


American cartography and GIScience



Cartography and GIScience received a major boost in 2008. The U.S.-based Cartography and Geographic Information Society (CaGIS) has published on the Web all the scholarly research published in its academic journal since 1974 as well as all the papers presented at the CaGIS-sponsored AutoCarto research symposia between 1974 and 1997. Both resources are available on the CaGIS Web site at www.cartogis.org.

The two-pronged effort—the digitization of all back issues of the *Cartography and Geographic Information Science* journal and of the AutoCarto archive—contributes to the goal of the CaGIS to “facilitate the creation and use of maps and geographic information through research and education.” The *CaGIS* back issues are accessible at www.ingentaconnect.com and the AutoCarto archive is online at www.cartogis.org. The journal is available at no cost to members of the society, and the AutoCarto papers are available free of charge to anyone.

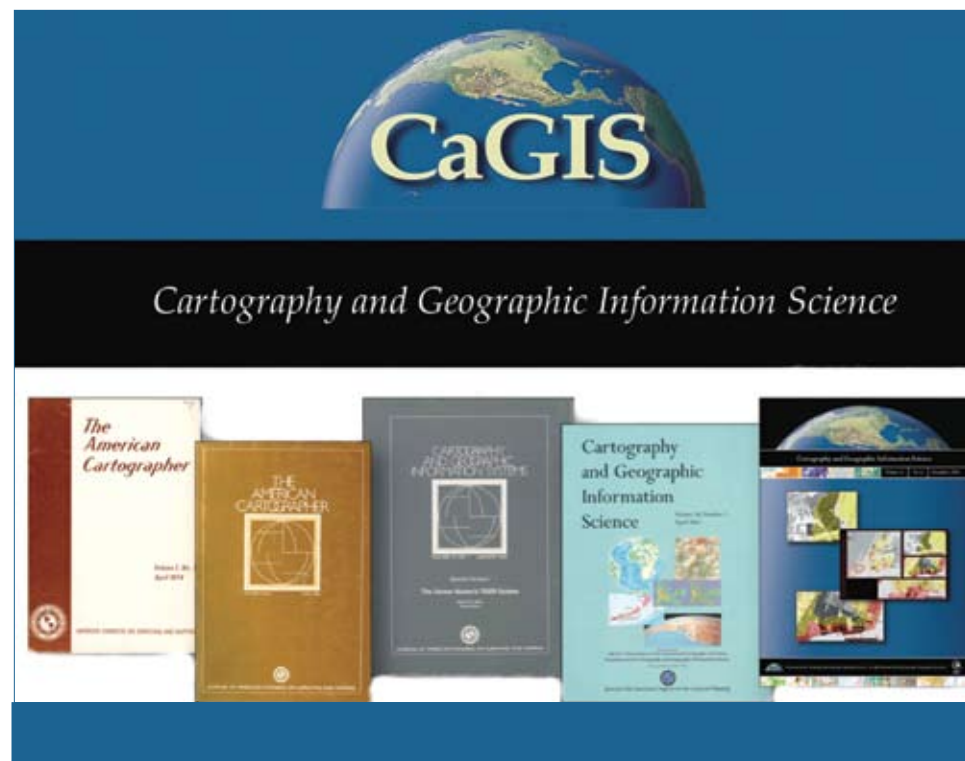
BY ILSE GENOVESE

The *CaGIS* Journal

Since its inaugural issue in April 1974 as *The American Cartographer*, the *CaGIS* journal has been the foremost U.S. cartographic publication. Widely recognized cartographers have and continue to fill its pages with important research on ways in which people collect, process, analyze, and present geographic information. Professor Arthur H. Robinson, an influential philosopher, academic and practitioner in cartography and creator of the Robinson map projection, was the journal's first editor. He was followed by such luminaries of U.S. cartography as Judy Olson (in 1978), Mark Monmonier (in 1983), Jon Kimerling (in 1985), Richard Dahlberg (in 1988), Robert McMaster (in 1991), Robert Cromley (in 1996), Terry Slocum (in 2000), Lynn Usery (in 2003), Elisabeth S. Nelson (in 2006), and Michael Leitner (in 2009).

Many other icons of U.S. cartography have put their imprimatur on the *CaGIS* journal. Waldo Tobler published his seminal work "Local Map Projections" in its very first issue. David Woodward, who would go on to co-edit a special content issue of *CaGIS* entitled "Exploratory Essays: History of Cartography in the Twentieth Century" with Mark Monmonier, published one of his first authoritative salvos on the topic on the pages of the second issue of *The American Cartographer*.

In 1990, *The American Cartographer* experienced its first transformation in response to advances in cartographic research and technology. "Current forces for change," wrote Phillip C. Muehrcke in the first



issue of the re-named journal, *Cartography and Geographic Information Systems*, "are information systems thinking, emphasis on visualization, and the electronic technology of computers and telecommunications." When these forces are harnessed for environmental applications, the result—as we have experienced over the years—is a geographic information system (GIS) that integrates spatial data bases, data management and manipulation methods, mathematical analysis procedures, and graphical representation techniques.

GIS burst on the scene, flexing its arms to get around cartography. Paper after paper in *CaGIS* validated Muehrcke's 1990 prognosis—"cartography and GIS influence each other, but mapping may get the best of the relation." The shift to GIS invigorated cartographic research in such areas as analytical cartog-

raphy, the nature of cartographic representation, cognition, and map projections. It also provided new ground for cartographic research in areas such as visualization, animation, and cartographic databases. Many who pursued these GIS-related lines of inquiry published their work in the *CaGIS* journal.

As early as 1991, Alan MacEachren and David DiBiase discussed how to create "Animated Maps of Aggregate Data." In the same year, Robert Cromley wrote a technical note on "Hierarchical Methods of Line Simplification" and Harold Moellering and Jon Kimerling developed a new process for digital slope-aspect display. In 1992, John Krygier and Catherine Reeves co-published with DiBiase and MacEachren a paper on "Animation and the Role of Map Design in Scientific Visualization." Also

in 1992, Mark Monmonier published a lengthy article in *CaGIS* on “Summary Graphics for Integrated Visualization in Dynamic Cartography,” and Dennis White, Jon Kimerling, and Scott Overton co-authored a research paper on “Cartographic and Geometric Components of a Global Sampling Design for Environmental Monitoring.” A year later, Lynn Usery published in *CaGIS* his “Category Theory and the Structure of Features in GIS.”

Fast-forward to 1999 -- cartographic research to improve geographic information systems continues to mature. With the growing adoption of the term “GIScience” comes a corresponding change in the name of the journal — *Cartography and Geographic Information Science*. The *CaGIS* journal, like the Society that publishes it, has positioned itself as the U.S. voice of 21st century cartography and GIS. It now claims a unique position as the journal that best represents advancements made at the interface of GIS, cartography, visualization, and spatial analysis.

Starting in the late 20th century and continuing into the 21st century, research on improving maps produced a number of innovative methods of representing map data. An excellent example is Cindy Brewer’s and Mark Harrower’s research on color schemes for maps which culminated in *ColorBrewer*, the first print version of which was published in the *CaGIS* journal in 2003. Also innovative was work that produced guidelines for the display of attribute certainty (by Michael Leitner and Barbara Buttenfield) and insights on integrat-

ing geographic visualization with knowledge discovery in databases (by Mark Gahegan et al.) Long-standing topics such as map projections, generalization, and type placement continued to receive attention, albeit in a computational realm. Cognitive and usability issue in geovisualization (by Terry Slocum et al.), interactivity in visualization (Jeremy Crampton), spatialization methods (by André Skupin and Sara I. Fabrikant), differences in map reading spatial abilities (by Robert Lloyd and Rick Bunch), and the politics of geo-surveillance and security (by Jeremy Crampton) are but a few of the issues emerging in the digital visualization environment of our high-speed information society.

U.S. cartography and GIScience have not developed in a vacuum. Over the years there has been frequent cross-pollination with cartography from Canada, Europe, Australia and other parts of the world. The current editor of *CaGIS*, Austrian-born Michael Leitner, is likely to continue this trend and expand it to include GIScience research from across the globe. It is perhaps then not at all surprising that the *CaGIS* journal’s junior associate editor to join the long-serving David Bennett is the South Korean-born Jeong Chang “JC” Seong. Indeed as an official journal of the International Cartographic Association, it is *CaGIS*’s role to provide a publication outlet for cartography and GIS research from all ICA member nations.

The infusion of U.S. cartography and GIScience in worldwide

cartography is at least three decades old, as documented in an article by F. J. Ormeling, Sr., then president of ICA, and published in the *American Cartographer* in 1980. The paper’s title, “The International Cartographic Association: An Information Paper,” introduces the ICA to those who may not have been familiar with the organization previously. Represented by *CaGIS* (at that time, the Cartography Division of ACSM), the U.S. community had a seat and a voice at the roundtable of the international cartographic community. Well known American cartographers — Robinson, Olson, MacEachren, McMaster, Brewer, and now Usery — have played prominent roles in ICA over the years. Serving primarily as vice presidents, commission chairs or co-chairs, and commission members, these and other cartographers and GIScientists have sustained U.S. participation in the ICA for over two decades.

It was during McMaster’s term as vice-president of ICA that action was taken to designate an official ICA publication. Recognizing that the art and science of cartography in the 21st century could not possibly be captured in any one academic journal, the ICA designated three publications to serve as its official outlets for scientific discourse. *Cartography and Geographic Information Science* was one of them. Together with *Cartographica* and *The Cartographic Journal*, *CaGIS* now serves the worldwide cartography and GIScience community through the publication of authoritative international papers.



The AutoCarto Research Symposium

Like the *CaGIS* journal, the AutoCarto Research Symposium also dates to 1974, and both continue to be standard-bearers of transformational research in cartography and GIScience. The early AutoCarto symposia are singularly illustrative of the rapid evolution of cartographic research in the late 20th century.

In 1974, when Dean T. Edson, program chair, wrote his foreword to the proceedings of the first AutoCarto symposium in Reston, Virginia, USA, automated cartography was about 15 years old. Resulting from large research and development investments in—as Edson wistfully put it—“costly super-systems,” automation of cartographic production led to equipment, products, and services that spurred a new way of perceiving and interacting with the geographic environment.

Edson’s prognosis that the “something-for-everyone” would “depend on the many hundreds, if not thousands, of low-budget users” has come to be—with one understandable miscalculation. Edson could not have foreseen that within four decades, GIS delivered on desk-top computers, laptops, and PDAs would become ubiquitous. Nor could

he have predicted the impact that GPS, the Internet, and other map-enabling technologies could have on cartographic research and practice. The AutoCarto symposium has throughout the years provided some of the most edgy research relating to these digital transformations.

Sixteen AutoCarto research symposia have been held since 1974. All have been sponsored (with three exceptions) by the CaGIS society, which, like its journal, has undergone a series of name changes reflective of the evolution of cartography and GIScience—from “Cartography Division” of the American Congress on Surveying and Mapping (ACSM), to the “American Cartographic Association” (ACA), and “Cartography and Geographic Information Society” as of 1996.


The AutoCarto symposium series was laid to rest in 1997, under the assumption that it had accomplished its goal to provide a forum for researchers and scientists working at the interface of cartography and GIScience. Eight years later, after the CaGIS society became incorporated, the AutoCarto symposium was resurrected, in recognition that, with the advent of new technologies, cartography and GIScience continue to change and new research is still needed on how to develop maps, geospatial data, and geographic databases for the 21st century. AutoCarto continues to bring together cartographers, geographers, geospatial analysts, GIScientists, and others from around the world conducting research on the cutting edge of

the geospatial sciences. Already, preparations are under way for the 18th in the series—AutoCarto 2010 to be held in Orlando, Florida, on November 15-18.

Each new AutoCarto symposium has presented a wealth of timely and relevant research issues. Eventually, a path emerges leading us from data capture to data coding, structure, and communication; from spatial allocation techniques to rules for modeling spatial features and improving spatial models; from line simplification to error reduction; and from statistical properties of maps to data standardization.

Automated cartography encouraged and demanded multi-disciplinarity. Through the AutoCarto symposia, multi-disciplinary cartographic research delivered the kind of breakthroughs that enabled the development of accurate digital terrain models and expert artificial intelligence techniques for military and civilian applications. The U.S. Census Bureau’s TIGER system is a prominent example of research on compressing vector topological data into contextual information structures; CEDS (Cadastral-based Expert Dasymeric System) is another. More recently, the move to increasingly smaller computers and more sophisticated visualization techniques, coupled with the Internet, have given us Web GIS and online maps, and other data display and transfer technologies that make us feel connected and empowered by spatial information.

An account of AutoCarto history would be greatly deficient if it did not give due credit to those who first saw a need for such a forum, envisioned it,



Save the date!
AutoCarto2010

Geospatial Data and Geovisualization for the Environment, Security, and Society

Sponsored by the Cartography and Geographic Information Society

November 15-19, 2010
in Orlando, Florida

The 18th in the series, this international research symposium will be held in conjunction with the APSRS¹, the ISPRS² Commission IV: Geodatabases and Digital Mapping, as well as a number of ICA³ Commissions.

Selected papers from the symposium will be published in a special issue of the *Cartography and Geographic Information Science* journal in April 2011.

Look for the AutoCarto 2010 "Call for Papers and Posters" in December 2009!

¹American Society for Photogrammetry and Remote Sensing
²International Society for Photogrammetry and Remote Sensing
³International Cartographic Association



Want to become a sponsor? Want to help with conference planning and events? Contact Paul Young (pyoung@usgs.gov).

www.autocarto.org

made it happen, and then supported it for decades. These researchers, mostly cartographers, came from the Defense Mapping Agency's Topographic and Hydrographic Centers, the National Ocean Survey, Central Intelligence Agency, U.S. Bureau of the Census, and the U.S. Geological Survey. Academic cartographers came from countless institutions across the globe. Researchers from private industry offered a different viewpoint

enhancing the cross-pollination of ideas even further. Through their contributions, these symposia participants advanced automated cartography and GIScience to enable the development of knowledge-based systems that could aid decision making at all levels of government, in numerous industries, and in many walks of private life.

"I came to Washington in the 1970s", wrote Robert Aangeen-

brug in his progress report on *Automation and Cartography, 1974-1997*, "from an atmosphere of revolution that was foisted on us at the University of Kansas in the late 1950s and early 1960s. I was not particularly impressed with the establishment, but I was taught a very quick lesson at AutoCarto I about the massive accomplishments in the federal sector. For three or four years [afterwards] I pretended that these were not really of any consequence and, moreover, that these feds—particularly the military types—were wasting the taxpayers' money." That, as history can now attest, was not at all the case.

The revolution Aangenbrug hinted at was the use of the computer for direct dissemination of maps at high-speed. We can now see them all around us—they are the spatial present and future that cartographers and GIScientists continue to advance through research, teaching, industry, and use.

The CaGIS-produced AutoCarto archive makes one thing clear. Aangenbrug's warning that "if we don't do it [automate map production], the TV people [and others] will step in and take over," seems to have fallen on exceptionally fertile ground. Cartography and GIScience have delivered a geospatial transformation on a par with other great discoveries of our times. It's exciting to know that both the *CaGIS* journal and the papers of the AutoCarto research symposium, which helped nurture the modern golden age of U.S. and international cartography and GIScience, are now available to all!