Brief Processual History of Volume 6

Cartography in the Twentieth Century—volume 6 of *The History of Cartography*—applies the innovative, critical, and rigorous approach that has marked the series from its inception to mapping activities as they developed after 1900, largely in the Western world. As with previous volumes, our strategy for developing volume 6 was to select a group of knowledgeable and willing advisors who reflect a wide range of cartographic themes, to rely on them to help us select a larger group of knowledgeable and willing contributors, and then to rely on these contributors to write informative essays with a useful set of references for further reading. But volume 6 differs from its predecessors in some key respects. Because of the period covered, many contributors have experienced the developments and consequences described in their entries firsthand. Consequently, we relied in part on the contributors' memories—not recollections alone, but memories useful in identifying relevant facts and useful references; in this sense volume 6 is at least in part a collective memoir. We also relied on the newly redefined intellectual structure of volumes 4, 5, and 6 outlined in the introduction. Implementing that structure was neither straightforward nor predictable. This concise account of how we translated that design into 529 encyclopedia entries is included here partly to satisfy users' curiosity about the thoroughness of the effort and partly to describe the unprecedented collaboration of hundreds of cartographic scholars and practitioners in a systematic attempt to write a comprehensive history of cartography's most recent epoch.

Volume 6 of *The History of Cartography* was rooted in the experience of producing volumes 1, 2, and 3, which depended heavily on grants from the National Endowment for the Humanities (NEH). Although the NEH had supported other massive reference works like the *American National Biography* and the *Dictionary of American Regional English*, it was not likely to support volume 6 while volume 3 was still under way and work on volume 4 was set to begin. Even so, the NEH provided support for a three-day conference on "Issues and Events in Twentieth-Century Cartography," held in Washington in early October 1997 and hosted by the U.S. Library of Congress. This event marked the formal beginning of planning for volume 6.

Participants were selected carefully to sample a broad range of expertise and viewpoints. Although language and travel costs limited the agenda's geographic reach, scholars from Canada (2), the Netherlands (1), and the United Kingdom (3) attended. The conference had four goals: refining the table of contents, identifying possible contributors, identifying key themes, and gathering suggestions on strategy and approach. Discussion in small-group meetings and plenary sessions contributed new ideas to an existing checklist of topics to be included in volume 6. Although the possibility of an encyclopedic structure was discussed at this conference, series cofounder David Woodward and I were still pursuing the long-essay approach discussed in the introduction.

The most promising funding source was the National Science Foundation, which was committed to supporting research on the history of science and technology and had contributed a major grant between 1994 and 1999 to support books 2 and 3 of volume 2. At first we submitted an ambitious but expensive five-year plan to develop volume 6 as a collection of long essays. After our proposal received mixed ratings and the NSF deemed the budget too costly, we pitched a more specific, less ambitious project that addressed the dearth of published scholarship by commissioning eleven researchers to write exploratory chapters on diverse aspects of the history of cartography in the twentieth century. The NSF saw our Exploratory Essays Initiative (EEI) as a workable preliminary step in developing volume 6 and agreed to fund us for three years.

In accord with the "initiative" model used for the NSF-funded National Center for Geographic Information and Analysis, the EEI recruited an international board of distinguished advisors and advertised widely for participants willing to write 10,000-word essays. With our advisors' help we selected eleven participants, who in June 2000 attended a three-day mentoring conference, held in Chicago, to meet with the advisors, exchange insights about strategies and sources, and discuss their preliminary plans and our schedule for the edito-

rial review of progress reports and preliminary drafts. Penultimate drafts were due in fall 2001, and results were presented orally in Los Angeles in April 2002 at a two-day symposium held in conjunction with the annual meeting of the Association of American Geographers. Woodward and I served as guest editors of the July 2002 issue of *Cartography and Geographic Information Science*, in which our short introduction preceded the ten essays that had survived editorial scrutiny (Monmonier and Woodward 2002). These essays addressed topics ranging from photomechanical reproduction techniques and commercial road maps to the Cold War, cognitive map-design research, and the impact of automation on the cartographic workforce.

As a process, the EEI was a valuable run-up to volume 6. We recruited a broadly international seven-member advisory board, which included scholars from Austria, Canada, Germany, the Netherlands, the United Kingdom, and the United States. Our EEI participants reflected a slightly narrower range of nationalities: one each from Russia and Spain, three from the United Kingdom, and six from the United States. While the roster might seem top-heavy with English speakers, the pool of applicants, roughly three times larger, had a similar bias toward North America and the British Isles. Although the ten published 10,000-word essays would have constituted ten percent of a long-essays volume of a million words, the effort was not lost when we switched to the encyclopedic format in 2001: all participants became contributors to volume 6, along with four of our seven advisors. In addition, two EEI participants and six EEI advisors became members of the volume 6 advisory board, and two participants and one advisor eventually joined the team of four volume 6 associate editors.

The imminent success of the EEI encouraged us to petition the NSF for a five-year grant to start in September 2002, immediately after funding for the EEI ended, but serious concerns about cost required a revised proposal, which the NSF's Science and Technology Studies (STS) Program (now the Science, Technology, and Society Program) funded with a September 2003 start date. A bridging grant from the Gladys Krieble Delmas Foundation provided a research assistant for the intervening year, but when efforts to secure significant additional support from dominant firms in the geospatial technology industry failed, we scaled back staffing plans for the Syracuse office, which was to have had a full-time editorial coordinator.

Designing Volume 6

In addition to producing research relevant to volume 6 and identifying potential contributors, the EEI heightened awareness of the impracticality of the long-essays approach. It was during the EEI that Woodward and his collaborators on the *History* adopted an encyclopedic format for volumes 4, 5, and 6, as discussed in the introduction.

Before developing a preliminary list of entry terms for volume 6, Woodward and I identified a shortlist of the diverse impacts of mapping on society that make the twentieth century a coherent era of cartographic history. We were concerned that the volume cover major conceptual shifts, including imaging the planet from satellites, aircraft, and other overhead platforms; the increased salience of the long-standing relationship between cartography and warfare; the conversion of geographic information to electronic media; the enhanced role of mapping in local and national public administration, regional planning, and the representation of national identity; and the globalization of mapping technology and cartographic practice concurrent with a fuller customization of map design and content, an increased diversity of map types, and a broader range of cartographic applications.

Experience with the EEI demonstrated the value of knowledgeable advisors. In developing the list of entry terms and selecting authors for volume 6, we initially enlarged the EEI board to eighteen members by recruiting other leading academics as well as representatives from the non-Western world. In 2003 and 2004, we expanded our board of advisors further by recruiting specialists able to advise on the history of remote sensing, digital computing, photogrammetry, cartography, and GIS while collectively covering commercial, civil, governmental, and military spheres. Other additions brought expertise in earth science, engineering, geodesy, law, map publishing, late twentieth-century military history, social movements, software development, and cartography in Asian and other non-Western societies. The ultimate board of thirty-five advisors (listed facing the volume title page) includes scholars from ten countries: Australia, Austria, Canada, China, France, the Netherlands, Russia, Spain, the United Kingdom, and the United States. Many of our advisors have extensive international experience as a result of holding office in the International Cartographic Association, collaborating with senior officials in other countries, or consulting with international agencies, foreign governments, or multinational corporations. Although Latin America, South Asia, the Middle East, and Africa were not represented directly, additional scholars were consulted as needed.

In December 2003 we began working with advisors to refine our list of entry terms. Advisors were asked whether each entry in areas close to their field of interest had a significant history in its development, its application or operation, or its impact; whether it should be merged with one or more other entries (or, conversely, split into two or more entries); and whether it merited a very long, long, medium, short, or very short treat-

ment. Advisors were also asked to suggest prospective authors and to propose additional terms. Their suggestions proved useful when the list of entry terms was refined the following summer.

In separate surveys board members were asked to provide similar evaluations for tentative lists of 137 individuals, 58 governmental agencies (like the British Library and the Jet Propulsion Laboratory), and 47 nongovernmental academic or commercial institutions (like Rand McNally and the World Bank). Because of space limitations and the large number of potential subjects for biographical entries, we decided to limit this type of article to individuals with (a) more than one significant innovation or contribution and (b) an interesting life that might account for his or her multiple contributions. Most individuals could be dealt with appropriately and efficiently in entries describing the innovation, concept, product, or activity to which they contributed. Our assessment of the expectations of readers who will use volume 6 as a "reference of first resort" was important in determining which individuals merited a separate biographical entry. Although limiting individual entries to persons no longer living would conserve space, this strategy was rejected as arbitrary and unworkable. Because of the need to conserve wordage, individual biographies were severely limited in length. Most were allocated only 500 words, with the largest allocations, 1300 words, reserved for Max Eckert, J. B. Harley, Erwin Raisz, Arthur H. Robinson, and David Woodward. The entry for Woodward was added shortly after his death in August 2004.

Two unavoidable biases were recognized early in the development of volume 6. The first is a dominant, almost exclusive focus on the processes and technologies of Western cartography, particularly on developments in Europe and North America, and the second is a bias toward the English-language literature, which we partly mollified by recruiting non-English-speaking scholars as contributors and encouraging them to cite the best sources and write in their own language (our budget included funds for translation). Of course, many chapters in the three books of volume 2 appropriately extend their narratives into the modern era, when traditional practices persisted or incorporated components of Western cartography. Moreover, several entries in volume 6 explicitly address impacts of Western ideas and technology in other parts of the world as well as the modification of Western practices to serve non-Western objectives and ideology. Representative examples include the entries on "Cartographic Societies in Latin America," "Decolonization and Independence," "Eurocentric Bias," "Geodetic Surveying in Latin America," "Indigenous Peoples and Western Cartography," "Marine Charting by Japan," "Military Mapping by China," "National Atlas," "Road Mapping in Africa," "Topographic Mapping in the Middle East," "United Nations," and "Wuhan cehui keji daxue (Wuhan Technical University of Surveying and Mapping; China)."

The final stage in designing volume 6 was to define each entry precisely. The approximate lengths (short, medium, long) were converted to specific word counts, and proportional numbers of references and illustrations were allocated to each, all to ensure that the budget of one million words and one thousand illustrations would be met. Because the generic scope descriptions were necessarily general, they were supplemented by specific guidance, added to make certain the contributor did not miss a point about a topic that the editor deemed essential. For example, the entry "Accuracy in Mapping" was assigned to the precise category "cartographic concept," for which the scope description reads:

> This focused essay explores a specific concept that featured in the production or use of cartography between 1900 and 2000. Identify the variant names of the concept (if any). Briefly define the concept and explain how it originated. Describe any significant variation in the concept, whether over time or between regions. Assess the contemporary and historiographical significance of this concept for twentieth-century cartography, especially with respect to (as appropriate): the larger scientific and technological contexts of cartography; map aesthetics; diminished international differences in practices or design; the diverse impacts of mapping on society; the increased use of maps as tools of governance; the transition to electronic media; the growth of overhead imaging; or the heightened salience of the long-standing relationship between cartography and warfare. Cite both contemporary and relatively recent literature.

To make the scope description more precisely appropriate to the particular entry, it was expanded by the further specific guidance:

> Examine in a historic context the concept of "accuracy" (including attempts to define "accuracy" and its relationship to "precision"), numerical standards for horizontal and vertical accuracy, the relevance of these standards to mapmakers and map users, reliability diagrams, categorical accuracy or attribute accuracy, and the issue of the map as an objective representation.

Specific guidance was also used to complement and refine context descriptions. For example, the entry "Intellectual Movements in Electronic Cartography" was supplemented by the context description:

> The context for this entry is Academic Cartography, which is the endeavor encompassing the institutional aspects of cartographic scholarship and training. Carried out in institutions of higher education but

> mediated through cartographic societies, academic journals, and other forms of academic discourse, it includes textbooks and academic paradigms and also cuts across (but does not subsume) other cartographic modes influenced by academic researchers, notably those concerned with map design, symbolization, map projection, cartographic analysis, and software development.

To mollify the context description's generic formalism as well as promote a more appropriate use of the 1900 words allocated this entry, the contributor was also advised specifically to "include GIScience, analytical cartography, PPGIS [public participation GIS], and the influence of the 'communications school' (Shannon, etc.) on electronic cartography."

A list of related entries was prepared for every entry. These cross-references were useful in helping contributors assess a topic's coverage elsewhere in the volume as well as in helping the editors carry out a careful review of allocated word counts, references, and illustrations before entries were commissioned. Because related entries provided supportive coverage of a topic, an entry with very few related entries might need to be longer than an entry of equal importance but with many more related entries. The related entries were also useful later in developing a *See also* list for each entry.

Once volume 6's design was established, approval was sought from the University of Chicago Press. Fortunately for volume 6, the volume 4 editors had already broken much new ground in assembling the necessary prospectus, including the refinement of the hierarchically integrated conceptual clusters, the identification of precise categories, and the crafting of generic scope descriptions for each. The volume 6 prospectus contained a full list of entries with specific allocations of word length, illustrations, and references. The prospectus was critiqued but enthusiastically supported by five anonymous reviewers and the volume approved for publication by the press's Board of University Publications on 25 May 2005.

After a publication agreement with the press was signed in December 2005, I was empowered to recruit contributors: a formidable task involving a massive amount of correspondence. To expedite the preparation of invitations and contracts, the central administrative office of the Project in Madison used a relational database system with all information about each entry and potential contributors. Once a contributor agreed to write for the volume, the software tracked the progress of the entry.

Each contributor also received a copy of our *Handbook for Contributors*, written to address a broad range of concerns and responsibilities. Some of these were logistical matters, such as the selection and format of bibliographic references (including the value of citing accessible references and avoiding inherently ephemeral websites). But the *Handbook* also advised on broader matters of substance. Because many potential contributors had little or no experience in historical scholarship, we cautioned contributors to avoid a presentist approach, focusing on state-of-the-art practices while ignoring antecedents and impacts, or otherwise failing to place the subject in context.

Volume Preparation

When refining the list of entry terms and identifying qualified contributors proved easier for volume 6 than for volume 4, the Project's editors collectively decided that volume 6 should precede volume 4. Publishing the volumes out of sequence was already a given, since Woodward's death had delayed planning for volume 5, and working on two volumes simultaneously would strain limited resources in Madison and Chicago.

The first invitations to potential contributors were mailed in late January 2006, and by the end of May, we had contributors lined up for 332 of our then 520 entries. Over the next four years, the number of active entries fluctuated, as several new entries were created and two dozen were deleted because of difficulty recruiting contributors or a decision that some topics were of lesser importance. Fusion and fission also occurred: the entries "Thematic Mapping: Design and Construction" and "Thematic Mapping: Institutional Setting" were merged after a potential contributor made a convincing argument that this separation was unwise and unworkable, whereas "Topographic Mapping in Africa" was partitioned among three entries (by the British, by the French, and by the Germans) after three distinct threads, requiring different contributors, became apparent. Entries added after the first round of recruitment include, among others, "Cartographic Duplicity in the German Democratic Republic"; "Cloth, Maps on"; "Conferences on Computer-Aided Mapping in Latin America"; "Escape and Evasion Map"; "Folding Strategies"; "Historic Preservation and Cartography"; "Historical Geography and Cartography"; "Map Pin"; and "World Revolution and Cartography."

Submissions were held until I had time to read the manuscript for general clarity, coherence, and conformance with the original assignment; to ask the contributor for clarification or additional information; and to negotiate approval of any rewording I thought appropriate. Approved manuscripts were then sent to Madison for fact and reference checking and more detailed line editing. By mid-May 2007, we had received 214 manuscripts, but only 45 had been vetted and forwarded to Madison. During the summers of 2007 and 2008 I began to catch

up with the submissions, but the realization of how much time and effort would be involved in finishing the project led to a request for a second five-year grant, submitted to the NSF in July 2007 and approved several months later. A central element in the new proposal was the hiring of two associate editors (Karen Severud Cook and Joel L. Morrison), who helped vet the manuscripts. In mid-summer 2010, we hired two additional associate editors (Peter Collier and A. Jon Kimerling).

Meanwhile, the Madison office had been making steady progress. Graduate student reference editors Jed Woodworth and Jen Martin, whose work was then reviewed by the managing editor Jude Leimer, carried out a comprehensive edit and fact check of every entry. In addition to reading and checking the content of each entry line-by-line, the reference editors obtained and examined each reference, checked inline references and page numbers, and put citations into University of Chicago Press style. The Madison office also undertook the complex task of maintaining consistency between entries including dates, spelling of personal names, map titles, personal titles, use of acronyms, place-names, references, names of institutions, and illustrations. The Library of Congress catalog, other national library catalogs, biographical dictionaries, volume contributors, and similar recognized sources were used to standardize personal names throughout the volume—for example, except in the introduction, Brian Harley is always J. B. Harley. To maintain consistency, alphabetical lists of personal names and dates and acronyms from completely checked entries were compiled and supplied to the press's copyeditor as the basis of their style sheets.

The managing editor also oversaw the work of our translators (listed in the preface). Twenty-six (5 percent) of the volume 6 entries were submitted in a language other than English: French, German, Italian, Japanese, Russian, and Spanish. After translation, the editor or an associate editor reviewed the translated entry and addressed queries to the contributor either directly or through an intermediary.

Each entry has a separate bibliography. Although the Project's editors originally considered having a single master bibliography for each encyclopedic volume, in emulation of the comprehensive bibliographical indexes in volumes 1 through 3, its placement at the back of only one of the volume's two bound parts was deemed a serious inconvenience not worth whatever wordage might be saved by eliminating redundant citations. Although we permitted references published in electronic journals, we did not include URLs, which are notoriously unstable, but instead used the notation "Online publication."

Contributors were intentionally asked to suggest more illustrations than the number budgeted for volume 6. After eliminating images that were inappropriate or redundant, we eventually ended up with 1,153, all of which were tracked in a database by Madison-based illustrations editor Dana Freiburger. With rare exceptions we avoided photographs of people, buildings, or the title pages of books and journals in order to focus on maps. Though we were strict in enforcing a no-portraits policy, a few photographs juxtapose an individual or group with a map or piece of equipment. We were also careful that our decisions about sizing and cropping of images did not result in losing important details or sacrificing a revealing overview of a significant spatial pattern or a map's geographic scope. Where an excerpt was cropped from a larger image, the caption also reports the size of the entire map as well as the original size of the area shown.

One hundred twenty-one illustrations were produced as line art by the University of Wisconsin–Madison Cartographic Laboratory. These include small-scale whole-world maps illustrating the graticules of noteworthy map projections, reference maps, time-series graphs, and other information graphics. Designed for legibility and efficient use of space, these drawings reflect the graphic style employed in earlier volumes.

This and subsequent encyclopedic volumes will benefit substantially from the press's agreement to produce the books in full color throughout. In the first three *History* volumes, most maps published originally in color were converted to halftones, and those that were shown in color were grouped into galleries of color plates, usually well removed from the pages where they were discussed.

The completed manuscript for volume 6 that we submitted to the press for copyediting and production in the summer of 2013 benefited from this evolutionary and theoretically informed process of more than a decade.

MARK MONMONIER

BIBLIOGRAPHY

Monmonier, Mark, and David Woodward, eds. 2002. "Exploratory Essays: History of Cartography in the Twentieth Century." *Cartography and Geographic Information Science* 29, no. 3.