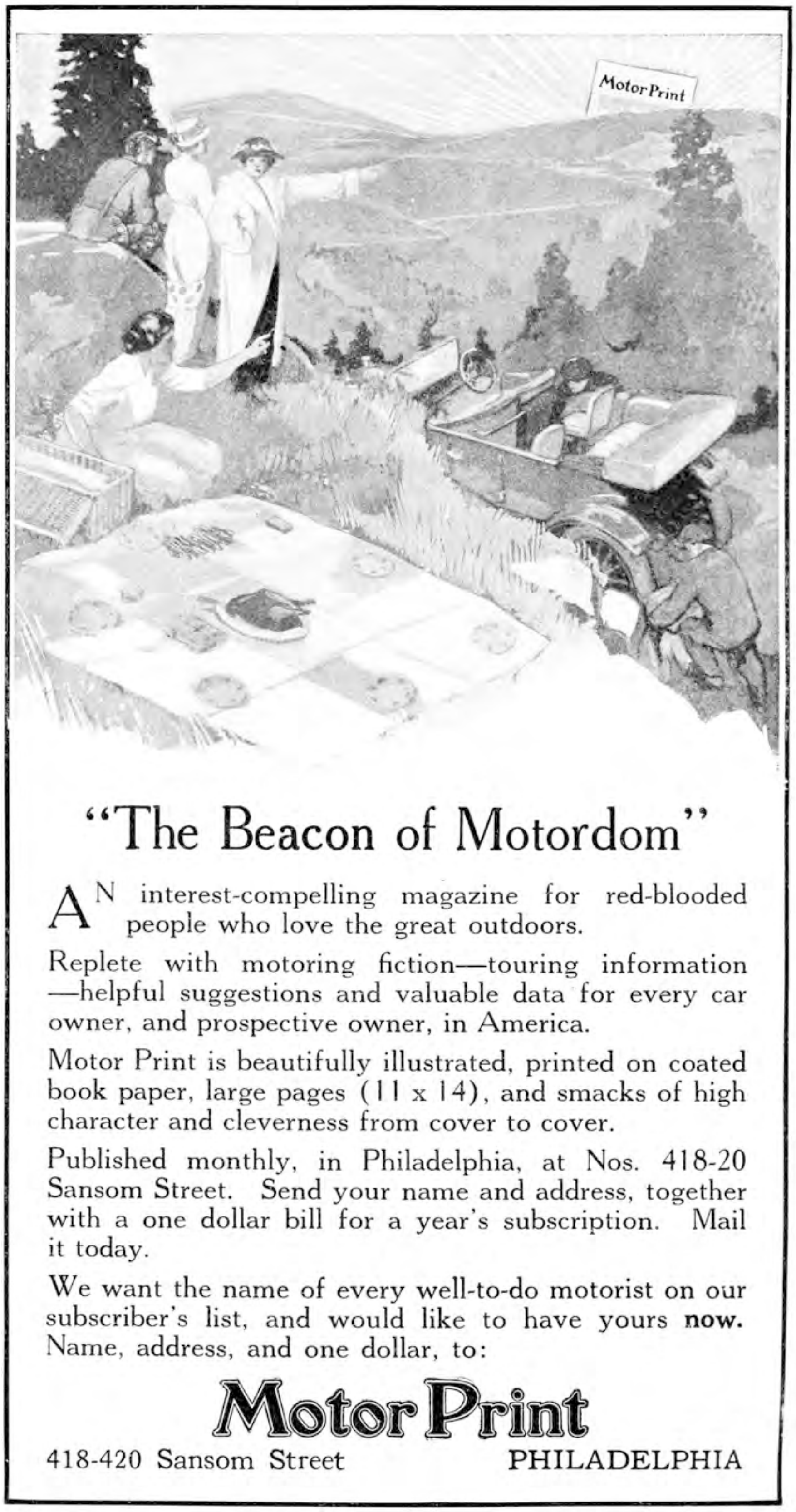

Figure 5. Magazine advertisement from the 1914 Middle West volume.

services provided. Number 1 supply stations provided comprehensive services and could charge electric vehicles, sold gasoline and lubricants, offered complete machine shop and repair shop services, and stored automobiles. Number 4 stations only sold gasoline and lubricants. Number 2 and 3 stations provided intermediate-level services.

Sixty-two routes were included in the 1901 edition. All of them are one-way; no reverse directions were given. Each route consisted of a short descriptive paragraph along with a table showing information about supply stations. Towns were linked together in such a way as to ensure that supply stations would be found every ten to fifteen miles (sixteen to twenty-four kilometers). For example, Boston Route 7, between Boston and Springfield, Massachusetts, connected ten supply stations, most offering category 2 or 4 services. The distance between each station, along with the construction material and condition of the roads, was also indicated in the guide. Motorists were supposed to navigate using the following detailed description:

> Leaving Capitol, follow Beacon Street through Back Bay, Longwood, Allston, Brighton to Newton. 6.75 miles, to Newtonville, 1 mile. Through West Newton, Auburndale, Newton Lower Falls, Wellesley Hills to Wellesley, 6.25 miles. Taking road to right between the two lakes to Natick, 3 miles, the road here follows Railroad tracks to So. Framingham, 3.5 miles . . . . The road here follows railroad through Butlerville, North Wilbraham, skirting three lakes to Springfield, 15 miles. Total 88 miles. (OABBC 1901, 166)

"In 1906, the Blue Book *series received official sponsorship by the American Automobile Association (AAA), immediately boosting its popularity (Ristow 1964; Class Journal Co. 1907). The AAA placed its logo on the front cover of each* **Blue Book** *and advertised itself prominently throughout the volumes' pages.* Blue Books *were offered to association members at a reduced rate."*

The guide's emphasis on automobile operations and maintenance is also indicated by an extensive reference section. Data tables on resistance, horsepower, energy, friction, traction, and other automotive engineering topics were included to help owners repair or refashion many of the unique, handmade parts of early autos.

New editions of the *Blue Book* were issued annually after 1901, but the series consisted of only one volume until 1907, when coverage expanded enough to require three (Class Journal Co. 1907). For $2.50, motorists could purchase a volume for New York and Canada, New England, or New Jersey and Pennsylvania (Table 1). Volume 1, covering New York and Canada, contained over two hundred routes (including reverse routes). Routes consisted of highly detailed verbal directions arranged in paragraphs. Total mileages between towns were included, but not intermediate mileages between turns.

The 1907 volumes placed more emphasis on touring and less on operations and maintenance, reflecting the increase in automobile ownership and touring. Gone were the engineering tables and detailed information about supply stations. In their place were full-page picture advertisements for service stations, hotels, automobile manufacturers, and other related businesses. Route index maps, included for the first time in 1907, along with strip maps and large-scale maps of cities and towns, were also added to aid tourists.

In 1906, the *Blue Book* series received official sponsorship by the American Automobile Association (AAA), immediately boosting its popularity (Ristow 1964; Class Journal Co. 1907). The AAA placed its logo on the front cover of each *Blue Book* and advertised itself prominently throughout the volumes' pages. *Blue Books* were offered to association members at a reduced rate. The author is unable to confirm whether or not this endorsement was related to Charles Gillette's role as Association Secretary. However, it is easy to see how these two facts could be related. The size

1901	1 volume – The Northeast	unknown
1906	1 volume	unknown
1907	3 volumes	$2.50 ea
	Volume 1 – New York & Canada	
	Volume 2 – New England	
	Volume 3 – N.J., Pa., & The South	
1908	3 volumes	unknown
1909	4 volumes	unknown
	Volume 1 – New England	
	Volume 2 – New York	
	Volume 3 – N.J., Pa., & The South	
	Volume 4 – Middle West & Chicago	
1912	5 volumes	unknown
	Volume 1 – New York & Canada	
	Volume 2 – New England & Eastern Canada	
	Volume 3 – N.J., Pa., & South Atlantic States	
	Volume 4 – Middle West	
	Volume 5 – Mississippi River to Pacific Coast	
1914	5 volumes	$2.50 ea
	Volume 1 – New York & Canada	
	Volume 2 – New England & Eastern Canada	
	Volume 3 – N.J., Pa., & The South	
	Volume 4 – Middle West	
	Volume 5 – Mississippi River to Pacific Coast	
1915	6 volumes	$2.50 ea
	Volume 1 – New York & Canada	
	Volume 2 – New England & Eastern Canada	
	Volume 3 – N.J., Pa., & The Southeast	
	Volume 4 – Middle West	
	Volume 5 – Mississippi River to Pacific Coast	
	Volume 6 – Calif., Ore., Wash.	
1916	6 volumes	$2.50 ea
	Volume 1 – New York & Canada	
	Volume 2 – New England & Eastern Canada	
	Volume 3 – Del., Md., N.J., Pa., Va., W. Va.	
	Volume 4 – Middle West	
	Volume 5 – Mississippi River to Pacific Coast	
	Volume 6 – Southeastern States	
1917	10 volumes	$3.00 ea
	Volume 1 – New York & Canada	
	Volume 2 – New England & Eastern Canada	
	Volume 3 – Pa., W. Va., & Mid Atlantic States	
	Volume 4 – Ohio, Ky., Mich., Ind.	
	Volume 5 – Ill., Mo., Iowa, Wis., Minn.	
	Volume 6 – Southeastern States	
	Volume 7 – Great Plains & Eastern Rockies	
	Volume 8 – Pacific & Western Rockies	
	Volume A – New York City & 100 mile radius	
	Volume C – Chicago & 100 mile radius	

Table 1. Territorial coverage and price of the Blue Book *for selected years.*

1918	11 volumes	$3.00 ea
	Volume 1 – New York & Canada	
	Volume 2 – New England & Eastern Canada	
	Volume 3 – Pa., W. Va., & Mid-Atlantic States	
	Volume 4 – Ohio, Ky., Mich., Ind.	
	Volume 5 – Ill., Mo., Iowa, Wis., Minn.	
	Volume 6 – Southeastern States	
	Volume 7 – Great Plains & Eastern Rockies	
	Volume 8 – Calif., Nev., Ariz., Utah	
	Volume 9 – Pacific Northwest	
	Volume A – New York City & 100 mile radius	
	Volume C – Chicago & 100 mile radius	
1919	11 volumes	$3.00 ea
	Volume 1 – New York & Canada	
	Volume 2 – New England & Eastern Canada	
	Volume 3 – Pa., W. Va. & Mid-Atlantic States	
	Volume 4 – Ohio, Ky., Mich., Ind	
	Volume 5 – Ill., Mo., Iowa, Wis., Minn.	
	Volume 6 – Southeastern States	
	Volume 7 – Great Plains & Eastern Rockies	
	Volume 8 – Calif., Nev., Ariz., Utah	
	Volume 9 – Pacific Northwest	
	Volume A – New York City & 100 mile radius	
	Volume C – Chicago & 100 mile radius	
1921	12 volumes	$4.00 ea
	Volume 1 – New York & Canada	
	Volume 2 – New England & Eastern Canada	
	Volume 3 – Pa., W. Va. & Mid-Atlantic States	
	Volume 4 – Ohio, Ky., Mich., Ind.	
	Volume 5 – Ill., Mo., parts of Iowa	
	Volume 6 – Southeast	
	Volume 7 – Southern Plains & Rockies	
	Volume 8 – Calif., Nev., Ariz., Utah	
	Volume 9 – Northern Plains & Pacific Northwest	
	Volume 10 – Wis., Minn., parts of Iowa	
	Volume T – Transcontinental Routes	
	Volume A – New York Metropolitan Routes	
1922	4 volumes	$4.00 ea
	Volume 1 – New York & New England	
	Volume 2 – Middle Atlantic & Southeastern	
	Volume 3 – Middle West	
	Volume 4 – Western & Transcontinental	
1924	4 volumes	$3.00 ea
	Volume 1 – New York & New England	
	Volume 2 – Middle Atlantic & Southeastern	
	Volume 3 – Middle West	
	Volume 4 – Western & Transcontinental	

Table 1 (continued). Territorial coverage and price of the Blue Book *for selected years.*

1929	9 volumes Volume 1 – New England & Eastern Canada Volume 2 – New York & Canada Volume 3 – Mid Atlantic States and Ohio Volume 4 – Southeastern States Volume 5 – Florida Volume 6 – Southern Plains and Southwest Volume 7 – Midwest Volume 8 – Northern Plains and Eastern Rockies Volume 9 – Pacific and Western Rockies	$1.00 ea

Sources:

1901 – McKenzie 1963; Ristow 1946; and 1901 volume.

1906 and 1907 – Series coverage index on page 532 of the 1907 Volume 1.

1908 – McKenzie 1963.

1909 – Automobile Blue Book Out, *New York Times*, April 25, 1909, part 4, Sporting News Section.

1912 – Series coverage index and map on pages 1 and 24 of the 1912 Volume 2.

1914 – Series coverage index and map on pages 968 and 970 of the 1914 Volume 4.

1915 – Miscellaneous news item in the *The New England Medical Gazette*, 1915, Volume 50: 331.

1916 – Copyright entries in *Catalog of Copyright Entries, Part 1 Group 2*, 1916 New Series, Volume 1, Issue 3: 193, and Volume 1, Issue 5: 465.

1917 – Series coverage index and map on page 756 of the 1917 Volume 2.

1918 – Series coverage index and map on page 376 of the 1918 Volume 6.

1919 – Series coverage index and map on page 416 of the 1919 Volume 6.

1921 – Series coverage index and map inside back cover of the 1921 Volume 7.

1922 – Series coverage index and map inside back cover of the 1922 Volume 3.

1924 – Series coverage index and map inside back cover of the 1924 Volume 4.

1929 – Series coverage index and map inside back cover of the 1929 Volume 3.

Table 1 (continued). Territorial coverage and price of the Blue Book *for selected years.*

and coverage of the series steadily grew as more routes and territory were added, expanding to four volumes in 1909 and to five volumes sometime between then and 1912. In 1915, a sixth volume was added, completing coverage for the entire United States. Year after year, the size and coverage of the series grew until it reached its peak in 1921 with twelve volumes (Table 1).

"Year after year, the size and coverage of the series grew until it reached its peak in 1921 with twelve volumes."

Apparently, a twelve-volume set must have grown unpopular or unwieldy, and probably too expensive, because a year later, in 1922, the entire country was condensed into four volumes. The publishers achieved this by consolidating volumes, cutting routes, and abbreviating the route directions. For example, Volumes 7, 8, and 9 from 1921 were combined to create Volume 4 for 1922. The Midwest volume (Volume 3) of 1922 contained routes from 1921 Volumes 4, 5, and 10 (Table 1). Routes were also removed from the guides. The 1921 Volume 7 lists forty-eight routes (including reverse routes) in Nebraska. In the 1924 Volume 4, only twenty of them remain. More routes were printed in a smaller amount of space. The 1924 Volume 4 used a smaller font, two-column pages, abbreviations, omitted common words such as "turn" and "corner," and omitted intermediate mileages so it could squeeze over 1,500 routes into 793 pages.

Competition from emerging sheet maps and other guidebook publishers accelerated these changes. By 1926, Rand McNally, H.M. Gousha, and General Drafting were producing thousands of sheet maps each year (Ristow 1946). Motorists could obtain many of these maps for little or no cost, so it became increasingly difficult for them to justify the high cost of a *Blue Book* set. The AAA stopped distributing the *Blue Book* in 1926 and launched its own series of guidebooks to replace it. Without its privileged relationship with the AAA, sales of the *Blue Book* series plummeted (McKenzie 1963). *Blue Book* publishers attempted the following year to make the series more competitive by switching to an atlas format. All turn-by-turn directions were removed and replaced with large-scale highway maps, greatly reducing the number of pages in each volume. The advertisements, city maps and descriptions, and touring information remained. For example, the 1929 Volume 3 contains only 162 pages and twenty-nine large-scale maps of its territory. This radical format change, however, came too late, and the series ultimately ceased publication after the 1929 edition.

"The AAA stopped distributing the Blue Book *in 1926 and launched its own series of guidebooks to replace it. Without its privileged relationship with the AAA, sales of the* Blue Book *series plummeted."*

Pathfinders

Little has been written about how the routes in the *Blue Books* were first traced. Evidence indicates, however, that both professional and amateur "pathfinders" did this work. These early automobilists took upon themselves the task of field-compiling routes while traveling local, unmarked roads. The first pathfinders were actually bicyclists with the League of American Wheelmen (Mason 1957). After growing enthusiasm for the automobile replaced the bicycle craze of the 1880s and 1890s, the task of pathfinding fell to members of local automobile clubs and highway associations. The compiler's forward to a 1907 *Blue Book* acknowledges "the friendly cooperation received from the American Automobile Association, its affiliated and other clubs, and from tourists who have placed notes of their own trips" (Class Journal Co. 1907, xxxv). Even the Rand McNally Company used information from its own pathfinders to support its "Blazed Trails" mapping program (Akerman 1993). Unfortunately, little research has been published detailing the crucial, behind-the-scenes role that pathfinders had in road mapping and the creation of a national highway system.

"The most famous and successful pathfinder was Anthon L. Westgard, who was employed as Field Representative and official pathfinder for the AAA."

The most famous and successful pathfinder was Anthon L. Westgard, who was employed as Field Representative and official pathfinder for the AAA. Westgard began his pathfinding career in 1903 and in just a few years earned the reputation as a foremost authority on automobile routes and touring. According to Westgard's memoirs, *Tales of a Pathfinder*, he was instrumental in the establishment of nearly forty transcontinental routes (1920). The *Blue Book* publishers must have taken advantage of the common association between themselves and Westgard, through the AAA, because the publisher's forward to the 1907 Volume 1 credits him for the volume's maps (Class Journal Co. 1907). Some even contain Westgard's initials (ALW) in their lower or upper corner. No *Blue Book* that the author has seen, however, credits any of the actual routes to Westgard.

The contributions of automobile club members and amateur pathfinders are revealed in a couple of routes in the 1907 Volume 1. The first route, from New York City to the Berkshire Hills, was contributed by Cortlandt F. Bishop of the Automobile Club of America (ACA). Apparently, the ACA gave the *Blue Book* publishers permission to include its own copyrighted routes. The other route, from New York City to Mineola, Long Island, was contributed by R. H. Johnston. Mineola was the site of the 1906 Vanderbilt Cup race, and Johnston documented this route for its official program (Class Journal Co. 1907). One could reasonably expect that there was a considerable amount of borrowing and copying of routes, both legally and illegally, among automobile clubs, pathfinders, and route guide publishers.

"In addition to relying on amateur pathfinders from automobile clubs, by 1907 the Blue Book publishers were employing their own professional pathfinders and outfitting them with official Blue Book cars."

In addition to relying on amateur pathfinders from automobile clubs, by 1907 the *Blue Book* publishers were employing their own professional pathfinders and outfitting them with official *Blue Book* cars. The 1907 guide states that "between eight and nine thousand miles of the routes described anew for 1907 have been covered personally, either by the Blue Book car, or by our staff in cooperation with local autoists" (Class Journal Co. 1907, xxxiii). Figure 6 shows an official *Blue Book* pathfinding car from 1912. The entire fleet consisted of three cars that year but expanded as the series grew to include the entire country. In 1924, the western United States required a fleet of five pathfinding cars.

Each car was operated by a team, consisting of a driver and "route compiler," whose job was to mark mileages, turns, and landmarks. A 1910 *Chicago Daily Tribune* article described these workers as "geography makers [or] professional route finders, who scour the country in their machines mapping out fresh trails for automobile tourists who wish to take long runs through sections of the country unfamiliar to them." Working from spring to late fall, each team spent the entire driving season covering thousands of miles as they created new routes and updated others in their assigned region of the United States. One team, for instance, assigned to New York State, drove over 10,000 miles (16,093 km) in 1909. Another team, responsible for all New England, covered 11,000 miles (17,703 km) that season. The cost of this route-finding work was high. Publishers spent almost $1,000 per month on each team, including $600 for the salaries of the driver and "route compiler" (*Chicago Daily Tribune* 1910).

"Early pathfinding excursions, such as those by Westgard, Bishop, and Johnston, were loosely planned and haphazard affairs."

Early pathfinding excursions, such as those by Westgard, Bishop, and Johnston, were loosely planned and haphazard affairs. A 1907 trip by Johnston between New York City and Savannah, Georgia, illustrates this well. Although he chose the overall route that "promised the most interesting sights and scenes," not the route of shortest distance, details of the journey, such as mileages, roads, and turns, were determined en route. For instance, Johnston claimed to have asked nearly two hundred people (quite possibly an exaggeration) for directions to Chattanooga, Tennessee, before finally getting correct directions from another motorist (Johnston 1908, 368). Professional pathfinding teams from the Automobile Blue Book Publishing Company were better organized, although they, too, often relied on directional advice. Before leaving for the field, teams met with company officials to map out potential trunk lines between major cities. Once in the field, the teams searched out the shortest distances and best roads, connecting them to create new routes (*Chicago Daily Tribune* 1910).

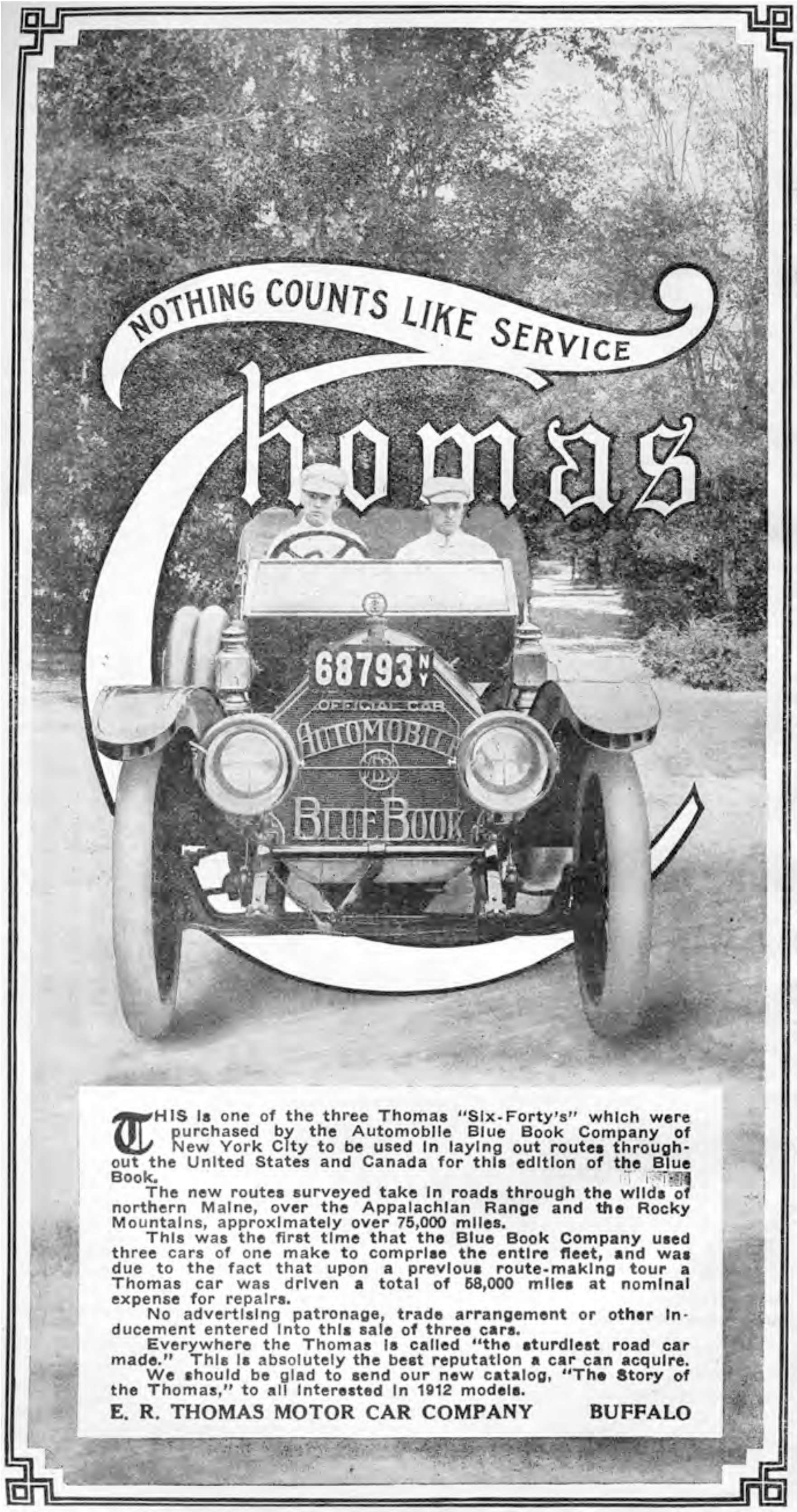

Figure 6. Official Automobile Blue Book *pathfinding car from the 1912 New England volume.*

Official Automobile Blue Books and Early Highways

The efforts of pathfinders such as Westgard, Bishop, and Johnston were made more difficult because of the very poor condition of roads during the early 1900s. In 1912, only 220,000 of the 2.2 million miles of public roads in the country were improved (Department of Commerce 1914, 260). The technological advances of automobiles, along with the public's adoption of the machines, quickly outpaced any improvements to the nation's road network. Driven by grassroots organizations such as the American Automobile Association, the American Highway Association, and the National Good Roads Association, public outcry for road improvements grew loud enough to spur Congress to pass the first federal highway act, the Federal-aid Road Act of 1916 (Hugill 1982; Jakle and Sculle 2008).

"The technological advances of automobiles, along with the public's adoption of the machines, quickly outpaced any improvements to the nation's road network."

Although the Act brought federal money to the aid of the nation's motorists, it did not create an integrated highway network or a standardized system of highway identification. These tasks were undertaken instead by various highway associations, which introduced named "booster" highways to the country. These highways were intended to promote road improvements and construction and encourage more people to travel by automobile (Jakle and Sculle 2008; Paxson 1946). Organizers marked the routes of these highways with color-coded blazes on signs or posts so drivers could be confident they were following the correct roads. Some early road maps, such as those of Rand McNally's "Blazed Trail" program, even contained indexes to dozens of different "booster" highway markings (Akerman 1993).

The first "booster" highway to capture the public's imagination was the Lincoln Highway, created in 1913 (Hokanson 1988). Hundreds more were established over the next few years, although many existed only on paper and were never adequately marked in the field. Others, such as the Yellowstone Trail, Pike's Peak Ocean-to-Ocean Highway, National Old Trails Road, Dixie Highway, and Meridian Highway became popular and well traveled (Jakle 2000). Many of the routes in the *Blue Book* were associated with these booster projects, often indicating the name of the highway a Blue Book route followed. For example, Route 27 in the 1914 Middle West volume, connecting Chicago, Illinois, to Clinton, Iowa, indicates that it was a section of the Lincoln Highway (ABBPC 1914). Route 625 in the 1924 Volume 4, connecting Belleville to Norton, Kansas, was a section of the Pike's Peak Ocean-to-Ocean Highway (ABBPC 1924).

"Many of the routes in the Blue Book *were associated with these booster projects, often indicating the name of the highway a* Blue Book *route followed."*

The increasing numbers of "booster" highways bred confusion within the motoring public. Many highways had similar names and blazes and connected the same towns. It was common for multiple highways to overlap and follow the exact same roads, where posts and poles became a complex jumble of painted blazes. In an effort to alleviate these problems, the American Association of State Highway Officials (AASHO[1]) in 1926 devised a unified highway identification plan based on one- and two-digit numbers. Every state quickly adopted this plan, which ensured that all interstate routes would maintain the same numeric designations from start to finish. States were allowed to mark their intrastate routes (those that did not cross state borders) in any fashion they wished (Weingroff 1997). The *Automobile Blue Book* incorporated these new highway numbers when it drastically altered its format in 1927 but did not remove the old booster names. Each large-scale section map indicated the numerical designations, while the introductory text for each section described the named highways of the area.

A Precursor to the American Road Map

The *Official Automobile Blue Book* was an important precursor to the American road map because it, like road maps decades later, was promoted to encourage automobile touring and automobile tourist-related businesses. Indeed, the entire series was created to benefit automobile tourists, for the inaugural edition explicitly stated "increasing touring facilities" as its main objective (OABBC 1901, 5). This emphasis on touring grew as the series matured.

The *Blue Book* was just as commercially oriented as the ubiquitous "oil company" road maps that appeared thirty years later (Akerman 2006, 2002, 1993; Ristow 1964, 1946; Schmiedeler and Perucca 1996) and the official state highway maps that became commonplace after them (Akerman and Block 2005). "Oil company" maps were intended to foster brand loyalty to the issuing oil company, thus selling more petroleum products. Companies hoped that by giving away free maps, tourists would return again and again to their branded service stations. Official state highway maps were also intended to be tools of economic development. They advertised touring destinations, thus encouraging tourists to spend their time—and money—within the issuing state. Similarly, the *Automobile Blue Book* was intended to encourage and promote automobile touring, and users were expected to patronize the businesses that advertised in the series.

"The Official Automobile Blue Book *was an important precursor to the American road map because it, like road maps decades later, was promoted to encourage automobile touring and automobile tourist-related businesses."*

Each *Blue Book* volume contained hundreds of advertisements for automobile-related literature, hotels, resorts, garages, auto dealers, and other related businesses. For example, the 1914 Middle West volume contains 190 advertisements for hotels and restaurants and 146 advertisements for garages and auto dealers (Figure 7). Its index to hotel and garage advertisements states, "[H]otel and garage accommodations are recommended and endorsed by the Publishers. Each has been carefully investigated and found to be thoroughly desirable as first-class accommodations in their respective sections" (ABBPC 1914, 936). Some garages and hotels even displayed signs advertising themselves as "Official Automobile Blue Book Garage" or "Official Automobile Blue Book Hotel" (Figure 8). It is unclear whether these businesses paid a premium advertising fee for the endorsement, or if the distinction was granted on their own merit. Apparently, only hotels and garages were endorsed because the index to general advertisers (literature, resorts, auto dealers, and other related businesses) lacks any official recommendation or endorsement note. Regardless of whether endorsements existed and how they were granted, though, it is clear that tourists were expected to patronize the businesses that advertised in the guides.

"Another reason the Official Automobile Blue Book *was an important precursor to the American road map was that the volumes provided directional information, helping motorists navigate."*

Popular touring destinations also advertised in the guides, often purchasing large, multiple-page, color ads that were intended to increase touring interest. Figure 9 shows one such advertisement for Colorado attractions, sponsored by the Denver Tourist Bureau. This spread is part of a twenty-four page "National Touring Objectives" insert in the middle of the 1921 Volume 7, which covers the southern Plains and Rocky Mountains. This special section contains destinations throughout the United States, including New England, New York, North Carolina, Michigan, Colorado, Montana, and Oregon. Since route directions to some of these destinations are covered in other *Blue Book* volumes, these advertisements also prompted users to invest in additional volumes in the series.

Another reason the *Official Automobile Blue Book* was an important precursor to the American road map was that the volumes provided directional information, helping motorists navigate. Today, the method of navigating by detailed mileages and turn-by-turn directions may appear

Figure 7. Hotel and garage advertisements from the 1914 Middle West volume.

Figure 8. Signs advertising Official Automobile Blue Book hotels and garages from the 1914 Middle West volume.

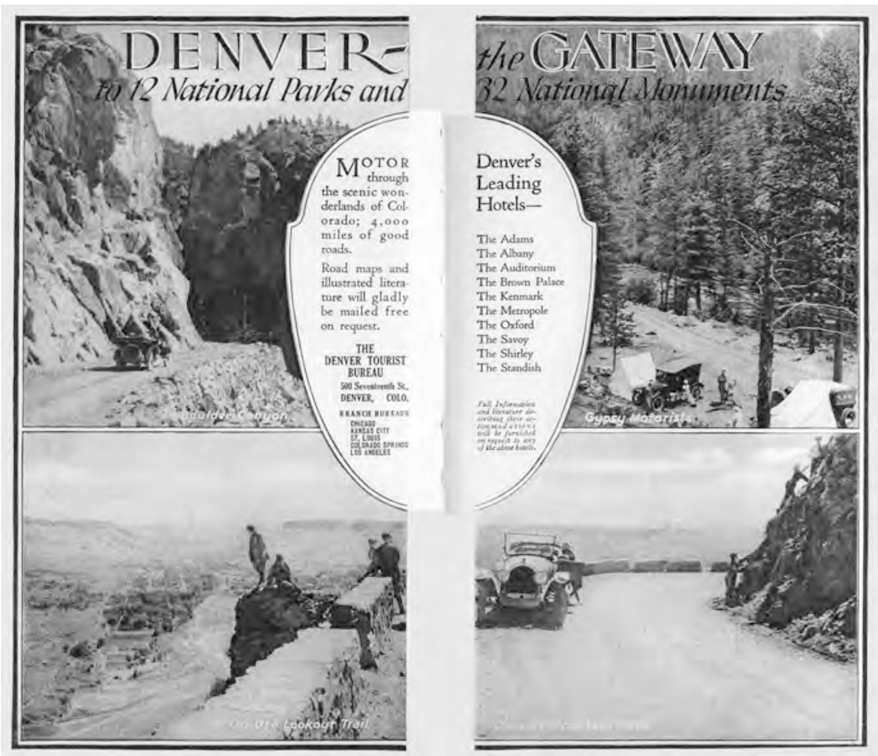

Figure 9. Denver Tourist Bureau advertisement from the 1921 Volume 7. (see page 58 for color version.

cumbersome and unnecessary to some drivers, especially those who excel at map reading, but those techniques were ideally suited for the conditions of automobile travel during the first two decades of the twentieth century. Roads at the time were constructed with only local uses in mind and often lacked descriptive signage. Prior to the automobile, roads that stretched across the country, or even a state, in an unbroken fashion were unnecessary. Traveling that far was reserved for railroads. Therefore, anyone wishing to travel cross-country by automobile was forced to make hundreds of turns onto hundreds of different roads. Such detail could not have been depicted at an appropriate scale on a sheet map because of the generalization that would have been required. Publishers and automobile enthusiasts turned to route guides such as the *Official Automobile Blue Book* and their turn-by-turn directions as a more effective solution.

Contemporary road maps work today because highways are built as continuous, unbroken networks and are adequately signed using a modern version of the AASHO numeric designation system. The highway numbers on the road signs match the designations on the map, so drivers at all times should know which highway they are on and the general direction in which they are traveling. Since these two features eliminate the need to show, in detail, every individual turn, sheet maps can effectively depict a generalized route at an appropriate scale. The *Official Automobile Blue Book* series, along with other directional route guides, fell out of favor during the late 1920s because improvements to the road network and a uniform highway identification system made their solution to the navigational problem obsolete.

"The Official Automobile Blue Book *series, along with other directional route guides, fell out of favor during the late 1920s because improvements to the road network and a uniform highway identification system made their solution to the navigational problem obsolete."*

Conclusion and Further Research

The *Official Automobile Blue Book* series of route guides was an important precursor to the road map because it commercialized automobile touring and provided directional information, two important functions of modern road maps, and did so before road mapping matured into a full-fledged cartographic business. Beginning as a single volume that connected service stations around the cities of the Northeast, the series grew into a massive enterprise filling a dozen volumes with thousands of touring routes, covering tens of thousands of miles. Its rise to prominence was only exceeded by the swiftness of its collapse. Eight years after its peak, the series and its publishing company were out of business, unable to compete in an era of uniform highway numbering and an ever-improving highway network.

Three avenues for further research can be pursued with what is currently known about the *Blue Book* series. It is clear that the guides were precursors to modern road maps, but did they also influence the emerging highway network? More specifically, do state and federal highways today consist of old *Automobile Blue Book* routes? Also, what was the relationship between the *Blue Book* routes and the hundreds of named "booster" highways? Did "booster" highways and the *Blue Book* borrow each other's routes? Research that compares the actual paths of *Blue Book* routes with the paths of "booster" highways and modern highways is necessary to answer these questions.

A related research avenue concerns the origins of the routes themselves. Thousands of routes were painstakingly assembled in the field by amateur and professional pathfinders, some of whom were employed by the book's publishing company. Little research has been conducted on pathfinders. Who were the *Blue Book* pathfinders, how did they assemble routes, and what were their objectives when blazing a new route? To what extent did they borrow each other's directions? Do *Blue Book* routes match those of competitors' route guides? The Automobile Blue Book Publishing Company's papers could potentially hold answers to these questions, but it is unknown which archive owns them, provided they even exist. Research that compares the paths of *Blue Book* routes with the paths of similar routes in other guides could possibly also yield answers.

Additional theoretical research is needed to investigate how *Blue Books*, and their directions, are related to emerging navigation technologies. One cannot thumb through an *Automobile Blue Book* today without noticing that the digital age is returning the turn-by-turn method of navigation to the mainstream. Internet-mapping Web sites such as Google Maps and MapQuest, as well as in-car Global Positioning System navigation units, provide maps and turn-by-turn directions with the click of a mouse or push of a button. It is a bit ironic that turn-by-turn directions, the navigation method abandoned by the *Automobile Blue Book* in 1927, are widely available today and seem to be gaining in popularity. Is this the reemergence of an old, time-tested navigation system or the appearance of a new paradigm in automobile navigation?

"One cannot thumb through an Automobile Blue Book *today without noticing that the digital age is returning the turn-by-turn method of navigation to the mainstream."*

NOTES

1. Currently the American Association of State Highway and Transportation Officials.

APPENDIX

Official Automobile Blue Book volumes used in this research:

From author's collection:

1912 Volume 2
1914 Volume 1
1914 Volume 4
1918 Volume 6
1921 Volume 7
1922 Volume 3
1924 Volume 4
1929 Volume 3

From Google Books:

1901
1907 Volume 1
1917 Volume 2
1919 Volume 1

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Data Layer Integration for *The National Map* of the United States

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The integration of geographic data layers in multiple raster and vector formats, from many different organizations and at a variety of resolutions and scales, is a significant problem for *The National Map* of the United States being developed by the U.S. Geological Survey. Our research has examined data integration from a layer-based approach for five of *The National Map* data layers: digital orthoimages, elevation, land cover, hydrography, and transportation. An empirical approach has included visual assessment by a set of respondents with statistical analysis to establish the meaning of various types of integration. A separate theoretical approach with established hypotheses tested against actual data sets has resulted in an automated procedure for integration of specific layers and is being tested. The empirical analysis has established resolution bounds on meanings of integration with raster datasets and distance bounds for vector data. The theoretical approach has used a combination of theories on cartographic transformation and generalization, such as Töpfer's radical law, and additional research concerning optimum viewing scales for digital images to establish a set of guiding principles for integrating data of different resolutions.

Key words: data integration, *The National Map*, federated GIS data, cartographic theory

INTRODUCTION

The U.S. Geological Survey (USGS) has begun a new program for supporting the needs of the nation for topographic mapping in the twenty-first century. That program is referred to as *The National Map* and involves a vision of:

> information current, seamless national digital data coverage to avoid problems now caused by map boundaries, higher resolution and positional accuracy to better support user requirements, thorough data integration to improve the internal consistency of the data, and dramatically increased reliance on partnerships and commercially available data. (USGS 2002)

This vision includes the development and maintenance of eight data layers: transportation, hydrography, boundaries, structures, elevation, land cover, orthographic images, and geographic names. The data will be available over the World Wide Web (WWW) and accessible for both direct viewing on the Web and for download by users. Data will be comprised of the best available source, and the USGS will depend on state, local, tribal, and other government organizations and private industry to supply data.

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The USGS will become a data producer only in cases where no other data are available.

The problem of using data from such a variety of sources is positional and thematic integration of the various resolutions and accuracies of data. Data must be positionally, sometimes referred to as horizontally, integrated to provide the seamless nationwide coverage as specified and thematically, sometimes referred to as vertically, integrated among the different themes to provide internal attribute consistency (Gösseln and Sester 2005). A large part of the data integration problem lies in matching points or features between data sets with different ontologies, data models, resolutions, and accuracies. A variety of methods to achieve feature matching have been developed for multiple vector data sets including an iterative closest point algorithm by Gösseln and Sester (2005), a statistical approach using measures from information theory by Walter and Fritsch (1999), and a data modeling approach in used by the Institut Geographique National in France (Devogele, Parent, and Spaccapietra 1998). For integration of vector and raster datasets, research has been focused on transportation and image datasets (Chen, Knoblock, Shahabi 2006; Wu, Carceroni, Fang, Zelinka, and Kirmse 2007). With the federated database approach (Sheth and Larson 1990; Devogele, Parent, and Spaccapietra 1998), *The National Map* has significant vertical and horizontal data integration problems, and the USGS continues research to develop procedures to accomplish this integration (Finn, Usery, Starbuck, Weaver, and Jaromack 2004). It is the purpose of this paper to document some of our progress to date and to better define the exact nature of the data integration problems. Specifically, Section 2 addresses the basic meaning of the term *data integration* in raster, vector, and combined geometric domains. Section 3 details our basic approach, data, and study areas. Section 4 documents an empirical study to determine the visual meaning of data integration. In section 5, the basis of a theory for integration is presented. In Section 6, we document an automated approach for vector and raster integration based on transportation and orthographic images. Section 7 provides further discussion with our conclusions for a theory of integration based on the concepts of scale and resolution ratios, optimum viewing scales, and image fusion presented in Section 8.

"The problem of using data from such a variety of sources is positional and thematic integration of the various resolutions and accuracies of data."

1.0 Data Integration Definition and Visualization of the Problem

The concept of an integrated dataset of various layers is based on the approach used in the standard five-color lithographic topographic map, which the USGS has produced for decades and provided to its customer base. In the same way that all features of different types on the lithographic map are co-registered and integrated into a single document, digital data sets need to register and integrate in a similar fashion. A major difference is that the USGS produced all the data for the topographic map and could force resolution and accuracy limits to maintain an integrated product. In the current environment of *The National Map*, data are provided by a variety of sources and at a variety of resolutions and accuracies. Forcing consistency is no small achievement, and simply establishing the meaning of an integrated dataset poses difficulties. For example, Figure 1a shows transportation and an orthographic image in an area west of St. Louis, Missouri. The image is a color orthophotograph from Nunn-Lugar-Domenici 133 priority cities of the Homeland Security Infrastructure Program (Vernon, Jr. 2004) with 0.33m (1 foot) pixel size, which approximates the resolution. The transportation file is from the Missouri Department of Transportation (MODOT) and provides one of the most accurate

"The concept of an integrated dataset of various layers is based on the approach used in the standard five-color lithographic topographic map, which the USGS has produced for decades and provided to its customer base."

sources for this area. Note the mismatch between roads as shown on the image and roads from the vector data file. Is this an integrated dataset? We provide a second example in Figure 1b using the same area and the same orthophotograph, but with Census Topologically Integrated Geographic Encoding and Referencing (TIGER) line files for a transportation source. The base source of the TIGER data is the USGS 1:100,000-scale topographic maps. As is evident in this example, the TIGER data are not integrated well with the image. Note that in both cases we really have not integrated the datasets; we have merely provided an overlay of the roads on the image. A final example is shown in Figure 2 including hydrography data overlaid on the same image base. In Figure 2a, the hydrography source is the USGS National Hydrography Dataset (NHD) while Figure 2b shows hydrography from St. Louis County. The St. Louis County data are certainly better and actually show the streams as double lines, but these data still do not match the image exactly. What does it mean to be integrated?

"What does it mean to be integrated?"

We take the position that integration means the datasets match geometrically, topologically, that is, have the same spatial relationships in the

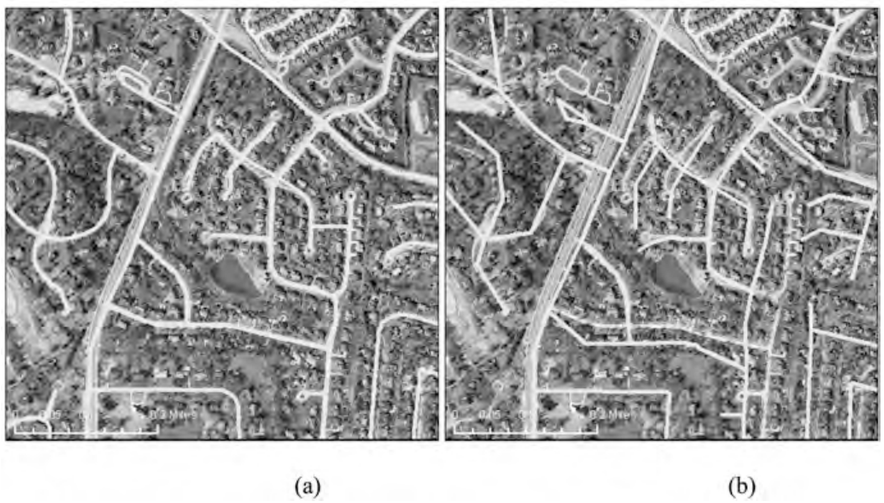

Figure 1. MODOT transportation overlaid on an orthographic image is shown in (a) while Census TIGER transportation overlaid on the same image is shown in (b). (see page 59 for color version)

Figure 2. Shown in (a) is hydrography from USGS NHD whereas (b) shows hydrography from St. Louis County. (see page 59 for color version)

data as those that exist in the real world, and have a correspondence of attributes. Thus, from the point of view of position, to be integrated, the vectors from the transportation and hydrography files in Figures 1-2 need to follow or match the corresponding features in the images. Further, if we have such a match we can fuse the vectors into the image without loss of information since the vectors will align. From a thematic integration viewpoint, two maps must share exact attribution so an extension of a feature from one horizontal partition to another remains the same feature with the same attributes.

Positional and thematic integration of vector and raster data are discussed above, but what does it mean to have two integrated raster datasets? For example, from *The National Map*, we use the USGS National Elevation Dataset (NED). This dataset includes data at 1, 1/3, and 1/9 arc-sec resolution (approximately 30, 10, and 3 m, respectively). The orthographic images for urban areas are 0.33 m resolution. If we integrate the elevation data, perhaps in the form of a shaded-relief presentation, with the image, we combine approximately 8,100, 900, and 81 image pixels, respectively, to match one elevation pixel of the resolutions of NED (Figure 3). How do we know when two raster datasets are integrated? We can base successful integration on the geometric frame of reference, but visually does it matter? In the case of a lake, the elevations should be flat; and, with flowing streams, the water should flow downhill, but can we really determine that with large resolution differences? One of the goals of our work has been to try to define the limitations, based on resolution and accuracy, at which datasets can be realistically integrated.

"From a thematic integration viewpoint, two maps must share exact attribution so an extension of a feature from one horizontal partition to another remains the same feature with the same attributes."

We have a similar problem if we discuss integration of two vector datasets, which, in *The National Map*, are layers for transportation, hydrography, boundaries, and structure outlines. For transportation and hydrography, positional integration should yield locations of bridges, culverts, and other structures. Resolution issues abound here as well, but accuracy appears to be a larger issue as shown in Figure 4 where the stream follows the road centerline.

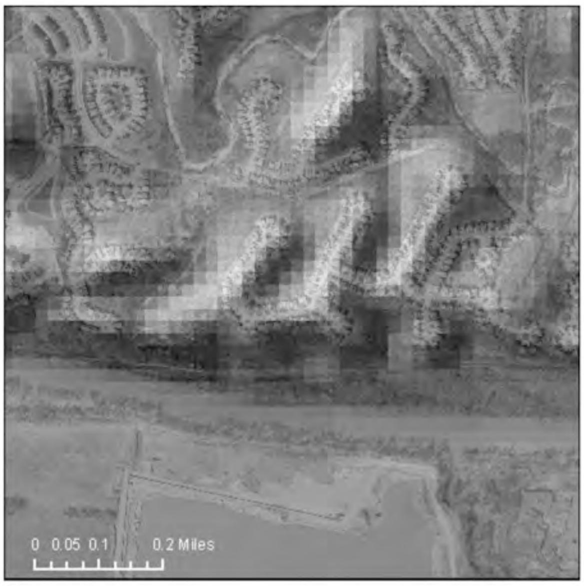

Figure 3. An orthographic image with 0.33 m pixel overlaid with elevation data with 30 m pixels. (see page 60 for color version)

Figure 4. Vector data for roads (red) and streams (blue) overlaid for the same areas. Note the area in the purple circle where the stream follows the road centerline. *(see page 60 for color version)*

3.0 Approach and Study Areas

Our approach includes an empirical exploratory analysis to establish a meaning, both visually and numerically, for data integration; theoretical development and proposition generation for data integration feasibility based on resolution and accuracy; and algorithmic development of procedures to shift features from one dataset to match a second to accomplish data integration. We selected five datasets and two test sites. The data include transportation, hydrography, land cover, elevation, and orthographic images (Table 1). We selected test sites over St. Louis, Missouri, and Atlanta, Georgia, based on the availability of the five data layers for testing. We used the available data for the test sites, which at the time was limited to 30 m resolution elevation and land cover. Accuracy in the table is from the accuracy specified for the dataset or that in the metadata.

The empirical testing was accomplished by overlaying one dataset on another, producing printed versions of the overlaid datasets, and conducting a visual analysis using a set of respondents to judge the effectiveness of the integration (match) between features in the two datasets. The proposition development is based on concepts from cartographic theory, including the radical law (Töpfer and Pillewizer 1966), known limits of generalization methods, the relation between raster resolution and map scale (Tobler 1988), an empirical analysis of viewing scale (Fleming, Jordan, and Madden 2005), and an examination of the results from image fusion methods for remotely sensed images of varying resolution (Ling 2006; Ling, Usery, Ehlers, and Madden 2006; Ling, Ehlers, Usery, and Madden 2007).

"The empirical testing was accomplished by overlaying one dataset on another, producing printed versions of the overlaid datasets, and conducting a visual analysis using a set of respondents to judge the effectiveness of the integration (match) between features in the two datasets."

Data	Source	Type	Resolution	Accuracy (from metadata)
Elevation	NED	Raster	30 m	2–10 m
Hydrography	NHD	Vector	1:24,000 source scale	13 m
Orthoimages	133 Urban Areas	Raster	0.33 m	0.33 m
Land Cover	NLCD	Raster	30 m	1 ha
Transportation	Variable	Vector		Variable

Table 1. Data Layers Used in the Empirical Study.

The algorithmic development has followed the work of Chen, Knoblock, and Shahabi (2006) and Chen, Knoblock, and Shahabi (2008) and attempts to force a vector transportation network to fit a corresponding image.

4.0 Empirical Testing

For the five datasets in Table 1, we produced plots of all pair wise combinations at 1:24,000 and 1:12,000 scales. We selected group of four skilled cartographic professionals to judge whether the two datasets were integrated. The goal was not to achieve a statistical test of individuals, but rather to establish the requirements of integration as viewed by cartographic professionals. For statistical analysis, each respondent judged forty locations on a two-quadrangle test area for two different sites, Manchester and Kirkwood in St. Louis, Missouri, and Chamblee and Norcross in Atlanta, Georgia. Cartographic professionals were selected because they possess significant experience in working with geospatial datasets and, at the time, were working on interactive data integration using GIS software to move vector transportation lines to match the image data.

"These ratings were provided for three aspects of integration: position, shape, and temporality."

We used a scale of 1 to 5, where 1 means no correspondence between the two datasets, 3 is moderate correspondence or integration, and 5 is perfectly integrated, meaning no visual discrepancy of position between the two sources. The numbers 2 and 4 provided intermediate values in the scaling (Table 2). This 5-point scale is similar to the Likert scale used in psychometric testing (Trochim 2001). These ratings were provided for three aspects of integration: position, shape, and temporality. Position is a measure of distance separating the same feature on the two sources. Shape assesses the correspondence of shapes but not necessarily directional alignment. Temporality is a judgment of whether the same feature exists on both sources. The respondents were shown examples of overlaid datasets meeting these measurements, including a standard that had been manually edited to force a match to the high-resolution orthoimages and produce a 5 scale value. Table 3 presents a summary of the results of the forty locations from the two test areas. The scores are a composite of the three measured aspects.

"Our preliminary interpretations are that the results generally follow expectations regarding data resolution."

Our preliminary interpretations are that the results generally follow expectations regarding data resolution. Orthoimages with a 0.33 m resolution did well, especially when compared with MODOT vector transportation, which is a high-resolution vector source. The Ortho/TIGER results can be explained by the poor spatial registration due to the small 1:100,000-scale source of the original TIGER data and the generalization

Scale Value	Data Integration Interpretation
1	No correspondence between the two datasets
2	Somewhat integrated
3	Moderate correspondence or integration
4	Highly integrated
5	Perfectly integrated with visual discrepancy of position, shape or existence

Table 2. Rating Scale for Visual Assessment of Data Integration Scale for Position, Shape, and Temporality.

Paired Data Sources*	12K Average Score (1–5)	24K Average Score (1–5)
NLCD – NHD	1.2	1.1
NLCD – MODOT	1.0	Not evaluated
StierLC –NHD	1.2	1.2
Ortho – NHD	2.3	2.8
Ortho – TIGER	1.3	1.5
Ortho – MODOT	3.6	3.6
NED – NHD	1.0	1.3
NED – MODOT	1.0	1.0
StierLC – MODOT	3.0	3.4

*NLCD – National Land Cover Dataset, NHD – National Hydrography Dataset, MODOT – Missouri Department of Transportation, StierLC – High resolution land cover, Ortho – Color Ortho image 1 ft.

Table 3. Summary Results of Visual Interpretation of Integration.

necessary for that scale. The NED, with a 30 m resolution, was hard to visually assess compared with the other data layers, plus it is difficult to determine what to actually use to assess quality of feature registration. In general, the raster-to-raster overlays were not evaluated since there is no obvious basis for visual assessment. For the forty locations on two sites, the standard deviations from the averages in the table were generally 0.5 or less. There were outliers, for example, the Ortho-MODOT integration had a standard deviation of 4.6 for the shape measure at the 1:12,000 scale, but only 0.5 at the 1:24,000 scale. The Ortho-GADOT comparison for geometry at 1:24,000 scale yielded a standard deviation of 4.4, indicating significant variance among the individuals and more specifically among the forty locations on the two-quadrangle area. Other than these outliers, all other comparisons showed standard deviations of less than 1.0 and in most cases less than 0.5.

"For the forty locations on two sites, the standard deviations from the averages in the table were generally 0.5 or less."

The plotting of data at 1:12,000 versus 1:24,000 scale made little difference since the level of integration is dependent on source scale and resolution and not on display scale. However, at some sufficiently small scale, all data sets will appear integrated since the small scale will override positional discrepancies and line weights will obscure actual lack of integration.

To quantify the meaning of the visual, empirical study, we made measurements of displacements of the roads from the MODOT dataset with respect to the orthoimages. Since these were the "best" data integration from a visual interpretation, it is logical to measure the discrepancies to establish a quantitative basis of what it means to be integrated. Using a sample of 38 points of the largest discrepancies on the test area, an average measurement of 6.2 m was obtained. Note that these are the largest areas of deviation and, at 1:24,000 scale, are well within the National Map Accuracy Standards (NMAS) accuracy specification of 13 m. Thus, apparently within 6 m or so, two data sets portrayed at 1:24,000 scale are perceived to be integrated.

"Using a sample of 38 points of the largest discrepancies on the test area, an average measurement of 6.2 m was obtained."

5.0 Cartographic Basis for a Theory of Data Integration

In order for geospatial datasets to be integrated, a basic compatibility of scale, resolution, and accuracy of spatial position and thematic attribution must exist. The three basic cartographic transformations of Keates (1982) provide a starting point to develop a theory of data integration. The first transformation is map projection which transforms from the sphere (or ellipsoid) to a plane representation. This transformation is mathematically rigorous, deterministic, correctable, and reversible. Thus, if we have two datasets that differ only in projection, they can be integrated through a mathematical transformation. Similarly, the second transformation from three-dimensions to two-dimensions, the planimetric transformation, is also mathematical, deterministic, correctable, and reversible. Again, if two datasets differ only in three-dimensional versus two-dimensional representation, they can be integrated through a mathematical transformation. The last transformation is generalization, which is non-mathematical, scale- dependent, subjective, and not correctable nor reversible. Thus, two datasets generalized at different levels may not be integratable unless they are close enough in scale and resolution to make integration possible. An example of the results of generalization and its intractability for integration is shown in Figure 5. The question remains how close is close enough.

To address that question from a theoretical perspective, we used cartographic theory, particularly, the radical law of Töpfer and Pillewizer (1966) with basic concepts of generalization and abstraction, and developed the following working proposition. If data meet NMAS or the National Standard for Spatial Data Accuracy (NSSDA), then integration can be automated based on the scale ratios as follows:

"The three basic cartographic transformations of Keates (1982) provide a starting point to develop a theory of data integration."

- If linear ratios of scale denominators are >= 0.5, then integration is possible through mathematical transformations (12,000 / 24,000 = 0.5) and adjustments.
- For ratios < 0.5, generalization results in incompatible differences (12,000 / 48,000 = 0.25) and data integration cannot be achieved through transformation, but will require manual/interactive adjustments of spatial data elements.

We use our empirical study with respondents to verify this working postulate, but further have developed an automated procedure, based on the work of Chen, Shahabi, Knoblock (2003) for integrating vector trans-

Figure 5. Example of generalization problem for data integration. The blue line is the generalized stream as represented in the Census TIGER data, which was developed from the USGS 1:100,000-scale topographic map; the red line represents the true stream course without generalization. *(see page 61 for color version)*

portation with orthographic images when the scale and resolution ratios are in the appropriate range.

6.0 An Approach for Vector and Raster Integration

In trying to expand on the methodology for integrating vector data with orthoimages, the USGS provided a small grant to the University of Southern California (USC) Information Sciences Institute to fund, in part, continuing work on an automated road integration approach. The approach, described in Chen, Shahabi, Knoblock (2003), Chen, Knoblock, Shahabi (2006), and Chen, Shahabi, and Knoblock (2008) requires identifying nodes (intersections) in the vector data, using the nodes to identify candidate locations of intersections in the image data, classification of road and non-road pixels in a buffer around the vector nodes, pattern patching of a vector template based on road widths and intersection angles around the node, elimination of poorly matched points, then computing a transformation between the locations of the vector intersections and the identified locations of the intersections in the image and applying the transformation to the vector data to force a fit with the image positions. This approach can be contrasted to the approach in Wu, Carceroni, Fang, Zelinka, and Kirmse (2007), of Google, Inc., in which the orthographic images are warped to register to the vector data. We chose to transform the vector data to match the images since our image data has much higher resolution and accuracy than the vector data that came from map sources.

"Once the intersections are identified in the images, the conflation techniques described by Saalfeld (1993) are used to match geometry of vector roads and orthoimages."

Once the intersections are identified in the images, the conflation techniques described by Saalfeld (1993) are used to match geometry of vector roads and orthoimages. The USGS research team has replicated this procedure to use in testing integration methods for *The National Map*. The USGS-developed software for testing and feasibility analysis of automated road integration includes the following steps:

1. Locate nodes (intersections) in vector data;
2. Using road width, create a geometrically accurate buffer around nodes and create within each buffer an image template of road segments;
3. Overlay the buffer template onto the original raster images;
4. Perform pattern matching, using correlation analysis, to identify the best match to the template;
5. Repeat steps 3 and 4 for all nodes in the vector data;
6. Based on distance and direction, filter poorly identified intersections;
7. Apply a rubber-sheeting transformation to correct the vector roads to match the image locations (for example, see Saalfeld 1985).

The results of the automated road integration were assessed by both qualitative and quantitative methods. Qualitatively, we compared the output of the automated approach with the ideal result created by manual editing of the vectors to force a match to the high-resolution orthoimages and produce a 5 scale value as was the standard for the empirical analysis above. Figure 6 shows an enlarged portion of this ideal standard. Figure 7 shows a case where the automated procedure improves the alignment for the road vector data. The visual assessment shows that this algorithm improved the alignment in most cases but, unfortunately, there were some cases where the algorithm caused degradation to the alignment.

"In most cases displacements were reduced to less than 1 m."

Quantitatively, measurements of discrepancies between the road vectors and the image positions of the roads were made as with the visual empirical study. In most cases displacements were reduced to less than 1 m. Whereas the MODOT roads are initially of high quality, the application of the automated procedure enhances the positions of the vector roads with respect to the locations of the roads in the images.

The semi-automatic process consists of a manual part and an automated part. The manual processing requires an operator to "train" the image

Figure 6. A vector transportation dataset was manually edited to match the orthoimages. The display of the manually edited data over the orthoimage became the standard against which qualitative evaluations were based. (see page 61 for color version)

Figure 7. MODOT and orthoimage integration after implementation of the automated procedure showing improvement in alignment for integration (red: MODOT; green: automatically processed roads). (see page 62 for color version)

by denoting areas of **roads** and areas of **non-roads**. The automated process consists of two aspects. First, there is the automated processing of the entire image to classify the roads and non-roads based on the input training datasets. Second, there is the automated process of finding the intersections based on the classified roads and then relocating the vector nodes. All of these processes are performed on one image tile.

The manual training of the roads and the automated classification of the images are required to be executed once per project (on a single image tile). The automated find intersection/relocate process must be executed on each image tile in a project.

"Thus, it becomes apparent that this semi-automated process can be a real time saver in integrating vector road data with orthoimages."

To manually correct all roads on an image tile as was done for our ideal standard (see the enlarged portion displayed in Figure 6), took on average approximately 16 man-hours. The manual training of an image tile in our semi-automated process takes an average of approximately 2 man-hours. The automated image classification of an image tile takes an average of approximately 0.25 man-hours. In addition, the automated find intersection/relocate process per image tile takes an average of approximately 0.25 man-hours. Thus, it becomes apparent that this semi-automated process can be a real time saver in integrating vector road data with orthoimages.

For an example, for one image tile the manual process would take 16 hours (1 * 16h); whereas, the semi-automated process would take 2.5 hours (2.0h + 0.25h + 1 * 0.25h)–a savings of 13.5 hours. Further, for a typical 7.5 minute USGS quadrangle, which is comprised of 20 image tiles, the time savings would be greater than 300 man hours (20 * 16 h = 320 h versus 2.0h + 0.25h + 20 * 0.25h = 6.25h). Obviously, the time savings increase exponentially, as would be the case when doing the two study areas of St. Louis and Atlanta. St. Louis (as defined by the 133 Urban Areas project) consists of 50 standard quads yielding a savings in excess of 15,000 hours.

In further qualitative analysis, we examined the type of control point filtering and the magnitude of the filtering on the output results. We looked at plots of a portion of the St. Louis area with 50 percent of the control points filtered using two different methods: a distance filter and a vector median filter. The distance filter eliminates control points identified by the algorithm solely on the difference of the distance, i.e., considering only magnitude, whereas the vector median filter calculates a median vector of all control points and filters those points with the greatest difference between the control point and this vector, thus considering both direction and magnitude. A visual assessment of these plots appears to indicate that the vector median filter is preferable, but at this point this conclusion is tenuous. In addition, we compared the different percentages of points removed for the vector median filter method sequentially between 10 percent and 90 percent incrementing by 10 percent, and found that there is a more noticeable difference between 10 percent and 50 percent of points removed than between 50 percent and 90 percent of points removed.

"The approach documented here provides a design for general vector/raster integration based specifically on integrating vector road data with high-resolution orthoimages."

The approach documented here provides a design for general vector/raster integration based specifically on integrating vector road data with high-resolution orthoimages. The approach can be effectively used with data that are integrated at a level of 3 from the empirical analysis. That is, our results show that MODOT data, with an empirical integration value of 3.6, while reasonably matched to the images in original form, can be improved to produce an acceptable final integrated product. TIGER data, with an empirical integration value of 1.3-1.5, cannot be transformed to produce an acceptable integrated product with the orthographic images. While this design may be able to support a variety of geospatial data and image sources, further testing is required. For example, integrating vector road data with land cover will not work with this design since the road intersections do not appear in the land cover data.

7.0 Towards a Theory of Data Integration

Our project goal is to develop theory that can be used to implement an automatic method to support data integration based on available information about resolution and accuracy in metadata. This development is based on concepts from cartographic theory, known limits of generalization methods, an empirical analysis of viewing scale (Fleming, Jordan, Madden, Usery, and Welch 2005), and an examination of the results from image fusion methods for remotely sensed images of varying resolution (Ling 2006; Ling, Ehlers, Usery, and Madden 2006). Our working proposition is that if scale denominators of source maps for vector data are within a factor of two, then the datasets can be integrated. If the factors are greater than two, then it may be possible to integrate the datasets, but significant processing and human interaction may be involved. For raster data, our working hypothesis is similar, but is based on a resolution ratio of two. This hypothesis is supported by research on raster resolution and map scale equivalents by Tobler (1988). For example, for a map of 1:24,000 scale, the equivalent raster resolution is 12 m, 24,000 divided by 1,000 to determine detectability, then divided by 2 to determine resolution in meters. The hypothesis is also supported by research on viewing scales by Fleming, Jordan, Madden, Usery, and Welch (2007), which provides optimum viewing scales based on the resolution of raster image data. The optimum viewing scale of 1:24,000 corresponds to a raster resolution of 12 m. The hypothesis is contravened by ongoing work by Ling, Usery, Ehlers, and Madden (2007), which shows image fusion of satellite sources can be accomplished at resolution ratios of 1 to 30, and by Lüscher, Burghardt,

"This development is based on concepts from cartographic theory, known limits of generalization methods, an empirical analysis of viewing scale, and an examination of the results from image fusion methods for remotely sensed images of varying resolution."

and Weibel (2007) showing road matching at ratios of 1 to 8. The capability to fuse images of such resolution differences results from the continuous nature of the pixel values and does not hold for mixing other types of data, such as vectors, with images. Those large ratios also introduce artifacts, however, and the exact resolution ratio for true integration and image fusion without artifacts is in the process of being established.

"We have defined the nature of the integration problem and, drawing from cartographic theory, have begun to set limits on the ranges of scales and resolutions of data that may be effectively integrated."

8.0 Conclusions

The integration of the various data layers for the *The National Map* of the USGS is a significant scientific and technical problem. Problems include the basic definition of data integration and the cartographic practices of generalization that prohibit recovery of the original information that could be integrated. We have defined the nature of the integration problem and, drawing from cartographic theory, have begun to set limits on the ranges of scales and resolutions of data that may be effectively integrated. The theory points to limits of a factor of 2 in terms of map scale denominators or resolution ratios that permit effective integration. This practical limit is supported through an empirical response survey, research on viewing scales for image data, and an automated procedure for integrating roads with orthographic images.

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Reviews

Arno Peters: Radical Map, Remarkable Man
Directed by Ruth Abrams; produced by Ruth Abrams and Bob Abrams; edited by Jamie Traynor.
Amherst, MA: ODTmaps, 2008.
DVD, $39.95 Individuals, $89.00 Institutions.

Reviewed by Scott R. McEathron
Thomas R. Smith Map Collection--University of Kansas Libraries

This DVD is a collection of short video clips, audio clips, PowerPoint slides, and documents (primarily in PDF format), a few of which are related to the title *Arno Peters: Radical Map, Remarkable Man*. The general layout and organization of the DVD is adequate, and it is relatively easy to use. The sound and video quality of the work seem amateurish–yet are adequate. However, the content of the work is neither scholarly nor of much use in providing an unbiased view of the Peters map controversy.

The DVD is organized into sections by format (Video, Print, PowerPoints, MP3 Audio, and Web Links). The sections are then organized by broad themes. For example, the Video Resources section is organized into the following six themes: 1) Arno Peters Outtakes & Bonus Clips (three clips), 2) Faith-based Origins of the Peters Map (five clips), 3) Denis Wood Interview (one clip), 4) Maps Bonus Clips (five clips--primarily related to the business of ODTmaps), 5) Movie Trailers (eight clips: six by Media Education Foundation, plus one titled *Israeli Attack on USS Liberty* and another called *The Man We Call Juan Carlos*), and 6) Human Rights Public Service Announcements (PSAs) (13 clips). Other sections are similarly arranged.. As the reader can see from just that section, it contains a eclectic assortment of subjects: Peters, the Peters map as an evangelistic tool, the business of ODTmaps, human rights, political propaganda in the media, and conspiracy theories.

A review of the elements related to subject of Arno Peters, the implicit thesis of this work, reveals that these elements are neither numerous nor substantial. The three short video clips of Peters do not provide a great deal of insight into his background or motives for adopting or creating the projection. The five video clips within the section called "Faith-based Origins of the Peters Map" preach that this projection provides a fair or Christian World View--but do little to enlighten the viewer on the subject of the work–Arno Peters. The print elements also add little. Relevant material consists of a "Peters Map Explanation," two articles from the *New Internationalist* on the Peters, an obituary, two letters from Lucy Peters to William Pickens, a small collection of one-line quotes from critics and enthusiasts, and the first chapters from the books *Seeing Through Maps* and *A New View of the World.* Finally, the PowerPoints section contains a presentation called "Arno Peters Photo Biography Images" that contains about twenty photographs of Peters and his family.

In summary, I do not recommend this work.

The Cancer Atlas
Judith Mackay, Ahmedin Jemal, Nancy C. Lee, D. Maxwell Parkin.
Atlanta: American Cancer Society, 2006.
128 pp, maps, tables, data graphics, photographs, $29.95. Softcover. ISBN: 0-944235-62-X.

The Tobacco Atlas
Second Edition.
Judith Mackay, Michael Eriksen, Omar Shafey.
Atlanta: American Cancer Society, 2006. 128 pp, maps, tables, data graphics, photographs, $29.95. Softcover. ISBN: 0-944235-58-1.

Reviewed by Russell S. Kirby
University of Alabama-Birmingham

The American Cancer Society (ACS) has published two complementary atlases focusing on cancer and on tobacco. While a number of atlases on various aspects of cancer incidence and mortality can be found in our libraries and in cyberspace, these books differ from traditional atlases of health and disease in that they are intended for a broad, international audience of consumers rather than cancer researchers or public health practitioners. Map plates are both colorful and informative and include additional data in graphical or tabular form, utilizing approaches common to other mass media atlases as popularized by *The State of the World Atlas* (first edition by Michael Kidron and Ronald Segal, 1981) series. Because the two ACS publications share a common organization and structure, as well as some subject matter overlap, this review covers the pair together.

Both atlases take a concerted public health perspective on their subject matters, reflected in the choice and arrangements of topics. While each atlas is designed to provide statistical data in map, graphical, and tabular forms, the focus is on the causes and primary and secondary prevention of specific types of cancer, their aggregation in particular sites, and how to reduce the local and global health impact of the production, sale, and use of tobacco products worldwide. *The Cancer Atlas* has six sections of unequal length: introduction, risk factors, burden, economics, taking action, the future and the past, followed by two tables of world data. *The Tobacco Atlas* begins with a brief discussion of types of tobacco, followed by five sections: prevalence and health, costs of tobacco, the tobacco trade, promotion, and taking action, and concludes with two tables of world data. Both volumes include time lines of key events and discoveries, glossaries of frequently used terms, sources, useful contact information, indexes, and numerous graphics and illustrations. While the reading level is adequate to convey the complex technical subject matter, the authors have taken care to ensure that the text is accessible to readers with no more than a high school education.

Neither of these publications fit the usual definition for a disease mapping atlas. In the case of cancer, only a few pages provide maps of the distribution of specific types of cancer around the globe. Only four maps focus explicitly on cancer incidence or prevalence. One map shows the leading type of cancer incidence in each country for males and females, respectively, while a second depicts the "geographical diversity" of specific cancers by focusing on the incidence of six types: liver, esophageal, and testis in males and breast, stomach, and cervix cancer in females. The third cancer incidence map shows worldwide patterns of lung cancer incidence for males and for females for the year 2002. The final plate on cancer incidence examines patterns of cancer among children under the age of 15 but displays these data in bar and pie chart form rather than on a map. These maps enable the reader to discern broad patterns in the spatial distribution of cancer incidence, but more detail would be helpful. For example, while breast cancer is the leading type of cancer among females in developed nations and many others in Africa and South America, cervical cancer is the predominant type of cancer among females in southeast Asia, central America, and sub-Saharan Africa. How long have these patterns persisted?

Where one might have expected detailed maps of cancer incidence and prevalence, we find numerous plates focusing on risk factors for various sites and types of cancer, including a plate depicting international patterns of smoking among men and women (repeated in the *Tobacco Atlas*), as well as plates showing patterns of infection, diet and nutrition, levels of ultraviolet radiation exposure, and reproductive and hormonal risk factors. Other plates show which countries have population-based cancer incidence registries, how much is expended on cancer research, and several patterns of cancer prevention.

The Tobacco Atlas clearly differs from traditional disease atlases in that its focus is on the uses and health risks of tobacco rather than on specific diseases *per se*. Here we find numerous plates focusing on tobacco use among adult males and females and boys and girls, exposure to passive smoking, and types of tobacco products used most commonly around the world, as well as the economic aspects of tobacco production, trade, and taxation. Only a single plate focuses explicitly on tobacco-related mortality. Even casual readers of this atlas will find a wealth of details about all aspects of tobacco placed in international context. As with *The Cancer Atlas*, the plates, diagrams, charts, and tables in *The Tobacco Atlas* will raise as many questions as they answer–and that is clearly a primary intent of the authors and the American Cancer Society which published both volumes.

Readers looking for handy and concise guides providing a public health perspective on the geography of cancer and of tobacco use and its implications will find these atlases extremely useful. Published in paperback editions at a relatively nominal price, medical geographers may wish to add them to their reference shelves. Map librarians may wish that these volumes were available in hardcover form for durability and should anticipate new editions of each atlas every three to five years. [Note from the editor: A second edition of the *Tobacco Atlas* is now available.] If these atlases increase public awareness of the global implications of tobacco use, international aspects of cancer incidence, and relatively inexpensive opportunities for primary prevention, the publications will have served their intended purposes. Let us hope that this will be so!

GIS for Homeland Security
by Mike Kataoka
2007 by ESRI Press, Redlands, California
99 pages, with full-color illustrations throughout
$24.95 softcover
ISBN 978-1-58948-155-8

Reviewed by Mary L. Johnson, Technical Writer, Remington & Vernick Engineers, Haddonfield, New Jersey.
www.rve.com

Since the creation of the Department of Homeland Security in 2002, the United States has been looking at ways to connect diverse and fragmented networks of information that can collectively assist in predicting, preventing and/or responding to terrorist attacks and natural disasters. *GIS for Homeland Security* describes the use of GIS technology for specific applications that will enable and further these goals.

GIS for Homeland Security is comprised of six chapters, the first five of which describe specific GIS applications related to homeland security. Each chapter includes three actual case studies demonstrating how these applications are being put into practice throughout the United States. The final chapter provides a look at the future of GIS for homeland security applications.

Data sharing is presented throughout the book as a key component of successful homeland security initiatives. Without some level of cooperation between local, regional, state, and federal entities, critical information may not be available where it is needed during a catastrophic event, or needless time and expense may be wasted in duplicative efforts. *GIS for Homeland Security* clearly indicates that, although much progress in coordinating available resources has been made since September 11, 2001, a great deal of work still needs to be done before GIS reaches its full potential as a universally available and usable tool for emergency planning and response.

Chapter One, "Gathering and Analyzing Intelligence," explores the daunting task of gathering and consolidating data from a variety of sources to create a single, comprehensive framework for emergency management purposes. The data must be easily accessible to emergency responders, yet adequately secured from individuals who would seek to misuse it. The "information sharing environment" called for by the President and Congress to combat terrorism involves not only law enforcement and intelligence agencies, but the general public's awareness of suspicious activity and knowledge of where and how to report it.

One of the case studies in Chapter One concerns the Emergency Management Mapping Application (EMMA) that helps monitor and protect the national capital region from natural and manmade threats. Towson University developed this Web-based initiative for the Maryland Emergency Management Agency in 2003 using ESRI mapping capabilities. EMMA had its first test that same year when Hurricane Isabel threatened the area with storm surge flooding. EMMA was able to direct the correct placement of sandbags at the Frederick County Reservoir in a fraction of the time it would have taken using standard field location methods. EMMA is compatible with other local and national GIS initiatives and has received high marks from independent consultants when measured against the federal government's technical standards.

A second case study involves South Carolina's use of GIS to collect and manage intelligence data. The South Carolina Information Exchange (SCIEx) also integrates the state's sex offender dataset, as well as information from the corrections system, court system, and similar agencies.

The third case study highlights the Arizona Counter Terrorism Information Center (AcTIC). Two hundred representatives of local, state, and federal law enforcement agencies encourage Arizona's citizens to report any suspicious activity they might see in public transportation corridors and other areas of interest to terrorists. This information is then entered into a GIS database and made availablefor homeland security operations.

Chapter Two, "Protecting Critical Infrastructure," describes the need to protect a community's vital buildings, systems, and resources from all types of emergency situations. Critical infrastructure includes high-profile buildings where government activities take place, as well as utility systems, communication networks, transportation systems, military installations, hospitals, chemical plants, agricultural and food supplies, financial systems, and other essentials. GIS can be used to locate and identify these sites, as well as assess risk, apply an evacuation radius, and analyze emergency management response time.

The CARVER method is presented as a means of assessing critical risk beyond the limited scope more routinely applied to natural disasters alone. CARVER is an acronym derived from the first letters of each designated step:

C*riticality* – Identify critical assets, single points of failure, or "choke points."

A*ccessibility* – Determine ease of access to critical assets.

R*ecoverability* – Compare time it would take to replace or restore a critical asset against maximum acceptable period of disruption.

V*ulnerability* – Evaluate security system effectiveness against adversary capabilities.

E*ffec* – Consider scope and magnitude of adverse consequences that would result from malicious actions and responses to them.

R*ecognizability* – Evaluate likelihood that potential adversaries would recognize that an asset was critical.

One of the case studies in Chapter Two highlights Kentucky's Chemical Stockpile Emergency Preparedness Program (KY CSEPP). The Blue Grass Army Depot is under mandate to eliminate its chemical stockpile while minimizing risk to the surrounding area. However, the rural area of Kentucky impacted by the depot had been relying on hardcopy methods of documentation and did not have money available for GIS and other digital data management applications to guide this process. Grant funding was ultimately obtained to implement a mapping support system.

It was important to map the three thousand-square-mile area surrounding the depot and analyze disaster preparedness in that region. Data was collected and compiled over a five-year period. GIS eliminated the need for hardcopy recordkeeping, and ongoing maintenance kept the system current all along the way. Web-based applications are now available to emergency management personnel and various government agencies for traffic surveillance, crisis management, evacuation routing, and chemical plume modeling analysis.

Other case studies for infrastructure management included an application for real-time video surveillance of airports, seaports, utilities, and other high-profile locations, as well as the coordinated GIS program used by the TriValley region of the Northern California Bay Area.

Chapter Three, "Responding to Complex Emergencies," involves rapid response needs for saving lives and property. GIS can deliver aerial imagery, floor plans, hazardous material locations, and other critical information to emergency management personnel. The California Fire Service created the incident command system (ICS) to assist firefighters by integrating resource data for complex emergency response.

The key features of an ICS are:

- A unified approach to incident management;
- A common terminology for clear communication;
- A generic organization structure that provides for interagency cooperation;
- A chain of command with accountability;
- An efficient use of resources.

California's ICS model ultimately formed the basis for the National Incident Management System (NIMS) utilized by the Department of Homeland Security to standardize the approach to disaster response. GIS helps visualize the nature and aftermath of a disaster with a variety of mapping applications.

One of the case studies for Chapter Three involves Hurricane Katrina, which brought to light disparities between NIMS standards and resulting emergency response. It was clear that NIMS had put in place a system suitable for disasters of a limited nature but did not provide what was needed to address an incident with the catastrophic proportions of Hurricane Katrina. Following the disaster, GIS was used to prioritize repairs, assess loss, and direct various levels of response. Volunteers worked around the clock to integrate disparate GIS and communications data in a format suitable for widespread use.

GIS for the Gulf, a combined effort of the U.S. Geological Survey, National Geospatial Intelligence Agency, and the Department of Homeland Security, is now assisting in preparedness efforts for future hurricanes, as well as long-term recovery needs for areas already devastated by Hurricanes Katrina and Rita in 2005.

The train wreck in Graniteville, South Carolina that released a deadly cloud of chlorine gas in January 2005 is the subject of another case study. Graniteville, about eight miles west of Aiken, is a small, rural town with a population of 7,000 residents who rely upon a small volunteer fire department. A disaster of this magnitude required assistance from other emergency management teams as well as by GIS applications. GIS helped analyze the potential spread of the chlorine plume and the areas in subsequent need of evacuation. The GIS data was continually updated and redistributed over the course of a two-week response effort, and the orderly evacuation plan it coordinated helped save many lives.

The third case study summarizes the use of mobile GIS by California firefighters to help coordinate a widespread response to wildfires in the San Bernardino Mountains. The mobile GIS units enabled firefighters to follow the spread of the fire in almost real time, which facilitated evacuations, fire lines, equipment movement, and even criminal investigations in the fire-ravaged area.

Chapter Four, "Preparing for Disease Outbreaks and Bioterrorism," outlines the use of GIS for public health applications. It is important for officials to know who may be exposed to a disease and how it might spread, whatever the source of the outbreak might be. Part of the homeland security initiative is to protect our nation's food supply from disease and bioterrorism, so GIS is used in tracking everything from West Nile Virus to Mad Cow Disease. By 2009, the National Animal Identification System (NAIS) is expected to have a database capable of following livestock from birth through entrance to the food chain to help limit the scope of potential disease outbreaks.

One of the case studies describes New York City's syndromic disease surveillance program. Using information gathered daily from emergency departments around the city, GIS is looking for any kind of increase or clustering of syndromes that might indicate a natural or bioterrorist disease outbreak. The system is automated and requires no user intervention. The syndromic approach is not looking at actual diagnoses, but at symptoms of disease, which may be the first indicators of any kind of widespread outbreak. The system helped health officials predict a flu outbreak two weeks before it hit, thus providing medical personnel a chance to prepare.

Another case study showed how Pennsylvania is using GIS to monitor the spread of West Nile Virus. Mosquito breeding areas are mapped, since mosquitoes help spread the disease.

A case study from Kansas looks at GIS used to track disease in cattle. GIS is helping reduce the impact of outbreaks among livestock through early detection and containment, as well as preventing contaminated livestock from ultimately entering the food chain.

Chapter Five, "Securing Complex Events," conveys the potential for terrorist attacks on large-scale sporting, political, or entertainment events. GIS can help monitor and identify security vulnerabilities, as well as facilitate response plans. Disaster preparedness exercises are highly encouraged and should include responding to nuclear, biological, chemical, explosive, and cyber attacks, as well as every type of natural disaster.

Case studies for chapter five include the preparation for and prevention of terrorist attacks on the Salt Lake City Winter Olympic Games, which occurred only five months after September 11, as well as the 2004 Democratic National Convention and the 2007 Super Bowl. GIS played an important role in coordinating data from multiple agencies to assess risk and establish emergency management and response plans for these events.

Chapter Six, "Looking Ahead," examines the need for consistency, coordination, and collaboration of GIS assets for the benefit of homeland security applications. The National Spatial Data Infrastructure (NSDI) provides the groundwork for technology and data sharing policies that can be utilized by all organizations using GIS. A key component of this initiative is the National Map. The National Map can only come to fruition with the critical input of local, state, and tribal interests; however,a study in 2004 showed that many such interests were reluctant to participate, since they could not be sure how or if the National Map would benefit them directly. Work is ongoing to change perceptions and elicit the necessary cooperation between organizations at every level of government.

GIS for Homeland Security includes a list of acronyms and abbreviations, as well as a glossary of homeland security terms. In the center of the book, between chapters three and four, are four GIS profiles of dedicated professionals who have used GIS in their positions as, respectively, California firefighter, Kentucky Chemical Emergency Planner, FEMA GIS Team Member, and Duke University Environmental Science Professor.

I found *GIS for Homeland Security* very informative overall, with a good mix of text, diagrams, and illustrations. The general principles and case studies presented are well suited to GIS professionals at every level. I would recommend this book to anyone who wants to know more about emergency management practices and homeland security applications, as well as anyone who is just curious about the impact of September 11, 2001, on government services in general.

I was particularly impressed with the CARVER method of assessing risk, which was outlined in chapter two. These guidelines could be easily customized to address virtually any type of security concern for locations ranging from rural neighborhoods to vast cities. That being said, I would like to have seen some actual case studies outlining emergency management applications on a smaller, more everyday scale. For example, what can the typical American suburb do on a shoestring budget to enhance its emergency preparedness, even if the most likely emergency is something as mundane as a house fire? In addition to learning what GIS programs can do to manage regional disasters, I had hoped to find out how the small-scale applications in my area might compare with similar applications elsewhere.

According to *GIS for Homeland Security*, as in other books I have read on GIS, one of the biggest roadblocks to creating any kind of centralized GIS, whether locally or nationally, is data sharing. In the civil engineering environment in which I work, an individual municipality or related organization generally solicits GIS implementation to streamline planning and development projects within its own boundaries. They are concerned that if they share their GIS data with larger entities, it may be redistributed for or incorporated into projects they do not feel are in their own best interests. In addition, a great deal of money is often invested to create the GIS data in the first place. Sharing their data, even for homeland security initiatives, often makes a municipality feel that it has unwillingly lost control of a valuable asset, and that its chances to recoup the costs involved or even to profit from the GIS data have been negated.

I have long been of the opinion that if a municipality or related organization is to be persuaded to relinquish a copy of its GIS data to a larger organization, some type of monetary incentive should be involved. Not grant funding*per se,* but some kind of system of ongoing fees that would encourage cooperation at every level. For example, a municipality sharing its GIS data with an outside organization would receive a pre-determined payment. If the outside organization then incorporates the municipality's GIS data into another project and ultimately shares that project with others, the municipality would receive an additional fee. If even a nominal type of fee arrangement system could be standardized across the industry, similar to the royalty system currently used in the publishing industry, it might be a very attractive incentive for even the smallest municipality, authority, or organization to create and freely distribute the local GIS data so valuable to homeland security and other beneficial applications.

Putting "America" on the Map: The Story of the Most Important Graphic Document in the History of the United States
Seymour I. Schwartz.
Amherst, NY; Prometheus Books, 2007. 400 p, maps, illustrations, photographs, $29.95. Hardcover.
ISBN: 978-1-59102-513-9.

Reviewed by Russell S. Kirby, University of Alabama at Birmingham

Having led a somewhat sheltered academic life, I had never taken the time to ponder what might be the most important graphic document in the history of the United States. Along with other questions more suitable to a cartographer's edition of the parlor game Trivial Pursuit, this issue had never flashed on my personal radar screen; but, if it had, I might have generated a checklist of important maps, some data graphics, and perhaps even a few items from the history of art and graphic design. I doubt that a highly obscure map that may have been the first to identify the western hemisphere by the name "America" would have made the list. Seymour Schwartz makes a lengthy case for assigning this accolade to the Waldseemüller world map of 1507, and while I might now consider putting this item in the top ten, I nevertheless came away unconvinced of the veracity of his recent book's title.

In a series of chapters with somewhat contrived alliterative titles, Schwartz weaves a narrative with several story lines. These include tales of the discovery of the New World, how cartographic information from each new voyage of exploration gradually filtered into the scientific knowledge base of European mapmakers, how a group of educated clerics residing in a small village came to create a series of cartographic products during the first and second decades of the sixteenth century, into whose hands these maps, atlases and gores passed, how they were stored over the centuries, and how some of these items first came to be displayed and later ownedby the Library of Congress in Washington, DC Many of these narrative discourses may be interesting reading, but Schwartz has a penchant for taking side excursions into intellectual controversies rather than focusing on the main topic under discussion. Likewise, his text is repetitive and reads as if each chapter were written separately and without any consideration that readers might not wish to continually review information previously described in similar detail. With judicious editing, and more careful organization, the material in this book could have been presented in perhaps half the number of pages.

This is not to say that *Putting "America" on the Map* will hold no interest for cartographic historians. The story behind the location of the sole extant copy of the Waldseemüller world map of 1507 contains features reminiscent of a novel of detective fiction, and the story of how the Library of Congress was eventually able to purchase the map for permanent display may be of interest to some readers. Schwartz also includes considerable detail on the methods of early sixteenth century map making and printing. But the most valuable aspect of the book, by far, is the series 22 plates on high quality glossy paper. These plates reproduce in full and in enlargement portions of the 1507 map and other maps and globes in which Waldseemüller was involved, together with earlier maps that influenced Waldseemüller's cartographic thinking. The volume also includes notes and a bibliography.

Schwartz, a physician by vocation, and a collector of rare maps and atlases by avocation, has clearly produced a labor of love. However, in the final analysis his labor falls short of the level of scholarship and clarity of organization and language necessary to make *Putting "America" on the Map* an essential monograph on the history of cartography. While map libraries may wish to add this volume to their collections in the interest of completeness, most scholars of the history of science and cartography will find it sufficient to borrow a library copy rather than adding this book to their personal bookshelves.

Cartographic Collections

The American Geographical Society Library at UW-Milwaukee

Angie Cope and Steve Burnham
University of Wisconsin Milwaukee Libraries

The American Geographical Society Library (AGS Library) at the University of Wisconsin- Milwaukee is the former research library of the American Geographical Society of New York (AGS of NY). Established in 1851, the AGS of NY is the oldest geographical society in the United States. The Society has conducted original research, aided the government, sponsored geographic scholarship, and once had an in-house cartography facility. The organization has played a prominent role in the advancement of geography by publishing and collecting periodicals, books, maps, atlases, and photographs. Led by notable explorers and politicians such as Isaiah Bowman, Charles P. Daly, and Robert E. Peary, the Society has been an integral part of the nation's maturing from its frontier beginnings. In 1978 an agreement between the AGS of NY and the University of Wisconsin System led to the transfer of over one million items to UW-Milwaukee. Today the pledge to maintain and preserve those materials and to carry on the tradition of promoting geographic understanding remains the focus of the AGS Library.

The collection today hosts an array of geographical treasures brought to Milwaukee from New York, including a 1452 manuscript *mappamundi*, a 1478 Rome edition Ptolemy atlas, and thousands of other rare maps, atlases, periodicals, and geographic texts. The Library also holds over 500,000 photographs and slides, some of which were the basis of two well-received recent exhibits at the Milwaukee Art Museum, "The American West, 1871-1874: Photographs from the American Geographical Society Library" (2005) and "Photographs from the Ends of the Earth" (2007).

The commitment to the historic materials is an important role, but, as the sole map library to a major urban research university, the AGS Library also provides modern resources to students, staff, faculty, and the community. The AGS Library staff collects, archives, and distributes digital data files from federal, state, and local governmental agencies. Visiting researchers from around the world benefit from two AGS Library fellowship programs. AGS Library staff members answer thousands of reference questions in person and via email and mail. Access is also made available via the scanning of materials using a *Colortrak 4280* large-format, sheet feed scanner. The scanning of maps has been an ongoing project since the early 2000's and one of the most requested services. A new scanning project will bring nearly 1,000 Sanborn fire insurance atlas sheets of Milwaukee online this year as part of the UWM Libraries' efforts to increase digital collections. Currently hundreds of photographs and maps from the AGS Library can be viewed in the Digital Collections at http://www.uwm.edu/Libraries/digilib/agsl/index.html.

Striking a balance between current and historic interests is both tricky and rewarding for a collection like the AGS Library. While the majority of our annual budget is used toward modern materials, the AGS Library also makes retrospective purchases when unique opportunities arise. Recently, with the assistance of the Wisconsin Map Society, the AGS Library acquired an extremely rare and unusual map. The Man of Commerce, published in 1889, is a highly detailed 31 x 50 inch map that conflates human anatomy with the American transportation system (Figures 1-3). Published by the Land and River Improvement Company of Superior, Wisconsin, the map promotes Superior as a significant transportation hub, showing the routes of twenty-nine railroads across the United States. Human anatomy was the most prominent of the biological sciences of the nineteenth century, and the map's metaphor makes West Superior "the center of cardiac or heart circulation"; the railways become major arteries; and New York is "the umbilicus through which this man of commerce was developed." The explanatory notes conclude: "It is an interesting fact that in no other portion of the known world can any such analogy be found between the natural and artificial channels of commerce and circulatory and digestive apparatus of man."

The map's cartographer was A.F. McKay, and the engraver was Rand, McNally and Company. Only one other copy of this map is known to exist but is held in a private collection. This unique map is now part of the AGS Library and UWM and is available for public viewing and cartographic research.

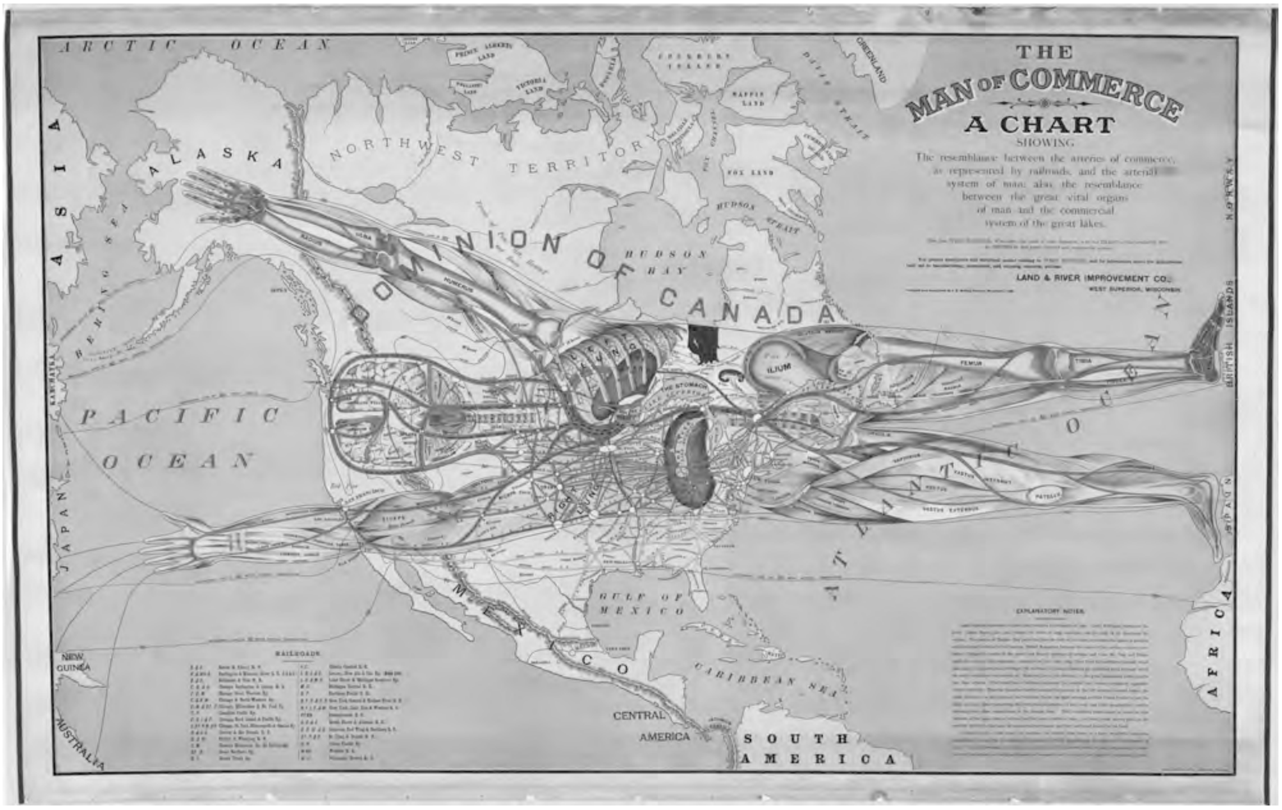

Figure 1. "The Man of Commerce: a chart," 1889 held at the AGS Library. (see page 63 for color version)

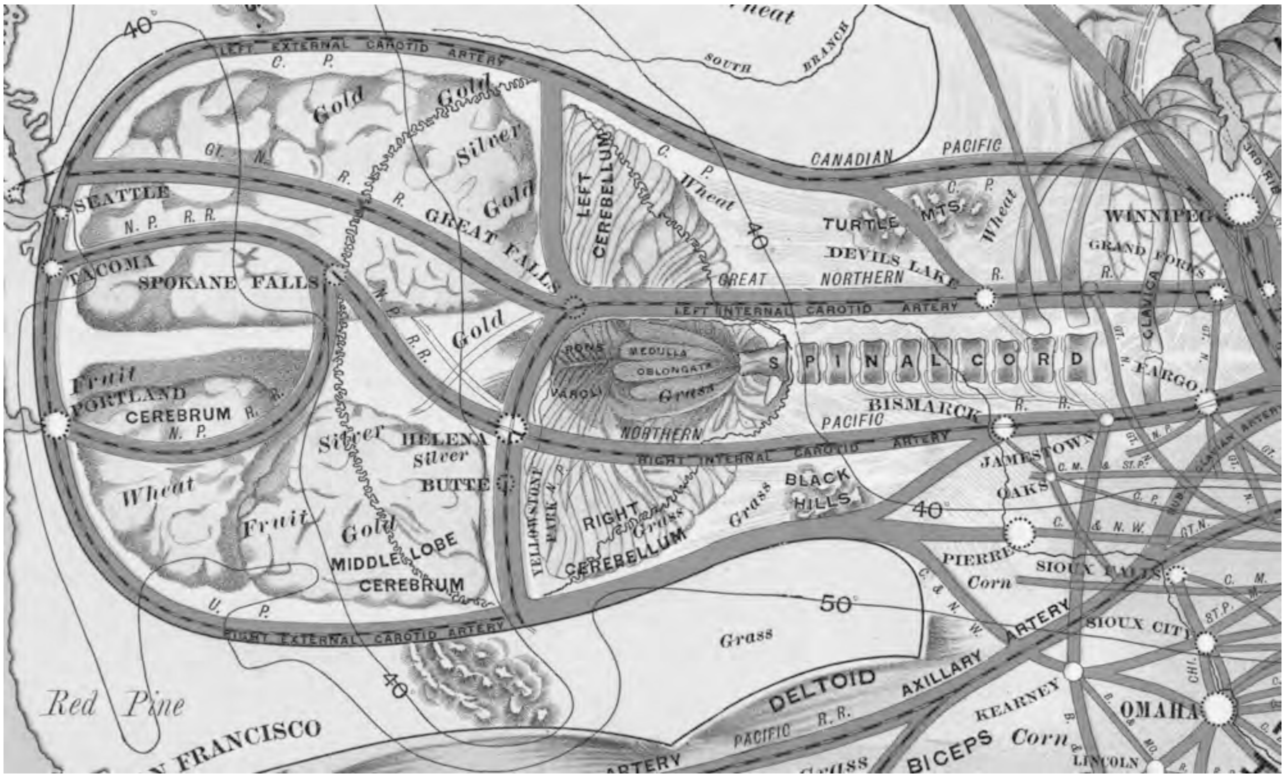

Figure 2. Close-up view of the Man of Commerce map: "As brain power moves man, so the precious metals are the basis of commercial movement, and they are found located at the head," from the explanatory notes. (see page 64 for color version)

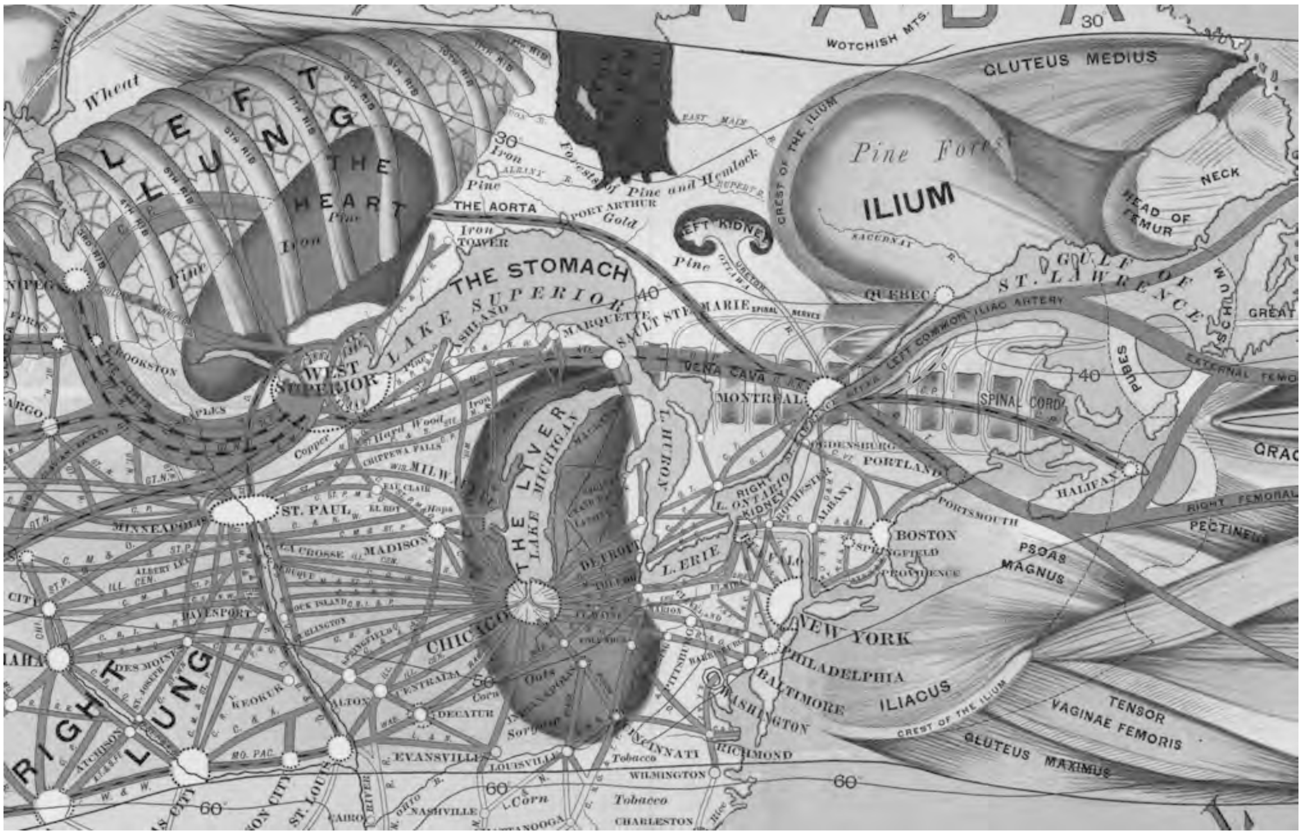

Figure 3. Close-up view of the Man of Commerce map showing the East Coast to the Great Lakes, identifying the lungs, stomach, liver, and heart. (see page 65 for color version)

Figure 4. An albumen silver print from glass negative held at the AGS Library. This photo is by John L. Dunmore and George Critcherson of the brig Panther *during Issac Israel Hayes's Arctic expedition in 1869. (see page 65 for color version)*

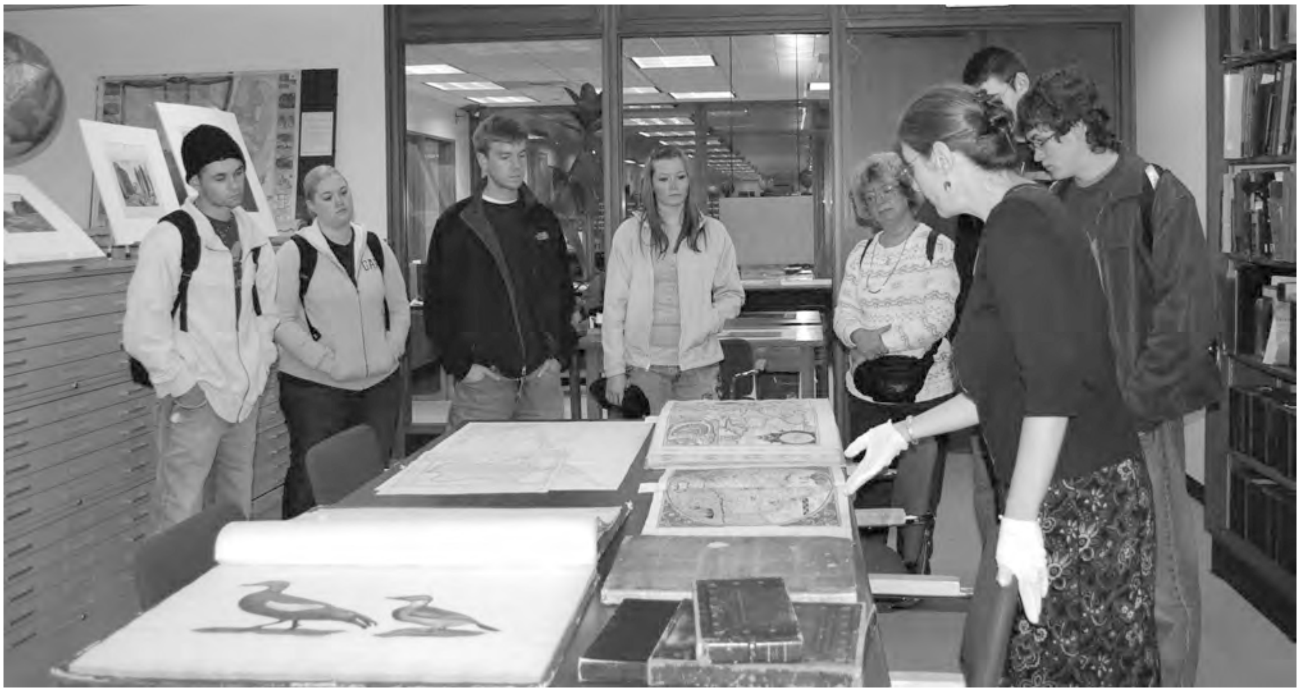

Figure 5. Reference Librarian Jovanka Ristic (wearing gloves) giving a tour of the AGS Library as part of GIS Day 2007 activities.

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Nat Case
Hedberg Maps

When Hedberg Maps created the first edition of our *Baseball TravelMap* in 1998, we wanted a graphically complex, annotated index. Working in Quark Xpress, we created type and character styles that allowed us to adjust leading to make the index fit as its leagues expanded and contracted. Using parent-child relationships within styles, we made one change to a parent style and so automatically made the same adjustments to related styles.

We almost never dared to reflow the entire index. The data for the index was maintained in a separate relational database. Because resetting all the headers, subheaders, and body text—line by line—was so much work, we just made line edits to the Quark file and then proofed them against the database. It was time-consuming and frustrating.

Then came Adobe InDesign CS[1], which opened a new world of annotated, graphically rich indexes. As a way to transform data into complex text layouts, InDesign was the tool Hedberg Maps had been waiting for. By using nested styles, InDesign allowed us to create paragraph styles with different "substyles" for different parts of the paragraph, and it allowed us to attach styles to index data using tagged text as it came out of the database.

InDesign Text Formatting and Styles

InDesign has two fundamental types of text formatting: character formatting and paragraph formatting. The difference between the two is self-evident: Character formatting covers characteristics like font, size, color, kerning, baseline adjustment, and compression that can be applied one character at a time; paragraph formatting includes components like indents, spacing, leading.

Users can generate styles based on each type of formatting: Paragraph and character styles each have their own palettes. Characteristics of the different character and paragraph style palettes overlap, as paragraph *styles* can include character-level *formatting* such as font, size, and color. Where both a paragraph and a character style apply, the character style generally overrides the paragraph style, and, in both cases, styles can be and are overridden by manually applied formatting. An easy way to think of the relationship between paragraph and character styles is that paragraph styles offer a default character style within a given paragraph, and character styles offer either building blocks to develop paragraph styles or an overriding style that can be applied manually within paragraphs where desired.

Competing systems of formatting can become very confusing. It is best, especially when working with complexly formatted text, to stick to formatting text using styles only (i.e., do not go applying italics manually—create an italic style and apply *that*). Be clear in your mind about how and where you are using character and paragraph styles.

Nested Styles

For the *Baseball TravelMap*, we had used carriage returns in Quark to separate header and body in our index. Each had its own paragraph style. For example, Figure 1 shows two separate paragraphs in Quark. However, the data used to generate this index is exported from the database as a single unit.

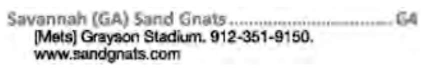


Figure 1. Two separate paragraphs appearing in Quark. (see page 66 for color version)

In InDesign, this is a single paragraph. While it is not difficult to put a replacement character (we use $, %, †, #, or any ASCII character not used in the index content) in the data export calculation and then make a global find-and-replace to a carriage return in Quark or InDesign, you then need to apply alternating styles to header and body, over and over. By using forced line breaks instead and applying one common paragraph style, we can save ourselves this entry-by-entry alternation.

The trick in InDesign is to use "nested styles," a feature of paragraph styles. They allow you to specify which character style will be applied to different sections within a paragraph, beginning and ending with specific delimiters. You can specify any character or type of break as a delimiter, and you can specify a count (for example, change character styles after the third instance of a semicolon). See Figure 2 for the nested styles dialog box.

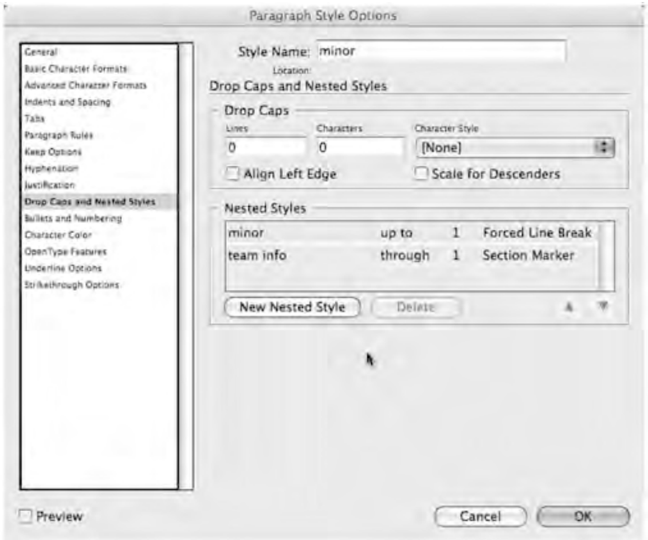


Figure 2. InDesign's nested styles dialog box. (see page 66 for color version.)

In our InDesign document, we would define (1) a character style called "minor league head" for the opening line, (2) a character style called "team body ital" for the italicized name of the major league team affiliation, and (3) a character style called "team body plain" for the remainder of the entry. We would then define a paragraph style called "minor." Within it, we would define nested styles (see figure 2), with "minor league head" delimited by a forced line break and "team body italic" delimited by a "]." We then could either fall back on a default paragraph style which mirrors the character style "team body plain" or add an additional nested style with an end delimiter that does not appear in the paragraph (as in the section break shown here).

I recommend using named character styles nested for the entire paragraph for one simple reason: leading. If you want to readjust an index for fit as the index shrinks or expands, the easiest way is to adjust leading. You will want this to be consistent throughout, and if you have some text that is being governed by paragraph styles and some being governed by character styles, chaos will ensue. If you set character styles' "parent" to a single character style and then adjust all of them by adjusting the parent style, your life will be easier. One caveat: Sometimes it seems as if whichever leading value is smaller between paragraph and character gets to be the trump, so it may help to keep the main paragraph leading value ridiculously small.

There is an invisible "end nested style" character available in InDesign, and this is useful if there is no obvious consistent key character (tab, line break, parenthesis) that can be used universally to signal a style change, or if that data field may or may not appear in any given entry. If, for example, you wanted to put in italics any information about new stadiums, which would not be applicable to all minor league teams, you could create a nested style activated and/or deactivated by an "end nested style" marker. In the database export, your substitution character would always be present, but when the end nested style marker is substituted in InDesign, these characters would either surround applicable text, or would appear immediately adjacent to one another and so would "cancel out" each other.

I hope it is apparent how powerful this feature is: You can use it to insert symbols in a different font and/or color (for example, see the index sample from Hedberg Maps' *Minnesota SuperMap*, figure 3). You can use it to generate sub-entries. (In the case of the *Baseball TravelMap*, we used it to put major league team home stadiums and spring training in the same paragraph but with line breaks and styling that make them *look* like distinct paragraphs. See figure 4).


I-007 Iron Trail RV Park & CG DD20
(800) 711-7789 48 EWSD
I-010 Island Beach CG K9
(218) 721-3292 20 EWD
I-015 Island Camping................................ Z25
(715) 792-2502 50 EWD
I-020 Island Lake CG................................J10
(218) 644-3543 30 EWD
I-025 Itasca SP E8
(218) 266-2100 226 ED
J005 Jackpot Junction Casino CG E16
(800) 946-2274 40 EWSD
J010 Jay Cooke SP................................K10
(218) 384-4610 80 ED
J015 Jessie View Res & RV CG................................G7
(218) 832-3678 37 EWSD

Figure 3. Example indexing from Minnesota SuperMap *showing the insertion of different fonts and colors. (see page 66 for color version)*


Minnesota Twins (Minneapolis)........................ E2
Hubert H. Humphrey Metrodome. 612-375-1366.
Tickets: 612-338-9467. mntwins.com
Spring Training: Fort Myers, FL................................H4
Bill Hammond Stadium at Lee County Sports.
Tickets: 800-338-9467.
AAA................ Rochester Red Wings................ G2
AA................ New Britain Rock Cats................K1
A (adv)............ Fort Myers Miracle................ H4
A................ Beloit Snappers F2
Rookie (adv)... Elizabethton Twins J5
Rookie............ GC Twins................ H4

Figure 4. Example indexing from Baseball TravelMap *showing line breaks and styling. (see page 66 for color version)*

Tagged Text

A second tool to automate styling text is tagged text. The idea of tagged text should be familiar to anyone who has used HTML tagging (<i>, </i>, etc.), and the theory is very much the same. All of InDesign's text formatting can be expressed in tags, and text can be imported with those tags in place, essentially doing all the formatting for you.

The easiest way to see how things should be tagged in your data application is to style a piece of text in the way you want it, and then, with the text selected, go to "Export" in the file menu, where "InDesign Tagged Text" is one of the export options (note this is not an option if only the text block is selected)

A few basic tags will get you started:

- Paragraph styles are denoted as pstyle:*stylename*>; in this case <pstyle:minor>.
- Character styles are denoted as <cstyle:*stylename*>. You can place <cstyle:> where you wish it to return to no character style.
- A "no break" range of text (for example a phone number or a web site) is <cnb:1> with <cnb:> at the end.
- A full range of tags is spelled out in the Adobe document "Adobe InDesign Tagged Text" available as a PDF at http://tinyurl.com/tagtext.

Note that unlike HTML, colons instead of equals signs are used, and no quotes are needed in stating the value of a tag. I have used abbreviated tags here, but there are verbose versions of all tags; in these three cases they are <ParaStyle>, <CharStyle>, and <cNoBreak>

In the *Baseball TravelMap* example above, the tagged text for this entry would look like:

<pstyle:minor>Savannah (GA) Sand Gnats G4<0x000A>[Mets] Grayson Stadium. <cnb:1>912-351-9150<cnb:>. <cnb:1>www.sandgnats.com<cnb:>

Note that the tab is not indicated by a special character, but the forced line break is ("<0x000A>"). Note also the placement of "no break" markers to keep phone numbers and web addresses from breaking across lines.

You must know three important things to make importing tagged text work properly:

- Be sure your text is truly plain text. Word formatting, RTF formatting, and other kinds of styling are likely to mess you up.
- The basic type of text formatting in your import needs to be indicated as the top line of the tagged text to be imported. For Windows, this will probably be <ASCII-WIN> unless you are using a different encoding system like Unicode. For Macintosh, it will be <ASCII-MAC>. I generally open the text exported from the database in a plain text editor and insert the line and resave before importing into InDesign
- On import, you need to be sure that your default paragraph and character styles are set to the default values. You can check this by deselecting everything and seeing which character and paragraph styles are indicated in the paragraph style and character style palettes. Adjust as needed.

Combining the two

Where to use tags and where to use nesting styles is really a judgment call based on how the index is structured. In the *Baseball TravelMap*, we have multiple different paragraph styles which incorporate nested character styles—for major league teams, minor league teams, independent league teams, etc. In this case we use tagged text to indicate paragraph styles and to prevent phone numbers and URLs from breaking. In an index with only one style (and no phone or Web information), we might dispense with this and just use nested styles.

My suggestion is to experiment! Put together with a decent database, these two aspects of InDesign can open up all sorts of possibilities in index design, making your indexes as information-rich as the cartographic elements of your map publication.

Notes

1. The techniques in this article work in Adobe InDesign CS, CS2, CS3, and presumably CS4, although they have not been tested in this most recent release.

References

My main source for learning about tagged text and nested styles is Olav Martin Kvern and David Blatner's *Real World Adobe InDesign*. I still use *Real World Adobe InDesign CS* from 2004, but *Real World Adobe InDesign CS4* is now available. .

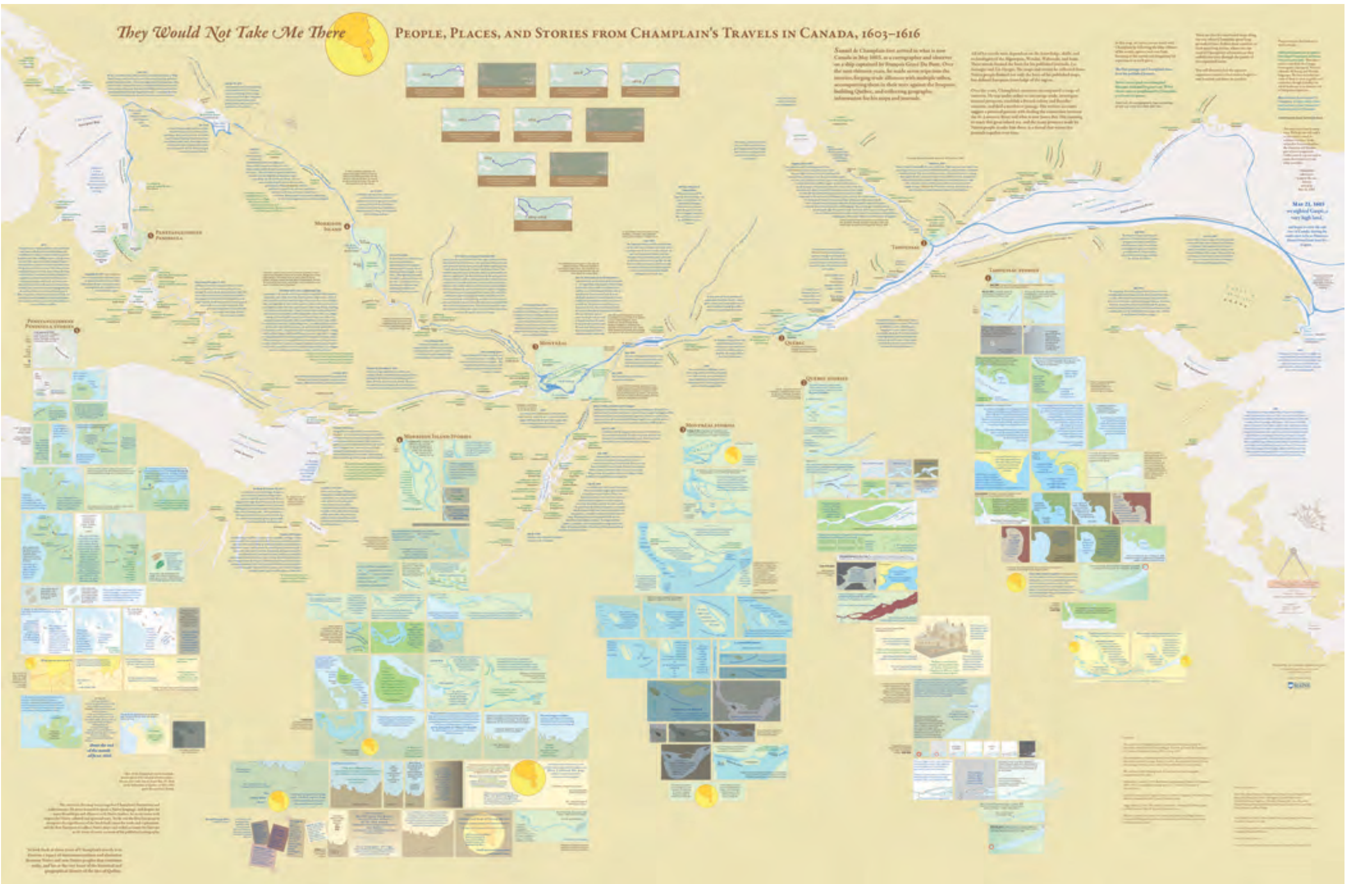
Nat Case is head of production and co-founder of Hedberg Maps in Minneapolis. This article is based on a presentation made at the 2005 NACIS Practical Cartography Day.

Visual Fields

In 2008, Michael Hermann (University of Maine) and Margaret Pearce (Ohio University) collaborated on a project to illustrate the travel journals of Samuel de Champlain in the 1600s.

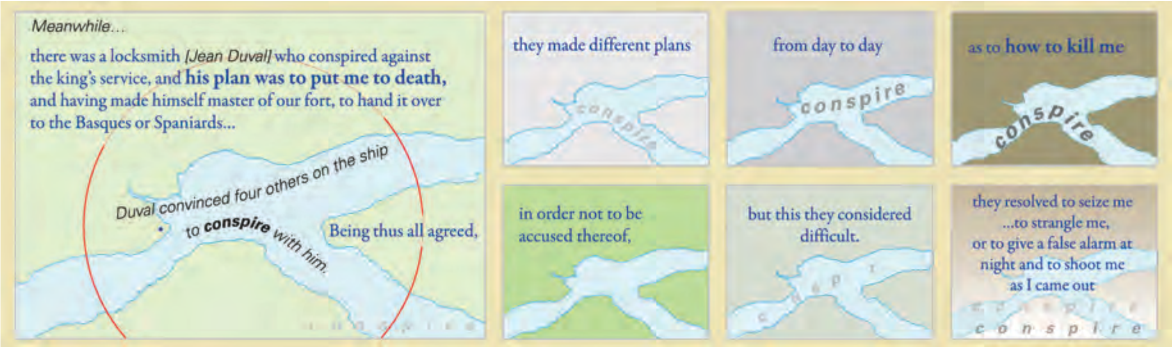
Within the context of a larger map (39 x 59 inches), they created a series of sequential panels to convey the depth and diversity of experience in places over time. These panels were designed to bring the reader into the storied landscape using different techniques with type, color, and scale, to express isolation, seasonality, danger, despair, death, hope, and survival. Champlain's voice is quoted directly from his journals (typeset in blue), imagined Native voices respond (in green), and the cartographers' voice (in black) moves the story along. The map is published on two sides; English on one side and French on the other. Native placenames are translated on both sides. Some examples follow.

They Would Not Take Me There; People, Places and Stories from Champlain's Travels in Canada, 1603–1616



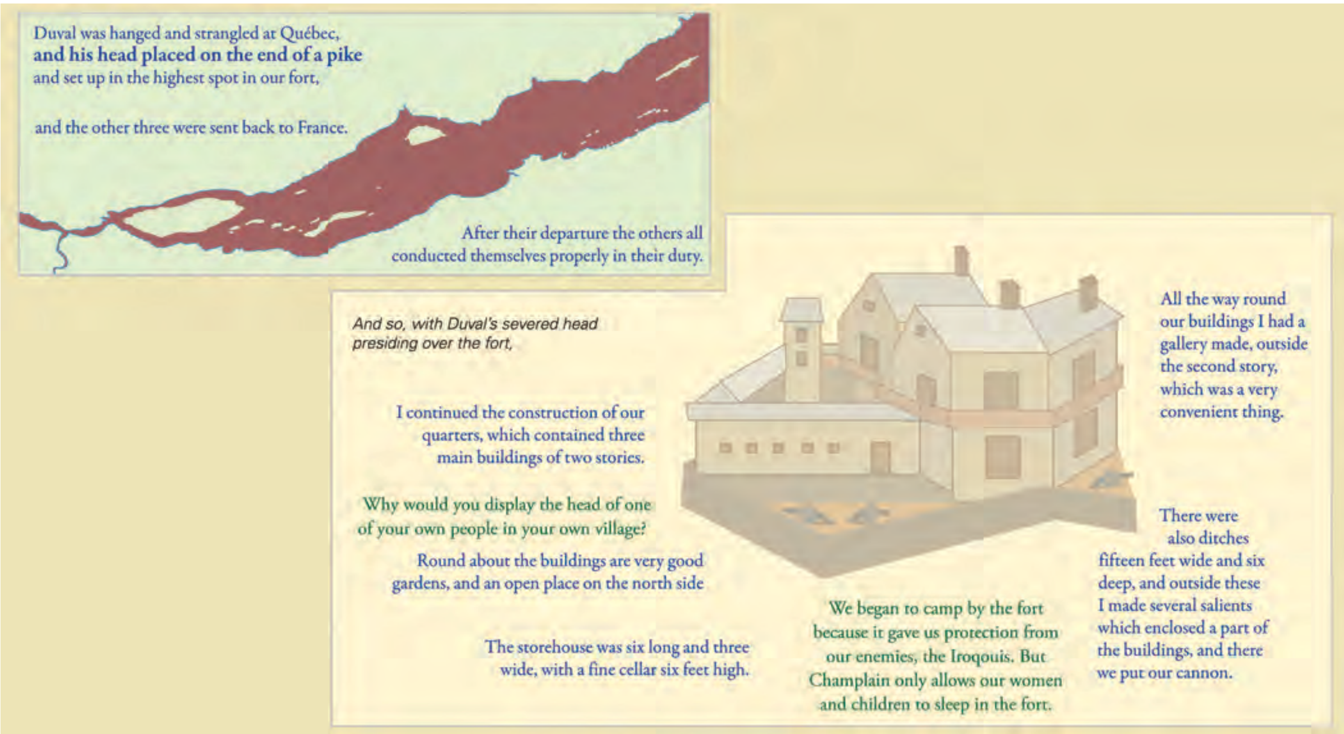
Paper map is 39 x 59 inches, folded to 8 x 10 inches, or available rolled. Published by the The University of Maine Canadian–American Center, Orono, Maine, USA. ISBN 978-0615-23159-4. Retail $14.99.

Conspiracy Panels



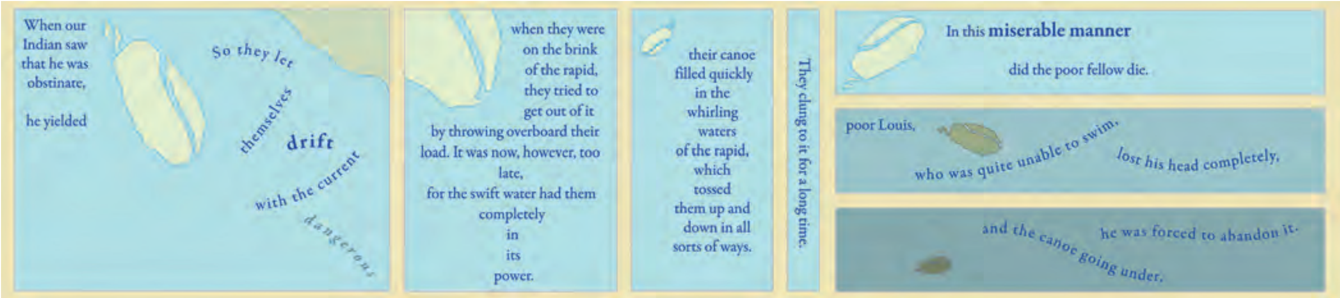
The conspiracy panels use color and typography to illustrate the story of a plot to kill Champlain. The same map is used seven times, once as an opening panel and then in a series of six small multiples. The text 'conspire' is the common element, placed on water because the conspiracy is located on the ship. The word appears and disappears in shades of gray, becoming darker as the plot thickens and disappearing altogether as they plan to avoid detection. In one panel, the vowels are removed to reinforce the difficulty the men faced as they considered how to avoid detection. In later panels (not shown) Champlain learns of the conspiracy and jails the men.

The Fort at Quebec



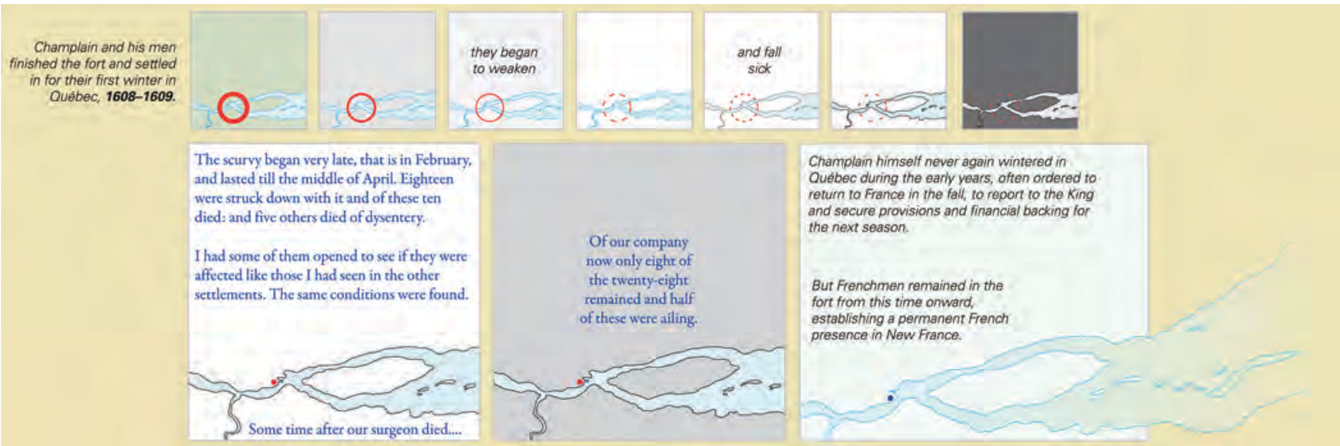
The conspiracy story ends with a St. Lawrence River flowing red to symbolize the beheading of Champlain's adversary. All of the men, whether part of the conspiracy or not, must now return to building the fort together. The fort is drawn in the same style of Champlain's rendering of the fort in his journal. Interspersed with the mundane details of the construction, Native voices question the scene before them, the French practice of beheading the man, and comment on the way in which Champlain controlled who could enter the fort.

Drifting and Drowning



In this series, Champlain tells the story of a drowning. The type is placed to suggest drifting with the current. The scale changes to reinforce the helplessness of the situation. As Louis drowns, the color palette darkens.

Winter in Quebec, 1608



A series of small multiples illustrate the first winter the French stayed in Quebec. A heavy red circle locates the fort in Quebec. The river is located at the base allowing an expanse of open space above to reinforce the sense of isolation. The first map is green to suggest late summer, and the thick red circle is a graphic fortress symbolizing many men and supplies against a long winter. As the season gets colder, the color palette shifts to grays and white: winter has arrived. As supplies diminish, the circle line weight is reduced, and as their health declines, the circle becomes a dashed line and the shoreline turns from blue to gray to black. The panel ends in black, forecasting death and dark times. This leads to a series of three panels and scale changes to bring the story back into the context of the river. Hue shifts from white (winter) to gray (emotion of survival) to green (spring), and the point symbol for the fort shifts from red to blue, as a handful of men survive to see spring. In the last panel, the St. Lawrence is spilling off the panel as the passage to France opens up, and the reader is directed back into the flow of events elsewhere in the map.

More information about this project can be found at www.umaine.edu/canam. It was awarded third place in the thematic category of the CaGIS 2008 36th Annual Map Design Competition.

Color Figures

The *Official Automobile Blue Book*, 1901–1929: Precursor to the American Road Map

John T. Bauer

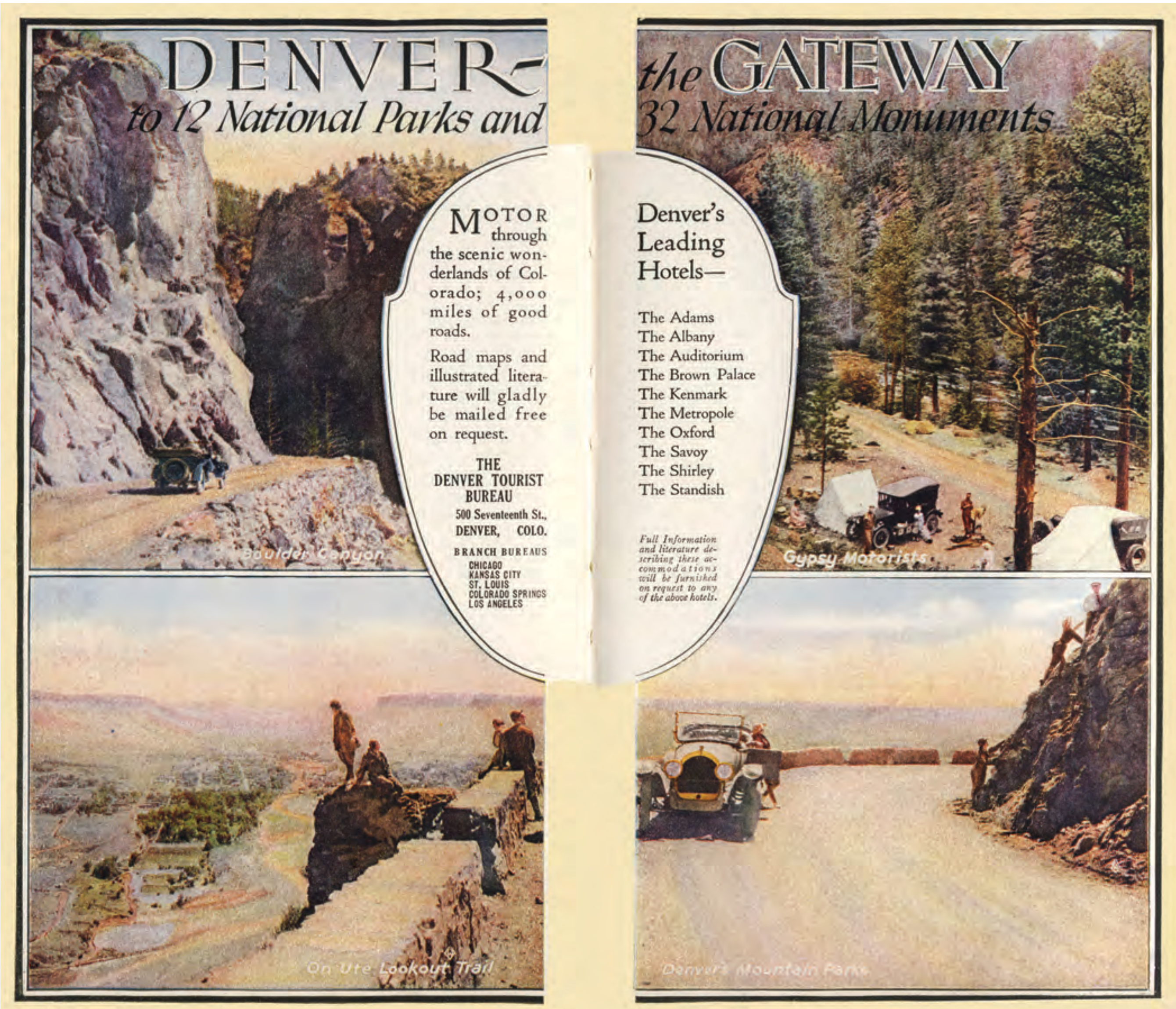


Figure 9. Denver Tourist Bureau advertisement from the 1921 Volume 7.

Data Layer Integration for *The National Map* of the United States

E. Lynn Usery, Michael P. Finn, and Michael Starbuck

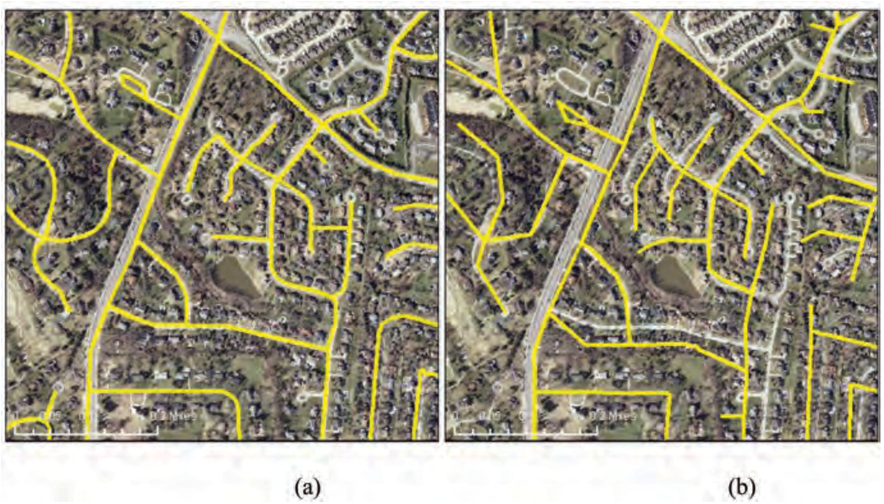


Figure 1. MODOT transportation overlaid on an orthographic image is shown in (a) while Census TIGER transportation overlaid on the same image is shown in (b).

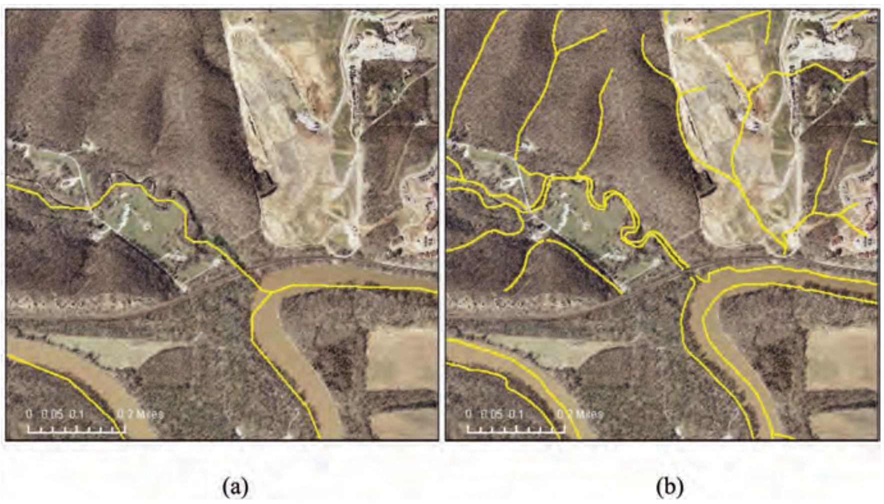


Figure 2. Shown in (a) is hydrography from USGS NHD whereas (b) shows hydrography from St. Louis County.

Figure 3. An orthographic image with 0.33 m pixel overlaid with elevation data with 30 m pixels.

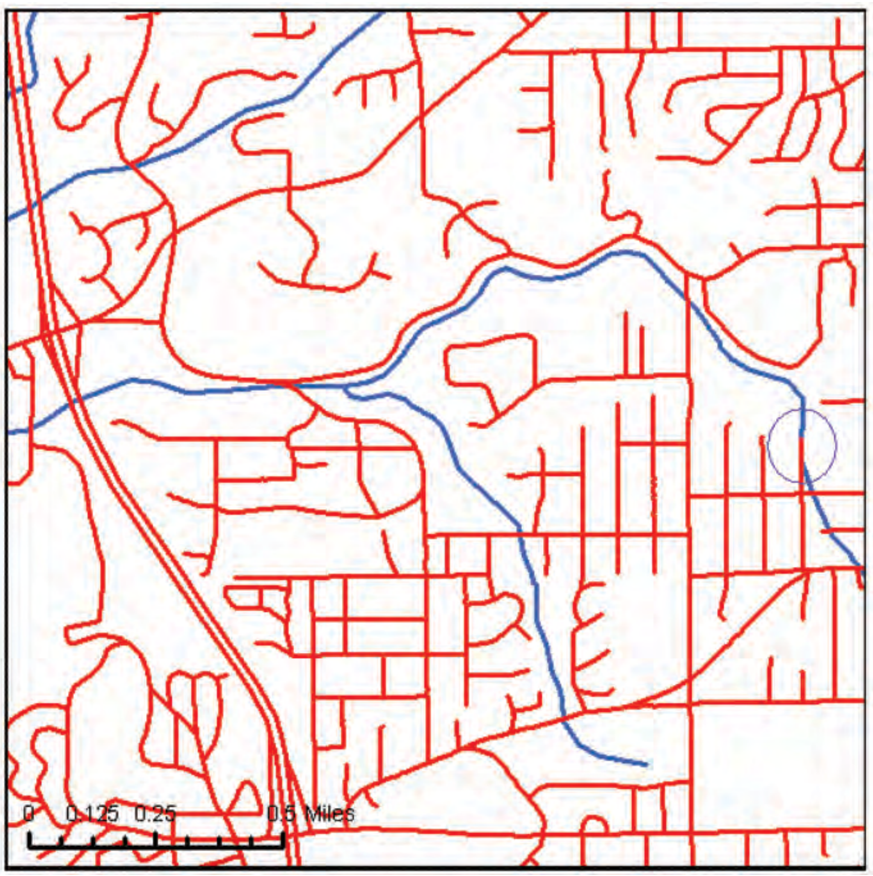


Figure 4. Vector data for roads (red) and streams (blue) overlaid for the same areas. Note the area in the purple circle where the stream follows the road centerline.

Figure 5. Example of generalization problem for data integration. The blue line is the generalized stream as represented in the Census TIGER data, which was developed from the USGS 1:100,000-scale topographic map; the red line represents the true stream course without generalization.

Figure 6. A vector transportation dataset was manually edited to match the orthoimages. The display of the manually edited data over the orthoimage became the standard against which qualitative evaluations were based.

Figure 7. MODOT and orthoimage integration after implementation of the automated procedure showing improvement in alignment for integration (red: MODOT; green: automatically processed roads).

The American Geographical Society Library at UW-Milwaukee

Angie Cope and Steve Burnham

Figure 1. "The Man of Commerce: a chart," 1889 held at the AGS Library.

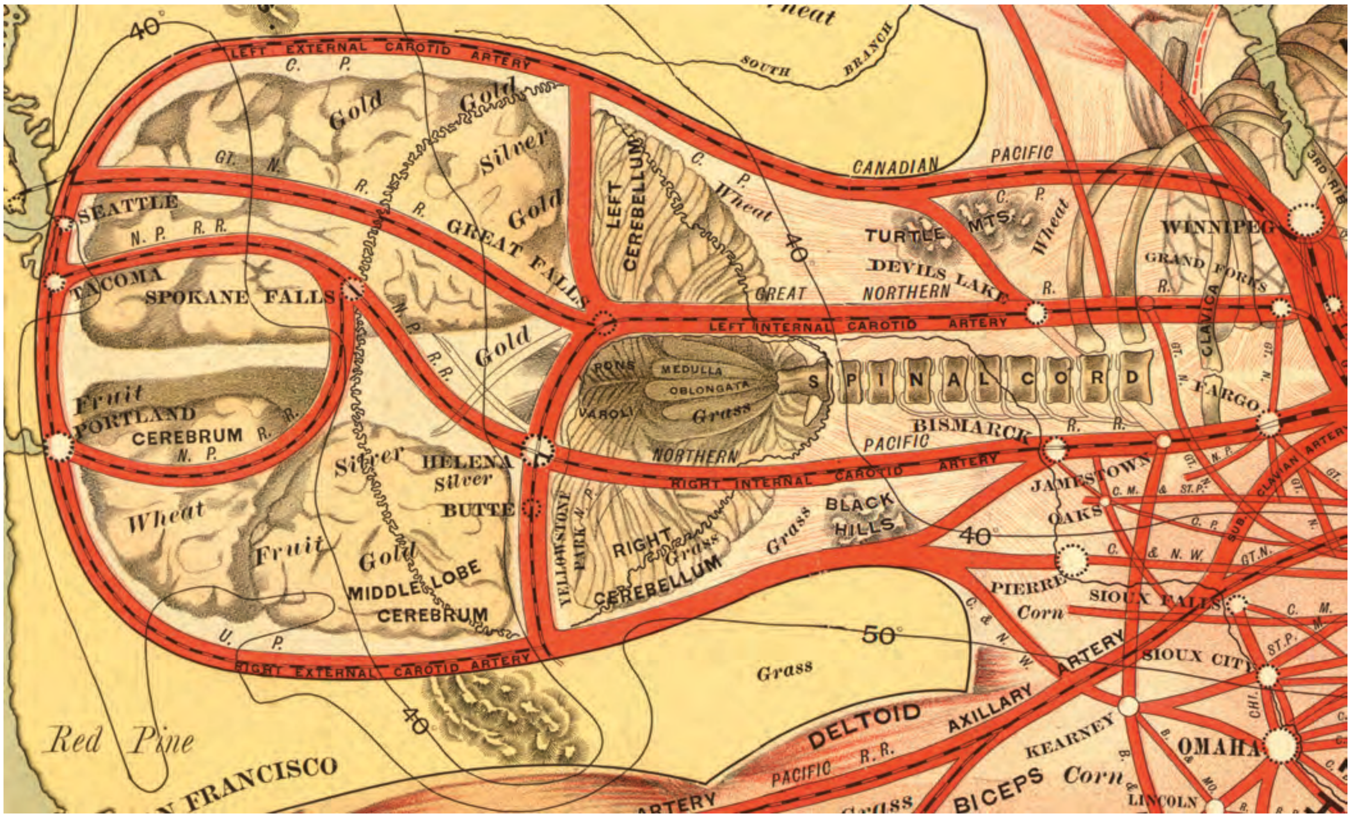


Figure 2. Close-up view of the Man of Commerce map: "As brain power moves man, so the precious metals are the basis of commercial movement, and they are found located at the head," from the explanatory notes.

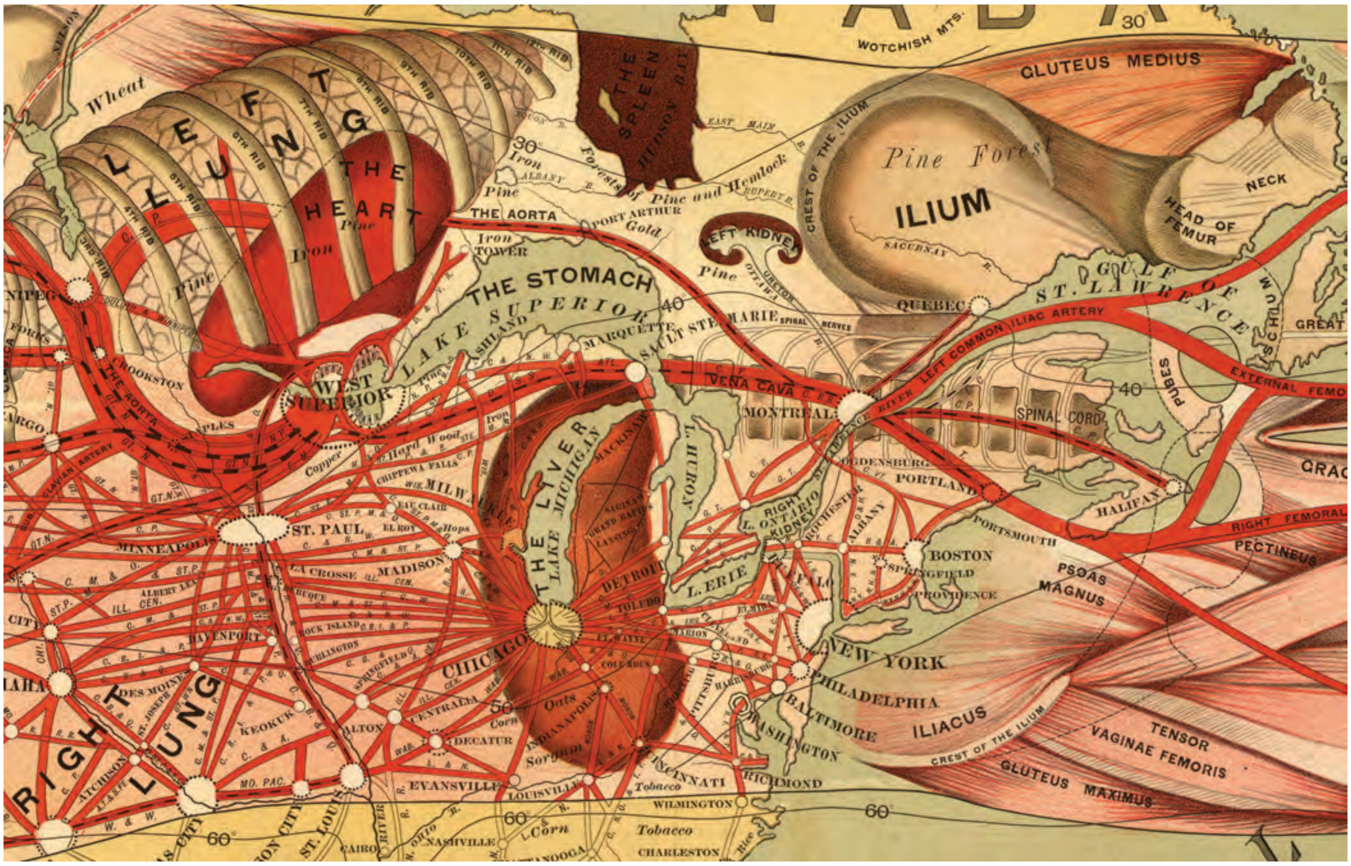


Figure 3. Close-up view of the Man of Commerce map showing the East Coast to the Great Lakes, identifying the lungs, stomach, liver, and heart.

Figure 4. An albumen silver print from glass negative held at the AGS Library. This photo is by John L. Dunmore and George Critcherson of the brig Panther *during Issac Israel Hayes's Arctic expedition in 1869.*

Creating Graphically Complex Indexes With InDesign

Nat Case

Figure 1. Two separate paragraphs appearing in Quark.

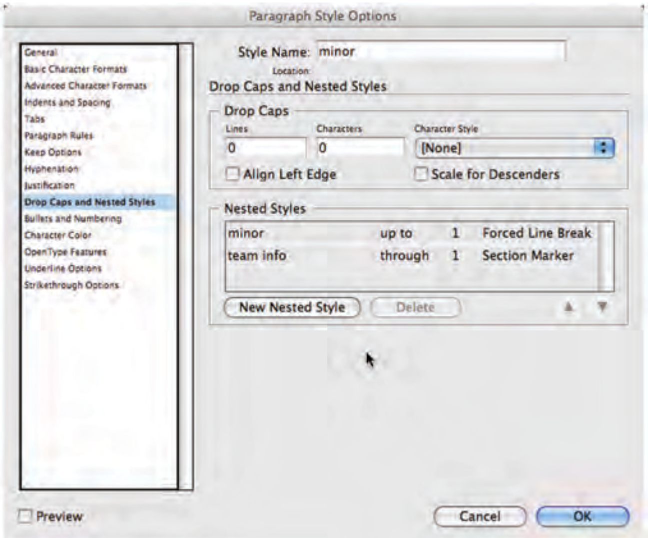


Figure 2. InDesign's nested styles dialog box.

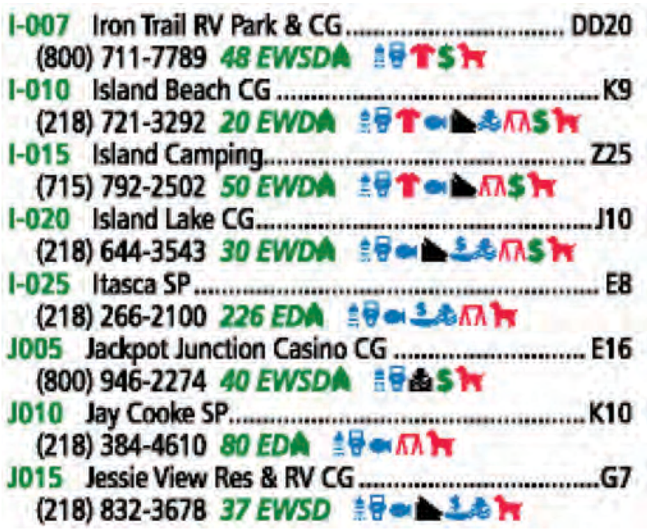


Figure 3. Example indexing from Minnesota SuperMap *showing the insertion of different fonts and colors.*

Figure 4. Example indexing from Baseball TravelMap *showing line breaks and styling.*


north american
nacis
cartographic information society
EST. 1980
Annual Meeting
2009
October 7–10
Sacramento, California
Opening session speaker
Michal Migurski, Stamen Design
Michal is Partner and Director of Technology Stamen, and maintains an active blog about mapping and design.
Cartography • Maps • GIS • Education • Art • Design
Join mapmakers, map users, map librarians, and map enthusiasts in Sacramento, California this October to talk about the thing we love — maps!
You'll find the NACIS meeting is a great place to share research, recent projects, and expertise with colleagues from around the nation, the continent, and the world.
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