cartographic perspectives

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Number 51, Spring 2005

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Letter from the Editor

Dear Members of NACIS,

I am honored to be writing the editorial column for this *Special Issue* of *Cartographic Perspectives*. This issue celebrates the lives and careers of Professors Arthur Robinson who passed away October 10th, 2004 and David Woodward who passed away August 28th, 2004. When the idea for this special issue was born, there was a sureness that whatever was produced would have to be unrivaled…not found elsewhere…entirely unique. That whatever was produced would have to provide a lens with a whole new tint through which to view the accomplishments of these two vastly influential men. That whatever was produced would not only honor their academic contributions, but would provide a glimpse of who Arthur and David were as colleagues, mentors and friends.

(*continued on page 3*)

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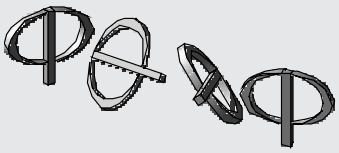
about the cover



The cover image was created by Pat Gilmartin at the University of South Carolina.

"T in O Map" by Pat Gilmartin. Earthenware with bronze patina, 12" diameter.

This sculpture is an abstracted version of a Medieval form of world map known as a "T in O," so-called because of the "T" (formed by the Mediterranean Sea, the Nile River and the Don River) inside an "O" (created by the ocean waters, which were said to flow around the earth). The map is centered on Jerusalem, the center of Christianity, with east (the Orient) at the top. Europe lies in the lower left quadrant, Africa in the lower right, and Asia is at the top.

(*letter from editor continued*)

I think that this issue of CP succeeds in every way.

Beginning with the cover, which is an image of a sculpture of a T & O map created by Patricia Gilmartin, each page of this issue shares some kernel of the impact of these two men. During the past 8 months, I have had the incredible and humbling experience of working with past Ph.D. students of David Woodward and Arthur Robinson on contributions for this issue. I have traded letters and/or emails with Albert Farley, Norman Thrower, Henry Castner, Joel Morrison, George McCleary, Judy Olson, Karen Severud Cook, Janet Mersey, Matthew Edney, Guntram Herb and Paula Rebert, and with Judith Tyner, a Ph.D. student of Thrower's. I have worked closely with Henry Castner on an academic genealogy. I have had email contact with at least 53 (at last count) people who hold a place in the Robinson academic genealogy. I have learned much…enough to cause me to feel relatively inadequate to be writing this column, really. But I write none-the-less.

In this issue are papers by Judith Tyner and Matthew Edney on the impact of Robinson's *Elements of Cartography* over the past 50 years (Tyner) and how Woodward's *History of Cartography* transformed the discipline (Edney). Following these papers is Robinson's Academic Family Tree that Henry Castner crafted by hand…a wonderful contribution! Henry's tree includes only those students who completed theses in "cartography"…there is a more complete genealogy at the end of this issue that includes 458 names.

Following this are nine personal stories from past Ph.D. students of Robinson's and Woodward's …letters that share thoughts, reflections and memories about their mentor. These stories are priceless, really, but one is especially worthy of note. When I asked for remembrance pieces from past Ph.D. students, I suggested a 1000 word length. Karen Severud Cook submitted a pared down version of a recorded discussion that she had with Arthur Robinson in 1997 so as to meet this suggested length. When I read her submission, I found it so fascinating that I insisted that she submit the entire transcript…which she did…and which is published here in its entirety. I am certain that you will find it as fascinating as I did. The last part of this issue includes an image called The Robinson XI Projection…an "Escher type" image created by, and given to Arthur by his doctoral students upon his retirement in 1980. This diagram is all about scale, bringing the various "worlds" of Robinson together into one graphic. Following this diagram is a letter from Lawrence Martin from the Office of Strategic Services (OSS). This letter was written to E. F. Bean at UW Madison when Madison hired Robinson at the end of his term at the OSS in 1946. It speaks of Robinson's immense impact on the production of maps for the military, and how he rose from draftsman, to Chief of the Map Division at the OSS. He achieved this before ever becoming a Professor.

I want to thank Henry Castner, Matthew Edney, Judy Olson and Judy Tyner—they were invaluable in terms of historical knowledge and fact checking. I especially want to thank Henry Castner for his knowledge and talent that produced (by hand!) the Academic Family Tree of Arthur Robinson, and for his contribution of the Robinson XI Projection and the letter from Lawrence Martin. Lastly, I want to thank the Department of Geography at UW Madison for its assistance in putting together this issue. Enjoy!

As always, I welcome your ideas, comments and suggestions.

Warmest Regards,

Scott Freundschuh, Editor

in this issue
(continued)

Elements of Cartography: Tracing Fifty Years of Academic Cartography

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When Arthur Robinson published the first edition of *Elements of Cartography* in 1953, it marked a major change in academic cartography. Erwin Raisz's *General Cartography*, first published in 1938 and revised in 1948, had been the standard text. Robinson's book represented the metamorphosis in cartography after WWII and set the standard for the second half of the twentieth century. A review of the book's contents through its 6 editions reveals the prevalent thinking in cartography during a dynamic period in the history of cartography. Through it we can trace changes from hand-drawn maps to the rise of GIS and remote sensing. Although *Elements* is no longer the major textbook, its impact was enormous. This paper traces the history of late twentieth century cartography through the pages of *Elements of Cartography*. A content analysis of all six editions of *Elements of Cartography* was done to determine the emphasis on various aspects of cartography. An analysis of Erwin Raisz's two editions of *General Cartography* was also included in order to note the changes in content and philosophy from pre-war to post-war cartography.

Keywords: cartography, textbooks, *Elements of Cartography*, Erwin Raisz

INTRODUCTION

Anyone who took a course on cartography, or who taught cartography in the last half of the 20th century, learned and taught the "gospel according to Robinson", and the gospel was *Elements of Cartography*. Amen. The impact of this textbook during a nearly fifty-year period was enormous; it both reflected changes in the field, and influenced them. The first edition of *Elements* was published in 1953, and now a half-century later, we take many of its innovations for granted. However, when it was first published, it was revolutionary.

". . . the gospel was Elements of Cartography*."*

John Wolter noted that textbooks have historical value in tracing the trends of a science. He examined the contents of the first three editions of *Elements* (Wolter, 1975). Although one can trace the history of any field by looking at any series of textbooks, *Elements* is unusual because of its extremely long run of 6 editions under the same primary authorship, spanning 1953 to 1995—a period that encompasses major changes in cartography.

In this article, I will look at changes in the book, rather than relate to the reader the history of cartography in the last half of the 20th century—many readers of *Cartographic Perspectives* have lived the history, some even making history. In order to understand the impact of *Elements of Cartography,* it is necessary to understand the cartographic culture of the period when it was introduced.

Initial submission, June 2004; revised submission, September 2004; final acceptance, September 2004

Pre World War II

Erwin Raisz's *General Cartography* was the standard text in the years immediately preceding and following WWII. The first edition was published in 1938, and the second edition in 1948. John Wolter considered the first edition of *General Cartography* a landmark textbook, in that it emphasized the "definitive nature of cartography" (Wolter, 1975). The 1938 edition provided a picture of what cartography was like 65 years ago. At that time there were few geography departments that offered courses in cartography, more often than not they were offered in civil engineering departments, and certainly the technical aspects were not considered a suitable research subject. Other than "history of cartography", or the creation of new projections, there was little in the literature on cartography. Cartographers made maps, they didn't write about them or concern themselves with whether symbols were effective and understood by readers. Cartography was a craft and a body of skills, not what we today would consider a science.

"Cartographers made maps, they didn't write about them or concern themselves with whether symbols were effective and understood by readers."

In the introduction to the 1938 edition, Raisz posed the question, "What should be included in a cartography course?" (see Figure 1) Raisz believed cartography should qualify the student to give clear and *correct* [emphasis mine] graphic expression to his/her ideas. He felt that in order to do this well, the student must adhere to certain cartographic principles and traditions, which could best be learned by an historical approach. In other words, the right way to make a map was the way maps had always been made. He felt the student should know commonly used projections and be able to construct them, but he said, "The mathematics of projections will be of little practical value to [the student]...". The course should teach the student to select symbols intelligently, with special regard to the modern methods of representing relief. Symbols here were primarily qualitative symbols, such as would be found on a topographic map, or on other general maps. And finally the course should teach good composition, handling of tools, lettering (particularly hand lettering), and fine drawing (Raisz, 1938). Preparation of special (thematic) maps, globes, field sketching and 3-D models was the subject of advanced study. One must remem-

1938 Goals of a Cartography Course

The purpose of such a course is to qualify the student to give clear and correct graphic expression to his ideas. To do this well he must adhere to certain cartographic principles and traditions, which can best be learned by a historical course.

The student should know the commonly used projections and be able to construct them. The mathematics of projection, however, will be of little practical value for him.

The course should enable him to select his symbols intelligently, with special regard to modern methods of representing relief.

Laboratory exercises should teach him good composition, handling of tools, lettering and fine drawing.

Figure 1. Raisz, Erwin. General Cartography, New York: McGraw-Hill, 1938.

ber that in 1938, technical pens, mylar, rub-on lettering, and pre-printed patterns, all tools we now consider *old fashioned* had not yet been invented.

The book included a fifteen-page chapter on *distribution maps* in which isarithms, choropleth, and proportional symbols were discussed. A twenty-three page section described economic maps, geographic maps, and maps of other sciences. There was no discussion of how to make such maps, or where to obtain data. Nor was the term "generalization" found in the book. The term *Statistical maps* was used as a synonym for distribution maps, but there was no content on even basic statistical analysis. References listed in the bibliography were primarily to history of cartography, to projections, and to map drafting.

"References listed in the bibliography were primarily to history of cartography, to projections, and to map drafting."

World War II brought large changes in technology, especially for the speedier production of maps. One would expect that the 1948 edition of *General Cartography* would reflect those advances in the field that were brought about by the war. However, except for a chapter on wartime cartography (in which Raisz described mapping agencies and the kinds of maps they made) and the addition of two chapters on air photos, there were few revisions. The bibliography in the second edition was divided into categories, and included many works on air photos and air photo reading, plus a section on surveying. The basic thrust of the second edition remained the same as the first.

Raisz's textbooks emphasized practical aspects. He stated in the 1938 edition "In the beginning of [a course in cartography], while lectures are on the history of maps, the laboratory hours are best utilized teaching lettering and the use of drawing instruments." A list of drafting equipment, and a series of lab exercises was included (Figure 2). Many of the early exercises were specifically drafting exercises, with later exercises telling students to "make a population map of...", with little or no instruction on how to obtain data, let alone how to process the data. There were several field surveying exercises that took students outdoors with a plane table and compass. These examples, plus sections on field sketching, were indicators of the different ways cartographers and their activities were viewed in the first half of the 20th century.

"Raisz's textbooks emphasized practical aspects."

All the foregoing instruments should be part of the geographic drafting room of every university. For individual students of cartography, who do not want to go into map making professionally, the following equipment is sufficient for a regular year's course;

1 *HB* pencil
1 2*H* pencil
Gillott pens, Nos. 290, 303, and 404
3 penholders
1 instrument set, consisting of a compass, a divider, and a ruling pen
1 kneading eraser
1 soft eraser
1 celluloid triangle 8 inches long
1 wooden T square
1 bottle of India ink
1 No. 4 sable brush
2 sheets of one-ply Strathmore board, smooth finish, large size
2 sheets of two-ply Strathmore board, smooth finish, large size
1 set of colored inks
1 block of transparent tracing paper
1 bottle of reproduction white
1 sheet of cross-section paper
1 set of colored crayons
} for every six students

Figure 2.

Impact of WWII

In the fall of 1941, Arthur Robinson, then twenty-six years old, interrupted his graduate studies to go to Washington D.C. to work as a cartographer in what became the Office of Strategic Services (OSS). Eventually he became the director of the mapping division. While there, he and other geographers in the organization needed to make maps quickly, and therefore new techniques, map types, and technologies were developed. After the war, Robinson returned to Ohio State to work on his Ph.D.

In 1952, 1953 and 1954, Robinson published three pieces that set forth what he saw as the goals and research agenda for cartography. The first of these was *The Look of Maps*, the second was the first edition of *Elements of Cartography*, and the third was the section on cartography for the mid-century survey of geography titled *American Geography: Inventory and Prospect*.

"Ironically, The Look of Maps *contained no maps, but instead was a collection of essays on various aspects of map design."*

Robinson's dissertation was published in 1952 as *The Look of Maps*, which many consider to be THE impetus for the enormous changes in cartography for the next 50 years. Barbara Petchenik said

> if we examine the characteristics of recent decades of research in cartography we can find stated explicitly in this book all of the fundamental assumptions that shaped that research as well as the major goals the research has been organized to achieve.(1983, 38)

Ironically, *The Look of Maps* contained no maps, but instead was a collection of essays on various aspects of map design. In fact, Norman Thrower recalls that Erwin Raisz, on first seeing the book, fanned through the pages and said, "*The Look of Maps*—no maps to look at!" (Thrower, 2003, personal communication**)**

The third piece (chronologically), the section in *Inventory and Prospect* written by Robinson, affords not only an overview of the field of cartography, but Robinson's vision of the field. Although he had input from O.M. Miller and Erwin Raisz, clearly the primary view was Robinson's.

By the early 1950s, geographers, who like Robinson had been engaged in wartime cartography, returned from military service to teach. The number of geography departments that offered cartography and air photo interpretation subsequently increased. *Geographic cartography* as an academic discipline was emerging, and owing to research by Robinson, Jenks, and Sherman, cartographers were beginning to examine their work, and to ask questions about the effectiveness of maps, validity of data, and how to symbolize geographic information (Robinson, 1954; Wolter, 1975). The textbook *Elements of Cartography* provided the tools for academic cartographers.

"Prior to 1950, though, cartography was more of a craft than a science, as we have seen from Raisz's books."

Elements of Cartography

What was so revolutionary, so innovative about *Elements*? A cover blurb on the first edition of *Elements* says "One of the important innovations in *Elements of Cartography* is the inclusion of a chapter on map design, a phase rarely covered in other books" (Figure 3). Another cover blurb said "Presents cartography as an intellectual art and science rather than as a sterile system of drafting and drawing procedures" (Robinson, 1953). Today these topics are such an integral part of any cartography text or course that they would not be mentioned. Prior to 1950, though, cartography was more of a craft than a science, as we have seen from Raisz's books.

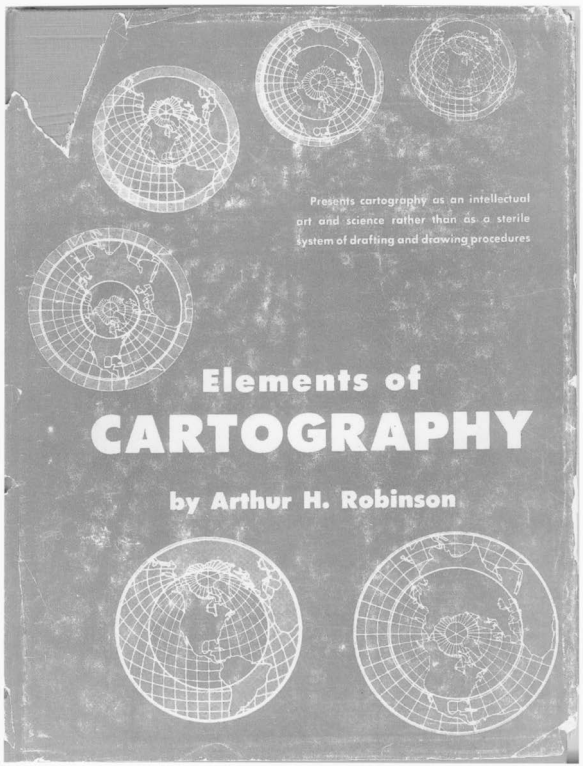

Figure 3. First edition of Elements of Cartography *(see page 77 for color version)*

Figure 4. Second edition of Elements of Cartography *(see page 77 for color version)*

The first edition of elements was only 218 pages of text, plus eight appendices. The first chapter, "The Art and Science of Cartography", set out Robinson's philosophy of the field. It included a discussion of Map Data, Principles of Cartography, Art in Cartography and the Science of Cartography. None of these had been described in Raisz's works. Two chapters were devoted to projections. The first discussed the employment of projections, an analysis of deformations including Tissot's indicatrix, and ways of classifying and describing projections. A second chapter focused on the construction of eighteen specific projections. An appendix of projection tables was included. One must remember that, in 1953, projections were drawn by hand. As a result, many introductory classes focused on projection use and construction.

Although there is only a twenty-one-page chapter on "Design", this aspect is woven throughout the book. This is especially apparent in the material on map lettering. While Raisz focused primarily on hand lettering, and told how to make a lettering guide, Robinson discussed the importance of lettering, planning for lettering, styles of type, and interaction of lettering and background. In other words, cartographic typography.

One of the lengthier chapters was on symbolization and distribution maps. Here we find another innovation—a section on processing data (the quantitative revolution in geography was beginning), and a discussion of specific symbols and symbology. Other texts prior to *Elements* (and even some post-*Elements*) addressed specific map types by geographic phenomenon, such as climatic maps, geologic maps, topographic maps, and population maps. If one wanted to learn about isarithms in general, it was necessary to look up each map type by geographic phenomenon that might use isarithms.

Though Robinson stated "The act of drafting a map is no more cartography than typing is authorship", (Robinson, 1953, 10) he recognized that ultimately maps had to be drafted and reproduced, thus a twenty-five-page chapter was devoted to drafting and reproduction. [Today we might say that knowing mapping software is no more cartography than knowing word processing is authorship, and we teach the use of various software packages.]

The second edition of *Elements* appeared in 1960, (Figure 4) and included no major changes, although research of the previous seven years was incorporated, and some sections were expanded. Projections increased from two chapters and two appendices to three chapters and two appendices. Symbolization, which Robinson had seen as the weakest chapter, was increased to three chapters and fifty-nine pages up from twenty-six pages. In this edition, Robinson responded to some criticisms expressed in reviews, and the book was, as are many second editions, a refinement of the earlier edition. In the preface to the second edition, Robinson stated,

> Perhaps the most significant [change] has been a continuation of the recent expansion of interest in cartography and in area analysis in all fields. The persistent growth of population pressures and the strengthening of regional ties throughout the world have multiplied many times over the need for both the smaller-scale map and the topographic map. Cartography has, therefore, continued to develop rapidly, both as a research technique as well as a tool of presentation. (Robinson, 1960, v)

Especially reflective of changes in geography was a section on elementary statistical concepts. Although only slightly over seven pages, and dealing primarily with measures of central tendency and the standard deviation, this section was a departure from previous works.

By the time of the third edition in 1969, (Figure 5) the quantitative revolution was in full force in Geography, and computers were increasingly being used. Randall Sale, who had been involved in earlier editions of the text, was listed as a second author. The book was expanded to a total of 343 pages. In the preface the authors stated,

> The study of spatial distributions is increasingly significant, both in the number of disciplines concerned and in the technical support provided by modern data gathering, machine processing, and new analytical methods. As a consequence, the demands upon cartography to map and display spatial variations and relationships also has increased. It is not just a matter of more maps being wanted by greater numbers of people: the complexity and quality of the maps needed have increased at the same time. (Robinson and Sale, 1969, v)

For the first time in a cartography textbook, changes in the field were described as a revolution.. Robinson stated, cartography is in the midst of a revolution, and few aspects of this complex field have escaped the forces of change.... (Robinson and Sale, 1969, v)

In this edition, the chapter on construction of projections was relegated to an appendix reflecting the increasing use of computers for this task. The number of pages devoted to processing data and symbolization was increased from a single twenty-six page chapter in the first edition, to three chapters totaling seventy-four pages by the third edition. A major change was the addition of a twenty-nine-page chapter on "Compilation from Air Photographs", which was a mini-course on photo interpretation and photogrammetry. For the first time there were references to automation in cartography in the index.

The fourth edition in 1978 (figure 6) marked several changes. The book had expanded to 448 pages, twice the size of the first edition. A third author, Joel Morrison, at that time with USGS, was added. A chapter detailing color theory and employment was included as well as a color signature, reflecting increased interest in color

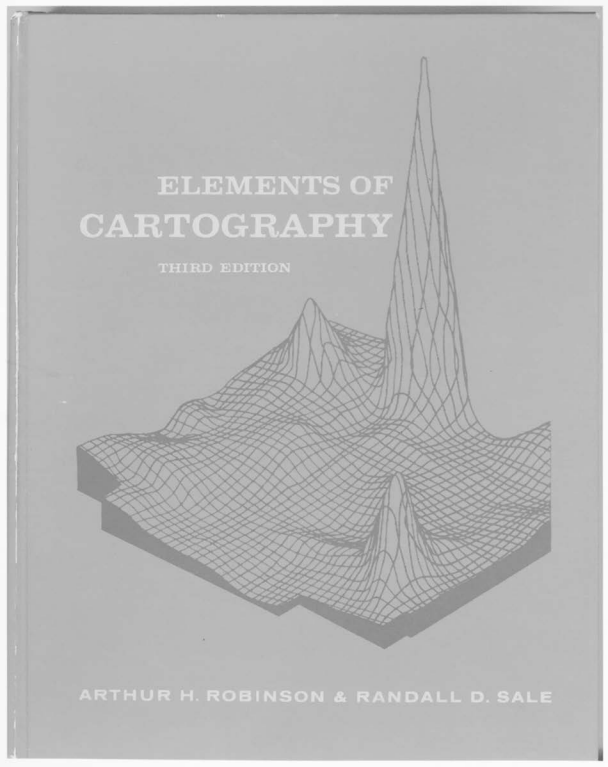

Figure 5. Third edition of Elements of Cartography *(see page 77 for color version)*

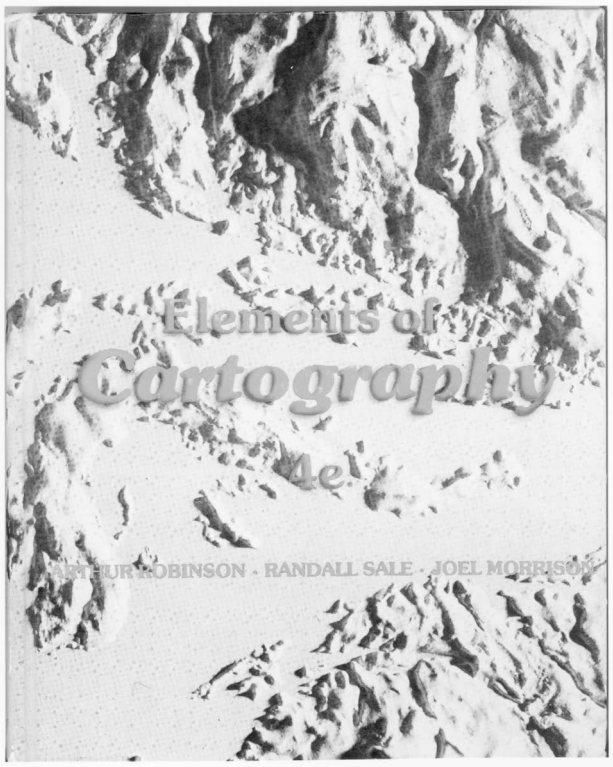

Figure 6. Fourth edition of Elements of Cartography *(see page 77 for color version)*

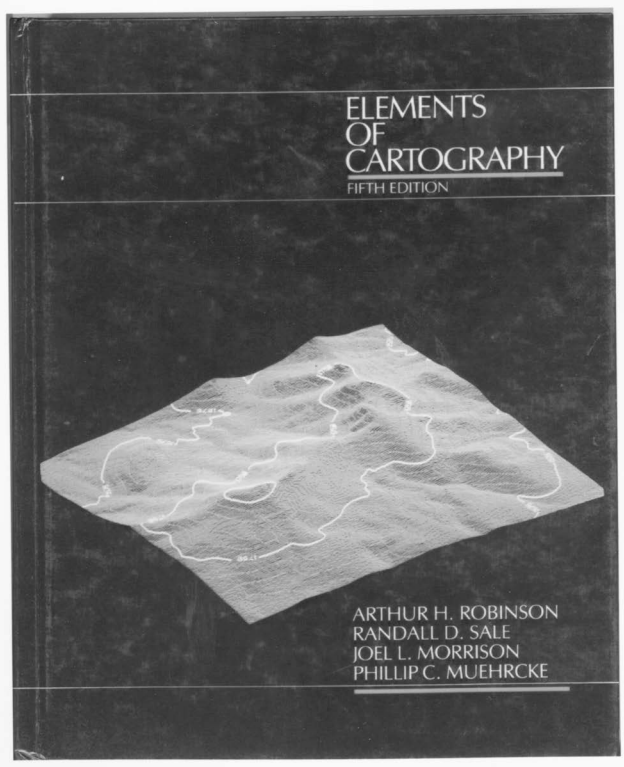

Figure 7. Fifth edition of Elements of Cartography *(see page 78 for color version)*

research. All illustrations were in two colors. Generalization was given its own chapter, and symbolism was enlarged "to reflect the basic significance of this communicative aspect of cartography" (Robinson *et al*, 1978, v). A significant change in the 4th edition, marking the impact of the technological revolution, was the inclusion of material on computers. References to computer assistance were made throughout the book, and a separate twenty-page chapter "Computer-Assisted Cartography" was added. The subject was still new enough that a two and one-half page glossary was included in the chapter. The material on air photography was expanded to include remote sensing.

By the fifth edition in 1985, (Figure 7) the cartographic "revolution" was in full swing, and *Elements* reflected this. Phillip Muehrcke had come on as fourth author, and the book had grown to 544 pages. The authors recognized that the revolution in the field was more than technological, but included changes in the basic concepts.

Cartography is in transition. Where the changes will lead is uncertain, but change in the discipline is pervasive, and the rate of change seems to be accelerating. Many of the changes are the result of very rapid and substantial development in the technology available to cartography. But, equally important, a conceptual maturation of the discipline itself has evolved. (Robinson *et al.*, 1985, v)

They noted that many practitioners must also adopt a new awareness of why cartography exists and develop an appreciation for its growing usefulness.

> ...as cartography has matured to an independent field, its basic principles have received increasing attention with the result that the field of cartography has developed to the stage where it is possible to talk with some confidence about basic theoretical principles that guide the mapping process. (Robinson *et al*, 1985, v)

"They noted that many practitioners must also adopt a new awareness of why cartography exists and develop an appreciation for its growing usefulness."

Cartography texts could no longer be "recipe books" or "how to" books.

The authors also pointed out that the cartographic curriculum at universities was lagging behind advances in the field. In 1984 desktop computers were becoming more common, but mapping software was not readily available and much of it was crude. Departments were adding computer labs and "computer-assisted cartography" courses, but in many cases were hampered by administrators who saw geography as a "chalk and blackboard" discipline. This was especially true for small departments. *Elements of Cartography* probably served as ammunition in the fight for departmental computer labs at some universities.

In the fifth edition, a sixteen-page chapter on "The Nature of Cartography" was introduced, which included a discussion of the four different foci of Cartography (geometric, technologic, presentation, and artistic). Another chapter (thirteen pages) was devoted to the "Technology of Cartography". Remote sensing was given its own chapter. The book was divided into 4 sections: Introduction to Cartography; Theoretical Principles of Cartography; The Practice of Cartography: Data Manipulation and Generalization; and The Practice of Cartography: Production and Reproduction.

There were only three appendices in the fifth edition compared to the eight in the fourth edition. Gone were the trigonometric and logarithmic tables, reflecting the ubiquity of calculators and increasing availability of computers, but a glossary of technical terms from other disciplines was added.

By the sixth edition in 1995, (Figure 8) Arthur Robinson, then eighty years old and retired, had assumed an advisory and editorial position, Randall Sale had passed away, and Jon Kimmerling and Stephen Guptill were added as junior authors. Many changes had occurred in the field in the eleven years between the fifth and sixth editions. A major factor in these was the increase in desktop computers.

> The current technological revolution goes a step further, permitting everyone to be a mapmaker. This means that diverse map users are no longer forced to make do with identical copies of a printed map. They can construct or tailor maps to fit individual needs. (Robinson *et al*, 1995, v)

And those users were not necessarily familiar with cartographic principles.

This was the largest and most encyclopedic edition with 674 pages, more than three times the size of the first edition with fifty-four pages of appendices and an eleven page, three column, six-point-type index. There were thirty-one chapters grouped into seven sections. The impact of GIS was responsible for most of the changes in this edition. The authors stated:

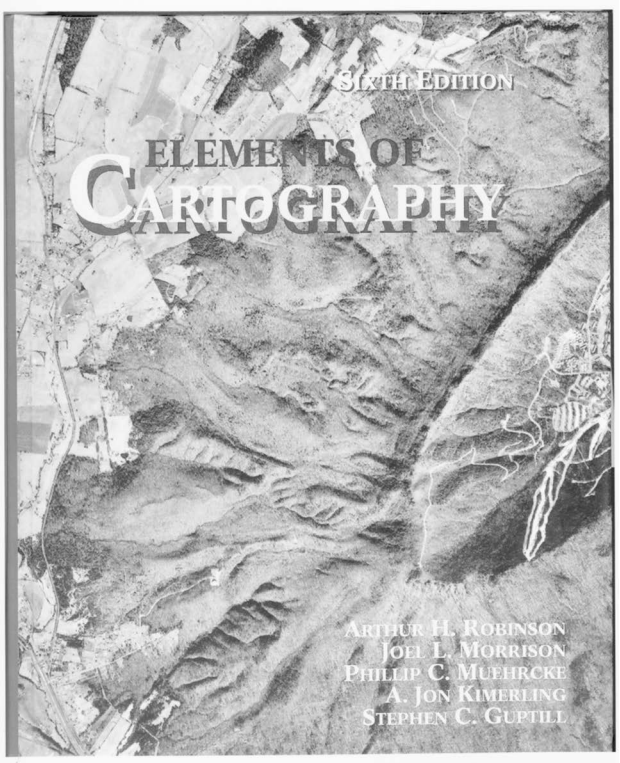

Figure 8. Sixth edition of Elements of Cartography *(see page 78 for color version)*

> In response to information-age demands, mapping increasingly is conducted within the context of geographical information systems (GIS) technology. Therefore, we have explicitly linked GIS and cartography throughout the book. Since integration and flexibility lie at the heart of GIS technology, we have had to expand the scope of the sixth edition. (Robinson *et al.*, 1995, v)

The authors noted that cartography now provided two products: databases and visualizations. This was the first time that the term visualization had been used in the text. These two products guided what was included. Unlike previous editions, which stressed the design and production of small-scale thematic maps, the sixth edition gave some emphasis to reference mapping and considered mapping throughout the possible range of scales. There was increasing emphasis on database questions. Three chapters (a total of forty-eight pages) dealt with data formats, structuring, accuracy and exchange standards, but these subjects were also scattered throughout the text. A section of three chapters dealt with sources of data including ground surveying and positioning, which had not been included in previous texts, and a chapter on census data. Remote sensing had been increased to two chapters, and GIS was given its own chapter. Two new chapters, "Multivariate Mapping and Modeling" (eight pages) and "Dynamic/Interactive Mapping" (ten pages) signaled the new map types cartographers were called upon to create.

"The authors noted that cartography now provided two products: databases and visualizations."

Because there was still some call for manual methods, these were included, but were relegated to an appendix. Some technical subjects were

placed in boxes or sidebars. One sidebar was the discussion of Tissot's Indicatrix, which was included in each edition, but migrated from chapter subheading, to appendix, to finally a "box" in the sixth edition. References to the most recent research in the field has been a constant in all editions of *Elements*, and in more recent editions, these were included at the end of each chapter.

Until about 1985, *Elements* dominated the field in the United States. Erwin Raisz published *Principles of Cartography* in 1962, but it was really a reworking of the older *General Cartography,* and could not topple *Elements.* The major competition came from British publications, notably Monkhouse and Wilkinson's *Maps and Diagrams* first published in 1952, but these had a definite British slant. Not until the publication of Borden Dent's *Thematic Cartography* in 1985 was Robinson's hold on the American market weakened. Several other American textbooks were written in the next few years, but only Dent managed to challenge *Elements.*[1]

"The frequency of editions of cartography textbooks is indicative of how fast the field is changing."

The frequency of editions of cartography textbooks is indicative of how fast the field is changing. Raisz's two editions of *General Cartography* were published ten years apart; his second book, *Principles of Cartography*, was published a leisurely fourteen years later. New editions of *Elements* were published at roughly eight and one-half year intervals, but Borden Dent's textbook (under various names) has gone through five editions from 1985 to1999 or roughly a new edition every three and one-half years. In part this reflects publishers' desires to sell books, but it also reflects the rapid changes in cartography and users' demands for the latest techniques.

CONCLUSIONS

What have I learned from poring through more than sixty years of cartography texts? First, I was struck anew by the richness of the field and the remarkable changes that have taken place in the last half of the twentieth century. *Elements* not only shows the changes in basic mapping operations, but also the changes in philosophy of the field, the technology, the kinds of data cartographers use, new types of maps, and new uses of maps. Whereas, fifty years ago one could be simply "a cartographer", now we have specialists in sub-fields—one can focus on map design, or thematic mapping, or communication, or visualization.

Sadly, the sixth edition marks the end of an era; there will probably be no seventh edition of *Elements of Cartography,* at least not in its current form. Of the original authors Arthur Robinson and Randall Sale have both passed away, and Philip Muehrcke has retired. New cartography texts have been written, and more will be written, but it is doubtful that any will be able to last for nearly fifty years and have such a tremendous impact.

NOTES

[1] Other American texts were Campbell, John. (1984) *Introductory Cartography*, New Jersey: Prentice-Hall, and Tyner, Judith (1992), *Introduction to Thematic Cartography*, New Jersey: Prentice-Hall.

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Putting "Cartography" into the History of Cartography: Arthur H. Robinson, David Woodward, and the Creation of a Discipline

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Arthur Robinson and David Woodward significantly expanded the scope and nature of the history of cartography. Previously, cartographic historians had emphasized the study of map content. As practicing cartographers, Robinson and Woodward promoted the "internal" study of the history of cartographic techniques and design. Robinson used an historically minded rhetoric to define the proper nature of U.S. academic cartography after 1945 and he pursued important studies in the history of thematic mapping. Woodward pioneered the study of map printing. Moreover, he was crucial in transforming the "internal" approach to cartographic history into a discrete discipline focused on the study of maps as human documents. Woodward's humanistic perspective ultimately formed the foundation of both the multi-volume *History of Cartography* and Brian Harley's cartographic theorizing.

Key Words: history of cartography (map content, internal, humanistic), academic cartography, cartographic communication, historiography

INTRODUCTION

The study of the history of cartography underwent substantial changes in the second half of the twentieth century. In 1960 it was little more than a branch of map librarianship and connoisseurship, an antiquarian backwater with relatively limited academic significance. Yet today, after a dramatic "paradigm shift" in the 1980s, the history of cartography is a widely respected field of study in the Anglophone world.[1] Scholars across the humanities and social sciences increasingly find the study of maps to be intellectually challenging and the interdisciplinary insights their study generates to be academically rewarding. The most obvious components of this intellectual revolution were J. B. Harley and David Woodward's massive *History of Cartography* (Harley and Woodward, 1987-) and Harley's own polemical and pyrotechnical essays (most reprinted in Harley, 2001). It is understandable that commentators have focused on this dramatic period of reform (Edney, 2005b). Yet in doing so they have overlooked earlier and equally important efforts by academic cartographers to reconfigure and extend the study of map history. This essay explores that earlier period of reform. In particular, it examines the crucial contributions made by Arthur Robinson and his student, David Woodward, to the formation of the history of cartography as a field of study.

"Scholars across the humanities and social sciences increasingly find the study of maps to be intellectually challenging and the interdisciplinary insights their study generates to be academically rewarding."

The development, after 1945 of cartography as an academic field of study entailed the significant augmentation of existing traditions of map history. Established historical interest in cartography focused on the assessment of map content. Led by Robinson, academic cartographers pursued an "internal"[2] history of cartography in which they studied past

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practices and techniques of map production and design. They placed "cartography" front and center within the historical picture. At root, this new approach to cartographic history was an ideological exercise: academic cartographers used their historical studies to define and delimit the very scope and nature of their academic enterprise. Subsequently, academic cartographers legitimized and validated their new position within academia by modeling cartography as a communicative science. Woodward, in turn, used academic cartography's communicative principles to reformulate the study of the history of cartography, expanding the internal history of cartography into a subject of humanistic significance. That move turned out to be a crucial element in the formation of the new "critical paradigm" of map studies in the 1980s. Thus, it is doubtful that the history of cartography would today occupy such a favorable intellectual position if academic cartographers had not first put "cartography" into the history of cartography.

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The Traditional Approach: An Empiricist History of Maps

It is actually rather misleading to posit a coherent field of study called "the history of cartography" for most of the eighteenth, nineteenth, and twen-tieth centuries. Rather, a number of professionals, librarians, professors, and lay scholars built a loose-knit, international community around a common interest in old maps. This community lacked a unifying identifier: the viscount de Santarém might have coined "cartography" in 1839 to mean the "study of maps," by which he specifically understood old maps (Harley, 1987, 12), but that label was very quickly appropriated by mapping professionals for their own endeavors. Although nameless and diffuse, the community of scholars interested in old maps all adhered to a common conceptual foundation: maps are unproblematic, scientific documents of spatial fact. This "empiricist paradigm" had its origins in the eighteenth century. Not coincidentally, this was the era when mapmakers with intellectual pretensions, such as John Green and Denis Robert de Vaugondy, first wrote the general overviews of map history (Harley, 1987, 10-12). These mapmakers presented their own work as the modern culmination of the process by which geographical maps had steadily improved in both the quality and quantity of their content. Many mapmakers have since prefaced their own atlases and textbooks with similarly rhetorical historical overviews that perpetuate the professional field's ideological claims to be a *science* (Raisz, 1938, 1-70). Such professional desires to place one's work at the forefront of cartographic progress has not, however, promoted the detailed study of particular cartographic episodes.

"Map scholars fell into three interrelated groups: geographers and historians; librarians and archivists; and, map dealers and collectors."

Detailed historical studies were accomplished by scholars interested in the content of old maps. Skelton (1972, 5) succinctly summarized their motivation: "the content of maps has undergone continuous change through time" and it is "this changing content that gives maps significance as documents for social, economic, and political history." Map scholars fell into three interrelated groups: geographers and historians; librarians and archivists; and, map dealers and collectors. Geographers and historians have been interested in old maps because they can serve as primary sources of information about the past: if the flow of information from the world to the map is unproblematic, then the proper interrogation of an old map will provide spatial information about the past. Santarém, for example, was a diplomat who sought to use old maps to shed light on international boundary disputes. Librarians and archivists, especially those in the large national libraries, have sought to make potential users—i.e., geographers and historians—aware of the collections under their

control and have accordingly undertaken a great deal of the writing about the history of maps. Furthermore, the standard library practices of selecting maps according to the quality of their content and then of organizing them according to the areas mapped have emphasized the progressive increase over time in the quantity and quality of spatial information and have encouraged the production of regional cartobibliographies and map histories. Finally, dealers and collectors have tended to privilege those maps which were the first to record specific items of spatial information and which therefore serve as markers of the progress of human knowledge and science (Harley, 1987, 12-23).

". . . dealers and collectors have tended to privilege those maps which were the first to record specific items of spatial information and which therefore serve as markers of the progress of human knowledge and science."

Map history was thus handmaiden to other historical scholarship. As William Cumming (1974, xi) could assert, from a position firmly within this traditional approach to map studies, the task of the map historian was simply to analyze old maps so as to generate "historical, geographical, and ethnic information" for use by scholars in other fields. In the 1960s, some scholars sought to formalize the study of old maps by regularizing the contextual information necessary for other scholars to interpret maps properly as historical documents (esp. Skelton, 1965; Harley, 1968; Skelton, 1972, 103-7; Edney, 2005b, chap. 2). Studies of map content have necessarily led to studies of map projections, land surveying, marine navigation, and the biographies of individual cartographers (Skelton, 1972, 62-63 and 90-91). They have also promoted the publication of facsimiles of old maps to allow wider access to otherwise rare materials, often with scholarly introductions to allow historians to interpret those maps properly (Skelton, 1972, 73-85 and 93-96; Blakemore and Harley, 1980, 33-44; Harley, 1987, 17-19). Yet whatever their precise concerns, all detailed map studies were founded on the belief in the ineluctably progressive nature of cartographic information.

"Yet whatever their precise concerns, all detailed map studies were founded on the belief in the ineluctably progressive nature of cartographic information."

Arthur H. Robinson: Cartographic Design and the Internal History of Cartography

A few map scholars did consider the history of the techniques involved in map making, incorporating them into the history of map content so as to construct triumphalist narratives in which maps served as surrogates for progress within Western civilization (e.g., Goode, 1927). The only single-volume history of cartography written to date with an emphasis on cartographic technologies was produced on this basis (Brown, 1949; Brown, 1953). Precise studies of mapping techniques did not become common until the establishment after World War II of cartography as a valid academic field of study. Academic cartographers employed a new, internal history to validate their intellectual concerns. By explicating how cartographers in the past designed and physically made maps, they could locate themselves in a trend-line of progress not in the generation of map content but in the techniques and technologies of map making as an implicitly apolitical endeavor.[3] The result was the prosecution of an internal history of *cartography* as a craft and profession in parallel with the more traditional map history.

"Precise studies of mapping techniques did not become common until the establishment after World War II of cartography as a valid academic field of study."

The crucial figure in the post-1945 establishment of an academic cartography in North America was, of course, Arthur Robinson.[4] During the war, Robinson had been in charge of the OSS's preparation of maps to inform the decisions of the officials who ran the political side of the war. He had realized that, although map scholarship had hitherto focused almost entirely on the "substantive research" of collecting and accurately reproducing spatial data at large scales, the creation of smaller-scale "specialty" and thematic maps was in fact a design process rooted only in

unexamined "convention, whim, and…ill-founded judgment." After the war, Robinson therefore set out to develop cartographic "design principles based on objective visual tests, experience, and logic"; his agenda featured "the pursuit of research in the physiological and psychological effects of color," the reexamination of accepted conventions, and "investigations in perceptibility and readability in typography" (Robinson, 1947, vii and 10; also Robinson, 1952, viii and 13). Such research would not only regularize the principles of map design, he argued; it would also prevent the political abuse of maps by unscrupulous propagandists and establish cartography as a properly academic discipline. By the 1970s, Robinson's proselytizing had indeed achieved the formation of a new academic discipline—complete with degree programs and professional journals—rooted in the study of effective design for small-scale, specialized maps (Wolter, 1975; Robinson, Morrison and Muehrcke, 1977; Robinson, 1979; McMaster and McMaster, 2002; Montello, 2002; Slocum *et al*., 2004, 18-32).

"Robinson relied extensively on an historical approach to define his vision of a logically rigorous discipline of cartographic design."

Robinson relied extensively on an historical approach to define his vision of a logically rigorous discipline of cartographic design. He rewrote the empiricist paradigm's established historical narrative to make room for his own vision. He did so by asserting that cartography had in fact bifurcated *circa* 1800: military and civil engineers took over the main line of cartographic progress with their large-scale, national or colonial surveys (the epitome of general-purpose mapping) and remained uninterested in map aesthetics; in contrast, social scientists pursued small-scale cartographies, through which they presented their understandings of how the earth and society functioned, and they began to be implicitly interested in aesthetic and conceptual questions of information presentation (Robinson, 1947, 1-2; also Robinson, 1952, 7-8). It was within this second trend that Robinson could identify the evolution of "the cartographer" as a design professional (Robinson, 1975, 3). Moreover, this second trend had since 1940 experienced a period of "rapid development," in what was effectively a cartographic revolution as profound as that of the Renaissance, and so needed to be properly institutionalized in centers of national excellence (Robinson, 1952, 3; Robinson, 1982, 12-15; Robinson, 1976b). These points have been inculcated in several generations of students through the introductory chapters of Robinson's crucial textbook, *Elements of Cartography* (Robinson, 1953, 1-8).[5]

"Robinson also explicated the preconditions of his new discipline with detailed studies of the history of cartography as a craft, and in particular of the history of thematic mapping."

No doubt strongly motivated by his own interest in history—he had majored in History at Miami University, Ohio (Anonymous, 1996, 468)—Robinson also explicated the preconditions of his new discipline with detailed studies of the history of cartography as a craft, and in particular of the history of thematic mapping. He began with three studies of exemplary thematic maps from the nineteenth century: Henry Drury Harness's statistical maps of Ireland from the 1830s (Robinson, 1955); Charles Joseph Minard's *cartes figuratives* of statistical flows, such as his famous 1869 map of Napoleon's Russian campaign (Robinson, 1967); and, Alexander von Humboldt's highly schematic isothermal map of 1817 (Robinson and Wallis, 1967).[6] While his purpose in each study was to tell the history of each map designer and their works, he was nonetheless interested in elucidating the effectiveness of their representational strategies and in drawing lessons for current cartographic practice. For example, Robinson and Wallis (1967, 120) found that Humboldt's map of isotherms exemplified a truly crucial design principle, previously expressed by Humboldt (1811, 1:cxiii-cxiv), that "a map…, overcharged with signs, becomes confused, and loses its principal advantage, the power of conveying at once a great number of relations." Robinson subsequently paid closer attention to the development of the concept of the isoline, whether through the statistical

creation of the isopleth or the generalization of measurements through isometric lines (Robinson, 1971; Robinson, 1976a). His historical *summa* was, of course, his monograph on *Early Thematic Mapping in the History of Cartography*, a work committed to the bifurcation of cartographic progress in the early 1800s, such that "thematic [i.e., academic] cartographers had no official connection, and little professional contact, with the makers of general maps [i.e., surveyors]" (Robinson, 1982, 18).

". . . his advocacy made historical studies a legitimate and central enterprise for the new academic cartographic profession. "

Our remembrance of Arthur Robinson as a significant historian of cartography in his own right should not be allowed to obscure his more profound legacy for cartographic history: his advocacy made historical studies a legitimate and central enterprise for the new academic cartographic profession. Many academic cartographers have undertaken internal histories, focusing in particular on thematic mapping (MacEachren, 1979; Castner, 1980) or on cartography's "technological transitions" (Monmonier, 1985). Of particular importance in this respect was Robinson's support for strongly internal historical studies by his own doctoral students, notably Norman Thrower (Thrower, 1958; subsequently, e.g., Thrower, 1966; Thrower, 1978), Karen Severud Pearson (Pearson, 1978; subsequently, e.g., Pearson, 1980; Pearson, 1983; Cook, 1995), and David Woodward (Robinson, 1982, xii). Yet the internal history of the academic cartographers remained largely distinct from the older tradition of the history of map content. Some academic cartographers did apply their statistical skills to cartometric studies of map content in order to quantify historical progress (reviewed by Blakemore and Harley, 1980, 54-75; see Maling, 1989), but very few sought to reconcile the two sets of historical practice at a conceptual level. Robinson himself did appear to do so once, in the mid-1960s, when he argued that cartography could make a meaningful contribution to a liberal education because "there are few results of man's activities that so closely parallel man's interests and intellectual capabilities as the map." The map is therefore "an ideal device around which to build such a study of man's changing interests [i.e., content] and abilities [i.e., techniques]"; there was accordingly "as much validity in studying maps as human documents…as there is in studying the changing attitudes toward romanticism, symbolism, realism, etc., in period literature" (Robinson, 1965, 39-40 and 45). David Woodward would take the crucial step of blending the two historical approaches, with the result of promoting the study of maps as "human documents".

"Academic cartographers definitely motivated some of the community of map scholars to espouse a broader understanding of their subject matter."

David Woodward: Map Form and a Humanistic History of Cartography

Academic cartographers definitely motivated some of the community of map scholars to espouse a broader understanding of their subject matter. Academic cartographers developed several models of cartographic communication during the 1960s in an effort to define themselves as "communication scientists." Regardless of their form (Edney, 2005b, chap. 3), these models modified, in principle at least, academic cartography's ideology in two important ways. First, they extended the field's subject matter to encompass the use as well as the design of maps. Second, they collapsed the two streams of mapping endeavor construed by Robinson—the "substantive" and the "specialty"—into a single process common to *all* maps, whatever their scale and purpose. This even-wider conception of the field seems to have contributed to the manner in which more traditional scholars began in the later 1960s and early 1970s to think in terms of a wider and further reaching history of cartography. Both Skelton (1972, 62)[7] and Armando Cortesio (1969-1971, 1:4) would advance definitions for a new field of the "history of cartography." Shortly thereafter, Helen Wallis (1973,

252) would suggest that historical studies should address maps as part of a larger, cartographic communication system.

David Woodward would serve as the primary interpreter of academic cartography's concerns for map historians. He was always deeply committed to the study of the art and design of maps: he left Britain in 1964 to study with Arthur Robinson not because of Robinson's historical work but because of Robinson's *Elements*, the definitive text on cartographic design. As a graduate student, Woodward addressed issues of map design, and especially the aesthetic influences of printing technologies, through historical studies that were necessarily internal in character (Woodward, 1967a; Woodward, 1967b; Woodward, 1970a; Woodward, 1970b). He was also interested in the non-historical dimensions of map design; for example, he briefly contemplated developing a postdoctoral research project on the subject of "the psychophysical aspects of map lettering."[8] However, his 1969 appointment to be the Newberry Library's first map curator, and in 1970 to be director of that library's newly created Hermon Dunlap Smith Center for the History of Cartography, ensured that his cartographic interests would be expressed primarily through historical studies.[9]

"Inevitably, Woodward saw the history of cartography through the lens of the academic cartography in which he had been trained. He was not impressed."

Inevitably, Woodward saw the history of cartography through the lens of the academic cartography in which he had been trained. He was not impressed. "I am appalled," he wrote to Harley in December 1969, "by the lack of organization reflected merely in the chapter headings of such standard books as Bagrow-Skelton, Tooley, etc." Some "organizational principle" was clearly needed to be imposed on the field to give it structure and discipline.[10] Harley, who had come to the study of old maps as an historical geographer interested in elucidating their content, had just previously suggested that traditional cartographic studies should be regularized by the application of the historian's critical principles of evidentiary analysis (Harley, 1968; Edney, 2005b, chap. 2). Woodward certainly appreciated Harley's desire for intellectual rigor,[11] but as an academic cartographer he nonetheless held that the desired disciplinary structure could come only from cartography itself. To this end, he used several of the models of cartographic communication—in particular, Kolácný (1969)—to inform his own "suggested framework" for the study of the history of cartography (Figure 1) (Woodward, 1974).

"With his framework, Woodward tried to encompass all the elements relevant to the study of the entire scope of cartography, balancing the highly abstract and idealized communication models with his more pragmatic experiences in map production . . ."

With his framework, Woodward tried to encompass all the elements relevant to the study of the entire scope of cartography, balancing the highly abstract and idealized communication models with his more pragmatic experiences in map production: the rows comprised the stages of cartographic communication, from the acquisition of data through their representation and dissemination to their consumption by the map user; the constituent personnel, processes, and products defined the columns. He could then graphically indicate the partiality of existing histories of cartography by shading cells representative of the material they dealt with. Figure 1, for example, demonstrates how traditional studies tended to be either biographical or bibliographical in nature. The areas left unshaded—in this case, cartographic techniques and the practices of map use—were areas that needed to be addressed if the history of cartography was to be considered in any way organized and rigorous. The shaded areas were emblematic of the traditional emphasis on the history of maps made *of* a country (e.g., maps of France) and so of map content; the unshaded areas represented the study of cartography as practiced *within* a country (e.g., French cartography) (Woodward, 1974, 109 and 102).

Woodward consciously presented his framework as a means to unify the two genres of map studies into a single, coherent field. With columns

	Production			Product
	Personnel	Techniques	Tools	
Information Gathering	Observer	Observation	Physical & Mental Faculties	Image
	Surveyor	Surveying Data Gathering	Surveying Instruments, Questionnaires, etc.	Data
Information Processing	Designer	Design	Design Tools	Specifications
	Editor	Compilation	Compilation Tools	Worksheet
	Draftsman	Drafting	Drafting Tools	Manuscript
	Engraver	Engraving	Engraving Tools	Plate
	Printer	Printing	Presses, etc.	Printed Map
Document Distribution	Publisher	Publishing	Publishing Facilities	Published Map
	Seller	Marketing	Marketing Facilities	Marketed Map
Document Use	Librarian	Acquisition Storage Retrieval	Library Facilities	Map
	User	Interpretation	Physical & Mental Faculties	Image

Figure 1. Woodward's framework for the study of the history of cartography, showing the limited coverage of traditional histories. After Woodward (1974, fig. 6).

for both "production" and "product," he could bring together either side of what he saw as the "fundamental distinction between the study of the making of the map and the study of the map itself." Overall, he argued that all the cells in the matrix dealt with aspects of map *form*, which is to say the proper subject of historical study informed by academic cartography, whereas map *content* permeated the entire matrix, flowing from one cell to the next. Ultimately, map form and map content were indivisible; ultimately, a single history of cartography could be attained through the subordination of map content to a *cartographic* framework. Woodward could thus conclude that the history of cartography *per se* is properly "the study of maps, mapmakers, and mapmaking techniques in their human context through time" (Woodward, 1974, 102 [quotation], 107-8, and 114).

". . . Woodward's framework did seem to privilege the processes of making maps over those of using maps."

As broad and as encompassing as it was, Woodward's framework did seem to privilege the processes of making maps over those of using maps. As J. H. Andrews pointed out when Woodward first presented the framework at the 1973 international conference on the history of cartography, it could not easily handle the social and cultural institutions and circumstances within which maps were made and, more significantly, in which they were used: cartography's socio-cultural context called for more than just the final row of cells allocated by Woodward (Woodward, 2001c, 37n; Blakemore and Harley, 1980, 45-53; Woodward, 1982). Making allowance for this point would have required Woodward to completely re-conceptu-

alize his framework and so he made no changes for the published essay. Yet he quickly incorporated this general issue into his thinking and in doing so gave the history of cartography a still firmer foundation as the study of an ineluctably human endeavor. This is evident in a paper he presented to a 1977 symposium in which he laid out his plans for a new research project on sixteenth-century Italian commercial cartography. The detailed analysis of the physical form of maps—the precise techniques of their printing, their paper and its watermarks, the assembly and binding of maps into composite atlases—would shed new light on the commercial practices of the map trade which would in turn shed new light on the nature of cultural production in the Italian Renaissance (Woodward, 1980; Woodward, 1996; Woodward, 2001b; Woodward, 2007). Ultimately, this perspective required the interdisciplinary study of maps, a point to which he alluded in 1977 and which, was convincingly validated by the 1980 Nebenzahl Lectures on art and cartography (Woodward, 1980, 139; Woodward, 1987).

". . . Woodward's conception of the history of cartography as a single field, structured and delimited by contemporary conceptions of cartography as an intellectual and so human endeavor, is evident from his interactions with Brian Harley in the 1970s."

The potency and efficacy of Woodward's conception of the history of cartography as a single field, structured and delimited by contemporary conceptions of cartography as an intellectual and so human endeavor, is evident from his interactions with Brian Harley in the 1970s. Harley had initially developed his cartographic interests in order to assess the worth of eighteenth-century, medium- and large-scale maps of England for historical geographical studies; he had undertaken a number of detailed studies of the English map trade, which had produced those maps, and he had become especially interested in the medium-scale topographic maps of North America published by William Faden during the American Revolution. This last project led Woodward to invite Harley to present two lectures in the fourth series of Nebenzahl Lectures, held at the Newberry Library in November 1974, which had as its subject the mapping of the revolutionary war (Harley, Petchenik and Towner, 1978, 1-78). After the lectures, Woodward prevailed upon Harley to extend his analyses of map production to the uses to which maps were put in the eighteenth century (Harley, 1976; Harley, Petchenik and Towner, 1978, 79-110). It was to accomplish this task that Harley first sought to theorize the nature of cartography, relying on the communication models advanced by academic cartographers to do so (Edney, 2005b, chap. 3).

". . . Woodward prevailed upon Harley to extend his analyses of map production to the uses to which maps were put in the eighteenth century."

Most important, Woodward in 1977 persuaded Harley to abandon plans for what Harley envisioned as a four-volume history of the mapping of North America and instead to collaborate with Woodward on a four-volume general history of cartography (Woodward, 1992; Woodward, 1994, xxiii; Woodward, 2001a, 23-24). In other words, Harley discarded a plan conceived according to the concerns of the traditional history of map content—in which maps are grouped together and studied simply because they happen to show the same geographical area—in favor of a study that groups together and studies maps according to the common practices and processes by which the maps were made and used. The result, of course, was the multi-volume *History of Cartography*, a work committed to the study of the cartographic activities within each country rather than to narrating the progressive history of geographical information of each country. Harley and Woodward's conception was strongly grounded in the goals of an internal history: a "general history of cartography ought," at the very least, they wrote, "to lay the foundations . . . for a world view of [cartography's] own growth" (Harley and Woodward, 1987-, 1:xviii; Edney, 2005b, chap. 4).

Yet the conviction that the history of cartography is a humanistic discipline concerned with what are at root human endeavors that are part and

parcel of larger socio-cultural trends—which is to say the sort of history that Woodward and Harley consciously set out to establish with the *History of Cartography* (Woodward 1985, 69)—is actually incompatible with an internal history of cartography. To understand map making and map use as human endeavors requires consideration of *all* mapping endeavors and not just those which contributed to the present-day concerns of academic cartography; moreover, it requires the understanding of past cartographic endeavors on their own terms and not as part of a supposedly progressive history of cartographic techniques.

". . . they argued that the scope and nature of academic cartography should be defined by historical studies and vice versa."

Harley and Woodward thus eventually moved together from a history of *cartography* to a *history* of cartography. It was to define the intellectual foundations of just such a history that Harley would move in the 1980s beyond models of cartographic communication to engage with linguistics, iconography, the sociology of knowledge, and poststructuralism (Edney, 2005b, chaps. 5-7). Harley and Woodward sought to reinvest academic cartography with this newfound humanism when they argued that the scope and nature of academic cartography should be defined by historical studies and *vice versa* (Harley and Woodward, 1989). Yet their argument made little impact on academic cartographers, at least of an older generation, who have rejected Harley's powerful critique as being largely irrelevant to cartographic practices and who want histories that are relevant to academic cartography's present-day concerns (Edney, 2005b, chap. 1).

CONCLUSION

An historical sensibility and particular historical studies were crucial elements in the formation of the post-1945 academic discipline of cartography. On the one hand, a clear sense of the overall outline of the history of cartographic techniques validated and legitimized the mission of Arthur Robinson and his colleagues to establish map design research as an appro-priate field of study within higher education. On the other, studies of past cartographic techniques shed important light on the issues of map design and production. The result was the undertaking of what might be called an internal history of cartography. This new history complemented the existing tradition of map studies, which focused on the history of map content, by putting "cartography" into the history of cartography. Both trends of inquiry were implicitly progressivist in nature, the one emphasizing the ineluctable increase in quantity and quality of map data, the other the technological revolutions that have underpinned the craft of cartography.

"In the mean time, however, Woodward built upon Robinson's work to establish that the history of cartography is, indeed, properly concerned with cartography."

In reconciling these two distinct approaches, David Woodward followed his academic training to advocate the study of the practices of map making and map use. But by focusing on such practices in the past, where they do not have any necessary connection to those of the present, Woodward understood them as fundamentally human endeavors. His work in the 1970s had a significant impact on the work of Brian Harley, who was forced to put cartography into his own historical map studies. Eventually, the pursuit of the humanistic nature of map making and map use led Woodward to look beyond the disciplinary concerns of academic cartography, no matter how committed he remained to those concerns in his teaching and professional service.

In the mean time, however, Woodward built upon Robinson's work to establish that the history of cartography is, indeed, properly concerned with *cartography*. Studies of map content have persisted but they are increasingly outmoded and marginal to the field, to the point where Simms and Van der Krogt (1995-), neither of whom could be called "radical," recently argued without irony that the single theme of the 1967 international

conference on the history of cartography—"Early Maps as Historical Evidence"—was "rather poorly chosen" because it gave "the conference and its papers too much the feeling of a historical geography conference than one properly on the history of cartography." Internal histories of cartography continue also to be written by academic cartographers, but they seem to have generally fallen out of favor as academic cartography has been increasingly redefined by digital technologies (Harley and Woodward, 1989). It is the new form of cartographic *history*, which has flourished as an interdisciplinary field. It is thus something of a paradox that Robinson never gave up on the empiricist paradigm that underpinned both traditional map studies and academic cartography (Fremlin and Robinson, 1998), yet he and Woodward lay the foundations for a new, critical paradigm of map studies.

AUTHOR'S NOTE

Matthew Edney studied with David Woodward at the University of Wisconsin, Madison, receiving the M.S. in Cartography in December 1985 and the Ph.D. in Geography in May 1990. He is currently associate professor of geography-anthropology and American & New England studies and is faculty scholar in the Osher Map Library and Smith Center for Cartographic Education, University of Southern Maine. In AY 04-05 he was a visiting associate professor in the program in American culture at the University of Michigan, Ann Arbor. Author of *Mapping an Empire: The Geographical Construction of British India, 1765-1843* (Chicago: University of Chicago Press, 1997), he is also co-editor of *Cartography in the European Enlightenment*, vol. 4 of *The History of Cartography*.

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Jim Akerman, John Cloud, Jeremy Crampton, John Krygier, and Mark Monmonier all gave invaluable comments on a draft of this essay. Robert W. Karrow provided copies of David Woodward's correspondence in the Newberry Library's archives.

NOTES

[1]Fabrikant (2003), properly reminded U.S. scholars that academic cartography is my subject matter requires me to concentrate on Anglo-American developments in the study of the history of cartography.

[2]After 1970, a generation of self-consciously radical historians of science sought to promote their own scholarly interests — placing science into social and cultural contexts — by sharply distinguishing them from established scholarship that emphasized the development of scientific ideas as almost pure, abstract forms. They called their own history of science "external" (broad-based, good), the established "internal" (narrowly focused, poor). Yet such an ideologically motivated distinction is impossible to maintain in practice and it has since mellowed into a scheme of classifying scholarship along a continuum constructed between two impossible ideals (the utterly external and the utterly internal). There remains, however, a more restricted use of "internal" — which this essay employs — as a label for histories of science which serve the ideological function of legitimating and justifying the professional preconceptions, institutions, and ideologies of a scientific discipline. (One can thus write a generically internal history of science without being ideologically internal, but not *vice versa*.)

[3]See, especially, the reconfiguration along strictly technological lines of Skelton's (1972, 5) empirically judicious statement of cartographic progress by Robinson (1982, 12-13). Tyner (1992, 5) echoed Robinson in her upwardly trending graph of "cartographic activity" over time. See also the two historical summaries created as institutional projects (Kretschmer, Dörflinger and Wawrik, 1986; Wallis and Robinson, 1987).

[4]Despite the centrality of maps to geographical studies, academic cartography barely existed in the USA before 1945; refer McMaster and Thrower (1991) and accompanying essays, including Robinson (1991). For (auto)biographical information, see Robinson (1947, 190-91), Robinson (1979), Ristow (1983), Anonymous (1996), and Cook (2005).
[5]The historical introduction has been repeated, with only slight variations, in the later editions. For similar arguments, see also Cuff and Mattson (1982, 1), and Tyner (1992, 1-18). Slocum *et al.* (2004, 18-32) provide an interesting variant of the historical preface; their institutional history of U.S. academic cartography culminated in the recent eclipse of cartographic design education by GIS, thereby presenting an implicit rationale for the book itself as a means to educate GIS-users in the principles of thematic cartography design.
[6]Robinson clearly drew extensively on the internal history that permeated Max Eckert's early and exhaustive manifesto for a critical study of maps and map design. In addition to an initial bibliographical overview of map history studies, Eckert (1921-1925, 1:24-48, 115-32, 410-97, 2:244-65, and 430-519 *passim*) based each topical section — e.g., map projections, relief depiction, geological mapping, and demographic mapping — on a progressivist overview of the development of that particular aspect of cartographic practice.
[7]Skelton (1972) originally comprised a series of essays presented in 1966. As published posthumously, it represents a significant hybridization of traditional and internal approaches to map/cartographic history.
[8]Woodward to Derek H. Maling, 24 April 1968, Newberry Library, Archives RG 07/07/01.
[9]Edney (2005a) and Edney (2005b, chaps. 3-4) provide biographical and bibliographical information.
[10]Woodward to Harley, 16 December 1969, Newberry Library, Archives RG 07/07/01, referring to Bagrow (1964) and Tooley (1949).
[11]Woodward, "Center for the History of Cartography: Monthly Report, September 1971," 2, 11 October 1971, Newberry Library, Archives RG 07/07/01, identified Harley as one of several scholars who formed a "new 'school' of thought" and who sought to place "the history of cartography . . . on a firmer methodological base . . . by discussing or demonstrating methodology in substantive work." Woodward also noted that such "ideas are in my own line of thinking."

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Arthur Robinson: An Academic Family Tree

Henry W. Castner
Professor Emeritus
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Imagine a quiet pond into which a small stone is tossed. The impact of the stone creates a series of concentric waves that radiate out from that point of contact. This seems a fitting metaphor for the life and influence of Arthur Robinson on countless people who are or were fascinated by maps.

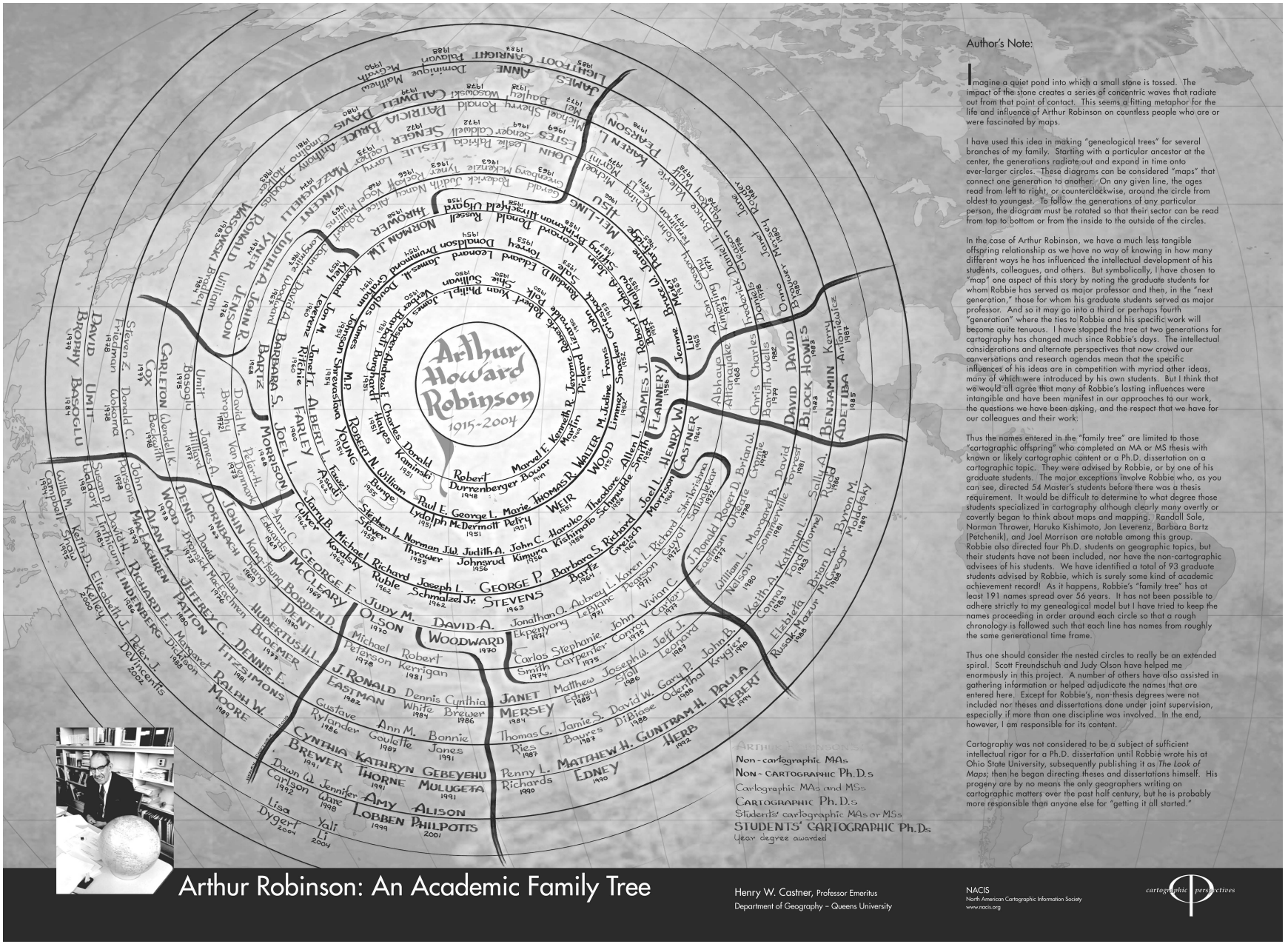
I have used this idea in making "genealogical trees" for several branches of my family. Starting with a particular ancestor at the center, the generations radiate out and expand in time onto ever-larger circles. These diagrams can be considered "maps" that connect one generation to another. On any given line, the ages read from left to right, or counterclockwise, around the circle from oldest to youngest. To follow the generations of any particular person, the diagram must be rotated so that their sector can be read from top to bottom or from the inside to the outside of the circles.

In the case of Arthur Robinson, we have a much less tangible offspring relationship as we have no way of knowing in how many different ways he has influenced the intellectual development of his students, colleagues, and others. But symbolically, I have chosen to "map" one aspect of this story by noting the graduate students for whom Robbie has served as major professor and then, in the "next generation," those for whom his graduate students served as major professor. And so it may go into a third or perhaps fourth "generation" where the ties to Robbie and his specific work will become quite tenuous. I have stopped the tree at two generations for cartography has changed much since Robbie's days. The intellectual considerations and alternate perspectives that now crowd our conversations and research agendas mean that the specific influences of his ideas are in competition with myriad other ideas, many of which were introduced by his own students. But I think that we would all agree that many of Robbie's lasting influences were intangible and have been manifest in our approaches to our work, the questions we have been asking, and the respect that we have for our colleagues and their work.

Thus the names entered in the "family tree" are limited to those "cartographic offspring" who completed an MA or MS thesis with known or likely cartographic content or a Ph.D. dissertation on a cartographic topic. They were advised by Robbie, or by one of his graduate students. The major exceptions involve Robbie who, as you can see, directed 54 Master's students before there was a thesis requirement. It would be difficult to determine to what degree those students specialized in cartography although clearly many overtly or covertly began to think about maps and mapping. Randall Sale, Norman Thrower, Haruko Kishimoto, Jon Leverenz, Barbara Bartz (Petchenik), and Joel Morrison are notable among this group. Robbie also directed four Ph.D. students on geographic topics, but their students have not been included, nor have the non-cartographic advisees of his students. We have identified a total of 93 graduate students advised by Robbie, which is surely some kind of academic achievement record! As it happens, Robbie's "family tree" has at least 199 names spread over 56 years. It has not been possible to adhere strictly to my genealogical model but I have tried to keep the names proceeding in order around each circle so that a rough chronology is followed such that each line has names from roughly the same generational time frame.

Thus one should consider the nested circles to really be an extended spiral. Scott Freundschuh and Judy Olson have helped me enormously in this project. A number of others have also assisted in gathering information or helped adjudicate the names that are entered here. Except for Robbie's, non-thesis degrees were not included nor theses and dissertations done under joint supervision, especially if more than one discipline was involved. In the end, however, I am responsible for its content.

Cartography was not considered to be a subject of sufficient intellectual rigor for a Ph.D. dissertation until Robbie wrote his at Ohio State University, subsequently publishing it as *The Look of Maps; then* he began directing theses and dissertations himself. His progeny are by no means the only geographers writing on cartographic matters over the past half century, but he is probably more responsible than anyone else for "getting it all started." The other elements in this special issue of *Cartographic Perspectives* provide further evidence of his influence. The diagram stands on its own, however, as a tribute to Arthur Robinson.



Arthur Robinson: An Academic Family Tree

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cartographic perspectives

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In Remembrance of Arthur H. Robinson

Arthur H. Robinson: An Appreciation

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Ph.D. 1958, University of Wisconsin, Madison
Original Survey and Land Subdivision in Rural Ohio

The name Arthur H. Robinson first came to my attention in the early 1950's when I was working as a cartographer in the Virginia Geographical Institute, while also a student at the University of Virginia, Charlottesville. Erwin Raisz had recently come to Virginia from the Institute of Geographical Exploration at Harvard University to teach cartography. In my presence, he opened a copy of Robinson's then new book (which had just arrived in the mail) *The Look of Maps: An Examination of Cartographic Design*, The University of Wisconsin Press, Madison, 1952. Upon leafing through this slim volume, which has several figures and tables but no maps, Raisz remarked: "*The Look of Maps*, no maps to look at!"

This illustrates an important difference between the two men who, either singly or overlapping, dominated academic cartography in the United States for some fifty years (c. 1932 - 1982). Raisz was a practitioner, and Robinson a theoretician. However, neither scholar was born in the United States. Erwin Raisz (d. 1963) had emigrated from Hungary after serving in the sappers (engineers) for the Central Powers in World War I. The much younger Robinson was born of American parents in Canada, and partly schooled in England. Both received their doctoral degrees in the United States after wartime service, which was important to their subsequent careers, and both wrote influential and widely used textbooks.

During World War II, from 1941 through 1945, Arthur Robinson was Chief of the Map Division of the Office of Strategic Services (OSS), and Chief United States Map Officer for the Cairo and Quebec (Allied) Conferences. Following this, he took a Ph. D. degree in the Department of Geography at Ohio State University, where he studied under Professors Guy-Harold Smith and Roderick Peattie, both of whom were helpful to Robinson in his, at the time, unorthodox dissertation research. The work became the basis of his first book. *The Look of Maps.* In 1953 I left Virginia for the University of Wisconsin, Madison where I had been awarded a four year Fellowship to work under then Associate Professor Robinson as one of his first three doctoral graduate students in cartography. Robinson was soon promoted to full Professor. Prior to coming to the United States, I had spent four years in the Survey of India and one year in the (British) Directorate of Colonial (later Overseas) Surveys. On Professor Robinson's recommendation, probably recalling his own wartime experience, I was given generous academic credit for this work, which was mainly concerned with photogrammetry and large scale, topographic mapping.

However, from Arthur Robinson I learned an entirely different kind of cartography, small-scale thematic (or as the British call it, "special

purpose") mapping. Robinson was then working on his seminal research articles on thematic maps, for example, "The 1837 Maps of Henry Drury Harness" published in *The Geographical Journal* of the Royal Geographical Society of London, vol. 121, 1955. Of this study, R (aleigh) A(shlin) Skelton, at the time Map Librarian at the British Museum Map Room (now the Map Division of the British Library), and a leading historian of cartography, remarked: "That article certainly opened up some eyes over here [in Britain], and we now always show Harness's atlas to groups of university students who come to the Map Room." Harness was an English Army Officer working in Ireland in the early 19th Century, which makes Robinson's discovery all the more remarkable. At this time Robinson was also working on the thematic map innovations of the Frenchmen, Adrien Baibi and Charles Minard.

Arthur Robinson, jointly with the historical geographer Andrew H. Clark, taught a special one-time graduate seminar at Wisconsin on the United States Public Land Survey (USPLS) system. From this seminar I developed the topic of my doctoral dissertation on American cadastral surveys, later expanded as my first book *Original Survey and Land Subdivision*.

About this time Robinson was awarded a contract from the Mountain Research Unit of the United States Army to map part of the Central Rocky Mountains of Colorado. Being otherwise committed, he asked me to undertake the necessary fieldwork. This I was very happy to do, not having previously been to the Western United States. He was very helpful in supervising the project, which resulted in some classified publications, and two jointly authored articles: "A New Method of Terrain Representation," *Geographical Review*, 47 (1957); and "On Surface Representation Using Traces of Parallel Inclined Planes," *Annals of the A.A.G.,* 59 (1969). I was greatly honored to co-publish with my major professor, and these articles were extremely helpful in my academic career, appearing in print soon after I was appointed as a faculty member at UCLA.

After I moved to California I continued to interact professionally with Robbie, as his close associates called him, and he invited me to present a University Lecture at Wisconsin on the astronomer Edmond Halley as cartographer, on which I was working for my Hakluyt Society volumes, published in 1980. For over forty years Robinson's Elements of Cartography, first published by John Wiley and Sons in 1953, and several later editions, was the leading cartography text in the English language. However, Robinson's most enduring legacy may well be his work on map projections, and his studies in the history of cartography. The Robinson Projection has been widely adopted for atlases and texts. Dr. Helen Wallis, Skelton's successor as Map Librarian of the British Museum and later the first Map Librarian of the British Library, was joint author, with Robinson, of *Cartographic Innovations: An International Handbook of Mapping Terms to 1900*. This monumental study was published by *The Map Collector Publications Ltd.* in 1982, and in association with the International Cartographic Association, in 1987. It is an important contribution to the history of cartography, especially that neglected period, the 19th century, Robinson's special interest.

Professor Robinson received many honors, perhaps the greatest being President of the International Cartographic Association. He had an ideal training for a career in academic cartography. The son of a distinguished professor of institutional history, Arthur Robinson had experience in government mapping before committing himself to academe. He was an excellent teacher, especially at the graduate level, but never lost sight of the fact that, as a faculty member at a research university, as he advised

his graduate students, "you also have a responsibility to your profession, through publication." He practiced what he preached by publishing in major journals and with several scholarly presses throughout his career, and inspired his students to do likewise. It is an honor to pay tribute to such an outstanding scholar, mentor, and friend. Having, surprisingly, received a Guggenheim Fellowship before Arthur Robinson, it was my pleasure to recommend him for this distinction. This helped me repay the great debt I had incurred to one of the leading cartographers of the Twentieth Century.

Arthur H. Robinson: Reflections on the Personage

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Ph.D. 1968, University of Wisconsin, Madison
The Effects of Sampling and Interpolation in Isarithmic Mapping

I was privileged to be closely associated with Arthur H. Robinson, professionally, for slightly over twenty years (1962-1983). We shared faculty teaching and research duties at the University of Wisconsin-Madison for fifteen of those years and I was a graduate student under his tutelage for almost six years. Prior, we both attained undergraduate degrees from Miami University in Oxford, OH, having both attended high schools in southwestern Ohio, and much later, we both served terms as President of the International Cartographic Association. Between my high school years and my term as ICA President, I got to know a great man who provided me with examples and assurances of many of the basic tenets that have guided my life, a fantastic "role model", and yes, a "father" figure. In this short essay, I hope to touch on some of those characteristics of Arthur H. Robinson, the man, not Arthur H. Robinson, the Dean of American Cartography.

Robbie was born in Montreal, but grew up in Oxford, Ohio. Oxford, the home of Miami (Ohio) University, is (was) a quiet small town in extreme southwestern Ohio, approximately 30 miles north of the Ohio River and a couple miles from the Indiana border. Oxford had about 1000-1500 inhabitants during Robbie's formative years. He was the son of a Professor of History, and experienced the advantages of educationally demanding parents. Spending one high school year in England and attending Tallawanda High School in Oxford along with the children of other Miami faculty, Robbie was fortunate to be introduced to the broadly liberal education that is still characteristic of growing up in cities like Madison, WI, Ann Arbor, MI, or Austin TX. Continuing his education at Miami University, well known for its quality Arts and Sciences undergraduate program, enhanced his education. To my knowledge he had one sibling, a sister who became a Professor of Art at the University of Hawaii.

What are the characteristics of this man that impressed me, or that were impressed upon me? There are five that portray the human side of Arthur Robinson: (1) an open-mindedness to change, (2) non-presumptiveness

about others and non pretentiousness, (3) ability to take the long term view and plan accordingly, (4) the importance of making major decisions in a calm and rational manner, and (5) self discipline. These character traits are not independent, as the anecdotes mentioned below will indicate.

Robbie's classical liberal education in high school and at Miami, followed by his master's at Wisconsin and final graduate study at The Ohio State University coupled with the frequent intellectual discussions around the family table, prepared him well for a lifetime of willingness to listen to the opinions of others. He could borrow and craft from these opinions and in combination with his own logic and feelings, create personal and academic plans of note. These skills allowed him to make decisions that could stand the tests of argument yet could be revised to fit the time and place of the current circumstances. In short he was a comprehensive thinker and a master politician.

I begin my anecdotes with the question: What do we call this giant of cartography? In this essay I will use the name Robbie, which he accepted as standard use by *anyone who was comfortable* calling him that. Many students worried about whether he should be Dr. Robinson or Professor Robinson, or in Wisconsin's own reverse psychology, Mr. Robinson. (Andrew Clark always maintained that anyone who was hired to teach at the University of Wisconsin-Madison would have a Ph.D. and therefore Dr could be assumed and equality demanded the use of the term Mr.). Following this psychology, the geography department's stated "preferred" title for students to use in the 1960-1980 period was "Mr". Robinson. However Robbie made it clear that students, and particularly graduate students, should use whatever name they were comfortable using, not some moniker that he, or the department, dictated. Most students, myself included, struggled for several years before "Robbie" came easily. I suspect he secretly enjoyed watching us struggle and took our eventual use of Robbie as a sign of professional growth. I do remember that Mary Lib (his first wife, Mary Elizabeth Coffin, who preceded him in death) called him "Arthur", and that Martha (his second wife and high-school sweetheart) has said that in high school in Oxford he was known as "Long".

This lack of pretentiousness, in contrast to some Wisconsin geography faculty members of the same time period, carried throughout his professional and personal life. It was extremely evident during his four years as President of the International Cartographic Association. He was himself, the same person, at least outwardly, whether he was talking to the King of Spain in Madrid, arguing with a communist government immigration official in Moscow, conducting an ICA executive committee meeting, or meeting with a graduate student.

This non-pretentiousness was also evident in his lecture style, though it had some unfortunate consequences. At Wisconsin some students, particularly undergraduate students taking his course to fulfill a graduation requirement, were heard to declare that Mr. Robinson "died" at the lectern. He was "slow talking", "monotone", and "boring", "putting everyone to sleep". An alternative description came from graduate students, who quickly learned that each word had been carefully considered and was meaningful. It was only through careful attention to his "dry" lectures that you could detect, and enjoy, the "dry" humor, and carefully crafted metaphors and explanations that he used in his lectures.

Away from the university, he enjoyed immensely the interludes with immediate family and well-known friends. His ties to Randy Sale played heavily in his relaxation. Randy and Robbie enjoyed working outside and

around their respective homes in Mt. Horeb, Wisconsin, and helping one another in those pursuits. It was a friendship that provided a necessary respite for Robbie and which carried over into their collegial relationship in the academic world. However, there never was equality in the academic environment. Robbie was the professor and Randy followed. Both men accepted completely this situation.

Even in relaxation, Robbie exhibited an incredible amount of self-discipline. He loved the solitude of thinking time. He preferred to drive long distances and to use that time to enable him to think through some of his professional questions. He told me once of driving to Columbus from Madison and of finally reaching the "correct answer" or "course of action" to his current academic question while driving on a stretch of U.S. Highway 30 that we both knew well in Van Wert County, Ohio. As any of you who have traveled this route know, it is a flat, straight, dual-lane divided highway with little or no traffic. It is a perfect place in "today's America" to get away from it all, and to do some serious thinking. He also effectively used his driving time to their summer home in Vilas County, Wisconsin, for thinking and planning. Even though these Northern Wisconsin treks were restful (vacation) periods, he took academic work with him and devoted a specific amount of time each day to academic pursuits. The time allocated was directly related to the task, and prior to leaving Madison, he could relay a date in the future when one could expect a chapter revision of "Elements of Cartography", or illustrations for an article to be sent from Northern Wisconsin. This takes an organized, planned, extremely disciplined mind, especially when there are 1001 things that a second home requires for maintenance and preservation through the harsh Wisconsin winters.

In today's parlance, Robbie had mastered the ability "to go with the flow" but he added the ability to subtly *direct* "the flow" by maneuvering events to his advantage. He could do this by having thoroughly thought the consequences of various options. In most of the world today, and particularly here in the United States, confrontation is accepted and most people do not understand the finesses and subtleties of bringing well thought long range plans to fruition. And if they did understand, many would rebel at the time it takes to implement such a plan. This is why the citizenry of the United States is currently so easily being misled as a nation. Robbie did understand and had the self-discipline and patience to implement. He excelled at it.

It should not be surprising then to learn that Robbie had a master plan for building cartography and a cartographic curriculum at UW that spanned decades. From his OSS war experience, his return to academia, and his promotion of well-designed maps, he realized early in his career the need for a cartographic discipline. That he was successful in creating it can be credited to the occurrence of a few fortunate events during the 20th century. But one needs to dig deeper to find the logical arguments and the careful attention to details that enabled him to bring about its realization.

In the 1950's the phenomenal post war growth and an aggressive University of Wisconsin Press meant a need on the Madison campus for "good" maps. State government also needed maps, and these forces led to the establishment of the UW Cartographic Laboratory. Randy Sale was hired in the Department of Geography to run the lab and to later teach the introductory course. It also made UW-Madison a prime site for the administering of National Defense Education Act Title IV graduate assistantships in Cartography beginning in 1961. This "outside" national stimulus combined with the on-going state support to further stimulate the growth of cartography at Wisconsin. Together they put UW-Madison

cartographically on-the-map "so to speak" (a favorite Robbie expression). Robbie's continually revised master plan for cartography did fall short in its numerous attempts in conjunction with George Jenks and John Sherman to establish a National Institute of Cartography. But at Wisconsin, his continuing but subtle support for cartography and his abilities to shift the supporting arguments to reflect the changing times finally led to the UW administration's agreement to hire an additional professor in cartography in 1967. Robbie also engaged in joint discussions with the surveying professors in Civil Engineering at UW-Madison, which allowed him to realize, after a long and painful process, the establishment of a degree program in cartography and the hiring of yet another cartographer in geography. This persistence, this long-range planning, this careful attention to detail and timing, and his open-mindedness resulting from his liberal education paid off by allowing him many alternative paths and positions to attain the realization of his goal.

Robbie was unflappable in his ability to wait until tomorrow, or until the time was "right" and the "heat", that is, the emotion, of the subject had waned, to push forward his ideas. The same events that may appear to be a setback often look differently with the perspective of passing time. The idea is that he understood that any major decision has a "time" when it is "right." Making it prematurely often results in creating more problems than the decision will solve. Similarly waiting too long can result in a missed opportunity for the "good" feeling that would accompany good timing. (I have seen the results of hasty decision making over and over again in Washington.)

Thorough, well-organized, and long-range thinking and planning can have its pitfalls for others though. I remember one incident that happened to me as a graduate student. Robbie was to be away from Madison for some convention or meeting. He asked me to present the lecture to his course in Advanced Cartography during his absence. He made his case that it would be "educational" and good experience for me and "sweetened" the task by offering to give me his lecture notes for that lecture. As I have stated, Robbie was very well organized and had his lectures down to the minute for his repeat courses. I agreed to deliver the lecture and the day he left, the day before the class, I went to his office for the lecture notes. My expectations were dashed completely when he handed me two small sheets of white paper with a total of about 8 words on them. They were in outline form, but hardly with enough detail to enable me to speak for 50 minutes. This illustration simply epitomizes Robbie's mental self-discipline and his organizational detail and long range planning capabilities. Within the course, he had his goals and he knew what ideas needed to be presented at this time of the course. Key words were all that were necessary.

Robbie also demonstrated how one should regard, or maybe it should be pre-view, major emotional events of life at a time when the emotional aspects of the events were not foremost, and prior to their happening, if possible. I saw him plan his funeral arrangements in the 1970's and to unemotionally inform Pat and Steve, his two children, of what they were to be. His careful attention to detail in his academic life carried over into his private life. I remember our personal discussions about religion, and especially about organized religion. His views have had a major effect on my life. Throughout all of the years of our association at UW-Madison, perhaps his most constant and meaningful role was to demonstrate an ability to set a pace and stay with it regardless of setbacks along the road to achieving a goal. Persistence works.

Arthur H. Robinson created a cartographic discipline in the colleges

and universities of North America. His professional writings will continue to be read. The world will be better as a result. Arthur H. Robinson, Robbie, also exhibited characteristics that many of the citizens of the world would do well to emulate: open mindedness, self discipline, setting long term goals and plans, operating and responding non-presumptively, non-emotionally, unpretentiously. Too few of us had the opportunity to observe and learn from Robbie. Those that have are better world citizens for the experience.

Contemplating the Challenges . . . and Some Recollections

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Ph.D. 1969, University of Wisconsin, Madison

The Dasymetric Method in Thematic Cartography

QUESTION [R. Klove]: … the purpose of a statistical map is to give a relatively true impression and not an absolutely correct one, and whether New York is 150 times the smallest or 250 times doesn't matter, does it?

RESPONSE [AHR]: To give a relatively true impression it *does* matter "whether New York is – appears – 150 times the smallest or 250 times." This is basic; without it we have no standards at all with which to judge the quality of this kind of thematic map. … The only way to test the quality of such maps is to have the map reader match up the graphic presentation with what is to be communicated.

"…true and absolute values" … are true and absolute to a planimeter, but we don't make maps to be "seen" by planimeters; we make them for people. … If one accepts the philosophy that maps are made for people to look at, and if one accepts that to see normally is not necessarily to see the way mechanical devices or our non-relative system of arithmetic "see" … then it seems to me one is bound to proceed according to the results of proper research. If we ignore its results then we are saying either a) "it is not correct," or b) "it may be so, but I just don't like it that way." Both are indefensible when we are making maps for others to look at.

[From an exchange of letters between Arthur Robinson and the Bureau of the Census, 1964]

PRACTICAL MATTERS 1 [AHR]: We buy meat at Krogers, produce at Safeway … and everything else at Piggly Wiggly.

CHALLENGE [AHR]: "I shall be out of town next week … would you cover the introductory cartography class for me?" [GMc]: "Sure … what's involved?" [AHR]: "It's map projections and the indicatrix … here are my notes [nine lines]."

Eleven completely filled five-by-eight note cards later, I had taught my first class. (Now I'm into dimples on golf balls.)

CHALLENGE: It is undoubtedly all too apparent … that structural elements in the cartographic technique are not only extremely complex, but

poorly understood as well. The reason that visual communication is so subjective and devoid of objective testing is probably, or at least partially, due to the assumption that, because of the infinite number of possibilities, any testing of isolated components would be of little actual worth. It seems likely, however, that a number of cartographic procedures could be evaluated by testing. … It should be possible by testing to arrive at a reasonably accurate area departure factor which when applied to different shapes would bring them to comparable size. On the other hand, many of the aspects of harmony, movement, balance, and proportion, seem likely to remain essentially subjective insofar as their evaluation is concerned. This does not mean to imply that the principles governing their use are purely a matter of individual caprice; it does mean that *exact* standards probably cannot be devised.

[*The Look of Maps: An Examination of Cartographic Design*, 1952]

AHR on foreign languages (for the Ph. D.): Spanish? No ... French and German … or Russian.

AHR, an aside, in the library: "About the [recently completed doctoral comprehensive, written, eight-hour] exam … you passed."

THE LEARNING EXPERIENCE [GMc]: It isn't a good exam if it isn't a good learning experience. I'm still trying to figure out the right answers for some of the questions.

In the fall of 1968, an AHR note … a real catalyst: "If you expect to finish your dissertation before 1975, you'd better do it now … I'll be out of town for the next couple of years."

TECHNOLOGY AND THE HISTORY OF CARTOGRAPHY: In these days of modern cartography, with its advantages of computers, plastics, remote sensing, instant communication, and so on, it is nevertheless worthwhile to look back. Often the basic truths and concepts of a field are made clearer by observing how the innovaters coped with problems no one else had ever faced.

[*Early Thematic Mapping in the History of Cartography*, 1982]

PRACTICAL MATTERS 2 [AHR]: We enjoy wine with dinner … would you like a glass …?

PRIME TIME ISSUE [AHR]: Every day, in some way, spend time with a globe.

STIMULUS [AHR]: I … urge the development of a year-length course in "map appreciation" … without prerequisite … a course that looks upon the map as one of the oldest methods of communication with a fascinating history; one that makes clear the roles of art, science, and technique in map-making; one that develops a modicum of critical judgment concerning the handling of the graphic elements of a map …

["The Potential Contribution of Cartography in Liberal Education," 1965]

RESPONSE [GMc]: How do people find their way from here to there or just around? Simple – they use maps. Maybe not maps on pieces of paper but maps in their heads: mental maps. Different people have different maps, even of the same place. Mapping is an ancient form of communication and maps have created ideas and opinions, promoted understanding and confusion. A non-technical approach to the transformation of space

onto maps, to their content and structure, and their role and impact in human activity, past and present. Neither background in geography nor artistic skills are required.

[Description of GEOG 111: Maps and Mapping, University of Kansas Undergraduate Catalog 1975-2005]

Remembering Arthur Robinson

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Ph.D. 1970, University of Wisconsin, Madison
The Effects of Class Interval Systems on the Visual Correlation of Choropleth Maps

Arthur H. Robinson, "Robbie," was my PhD advisor at the University of Wisconsin. That is far from a unique honor; he advised no fewer than 14 Phd students during his career, and I was one of the last he took on. Perhaps it was all the advising experience before I came along that made him such an expert guide, and that he was. My tribute to Robbie here will start with my experiences as a graduate student and then move on to *The American Cartographer* and to more recent personal memories of this wonderful man.

My first memory of Robbie when I was a graduate student is somewhat vague, but I do remember how I felt—in awe that I was glimpsing the author of that textbook I had been reading as an undergraduate. He looked—so human. Since my master's work was not in cartography, and since Joel Morrison was teaching several of the cartography courses by the time I matriculated at UW, the only lecture course I took from Robbie was the History of Cartography. Even though I was not a specialist in the history of the field and was not particularly enamored of history courses in general at that time, I found Robbie's class extremely enlightening, and to this day I remember many of the things he talked about. His lectures were well organized and, if not particularly dynamic, very easy to listen to, and my fellow graduate students and I absorbed the content and often discussed it out of class. Like all UW geography courses that included both graduate and undergraduates, History of Cartography had a "grad section," an extra meeting at regular intervals (every other week perhaps) of just the graduate students and professor. A term assignment went along with it. I chose to look at the press coverage of the controversy stir-red up by *The Vinland Map and the Tartar Relation*, the first (1965) edition of which had been released on or just before Columbus Day (or perhaps it was just the news of it, but I distinctly remember the involvement of Columbus Day). After giving my report, Robbie asked if I thought they chose that day on purpose, and green young graduate student that I was I said oh, no, I didn't think they would have done that. He very matter-of-factly said "Oh, I think they did" and went on to the next report. He offered no further argumentation and had not stated it as a put-down; it was just an understated hint that opened my eyes to the whole phenomenon of rivalry in the world of publishing and in academics.

The comment is one of many that stuck with me through the years. A small phrase would open up a whole new understanding. Sometimes

it was an aphorism. "You can't edit your own work" (referring to himself as well as those of us listening), "Don't be a slave to consistency [in writing]," and the quotation "Never use a preposition to end a sentence with," come back to me in Robbie's deep voice.

While I was working on my master's thesis I became very interested in the research going on in cartography at the time. In addition to sheer interest, I had a practical bent, I had debated about cartography as the direction to go with the master's, and I was picking up signals that cartography would be a good field to be in over subsequent years. Not surprisingly, I decided to shift emphasis for the PhD. I would have to give the credit to Joel Morrison and to fellow cartography graduate students—Karen Severud (Cook), David Woodward, and others—for inspiring me to go in that direction. But when it came to selecting an advisor, I sought Robbie's input (probably feeling too lowly to ask him outright) and he simply said that for the type of dissertation I had in mind he should and would be my advisor.

I am sure he must have had moments of regret (not too many I hope). One of my biggest challenges as a graduate student resulted from having chosen to minor in statistics, which required, in addition to applications courses, a year-long sequence in mathematical statistics, an experience not for the faint of heart. I sat in on calculus through multiple integration and differentiation in preparation, but even the math majors in the math stats class had difficulty, and the first exam had me in Robbie's office suggesting a change of program. In his usual calm manner, he suggested that I just keep going with what I had set out. Fortunately, my low grade on the exam, demoralizing as it was, was relatively high on the curve (no one would have passed without use of a grading curve in the class) and my attitude toward the class changed during the review of the exam when I recognized the usefulness of the solution to one of the problems. Without Robbie's sage advice, I probably would not have been there to hear what that problem had been about. There were definite advantages to the esteem in which we held our advisors at that time.

Another conversation that I found memorable took place a few weeks before Robbie's graduate seminar in which I participated (the only non-lecture course I had from him). He came into the Cartography Lab where I was working, probably on some errand, but seeing me he sat down and asked what I thought should be the theme of the seminar. It had never occurred to me that someone might ask my opinion about course content, but I swallowed my shock and told him what I had been finding interesting in the reading I had been doing. He said yes, psychophysics would be a good topic and, I assume with the input of other enrollees as well, that was the theme. It was from the seeds of that seminar and from another that was led by Joel Morrison that my dissertation, with its two distinctive but interrelated parts, developed. Had he not asked us, I am not sure what the theme would have been that year. It was an interesting lesson to me about being in tune with student interests.

Robbie was never one to over-emphasize his role in such matters as funding of graduate students, but I do remember that one year I was given a small scholarship by the University that was (unbeknownst to me) misunderstood by the department to be a full ride for the year. Since the scholarship, despite its paltry size, precluded taking an assistantship, I received no word of renewal when everyone else did. Robbie was chair at the time, and worried about what I was going to do without a graduate assistantship, I went to his office and broached the subject. He looked at me with alarm and told me to sit down while he checked up on what had

happened. He returned in minutes to inform me of the misunderstanding and to tell me my funding was restored.

Later I needed funding to print materials for my dissertation, an amount that was trivial, I suppose, but would have been a burden for me. He made sure I got the funding for it from somewhere within the University, and given my vague recollections of the whole process, I suspect he played a significant role in the application.

Probably the most memorable and appreciated incident in my relationship with him as a graduate student was his handling of the reading of my dissertation. I had accepted a position at the University of Georgia early in the year and wanted to be finished before I left in August. When the dissertation was approaching the finishing stages that summer, he informed me that I should call him when it was ready and I could drop it off at his house. I did. Four days later he called to say he was finished with it and I could pick it up again. I did the last revisions and took it to the typist, who would make a clean copy of my portable-typewriter draft with my corrections as well as Robbie's on it. My defense was in August, with my full committee present, and I was finished and off to Georgia. I wish I could report that I returned my own PhD students' dissertations in four days.

As I started my academic career, one of the organizations in which I participated was the American Congress on Surveying and Mapping (ACSM). It was within that organization that Robbie was encouraging the development of an American cartographic journal. Robbie's diplomatic skills and his goodwill among ACSM colleagues as well as his vision for the new journal led to a favorable outcome on the matter. Either just before or just following the decision, Robbie called me at the University of Georgia and wondered if I would be the Associate Editor. He was very specific about the title being Associate Editor and not Assistant, and I doubt I understood the significance of that at the time. Although I do not recall his ever saying anything about discrimination in academia, I suspect he was well aware that women could not have the image of "assistant" if they were to make it in their careers (he never suggested putting his name on anything from my dissertation either). To say the invitation was unexpected is an understatement, but I talked with colleagues about it and decided to accept the post of Associate Editor of the as yet unnamed journal that launched as *The American Cartographer* in April of 1974. As I have indicated in a tribute to Robbie in *Cartography and Geographic Information Science*, which is the current title of that journal, he gave me independence in handling my share of manuscripts. He consulted on various issues and kept me informed and was in effect, if not intent, grooming me to be the next editor, something I would have been altogether unable to do without some experience. He had considerable influence on the journal, but he launched it to exist on its own and accepted not only that it would change and evolve over time, but that others would have control of those changes.

On the human side, there is an image from the planning meeting for the journal that especially stands out in my mind. Robbie was sitting in the lobby of the Disney World hotel where ACSM was meeting (Fall '73). I suppose I expected him to be bored with the trappings of a theme park, but as I approached he pointed over at an awestruck youngster being greeted by the Disney character Goofy. At the time I was wishing I had a camera to catch the youngster. Later I wished I had been able to take a picture of Robbie enjoying the sight of the youngster with the big old lovable Goofy. Robbie was quite capable of seeing and enjoying the magic of the Magic Kingdom as he waited for the meeting that was to be crucial to a journal that has survived for over 30 years.

I turned to Robbie for advice from time to time in the early years of my career and occasionally even later on. He was willing to offer it, but even in the early years, he never offered a lot of it. He did not micromanage his students either before or after they graduated. He made sure in his own way that we were launched in our careers, but like the new journal, we were intended to continue on our own.

My most recent memories of Robbie are due to some fortuitous events. One was that I decided, enroute, to travel through Madison on my way to central Wisconsin last summer. Staying over night at my sister's house, I called Robbie in the morning and asked if he would like a visitor. I received a hearty response and proceeded to the condo to visit Robbie and his wife Martha. He was in good humor and engaged readily in conversation. I showed him some materials from a current (unusual) research project and he was very interested to hear what I had been working on. He wondered when I was going to retire and when I said I hadn't quite decided, he said "Well, I highly recommend it!" As with many statements from Robbie, I was caught by surprise. Here was a gentleman who had changed the cartographic world admitting, albeit indirectly, that he had been happy to finish his career and enjoy retirement. We visited for an hour or so before I headed north.

In October, I was in Madison for David Woodward's memorial service and was fortunate enough to have the company of Karen Cook, also one of Robbie's students and my roommate in graduate school. We contacted Robbie and Martha and invited them to dinner on Saturday evening and to ride with us to the memorial service on Sunday. They, in turn, invited us to dinner on Sunday evening, and it was wonderful contact with them, albeit under the very sad circumstances of the loss of David, which was especially poignant for Robbie, who had outlived another of his favorite students. Robbie was ambulatory but frail and his eyesight had been deteriorating over several years. His mind was sharp, however, and remaining vision sufficient that he competently navigated for us. As usual, he was interested in what we were doing and was especially interested to hear about China and the 2001 ICA Conference, an event both Karen and I had attended.

That was the weekend of October 3. Robbie passed away one week later. Our intention of honoring David with our presence at his memorial service had turned into a goodbye to Robbie as well.

A Lifelong Curiosity about Maps

Ph.D. 1978, University of Wisconsin, Madison
Lithographic Maps in the Nineteenth Century Geographical Journals

Karen Severud Cook
Spencer Research Library
University of Kansas

After finishing my Ph.D. under Arthur H. Robinson's supervision in 1978, my association with him evolved from a formal student-professor relationship into a friendship. Chances to meet in person were infrequent but treasured occasions. When I visited Madison in 1997, Robbie and Martha graciously welcomed me into their home. The following are his reminiscences about the beginning of his career taken from a conversation that I recorded during that visit.

KSC: I want to ask you some questions about cartography and thematic mapping --- and how that has been important in your career. I suppose we should start at the beginning. How did you first become interested in art and graphic design in cartography?

AHR: I suppose it had to do with the fact that my father was an historian, and I read a lot of books about travel and history. I was always interested in places, and when I was in college I majored in history and minored in geography, and I also had a minor in art. I did a lot of oil painting and things like that. And so, it's probably in the genes as well, because my grandmother was quite an artist. My sister taught art at Ohio State University and at the University of Hawaii. I was always pretty handy with my fingers, and I could draw. So I suppose that's the background of it.

KSC: Which grandmother was that?

AHR: My father's mother. She didn't do anything commercially, but I can remember that there were paintings hung around the house --- pictures that probably had to be hung. And they weren't bad at all. As I said, in college I did a lot of art, but when it came time for me to go to graduate school, it turned out that I didn't have enough credits in art to go into art, or I probably would have. I had enough credits in geography, and also the geography professor knew somebody that could get me an assistantship, so that's why I ended up in geography. And then I came to Madison and did drafting and making some maps for various people in other departments at the university to earn a little bit of extra money. And so I just got started in it.

KSC: Were you a graduate student here in Madison?

AHR: Yes. 1936-1938. Then I moved to Ohio State.

I think probably the first map I ever made, though, was right after I graduated from college. I had a job as a secretary, a very rotten secretary, to a member of the Ohio Board of Liquor Control, and she, Mrs. Patterson of the Patterson family of National Cash Register was quite a politician. She wanted a map showing the distribution of local option in the state of Ohio, because Ohio laws varied from county to county as to whether you could sell wine or beer and whether you could have a liquor store or not.

It was all very complicated, but they had all the data, and she wanted me to make a map, so I said, "OK, I'll make a map," and I did. It was a pretty good map, but the one problem I had was the lettering. I hadn't had any experience with lettering, and I wasn't about to try to do it, so, for my own purposes, I invented stick-up. I figured out all the names and all the sizes and had them printed on gummed stock. Then I just cut them off with scissors and licked them and pasted them on the map. Pretty good. I had never heard of stick-up or anything like that. So that was the first map I ever made. That was in 1936.

Later, I became quite busy at Ohio State making maps on a free-lance basis. I got into the business then. Also, I met quite often with my brother-in-law, Bob Coffin, who taught art at Ohio State. We got talking and of course I was very much interested in the art program. I even sat to be sculpted in the Art Department. I got to know a number of their professors quite well, and, actually, someone from the Art Department was on my PhD examining committee. Yes, I did a lot of work making maps at Ohio State.

KSC: Was that mostly for people in the Geography Department?

AHR: No, what I was doing was under independent contract with publishers of geography books, ones for which Roderick Peattie was the geographic advisor. The publisher was Scott, Foresman Company. He wasn't the author, but he was their geographic advisor. And so I was the cartographer for a series --- a couple of books.

KSC: And that time you didn't really have any contact with anybody in psychology about map perception.

AHR: Nope. Not a bit.

KSC: I thought so but felt I'd better ask. At that time, what aspect of cartography would you say that you were most interested in?

AHR: Well I suppose it would have to be the kind of stuff that I was doing. They were mostly thematic types of maps. I did some work for several federal agency people in Ohio; there were some programs, and they needed some maps. But mostly I was working at home on maps for the textbooks. I did all kinds of maps.

KSC: Was it mostly pen-and-ink drafting that you were doing?

AHR: Yes, it was mostly black-and-white drafting, although often the company had it printed in color, and they did weird things sometimes. But, yes, it was mostly black-and-white. Oh, I did special kinds of things for books that Peattie himself wrote. I illustrated one or two of his books in which I used various media. I used Coquille board and Ross board, and those were all black-and-white. I was also the sole user, as far as I can remember, at that time in Columbus, Ohio, of Zip-A-Tone. The art store had never even heard of it when I went to buy it. As far as I can remember, I didn't use any more stick-up lettering then. I did hand lettering instead, and I certainly used a lot of Zip-A-Tone.

Now the reminiscences shift to the Second World War and his cartographic work in the OSS (Office of Strategic Services). As Robbie had earlier recalled, Richard Hartshorne, a University of Wisconsin Geography faculty member, had been appointed in 1942 to head the Geography Division of a newly formed intelligence service (which would become the OSS). Driving alone with his two small children from Madison to take up his new position in Washington, D.C., Hartshorne arrived, frazzled, on the Robinson doorstep in Ohio. While enjoying a hospitable break from the road trip, Hartshorne also took the opportunity to recruit Robbie as a cartographer.

KSC: Let's say that you have just arrived in Washington. What kinds of maps were needed, and how did that change over the time you were there?

AHR: When I first got there, Hartshorne simply knew that there were going to have to be maps. He didn't know anything about what kind. He thought he'd better get somebody that knew something about map making. I don't remember for whom I made the first map. After a while people would come to Hartshorne saying they'd like to have a map of this to go with this report, and he would shunt them to me. I don't recollect the topics or anything, except that it was everything under the sun. The Europe-

Africa Division would be doing a report on the electrical situation, the grid in France, and they would want a map. They'd have a whole bunch of different information, and we'd have to compile it and put it together.

KSC: Were those mostly written reports?

AHR: They were written reports. There was a branch of Research and Analysis, which was a very large branch with several hundred people in it, mostly from the academic world --- a lot of historians, some geographers, economists, anthropologists and the like. They were doing reports. Some they thought would be useful and dreamed up themselves. Some were at the request of the Department of State. A lot of them were at the request of various branches of the military, especially the Joint Chiefs of Staff. There were just all kinds.

Very soon after, in 1942, they created what would become the OSS. They got rid of the Geography Division as a division and reconstituted a Map Division consisting of two sections of the old Geography Division, plus two others sections that I organized a little later on. Hartshorne became a member of the Board of Analysts, a very prestigious part of the organization which vetted all the reports, so he was very busy.

There were a lot of geographers about. As you would expect, they wanted maps, and we were flooded with map requests. They came from the people in the Research and Analysis Branch and also from the Administration of OSS. We had them from the War Department. We did the daily situation map for the Operations Division of the War Department. We were just busier than bird dogs all the time.

KSC: When I visited the National Archives in Washington last week, I looked at some of the maps that were produced by the OSS. Some were black-and-white, others were color, and they looked like they were printed. There were also a few that looked like black-and-white photographic prints.

AHR: They were photostats. To begin with, in what was called the COI, that was our only method of reproduction. The first organization was called the Coordinator of Information, and that's what Donovan [Colonel Bill Donovan] originally headed. Sometime in early 1942 it was changed from the COI to OSS. Same outfit, they just changed the name.

KSC: You must have been producing the maps in small quantities.

AHR: They were not in large quantities at all. You see, these were reports. The reports were not duplicated in great numbers. All we did was to illustrate reports. I don't recall that we had any call for many copies of things until later on, much later on.

KSC: Were any maps produced to illustrate talks?

AHR: No, not very many. Oh, we'd be called upon occasionally to make an organizational diagram or the like, but we were primarily concerned with maps.

KSC: You said before that you were alone making maps there at first, but the number of people expanded quite rapidly to meet the demand.

AHR: Yes, I don't remember when that started, but it was certainly some-

time within the first year, in 1942. We were up and going, really operating, within four to five months. It was a burgeoning output.

KSC: How did it work if somebody had the idea that they needed a map? Would they come to see you?

AHR: They would come to the office, the main office, my office, and they would be assigned to a cartographer. He would go over all their needs, establish what data they had and what data we had to provide, usually the base data. The author of the report would work with the cartographer. After the cartographer got it all squared away, he would write all the specifications, how it was to be drafted and so on. We would have the individual who wanted the map check over the worksheet and later the drafted map, just to be sure there weren't any bad mistakes. They mostly checked the data they had provided. They didn't know anything about base data. A lot of these people didn't even know that water doesn't flow uphill. The map would probably be checked several times, and then, after final drafting, it would be checked again by those involved in production.

KSC: Did you interact with the cartographers who designed the maps?

AHR: To begin with, I certainly did. For the first couple of years of the operation, I was pretty involved. When the cartographers had questions or couldn't handle something, they would come and ask me. We would go over the possibilities. They used a lot of special kinds of methods and techniques, as well. We had airbrush and so on, but we didn't have people who were very good at doing it. I sent a group up to New York City to work with Richard Edes Harrison and Robert M. Chapin, Jr. and learn more. We did some color experimenting. We wanted to use plastics and alcohol-based inks. We were trying all kinds of things. We had everything under the sun coming at us to be made, so we were just trying to meet the demand. It wasn't easy, because we were learning as we went.

KSC: There was little evidence of process colors on the maps that I saw at the National Archives last week. The ink colors that you used were quite varied.

AHR: Well, I don't think we used process color in the sense of overlaying the primaries. I don't remember doing that. We were more concerned with printing something in blue or red or green, and so on.

KSC: Yes, the water would be blue, and other information would be another color.

AHR: I don't remember being real fussy about colors, and I don't remember that we had a color chart.

KSC: Really!

AHR: Yup.

KSC: Were the maps printed somewhere close by or in your shop?

AHR: At first the Photostat Unit was all there was in the way of reproduction, so all the early maps were black-and-white. Then the Reproduction Branch developed and began lithographic printing, flatbed at first and

then rotary. It wasn't very big, but it made color printing possible. That was all inside OSS, but it was not Map Division, it was a Reproduction Branch. We worked very closely with them all the time. Later on, when we began to do some big print runs, we began to use the Government Printing Office and outside printers.

We did what we called the OSS Theater Map, and we printed it in color, very subtle color. We didn't want to have a lot of stuff on the map. That was printed in Baltimore by Hoehn and Company, who had done all the National Geographic and American Geographical Society maps. I got into trouble with old A.B. Hoehn, the owner-operator, because we were trying to make a map that you could see and use on a wall. By that time we, or I, had learned that blue is a lousy color for edges. We wanted to make the ocean something that wasn't blue but was similar. We experimented by mixing up colors and putting them on things in the hallway, so we could get far enough away from them to look. We finally decided on a green color. Old man Hoehn said, "No, I'm not going to print that!" I said, "Well, you're not going to get enough contrast if you don't print it." I explained to him about the color. He even wrote me a poem about it. I wish I'd kept the poem. But at any rate, finally he understood, and he printed it. He acknowledged afterward that we were right. He called it a degraded green, which means it had black in it.

You could see the edges in green, you know --- coastline edges, water bodies and so on --- you couldn't see them in blue.

KSC: There were a lot of OSS Theater Maps of different areas. What can you tell me about them?

AHR: Well, the OSS Theater Map covered, or was supposed to cover, the world. And I think it probably did, too, at a million and a half scale. We fudged a projection for the thing, so you could put together without gaps for any set of maps anywhere on the earth. You can't do that with IMW (the International Map of the World at 1:1,000,000). There were individual sheets, a whole lot, hundreds.

KSC: And the people who used those maps, did they add information to them?

AHR: They would stick them up on the wall and mark them up. It was a sort of base map. As I understand it, they were widely used in the field. A million and a half is a pretty good scale, and you could get a lot of information on them. They would post the daily situations on the maps as they came in. When they used up a sheet, they would get out another one and stick it up.

KSC: What about the thematic maps that you produced, the maps that illustrated the reports. Did you have any interaction with the people using them that changed the way you produced them?

AHR: No. You see, other than geographers, people don't know much about maps. We just tried to make them as legible and neat and effective as we could. The only real feedback we got was that they looked too good, too authoritative, so we devised a reliability statement that went on maps.

KSC: How did you come to leave the OSS?

AHR: From about 1944, actually the middle of 1943 onward, I was mostly in administration and management, and I wasn't much involved any more in the actual map-making except as an occasional advisor. I worked all the way through 1945, and near the end, October or something like that of 1945, the OSS ceased to exist. It was portioned out. Some of it just died out, but cartography went to the State Department. Map Intelligence also went to State Department temporarily. Model Section went to the Army Map Service. I think the Photographic Section just ceased to exist, but, while I was there, it was still operating.

I came to Madison immediately the first of January. Actually, I had been appointed in September and was on leave for the first semester of the 1945-1946 academic year. I began teaching here in January of 1946. I had received a demobilization award to carry me through a couple of summers, while I worked on the dissertation. They were readily available for people like me with interrupted graduate work. I didn't actually go back to Ohio State at all. I may have registered in absentia or something like that.

KSC: You were an ABD – all but dissertation.

AHR: Yes, that's right.

KSC: Did you pick the topic for your dissertation after you got out?

AHR: Yes, I had planned to do a dissertation on the historical mapping of the Mississippi Valle, but after the OSS experience I was very much interested in map making. So I proposed to do a dissertation on the foundations of cartographic technology, I think that was the name of it [It was *Foundations of Cartographic Methodology*, Ohio State University, 1948]. Guy-Harold Smith, who was my advisor, agreed, and so I did it. My dissertation was read by a chap in the Art Department and by Guy-Harold Smith as the advisor. There were no problems. I just buzzed through. And that's what became *The Look of Maps*.

KSC: Obviously art and ideas from art were and continued to be important for you, but at some point you became interested in psychology and the testing of perception. It seems to me that by the time you wrote *The Look of Maps* that idea was already there.

AHR: It was mostly in the dissertation. Yes, I remember picking up books having to do with art and color and the graphic arts and so on. They opened my eyes to the fact that there had been a lot of psychological work going on, perception of lettering and things like that. It all seemed to fit very well indeed to map making, and that's what happened, that's all I can say. I just kept finding out new things and being greatly intrigued by the stuff that had been done in other fields.

KSC: In your early years of teaching at the University of Wisconsin you finished your dissertation, wrote *The Look of Maps* and wrote the first edition of *Elements of Cartography*. When did the cartographic laboratory at the University of Wisconsin get going? What was your role in that?

AHR: Well, my position was a new one when I came here. Part of the responsibilities that Vernor C. Finch envisioned for my position was to help make maps for others around the university.

He also wanted me to be an advisor to the various state agencies making maps. Now, when you think about it, they're not about to take advice. I can relate one such experience. I went to the organization that made the official highway map. I was appalled to find that they did the lettering with what they called an imprinter. They literally set the type in a little hand-held device, inked it and pressed it on the map. I'd been using stick-up for years. This was back in the dark ages. I mentioned to the chap that was running the outfit that it's a lot easier to use stick-up. He said, "I'll never use it in this office!" I asked why. He replied, "We used stick-up once for one of our maps, and one of the names fell off when it was being printed. Unfortunately, it was Wisconsin Dells, the primary resort place in Wisconsin. I will never use stick-up!" So that was one of the things I was supposed to be doing, and it just fell flat. There was no point in even trying to give advice.

But I did get occasional requests to make maps. I was able to get a graduate student who, as part of her stipend, worked with me and did drafting. I had requests from the very beginning.

For example, one of the old professors, a former president of the university named Burge, came bustling into my office one day. He was about 98 years old at the time, one of the few people that outlived his insurance and got paid. Anyway, he wanted a map drawn up of a lake in northern Wisconsin. He went back out, and I don't remember whether I ever did it or not.

The first real map that we made was a very large, colored soil map of Langlade County, a big operation. I had a drafting table in my office which was located at the south end of the hallway on the third floor of Science Hall. It no longer exists as an office, but it was a big office, and I had a big drafting table in there. This student came and worked regularly, but it was simply something that we did. It wasn't an organized service. It was just the two of us.

But I was still doing a lot of free-lance map making to augment my salary. I did the Whipple James series of books, while I was here. [Gertrude Whipple and Preston James collaborated on a series of geography books published by Macmillan.]

KSC: So this would have been the period before the cartography lab got started.

AHR: Oh yes, this was at home. On that set of books, I got Gene Kingman to do a lot of artwork for them. I will show you some.

It didn't become a formal organization until sometime in the 1960s. By then we had a pretty good-sized organization, but it was still informal. Randall Sale was working half-time at the Wisconsin Geological and Natural History Survey and half time for me.

KSC: Was he a graduate student?

AHR: Yes, he did an undergraduate degree and a master's degree, but he didn't want to go on. We had more and more graduate and undergraduate students doing drafting. I decided it was time to become a legitimate organization. I proposed that we start a cartographic laboratory, and the department approved it. I got the Dean to go along, and we became a legitimate sub-department of the Geography Department. We had a separate budget, and we had income from the Graduate School, the University of Wisconsin Press, and places like that. We became quite busy. From then

on it was a cartographic laboratory. I was the titular director, and Randy Sale was the associate director.

KSC: Were you involved in the design of the maps?

AHR: Yes, not all of them by any means, but from time to time a question arose about how to handle a map. I wasn't divorced from the map making at all. I was much involved, but not on the routine stuff. Randy Sale and I cooperated very closely, and we consulted often.

KSC: Could I just come back to the idea of using photographic tint screens for what I call the graphic middle ground? If you understand what I mean, it's combining a gray background with both lighter and darker symbols and lettering. I learned about that design approach as your graduate student in the mid-1960s. When did you start using it at the University of Wisconsin?

AHR: Well, it might have been in a paper by Clarence Olmstead published in *Economic Geography* ["American Orchard and Vineyard Regions," 32:3 (1956), 189-236, figs. 5-9]. We had a hard time with the printer in Boston, because he said, "You can't do that!" And we said, "Oh yes you can. You just follow these directions." There I'm sure we used a neutral color, neutral gray, with dark and light on it. We used reversed out images on other maps, as well.

KSC: I remember that the cartographic laboratory had samples of black-and-white lettering printed on different shades of gray. The background consisted of flat grays and also screened Zip-A-Tone patterns, both created with tint screens.

AHR: Yes, after we got screens, we could do anything. We did a lot of masking to get the effects, reversing and the like.

KSC: Were you inspired by work that was being done with maps elsewhere? Was there any particular type of map? For example, geological maps use a lot of area patterns. Or was there a printer who was doing interesting things?

AHR: I was quite aware of all of those things. I was especially aware that flat tones are hard to tell apart. You have to put some pattern in them, so that you can tell them apart. I still see some awful examples, grays as well as colors. You're supposed to be able to tell them apart, but you just can't figure out which one is which. That's been something that I've preached as long as I can remember, that you've got to identify the categories.

KSC: The number of categories that you can have is fairly limited, isn't it?

AHR: Yes, it seems to me that the magic number is 4 or 5.

KSC: After the war, when you were teaching at Wisconsin, were you in touch with people that you had worked with at the OSS about cartographic things?

AHR: Yes, in some respects. Of course I knew the people in the CIA Map Division, a lot of them had worked for me in the OSS. I kept in touch with people that were in the organization, good friends of mine, Bob Visual,

Henry Frieswick and people like that. We kept in touch, but I didn't have anything to do with their map making.

KSC: What about Arch Gerlach, who was the Chief of the Geography and Map Division and then became the guiding force behind the *National Atlas?*

AHR: Yes, Arch was my Assistant Chief in the OSS Map Division. After the war he came here to Madison to teach for a few years.

KSC: Was he teaching cartography?

AHR: No, he was a geographer. He didn't teach cartography. Then he got the opportunity to take Brook Atkinson's job at the Library of Congress, so he took it and moved to Washington. He was a very close friend of mine. We kept in touch.

KSC: I know that various people in cartography worked on thematic maps for the *National Atlas*. George Jenks and some students at the University of Kansas created some dot maps, for example. Did you have any involvement like that?

AHR: The involvement that I had was in an advisory capacity. I don't remember making anything, but I know that I consulted. I made trips to Washington to work with Arch Gerlach on the planning.

KSC: George Jenks and John Sherman became important in academic cartography after the war. Had you known George Jenks during the war?

AHR: No, I hadn't known him during the war. He had a grant after the war to go around and look at cartographic operations, and he spent some time here, not very long. He was making a tour of places that were doing map work, so I got to know him that way. And then of course we kept in close touch from then on.

John Sherman I did not know during the war either, but I got to know him pretty well later on. We were both much involved in work on the National Research Council. There was the idea of having a national cartographic institute of some kind, in which John Sherman was very much interested. I was involved in helping, although he was the prime mover. And then I was asked out to Washington for a week to give a series of lectures. Yes, I got to know John pretty well.

KSC: Did you exchange information about the research that you were doing or maps that you were working on?

AHR: Not much, although more with Jenks than with Sherman. Sherman was very much involved with map making in the Pacific Northwest. I didn't know anything about that, and he had a good helper there named Willis Heath. They had quite a going concern.

I had more to do with George Jenks, who was much more interested in statistical problems in cartography, but more informally than anything else. I know we both attended a conference in the Netherlands. We had some long talks debating how to go about things. I knew George very well.

KSC: Were there any other people in cartography from the 1950s through the time you retired that you feel were important to you, that you interacted with?

AHR: Well, I became quite well acquainted with John K. Wright. We were sort of kindred souls, and I knew the people at the AGS. Of course I knew the people in the CIA cartographic outfit. Occasionally I would visit Washington, and the CIA would let me come in and go through their organization and see what they were doing. Then I worked with Wally Ristow and John Walter at the Library of Congress.

KSC: What about internationally?

AHR: Well, not in terms of making maps or anything like that. It was mostly international organizations. I was very busy on that.

I just don't remember that I had many contacts. I was pretty much alone until after graduate students like yourself and some of the earlier ones, Barbara Petchenik and people like that, got out and became active. Then I had people to work with. And George Jenks was the same way. John Sherman was the same way.

KSC: So I think what you're saying that your students have been important as people to interact with and also a way that your ideas about design and other aspects of cartography have been disseminated.

AHR: Oh yes, there's no question about that. Students were very, very significant.

KSC: I think this conversation is partly a personal exploration for me of the formation of my own ideas. Just to give you an incident, when I decided to work on the history of map lithography, which was going to be my thesis topic, I was sure that I had thought that up myself. Then I went to a conference where I met Mei Ling Hsu for the first time. She asked me what I was doing, I told her, and she said, "Oh, so he finally got somebody to do that topic!" Ever since then I thought, "Hmm, how much of that topic was me, and how much of it was me being impressionable?"

AHR: It could have been my idea. That was something I was very much interested in. I did some, but I never had much of a chance to look into it, you know. It was just like Jim Flannery and the graduated circle. I knew that you didn't see them right, that you couldn't judge them properly. Other people knew that. And I thought there's got to be a way to figure that out, an alternative way, and that became his dissertation. I think that's usually the way dissertations get started, really. I don't think there are very many that the candidates dream up all by themselves.

KSC: Well, I feel very fortunate that you were interested in both map perception and design and in the history of cartography, so I was able to take seminars in both. Ever since then, I have been moving back and forth between the two topics.

AHR: Well, that's good; then you don't get bored.

No, Robbie, I don't think either of us could ever find maps boring. In 1979 you wrote me that you wanted to call the book you were working on Curiosity Mapped: The Early History of Thematic Cartography (personal communication, June 18), a book that eventually appeared as Early Thematic Mapping in the History of Cartography (Chicago: University of Chicago Press, 1982). By the time I entered the University of Wisconsin as a graduate student in Geography in 1965 I was already curious about maps. Thank you for channeling that curiosity and encouraging me to spend a lifetime satisfying it.

In Remembrance of David Woodward

Of Mentors and Madison

Jan Mersey
Department of Geography
University of Guelph,
Canada

Ph.D. 1984, University of Wisconsin, Madison
Color on Choropleth Maps: The Effects of Color Scheme and Number of Classes on Map Communication

I did not commence my graduate studies at the University of Wisconsin with the specific aim of studying under Arthur Robinson or David Woodward, yet these two men became the most significant and influential mentors for my own professional career. Their ideas, attitudes, and character affected me deeply and as the years pass I appreciate more than ever the privilege I had of completing my graduate work under their tutelage. Many of the practices and approaches that characterize my own teaching and advising style were shaped by my experiences with these two eminent professors.

I spent nearly five years in Madison (1977-1981), where my academic home base became a desk in 470 Science Hall overlooking Bascom Hill. What a fertile environment that office was with dozens of cartographically-minded graduate colleagues always available to share ideas, offer support, and of course, partake of the occasional beverage across North Park Street on the terrace. It is a great pleasure to still hear from many of these individuals and to meet up with them at conferences or on my travels.

In the initial semester, all students in the cartography program (there were about 30 of us including both the thesis and non-thesis streams) were required to take *Geography 765: Research Methods in Geography*. This course, coordinated by Phil Muehrcke, seemed designed to incite terror in the hearts of all new grads, primarily because it required the dreaded *oral presentation*. In fact, it required three of them: a literature review essay, a book review, and a research proposal. For the literature review, we were assigned our topics. Here's a sample: Negative Scribing (Doug Bedell); Cartographic Psychophysics (David Seldon); History of Cartography since 1900 (Bob Marinaro); Photo-Mechanical Map Production (Harry Epp); Development of Map Use Skills (Anne Geissman); Marine Cartography (Mike Rynish); and Cartographic Communication (Jan Mersey). Somehow, we all survived (although not all our topics did).

In the same semester, I completed my first course with Arthur Robinson (*Mr. Robinson*, on the course syllabus) - *Geog 572: Graphic Design in Mapmaking*. I was immediately impressed by his calm and composed manner, his extensive knowledge of the subject matter, and his considerable organization. Each week we would receive a detailed mimeographed outline containing all the key elements covered in lecture. Other than the outlines, he used few props. Instead, all eyes were on him as he introduced us to ideas like the design comprehensive, non-verbal thinking, and the visual variables. I can still hear his resonant voice as proclaimed "simplicity in design is always desirable" or "excellent design will not be apparent ex-

cept by contrast with poor design". I later had the opportunity to serve as a teaching assistant for this course, and came to realize just how many students decided to pursue cartography as a career because of Robbie.

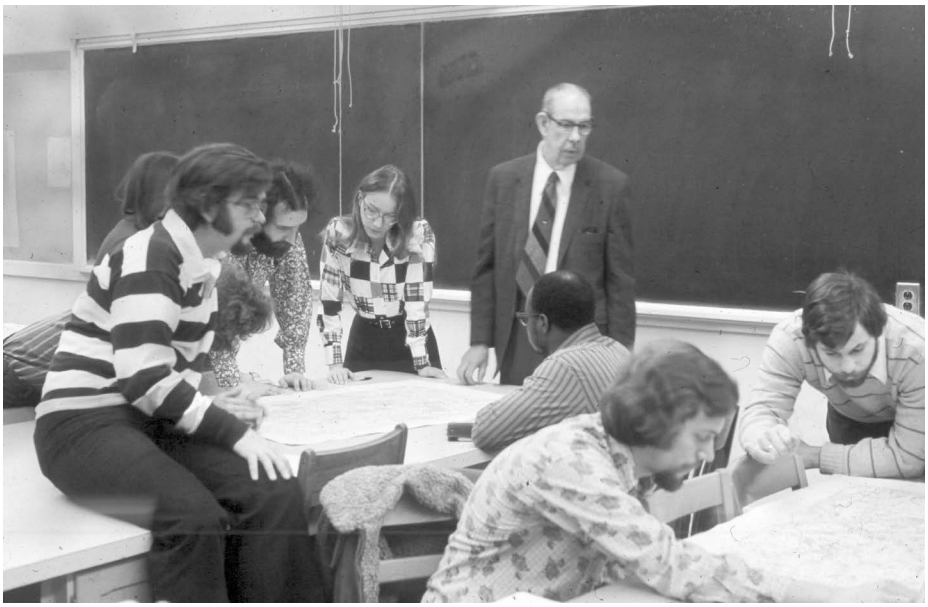
Despite the admiration and respect students had for Robbie, he was always approachable. His office was also on the fourth floor of Science Hall and he kept quite regular hours. I recall timidly dropping by his office one time to ask a question, when he picked up a rolled-up map and whacked it down on his desk. This he told me, was the trick to making a map lay flat - it "startled the fibers into alignment". It has the same effect on students.

On another office visit I remarked to him about how nervous I was about having to deliver my research proposal orally to our seminar class. He surprised me by telling me this was exactly the way one should feel before public speaking, since it meant that you were taking the occasion seriously and would prepare with the necessary care and attention. The worst presentations, he related, happen when the presenter is too casual, even flippant, and handles the subject manner in a nonchalant, cursory manner. Sitting though many conference presentations in years to come, I found his remarks proved true time and time again.

I witnessed Robbie angry on only one occasion. It was during a lab session in a cartography course where I was the teaching assistant. A student was furious with the grade I had given him on an assignment and was hurling a barrage of expletives at me. Robbie happened to walk by, noticed what was going on, and intervened. He quickly became the receiving end of the verbal storm (I still recall the student's exact words but can't repeat them here). I stood there completely mortified that someone would speak that way to Professor Robinson! Robbie (not a small man, remember) took the student's assignment, got within about two inches of his face, and boomed "I agree with these grades!", while jabbing a pointed finger on the pages. The student withered and slunk off. Robbie calmly turned to me and asked if everything else was going ok in the course. We never mentioned this incident again, but his unquestioning confidence in my assessment of this student's work meant a great deal to me. He taught me how important it is to show support for your teaching assistants, especially in front of students, and to handle inevitable disputes in a way that does not compromise their authority.

Robbie, along with the other cartography faculty at the time, strongly encouraged students to participate in conferences, and I was invited to help staff the University of Wisconsin booth at an upcoming ACSM meeting. So, in March 1979, a group of students, including Marian Clark, Mark Riggle and myself, set off to Washington DC in a university station wagon. This was my first conference, and it was pretty exciting. The highlight for me was a session on "Map Design and Perception", chaired by Carleton Cox and Ted Steinke, which included three papers related to the infamous "equal value gray scale". Robbie had kindly arranged for me to meet with several cartographers from the Census Bureau, and they provided me with some two-variable maps I subsequently used in my own Masters research.

On April 11th, 1980, it was an honor to attend the retirement dinner and ceremony for Arthur Robinson, at the Inn on the Park in Madison. Henry Castner presided as Master of Ceremonies, and remarks were delivered by ten speakers including Patricia and Stephen Robinson, George Jenks, Barbara Petchenik and Joel Morrison. Robbie himself concluded the event with a gracious appreciation speech. The evening was particularly significant for me, as I not only had the chance to personally thank Robbie, my mentor and M.Sc. advisor, but to meet "the



Robbie teaching a cartography class in Science Hall, March, 1979.

new guy" - David Woodward, who was to become my Ph.D. advisor and future mentor.

When David joined the Geography Department in 1980, he inherited me as his graduate student, as I had just completed my Masters degree and had been accepted into the Ph.D. program. Although we didn't exactly choose each other as partners in our student-advisor relationship, this arranged marriage turned out to be an excellent one, and the beginning of a life-long friendship. David quickly earned my respect for the meaningful guidance and support he provided as I struggled to develop my thesis proposal. With his gentle humor and unassuming manner, he was a pleasure to work with, and his implicit unspoken expectation of excellence made me want to do my best.

David was a wonderful teacher. Naturally, the history of cartography course was his specialty, but most memorable for me was his teaching of *Geog 570: Problems in Cartography - Map Lettering* in the winter semester of 1981. In the labs, David tried to teach us calligraphy but no one could come close to matching his beautiful handwriting. David was passionate about fonts, and his descriptions of the grace of Palatino, and the "chumminess" of Souvenir, and the timelessness of Times Roman have stayed fresh in my mind. How often I think of him when I see a badly kerned sign or headline!

I was impressed with how eagerly David embraced new technology in his teaching. Even in the map-lettering course, we were sent off to MACC to use a new computer-typesetting program called UNADS to create sheets of stick-up lettering for a mapping project. When the new digital imaging lab opened in the Helen C. White library, David was first in line to book it for his history of cartography course with a scheme in mind to scan old maps and measure distortion. Remember, this is still long before laptops!

Visits to David's home were frequent and wonderful. A houseful of Airedale terriers, a working printing press in the basement, delicious homemade meals (with great wine!) and Roz's warm hospitality made for some memorable evenings. We continued to keep in touch over the years (I always welcomed those custom Christmas cards) and during a brief sab-

batical stay in Madison in 2002, it was enjoyable to once again inhabit an office in Science Hall, and see David regularly at his desk.

Upon his retirement, David generously sent me several CDs containing his cartography lecture notes and illustrations—they have proven to be a valuable resource indeed. It was a rewarding occasion for me when David, myself and Andrew Millward, one of my own graduate students, took turns at the podium during a cartography session at the NACIS conference in Portland, Oregon, in October 2001. The cycle of educational succession continues. How fortunate I was to have studied with two of the best!

David Woodward, An Appreciation

Mattthew H. Edney
Department of Geography–Anthropology
Univ. of Southern Maine

Ph.D. 1990, University of Wisconsin, Madison
Mapping and Empire: British Trignometrical Surveys in India and the European Concept of Systematic Survey 1799-1843

I suppose I had the best sort of student-advisor relationship with David. I went to Madison to study with him, but I went on the advice of my undergraduate advisor and with no idea of what kind of work he did. I did not work on the same sorts of research questions as David did, so there was less chance of disagreements and disputes over my work. Our relationship was therefore based on a shared interest in the history of cartography and friendship. Because David had always treated me with respect, my transition from being his student to being his colleague was seamless. Our interactions were of course fewer after I left Madison, but he always remained generous with his advice, support, and understanding.

But David was not necessarily the best advisor. He was much more of a listener than a talker. His ability to listen was, perhaps, the crucial element of his professional success: he cultivated colleagues and potential donors alike by listening to and affirming their fascination with maps; he was rarely aggressive in putting forth his own ideas and convictions. But such reticence is not good in an advisor, who must on critical occasions be a dictator. He had a very much hands-off approach and he expected his students to be self-motivated. When they weren't, he could get quite discouraged. At the same time, however, they could bring forth his humor and keen appreciation for the absurd. We were on the front deck of my second-floor apartment during a summer party when an especially recalcitrant and unproductive graduate student arrived in the street below, carrying an offering for the party; David leaned over the railing and lightheartedly called down, "is there a thesis proposal in that watermelon?" But if the student came through with the goods, David was a wonderful supporter, both intellectually and materially. Moreover, he was always thoroughly honest in all of his dealings; he always despised and refused to play the power-games that seem to permeate so much of academia.

David was an artist — he was not at all numerically inclined — and he expressed his technophilia through the acquisition of all of the newest Macintosh products and a consistent despite of all things PC and Microsoft. In particular, he had that right-brain sense of design, precision, and structure that encourages an intuitive logic in all forms of presentation, whether verbal, written, or graphic. My own sense of logic is rooted more in left-brain Euclidean and algebraic geometry, but we met halfway. And in that middle ground it was impossible for his aesthetic sense — especially about typography — not to rub off on me. This was not a conscious process. I arrived in Madison a surveyor; I even began my dissertation in 1986 with the absolute conviction that I was not going to reproduce any old maps in my work because I was interested only in the surveys. I don't think that I truly appreciated the aesthetic skills and graphic logic that I had somehow absorbed from David until I took up my position at the University of Southern Maine. There, with free and unfettered access to the old maps and books in the Osher Map Library and with the task of interpreting those materials for both academic and public audiences, what had still been a latent (dare I say "academic"?) concern for the physical artifact and for the graphic qualities of maps and books alike suddenly flourished and I came to understand David's fundamental concern for maps as *things*.

The most prominent aspect of David's career as an historian of cartography was his 24-year collaboration with Brian Harley on *The History of Cartography*. Looking at this partnership from the outside, Brian's social and political exuberance seemed to overshadow completely David's almost painfully shy rectitude. It is easy to turn Brian into the "ideas man" and David into the "manager." But this would do David a disservice. Brian might have been the flamboyant front-man for the new history of cartography, but it was David's quiet, polite insistence on the need for new ideas and new approaches that has given the field the depth and soundness it so desperately needed. If the history of cartography was The Who, Brian would have been Roger Daltrey, swinging the microphone, strutting around the stage, and demanding attention, but David would have been John Entwistle, standing off to the side, barely within the stage lights, but laying down the intricate bass rhythms that drove the whole ensemble along, gave it structure, and kept it together. In terms of David's favorite comedy troupe, Monty Python, he would have been Terry Gilliam, the artist/director whose humor and aesthetics held each show and film together. He was Teller to Brian's Penn.

Above all, I must remember David as a friend. There were weekends at the cabin in Vernon County doing a mixture of interior construction both delicate (e.g., wiring) and crude (e.g., beating the @$#&*% out of a disagreeable stud wall). There were, of course, disagreements and arguments. There were the dinners and drinks in Madison and at conferences. He read a scripture passage at my wedding. And he opened his home and family to me. He was a good man and he will be sorely missed.

David as a Map

Guntram H. Herb
Department of Geography
Middlebury College

Ph.D. 1992, University of Wisconsin, Madison
National Self-determination, Maps and Propaganda in Germany, 1918–1945

When I think of David Woodward, I think of a map. It is an extraordinary map. For in David's view, there was no such thing as an "ordinary" map and David was an exceptional human being. This map has a special place in my heart. It has guided me and continues to guide me through perilous voyages of discovery: my research, my professional career, and my personal life. It gave me a baseline from which to start, it helped me orient my endeavors, and it clearly depicted the peaks that I should aspire to reach as well as the treacherous passages I should evade.

What are the dimensions of this map? Don't think of it in two or even three dimensions and don't even try looking for a border. David's intellectual curiosity and imagination were not constrained by conventions. His spirit soared far beyond the Euclidian grid. His map's scale is flexible and dynamic. When David and his friend, the late Brian Harley, first conceived of the History of Cartography project, they envisioned three or four volumes, but soon it grew to six. Once work got under way, the individual volumes grew so much that some had to be split into two or three books. For David, scale was not pre-defined, but intimately tied to the goals he set for himself—and David had big plans. He never tired or lost sight of his vision. When financing became tough with major budget cuts for funding agencies, he didn't despair; he just looked for new sources. Whenever I faced a major challenge, I thought of David's response to adversity: "there is always another way…"

What kind of artifact is this map? If you have ever seen an original map from the Renaissance—David's favorite historical period—you should have an idea of its artistry, beauty, and scientific sophistication. David was not only a renowned scholar, but a superb cartographer, craftsman and designer. His penmanship would have earned him respect even among the scribes of the Islamic world where calligraphy was cherished. His maps and sketches were striking and the broadsheets he printed for the friends of the History of Cartography project were stunningly beautiful compositions that integrated text and image. Just like the pieces he created, David's map is a synthesis of art and analysis. He was at home and happy in the archive as well as the print shop, the class room as well as outdoors, and even in the air—he obtained a pilot license a few years ago and was passionate about flying. Looking at David's map makes me realize that happiness means walking different paths—and that narrow specialization is something to be avoided.

What is my favorite part of this map? I could not single out one element for it would do injustice to the sweeping influence David's map has had on me. Its projection is multifaceted and conveys wisdom, warmth, ethics, and humor. Yet, I will elaborate on the sense of humor since David was not inclined to end on a sad note. I fondly remember David's comments on papers, often illustrated with a succinct image and always with beautiful penmanship and wit. The best example I can think of is the comment he wrote on one of Kevin Kaufman's papers. Kevin's statement, the "scale found its way on the map" was brilliantly critiqued with the

drawing of a scale as a caterpillar that moved towards a map. The same dazzling wit comes out in David's excursion into bovine cartography. He gave brilliant and hilarious lectures on the scientific controversy over the map-like, black-spots on Holstein cows and put it in practice by painting a map of Wisconsin directly on a cow. A photo of this "Wisconsin geography" graces my favorite coffee mug. I proudly bring the mug—and along with it the spirit of the remarkable man that conceived it—to every class I teach at Middlebury College.

P.S.: I should tell you that no animals were hurt in the creation of the map of Wisconsin. Rumor has it that the embellished cow became a celebrity among her fellow bovines. She is also credited with putting body art on the map.

In Memory of David Woodward, Scholar and Mentor

Paula Rebert
Albuquerque, NM

Ph.D. 1994, University of Wisconsin, Madison
Mapping the United States–Mexico Boundary, 1849–1857

I am deeply honored to write in memory of David Woodward, and I thank *Cartographic Perspectives* and Scott Freundschuh (and Matthew Edney for putting Scott in touch with me) for inviting me to contribute to this special issue on the accomplishments of Professors Arthur Robinson and David Woodward. I was privileged to meet Arthur Robinson when I was a student and he was a guest speaker in a graduate seminar in cartography taught by David Woodward. It was my great privilege to be a student of David Woodward's. David was my Ph.D. adviser and my mentor, and above all, my model as a scholar.

In my memory, I am most likely to see David seated at his desk in his office, the setting for graduate student consultations. His office was in an angle of the fourth floor of the University of Wisconsin-Madison's venerable Science Hall. An odd-shaped room, it had the feel of a garret in a medieval turret, especially with its metal staircase spiraling up to a balcony inside the office. It was a crowded room, filled with books in bookcases reaching from floor to ceiling ("I like books," I recall David saying one time when I talked with him in his office, "I just like having them around me") and piles of papers covering desk and shelves and filing cabinets. The balcony was filled with more books, a microforms reader, and boxes of papers and past projects. On shelves near his desk, in neat stacks, were reprints of articles he had written. In his office, surrounded by his library and archives of the history of cartography, David seemed most at home.

David's intense interest in the history of cartography followed from his early experience as a cartographer. My own interest developed according to a similar pattern; as I began my PhD program in the history of cartography at the University of Wisconsin-Madison, after completing my MS in applied cartography and working as a cartographer at Northern Illinois

University, David's own background as a cartographer was fundamental for me. One of David's impressive characteristics as a scholar was his ability to appreciate the vastness of the history of cartography in its relationship to other human achievements and across diverse cultures and past civilizations, and yet never waver from his focus on cartography. Two of David's papers that influenced me as a graduate student, and which I found especially pertinent, were "The Study of the History of Cartography: A Suggested Framework" (*The American Cartographer* 1 [1974]: 101-115) and "Why Cartography Needs Its History" (with J. B. Harley, *The American Cartographer* 16 [1989]: 5-15). The first paper offers an outline for research in the history of cartography that maintains the map itself as the center of attention. The second considers the importance of the history of cartography for the discipline of cartography, especially in the education of cartographers. I think that both of these papers continue to be valuable and important contributions.

Although David's writings were important to me, he imparted ideals of scholarship mainly by example through his work on the History of Cartography Project. The Project, of course, was the plan to create a multivolume world history of cartography, as conceived and organized in the late 1970s-early 1980s by David and his colleague, the late J. B. Harley. An invaluable experience that he provided for me (and many others before and after me) was an appointment as a graduate assistant on the History of Cartography Project. My assistantship afforded daily contact with exemplary scholarship. It also offered an acquaintance with the spectrum of the scholarly publishing process, from research and writing to editing and production, all in the context of the high standards of *The History of Cartography*.

Almost immediately upon my arrival at the University of Wisconsin, I assisted in a Project move from cramped quarters to a new office on Science Hall's fourth floor, where staff and students had desks and workspace. David was often to be found in the Project office, and was always its presiding presence. The History of Cartography Project became my graduate school home base. Project staff and students were all made to feel that they were part of David Woodward's extended family. Gatherings with David and his wife Roz and sometimes their daughter Jenny and son Justin, at their home or at their summer cabin in the Wisconsin countryside, were special occasions. The break from Project industriousness that always came with the annual holiday party in the Project office was another special event—especially when we were joined by Brian Harley and friends from the Milwaukee office of the History of Cartography Project.

In addition to the example he set through the History of Cartography Project, David also presented a model of scholarship as a lecturer and public speaker. Unfailingly, his classroom lectures and public presentations were meticulously researched, well organized, and interestingly presented. Both as a student and when I heard him speak later, I found his talks inspirational. For David was, himself, truly inspired by the intellectual significance and the richness and beauty of the history of cartography.

I am left now with a feeling of profound loss and sorrow at David's passing. The history of cartography will miss its great champion. David's dedicated enthusiasm for the history of cartography and his ability to inspire enthusiasm in others are great losses for all the cartography community.

The Robinson XI Projection

Henry Castner
Professor Emeritus
Department of Geography
Queens University

Arthur Robinson is world famous for his map projection, which has been adopted by the *National Geographic* as the basis for all its world maps. So it may come as a surprise to readers of this volume that there was an eleventh projection, which bears his name. In this case, however, it was named for him but not created by him.

When Robbie retired in April of 1980, the Department of Geography organized an event to which a number of people were invited [1]. Most of his Ph. D. students gathered beforehand at Joel Morrison's home for our special toast to his career. On that occasion we signed and I presented Robbie with the Robinson XI Projection—a recognition of, and by his eleven cartographic doctoral students, and a play on some of the ideas of the Dutch graphic artist Maurits Escher, particularly those found in his (Escher's) *Still Life and Street*, a woodcut from 1937. One of the themes of this and several other drawings, particularly *Savona*, 1936 and *Still Life with Mirror*, 1934, is the smooth connecting of different worlds [2]. Cartographers might express this effect as the seamless change in scale from one part of a map to another. This, of course, can be found in any small-scale map of the world made on our traditional projections such as the Mercator, Mollweide, Sinusoidal and even those by Robinson! It is only when we produce a world map on the icosahedron [3], as

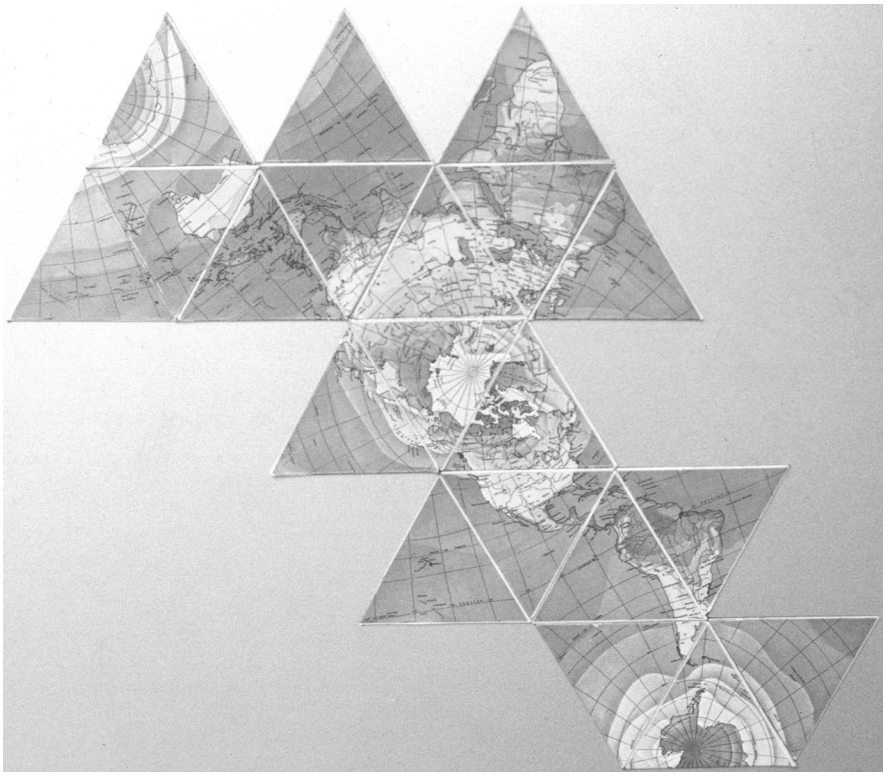


Figure 1. (see page 79 for color version)

in Figure 1, that we come face to face with this reality. The interruptions between and arrangements of the twenty equilateral triangles can never produce a uniform circular, elliptical or rectangular projection of the earth because of the mandatory breaks between the triangles, each of which has three possible positions. We must always compromise!! Or, as in the case of most world maps, we pretend these compromises aren't there and do not warn our lay viewers of the hazards hidden therein.

The manipulation of scale is also apparent in some of Escher's other works. For example, his *Balcony*, a lithograph from 1945, enlarges its central portion in order to call attention to a particular balcony in an otherwise complex scene with many balconies. Cartographers utilize many different devices to achieve emphasis, although not always with gradual enlargements of scale around some important feature or area. The best examples of this idea applied to flat surfaces are the many drawings of the famous op-artist, Victor Vasarely, from the 1960's. Sadly, there aren't many map examples around, although John Snyder [4] provides some interesting examples, e.g., the logarithmic azimuthal projection. As well, any perspective projection at some finite perspective elevation illustrates this idea.

Perhaps the nexus of cartographic and Escheresque ideas can be found in Escher's *Hand with Reflecting Sphere* from 1935—the image of a reflective sphere showing Escher, his office, his arm, and his hand which is holding the sphere. Bruno Ernst (1976, 75) notes that "In a convex mirror the eye sees the mirror image of the whole universe, with the exception of the part that is covered by the globe. The farther the eye is removed from the convex mirror, the larger the uncovered part becomes." This seems like another way of distinguishing large and small scale in maps. While the person holding the sphere is Escher, one wonders if, symbolically, it is not a cartographer for it is we who professionally contemplate the globe and experiment with ways to control the variations in scale so as to best represent some idea or reality. I don't know when the first fish-eye lenses became available for cameras, or the first semi-spherical security mirrors were deployed, but they certainly provided my generation, if not Escher's, wonderful examples of scale variations in the world immediate to our surroundings. Whether Robbie saw scale change in such vivid ways we may never know, but clearly he was a master at manipulating scale changes for our benefit in world maps. Including some references to Escher might make our studies of map projections a far more interesting topic!

Now as to my drawing, Figure 2; it clearly extends Escher's ideas from *Still Life and Street*. The desk foreground preserves Robbie's view to the right outside of Bascom Hill from the windows in the corner of Science Hall nearest to the viewer. At the time of Robbie's retirement, he had just completed two terms as President of the International Cartographic Association and had presided over its most recent international congress in Moscow—hence the orientation of the globe. Thanks to some stealth photography by Joel, the snap shot cube, scriber, paper clips and calendar were a part of his desk accessories. The vertical books represented the dissertations of the eleven of us who did cartographic research under Robbie and who signed the diagram in the branches of the tree at the up-per right. The pile of horizontal books represented, symbolically, the four editions of *The Elements* that had appeared by that time, *The Look of Maps*, and *The Nature of Maps*—the six seminal publications that he gave to us. I can't remember if the paints and fly swatter were there or a product of artistic license! Of course in the history of cartography, a topic for which Robbie is also well known, water colors were a significant innovation.

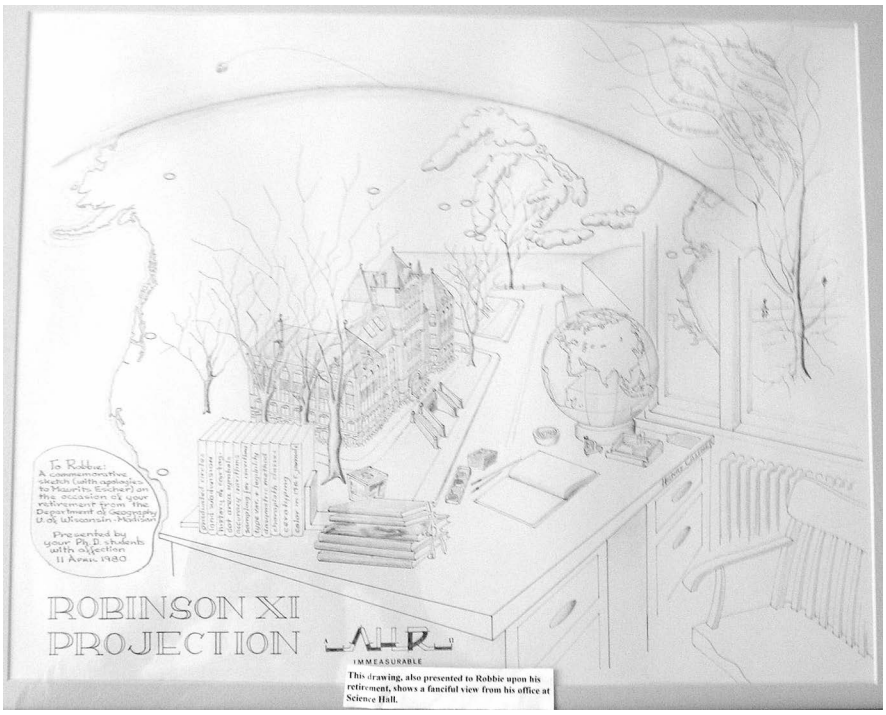


Figure 2. (see page 79 for color version)

West Street, running in front of Science Hall extends past Memorial Hall on the right and, on the left, the psychology building where Robbie made some useful contacts that surely influenced his thinking. West Street then extends to a near horizon across Lake Mendota. The third scale change involves the sky, the Great Lakes-shaped clouds and the curved limb of the earth that combine to produce an outline of North America. The small circles represented the places where the eleven Ph. D. students were working at that time. The legend credits Escher's influence and notes the presentation date. And of course, like every good map, there was a scale bar! Coming over the horizon is a suggestion of how technology was going to change in so many ways how we approach the art and science of cartography.

In the case of the map projection adopted by the *National Geographic*, it was Robbie, as manipulator of scale *par excellence* that produced our most attractive compromise for a general world map.

NOTES

[1] Another document that surfaced at that time, but was not used in our celebration, was the letter reproduced in this issue of *CP* (see *Arthur Robinson And The OSS)* from Colonel Lawrence Martin. It was passed to us by Mary Lib, the first Mrs. Robinson, who thought it would be interesting to know what Colonel Martin thought of Robbie since for some years Robbie was the Lawrence Martin Professor at Madison. She was fairly sure Robbie had never shown this letter to his colleagues. The reading of this letter reveals in detail the nature of the work and activities that Robbie performed during the war while at the Office of Strategic Services.

[2] Escher's images referred to in this paper can all be seen in *The Magic Mirror of M.C. Escher* by Bruno Ernst published in 1976 by Ballantine Books in New York. There are, of course, many other places where his works have been published.

[3] Figure 1 is one arrangement of the 20 equilateral triangles that made up the Fuller icosahedron; they are centered on the North Pole with most lying along a single meridian.

[4] Snyder, J. P., 1991. Enlarging the Heart of the Map, in *Matching the Map Projection to the Need*. Bethesda, MD: American Congress on Surveying and Mapping, pp. 12-13.

Arthur Robinson and the OSS

A Letter from Lawrence Martin

January 5, 1946

Mr. E.F. Bean
State Geologist
Science Hall
Madison, Wisconsin

Dear Earnie:

Major Arthur H. Robinson, your new colleague at the University of Wisconsin, will be arriving and taking up office during the present month. You and he will have many common associations and interests and I know you will enjoy and profit by working with him.

Of all the American geographers who worked in Washington during the war Robbie rose the highest from the lowest start. He came as a draftsman; he ended as the Chief of the Map Division of the Office of Strategic Services of the Joint Chiefs of Staff; President Roosevelt took him to international conferences at Quebec, at Casablanca, at Cairo, and again at Quebec. He built up the Map Division from a puny waif that had to borrow all its maps from the Library of Congress to a well balanced map depot of almost 2,000,000 maps, atlases, and geographical documents. He created a section of Cartography which compiled and printed better war maps than any other federal institution. Before the collapse of Italy, Germany, Japan, and their satellites he had map outposts in all feasible places in Europe, Asia, and Africa staffed my professional American geographers and producing timely and authoritative maps as well as collecting maps for the armed forces and also for the OSS workers in Washington. There were upwards of 180 of these assistants of Robinson abroad. During the fighting days it was Robinson's assistants and not Army's Military Intelligence of the General Staff who made the maps for the Joint Chiefs of Staff; it was Robinson's lad and not the Army Engineers Map Service or the General Staff's Military Intelligence that kept up the war situation maps for the Secretary of War and Chief of Staff. And after the last gun was fired his Map Division in OSS was not discontinued for Robinson had built so well that the old line agencies wanted to swallow up his collections and apparatus and cartological procedures. And as it turned out Robinson's Map Division of OSS swallowed the State Department's Division of Geography and Cartography which his successor will run within the Department of State.

That's somp'n.

My regards to your family, your several collages, and anybody in Madison who remembers me without loathing.

Always yours,

Lawrence Martin

This list represents a compilation of students, both cartography and/or geography, that are members of the Robinson Academic Family Tree. Any omissions are entirely unintentional, and reflect more so the difficulties in finding historical documentation of "who was whose" student.

ROBINSON | **FIRST GENERATION** | **SECOND GENERATION** | **THIRD GENERATION** | **FOURTH GENERATION**

Arthur Robinson (PhDs)

Thomas Robert Weir	1951
Walter Frank Wood	1951
Robert Nelson Young	1954
James John Flannery	1956

James Flannery (PhDs)

David Block	1983
David Howes	1983
Benjamin Adetiba	1985

James Flannery (MAs)

Hector Zamora	1967
Charles Gloor	1968
Donald Rambadt	1968
Abhaya Attanayake	1968
Wayne Sylvester	1971
Terrence Taylor	1973
John Jansen	1976
Chris Baruth	1979
Charles Wells	1982
Kerry Antoniewicz	1987

Norman J. W. Thrower	1958

Norman Thrower (PhDs)

John Estes	1969

John Estes (PhDs)

Thomas Logan	1983
Stephen Yool	1985
Timothy Foresman	1987
Robert Crippen	1989
Charlene Sailer	1989
Donald Lauer	1990
David Woo	1991
David Stoms	1991
Leonard Gaydos	1991
Daniele Ehrlich	1992
Kenneth McGuire	1992
Thomas Henderson	1996
Robert Frohn	1997
Thomas Loveland	1998
James Verdin	1999
Nasr Al-Sahhaf	2000
Jennifer Gebelein	2001

John Estes (MAs)

Douglas Stow	1978
Peggy O'Neill	1980
Tara Torburn	1980
Michael Wilson	1981
Donald Taube	1981
Ci-Xiang Zhan	1981
Raul Ortega	1981
Timothy Minor	1982
Susan Bertke	1982
John Carlson	1982
Elaine C. Ezra	1982
Charlene Sailer	1982
Edward Almanza	1983
David Eckhardt	1983
Fred Mertz	1984
Elizabeth Ritter	1985
Rowena Carlson	1985
Lisa Mann	1985
Michael Cosentino	1986
Christiane Schmullius	1986
Timothy Wade	1986
David Stoms	1986
Kenneth Rockwell	1987
Gloria Fletcher	1987
Kenneth McGwire	1987
Mark Friedl	1988
Daniele Ehrlich	1989
Joseph Scepan	1989
Joddi Leipner	1990

Teresa Morris	1990
Tong Du	1990
Richard Walker	1992
Karen Beardsley	1993
Dean Fairbanks	1993
Kelly Cayocca	1994
Jeffrey Lenay	1994
Michael Lawless	1996
Gavin R. McGhie	1997
David R. Jones	1999
Greg Husak	1999
Melissa Kelly	2000
Karen Kline	2000
Jeff Hemphill	2001
Brian Hadley	2001

Leslie Senger	1972
Vincent Mazzuchelli	1974
Judith Tyner	1974

Judith Tyner (MAs)

Michael Carson	1990
Edward McLaughlin	1994
Scott Ferris	1999
Willa Mann	1999
KC Vic Offenberg	2000
Angela Cangelosi	2002

John Jensen	1976

John Jensen (PhDs)

Eric J. Christensen	1987
Michael E. Hodgson	1987
Elijah W. Ramsey	1988
Miles Roberts	1990
Roy Stine	1991
Drew Decker	1991
Yang Cheng	1993
Fernando Echavarria	1993
Sunil Narumalani	1993
John Althausen	1994
Bruce Davis	1996
Kan He	1996
Xueqiao Huang	1996
Minhe Ji	1996
Xinghe Yang	1997
Eric Dobson	1998
Francois Smith	1998
Jonathan Byron	1999
Jennifer Meisburger	2000
Fang Qui	2000
Steve Schill	2001
Mark Jackson	2001

John Jensen (MAs)

Peter J. Pace	1983
Michael E. Hodgson	1983
Jeffrey T. Booth	1984
Anne M. Hale	1984
William M. Christie	1984
Richard B. Lacy	1985
Bruce A. Davis	1985
Karen E. Magill	1985
Brent W. Moll	1985
Michael J. Fischer	1986
Basil Savitsky	1986
Matthew Heric	1987
Jeanne Murday	1988
Gita Matieaux	1988
Donald Matieaux	1988
Robert Stephens	1988
Nicholas Schmidt	1988
Keith Goodwin	1989
Dan Sarlitto	1989
Joanne Halls	1989
David Wigle	1990
Suzanne Keys	1990
Paul Holt	1991
Chris Keithley	1991
Oliver Weatherbee	1992
Fiona Renton	1993
Chris Curlis	1994
Teresa Martin	1993
Shan Burkhalter	1994
Rick Collins	1994
Eddie Hollowell	1994
Tim Kammerer	1995
Kevin Boyd	1996
Matt Sposato	1996
David Karinshack	1996
David Ache	1996
Bill Proger	1997
Mark Bramer	1997

Robert Maggio	1997
Steve Schill	1997
Sara Weiland	1997
Jennifer Meisburger	1997
Anthony M. Filippi	1998
Craig Evans	1998
Chad Hendrix	1999
Judith Ann Berglund	1999
Jackie Luders	2000
Gunar Olsen	2000
George Raber	2001
Jason A. Tullis	2001
Laura Schmidt	2001

Patricia Caldwell	1979
Bruce Davis	1980
Ronald Wasowski	1983
James Lightfoot	1985
Anne Geissman Canright	1987

Norman Thrower (MAs)

Gerald Greenberg	1963
Roderick McKenzie	1963
Judith Tyner (Zink)	1963
Nancey Rockoff	1966
Alice Vogel	1968
Robert Mullins	1969
Leslie Senger	1969
Patricia Caldwell	1972
Larry Loeher	1973
Michael Mel	1977
Sherry Bayley	1978
Ronald Wasowski	1978
Anthony Cimolino	1981
Douglas Holker	1983
William Bradley	1984
Dominique Palavan	1988
Mathew McGrath	1990

Albert Farley	1960
George Putnam Stevens	1963
Henry Walker Castner	1964

Henry Walker Castner (MAs)

J. Ronald Eastman	1977
Roger D. Wheate	1978
Brian W. Cromie	1978
William L. Nelson	1980
Margaret Sommerville	1981
David Forest	1981
Keith A. Connal	1983
Kathryn L. Ford	1983
Sally Rudd	1986
Elzbieta Rusak-Mazur	1988
Brian McGregor	1988
Byron Moldofsky	1989

Mei-Ling Hsu	1966

Mei-ling Hsu (PhDs)

Luk Chiu-Ming	1988
Roger Selya	1971

Mei-ling Hsu (MAs)

James Eldredge Larson	1994

Barbara Bartz	1968
Joel L. Morrison	1968

Joel Morrison (PhDs)

Umit Basoglu	1984
David Brophy	1979
Carleton Cox	1977

Joel Morrison (MSs)

David M. Brophy	1972
Peter H. Van Denmark	1973
Umit Basoglu	1975
James A. Hilliard	1977
Wendell K. Beckwith	1978
Steven Z. Friedman	1978
Wokoma Wokoma	1978

George F. McCleary	1969

George McCleary (PhDs)

John E. Dornbach	1967
Borden D. Dent	1970

Borden Dent (MAs)

Richard Averack	1973
Richard Lindenberg	1975
Frank Drago	1976
Eric Moran	1976
Patricia Gilmartin	1977

Sharon Carlson	1978
Evelyn Hopkins	1983
Mary Josephine Parks	1987
Sara Yurman	1989

Denis Wood	1973
James Cerny	1975
Hubertus H. L. Bloemer	1977
Alan M. MacEachren	1979

Alan MacEachren (PhDs)

John Krygier	1995
Trudy Suchan	1998
Robert Edsall	2001

Robert Edsall (MAs)

Mariela Soto	2002
Laura Sidney	2004
Brandon Adair	2005

Mark Harrower	2002

Mark Harrower (PhDs)

Naijun Zhou	2005

Mark Harrower (MAs)

Joanna Seeber	2003
Bill Buckingham	2004

Frank Hardisty	2003
Amy Griffin	2004
Isaac Brewer	2005

Alan MacEachren (MSs)

Ellen White	1983
Greg Johnson	1983
Don Keil	1983
Bill McLay	1987
Ann Deakin	1989
John Ganter	1989
Tami Mistrick	1990
Fritz Kessler	1991
Martin von Wyss	1994
David Howard	1994
Beverly Evans	1995
Nick Huffman	1996
Daniel Haug	1998
Mark Harrower	1999
Amy Griffin	2000
Biliang Zhou	2004

Jeffrey C. Patton	1980
Dennis E. Fitzsimons	1981

Dennis Fitzsimons (MAs)

Carol Harlan	1983
Susan Robeson	1984
Tami K. Wiggins	1991
Peggy S. Wittie	1991
Lynne Marie	1993
Jane D. Rossi	1993
Francisco Brazile	1995
Susan Perry	1996
Billy Branch	1997
Marcus Ollington	1998
Mark A. Garcia	1999
Kris Norman	2000

Richard E. Lindenberg	1986
Ralph William Moore	1989
Ming-Chyuan Ho	1991
Chien-Hsiung Chen	1998

George McCleary (MAs)

Russell Muncaster	1967
Kang-tsung Chang	1969
David Dronsick	1975
Mark Berte	1976
Alan MacEachren	1976
Rick Dulas	1978
Thomas Luellen	1978
John Parsons	1978
John Beets	1980
James Dumler	1980
Peter Eldridge	1981
Susan P. Waldorf	1981
James D. F. Cole	1982
Othman A. El-Awshar	1982
John A. Hutchinson	1983
Jeffrey A. Reber	1983
Jill (Holley) Kieswetter	1984
David H. Linthicum	1984
Pak Yen Lim	1987
Margaret Dickison	1988
Roy D. Wall	1992

Lois McMillan	1993
Kevin P. Skridulis	1993
John L. Brewer	1993
Michael W. Podolny	1994
Samuel C. Wallace	1994
Willa M. Campbell	1994
Keith D. Shaw	1995
Neil H. Allen	1995
Elizabeth Jacoby Kelley	2000
Robert A. Ore	2000
Peter J. DeVincentis	2002
Min Yang Teh	2003
Kurt Davis	2003

Judy Mae Olson 1970

Judy Olson (PhDs)

J. Ronald Eastman	1982
Cynthia Brewer	1991

Cynthia Brewer (MAs)

Caroline Sallaway	1994
Cheryl Rogers	1994
Laura Edgeman	1994
Robert Marin	1994
David Barnes	1997
Elizabeth Fauerbach	1997
Cory Eicher	1999
Shaun Faith	1999
Michael DeGennaro	2000
Erik Steiner	2001
Geoffrey Hatchard	2003

Kathryn Ford Thorne	1991
Gebeyehu Mulugeta	1991
Amy Lobben	1999

Amy Lobben (MAs)

John Nelson	2004

Alison Philpotts Feeney	2000

Judy Olson (MAs)

Michael Peterson	1978
Robert Kerrigan	1980
Dennis White	1984
Cynthia Brewer	1986

Gustave Rylander	1986
Ann M. Goulette	1987
Bonnie Jones	1991
Dawn Wiberg Carlson	1992
Jennifer Ware	1998
Mark Bowersox	1999
Lisa Dygert	2004
Yali Li	2004

David Woodward 1970

David Woodward (PhDs)

Janet Elizabeth Mersey	1984

Jan Mersey (MAs)

Andrew Tofflemire	2005
James Ferguson	2005
Rob Meyers	2005
Ed Chart	2003
Robyn McMullen	2002
Shengjin Chu	2002
Xuejuan Sun	2001
Jennifer Turner	1999
Andrew Millward	1998
Elizabeth Malta	1997
Tim Lamon	1995

Matthew Henry Edney 1990

Matthew Edney (MAs)

Bridget Ryan	1995
Mark Hanna	1995
Michael Kazmierczak	1995
Dylan McTigue	1995
Gary Schwartz	1994
Hans S. Bader	1993
Ben Jones	1993
Dennis Anthony	1992
Bernadette Coll	1992
Michael Marino	1992

Guntram Henrik Herb	1992
Paula Rebert	1994

David Woodward (MAs)

Matthew Henry Edney	1985
Joseph Winfield Stoll	1986

Jeff Jason Leonard	1987
Thomas George Ries	1987
Jamie Sue Baures	1987
David Wesley Di Biase	1988
Gary Paul Odenthal	1988
John B. Krygier	1990
Penny Leigh Richards	1990

Karen Pearson Cook	1978

Arthur Robinson (MAs)

Robert Durrenberger	1948
Marvel F. Bowar	1949
Kenneth Robert Martin	1949
Jerome Percival Pickard	1949
Roberto Lizarralde	1950
Robert R Polk	1950
Yuan I. Shie	1950
Philip Leroy Sullivan	1950
James L. Verber	1950
Prosper Barbati	1951
Andrew Frank Burghardt	1951
Charles R. Hayes	1951
Donald Joseph Kaminski	1951
Paul Edward Lydolph	1951
George Louis McDermott	1951
Marie E. Petry	1951
Sister M. Judine Limmex	1952
Frans J. Snacken	1952
John Griesback	1953
Randall D. Sale	1953
Edward P. Torrey	1953
Leonard G. Donaldson	1954
James H. Drummond	1954
Douglas G. Graham	1954
James Henry Johnson	1954
M.P. Shrevastava	1954
William W. Bunge, Jr.	1955
Stephen Leech Stover	1955
Norman Joseph Thrower	1955
Judith A. Johnsrud	1956
John Chiyuki Kimura	1956
Haruko Kishimoto	1956
Theodore H. Schmudde	1956
Allen L. Smith	1956
Robert Charles Bard	1957
John Albert Mallow	1957
John Phillip Sifling	1957
Leonard W. Brinkman	1958
Donald Hirschfeld	1958
Russell O. Utgard	1958
Konrad Kley	1959
Jon M. Leverenz	1960
Janet Irene Ritchie	1960
Fawzi Asadi	1962
Jarry Bayley Culver	1962
Michael Kovalsky	1962
Richard L. Ruble	1962
Joseph L. Schmalzel, Jr.	1962
Barbara Sue Bartz	1964
Richard George Greisch	1964
Joel Lynn Morrison	1964
Jeanne Tsou Liu	1965
Bruce William Meier	1965
Jane Patridge	1965
Joan Marie Longmire	1967
David Alfred Woodward	1967
Ann Cherie Edwards	1969
Jonathan O. Ekpenyong	1971
Aubrey Leonard Le Blanc	1971
Karen Louise Pearson	1971
Richard A. Guyot	1972
Shrikrishna S. Satwalekar	1972
A. Jon Kimerling	1973
Gregory Chu	1974
John Fenniman	1974
Leslie (Ching Yee) Li	1974
Michael Marini	1974
Carlos Smith	1974
Stephanie A. Carpenter	1975
John Conroy	1975
Vivian Carleton Carter	1977
Frederick L. Daniels	1978
Daniel T. Gleason	1978
Bruce Van Roy	1978
Valerie Wulf	1978
Onno Brouwer	1980
Janet Mersey	1980
Jane Rouder	1980

David Woodward at the farewell lobster bake, 20th International Conference on the History of Cartography, on Peaks Island, Portland, ME, June 2003

David Woodward in Science Hall, Department of Geography, UW Madison, 2002

David in the History of Cartography project office, 2002, with the complete manuscript of all of Volume Three, Cartography in the European Renaissance

David Woodward taken at his home in 2000

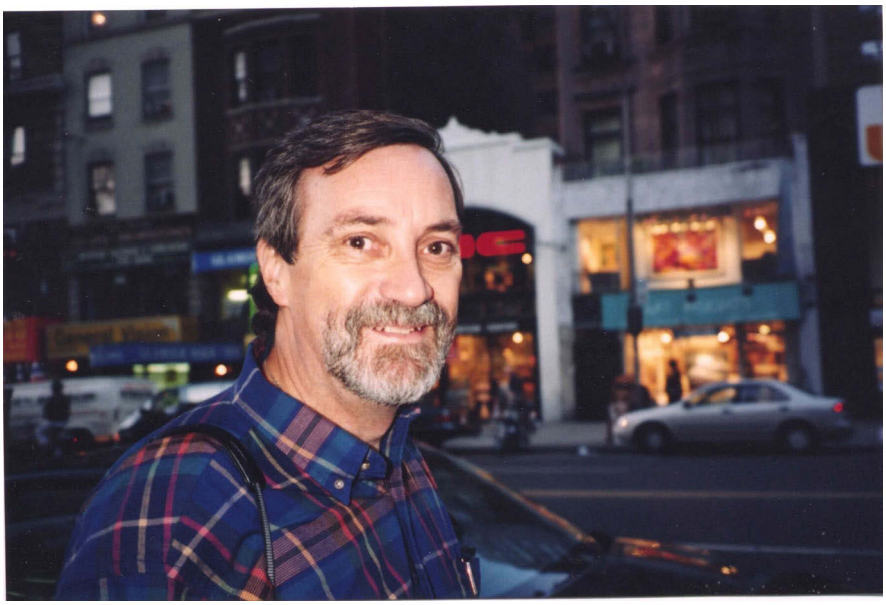
Presented to Robbie by the Department of Geography, UW Madison upon his retirement (4/11/1980)

Karen Cook, Arthur Robinson, Judy Olson, and Martha Robinson dining at the Dardanelles Restaurant in Madison, WI, on October 2, 2004

Party at David Woodward and Ros's house in Madison; at far right is Beth Freundlich (Project Administrator) w/daughter Erica, Jude Leimer (Managing Editor), and Prof. Robert Sack of UW Geography

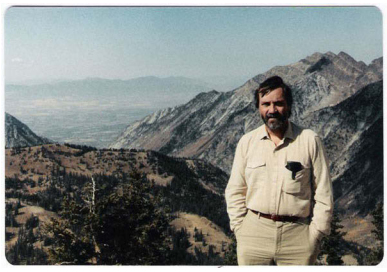
Robbie teaching a cartography class in Science Hall, March 1979

David Woodward at DeLorme in the late 1990s



David Woodward at night in NYC, Late 1990s; photo by Jenny Woodward (daughter)

Farewell Dinner, 19th International Conference on the History of Cartography, Madrid, July 2001. David Woodward, Rosalind Woodward (wife), and Tony Campbell (Chairman, Imago Mundi Ltd.) [the head at side is Lisette Danckaette, of the Bibliotheque royale Albertler, Brussels]



David Woodward at Snowbird in the Wasatch Mountains overlooking Salt Lake City in 1988. David came to a meeting of the NCGE where he was one of three speakers in a session honoring Arthur Robinson as a "Master Mentor."

Elements of Cartography: Tracing Fifty Years of Academic Cartography

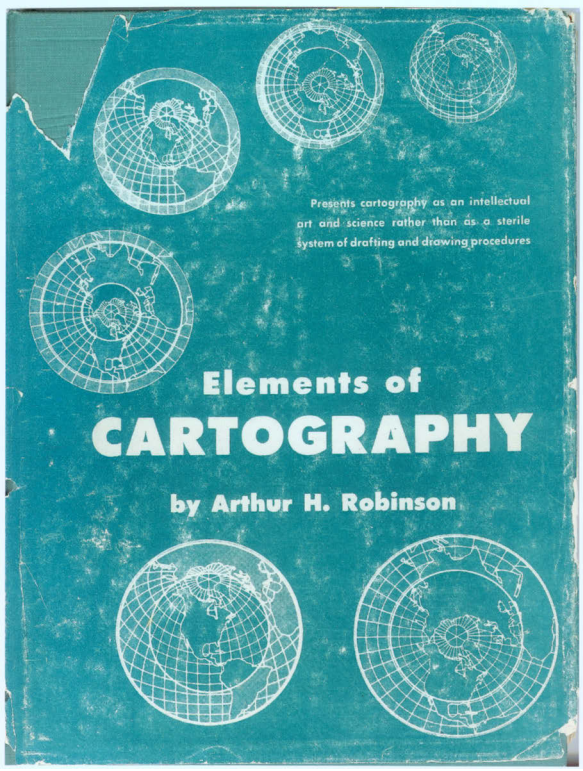


Figure 3. First edition of Elements of Cartography

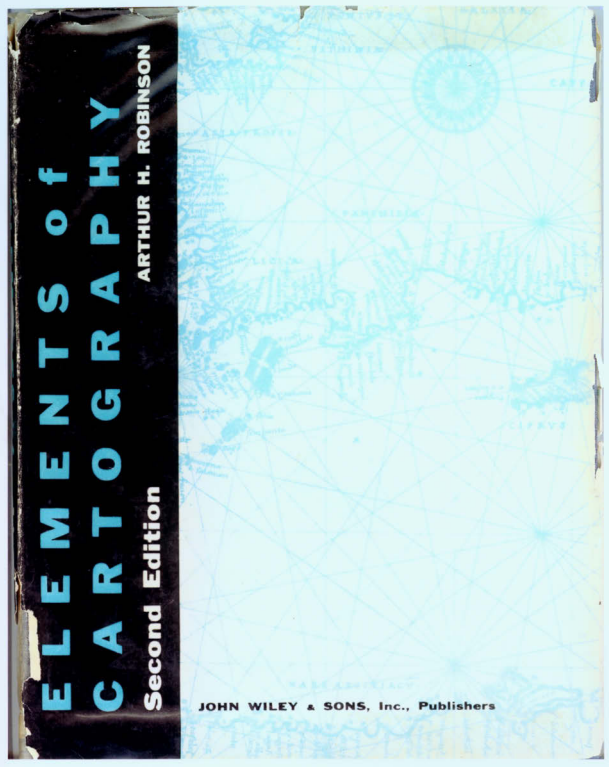


Figure 4. Second edition of Elements of Cartography

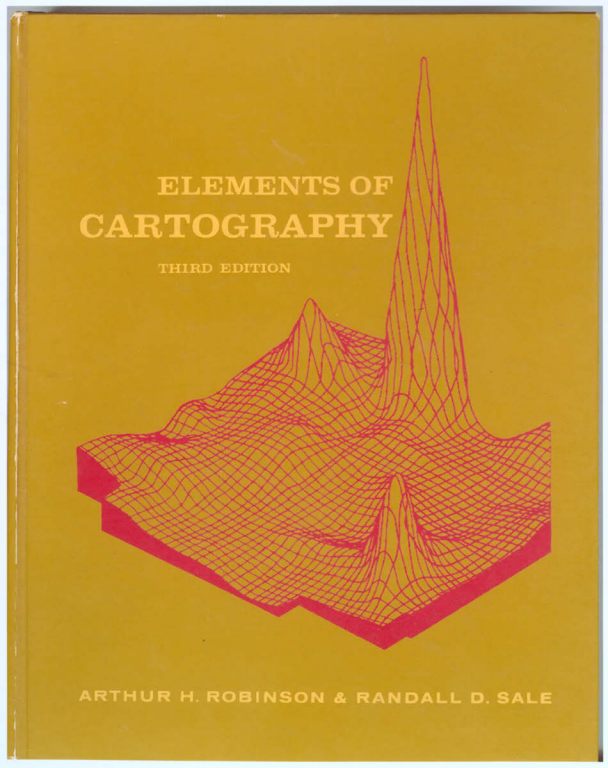


Figure 5. Third edition of Elements of Cartography

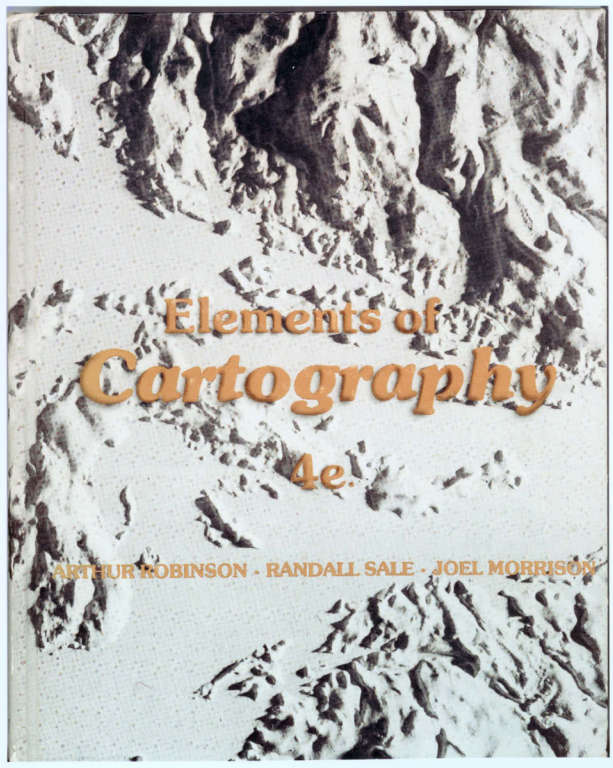


Figure 6. Fourth edition of the Elements of Cartography

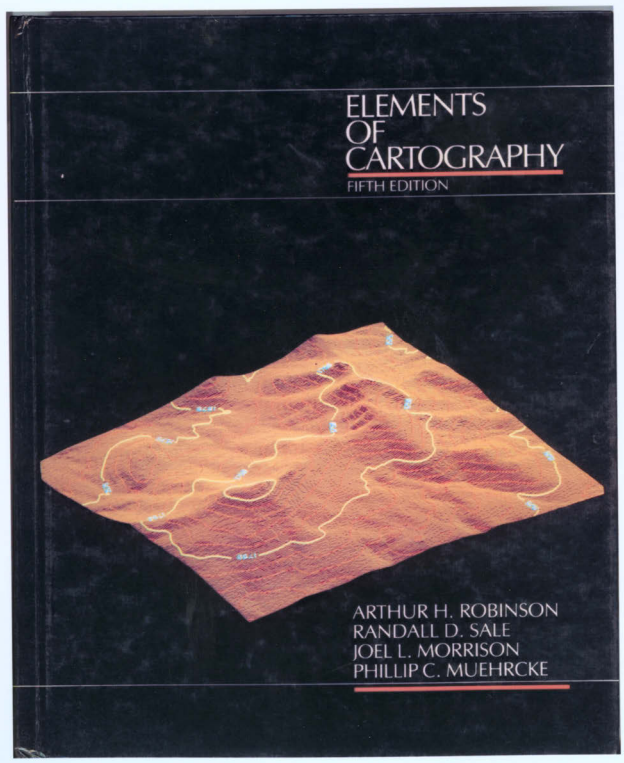


Figure 7. Fifth edition of Elements of Cartography

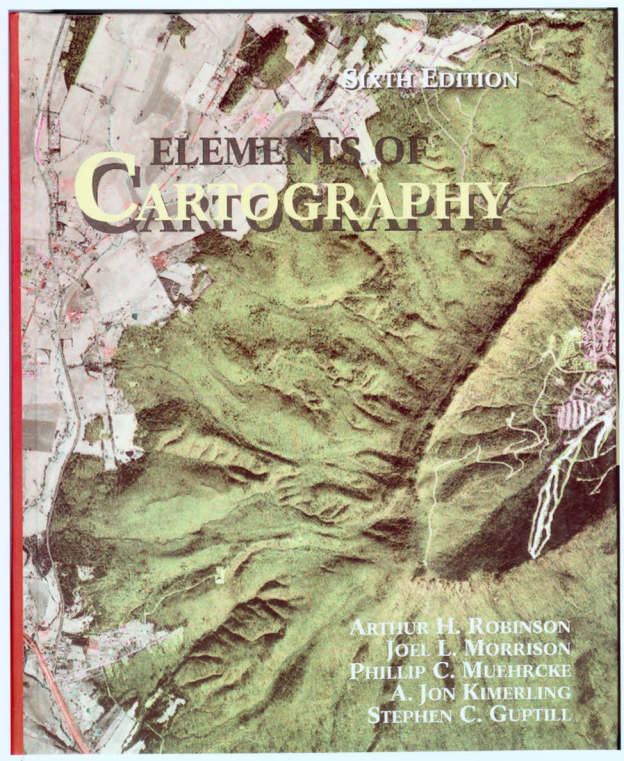


Figure 8. Sixth edition of Elements of Cartography

The Robinson XI Projection

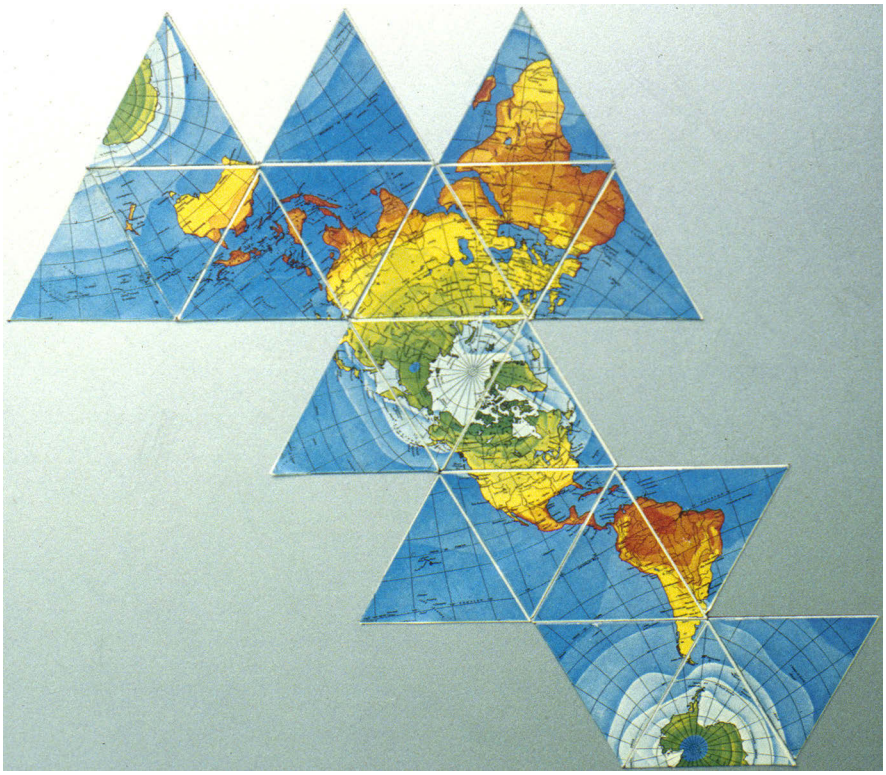


Figure 1.

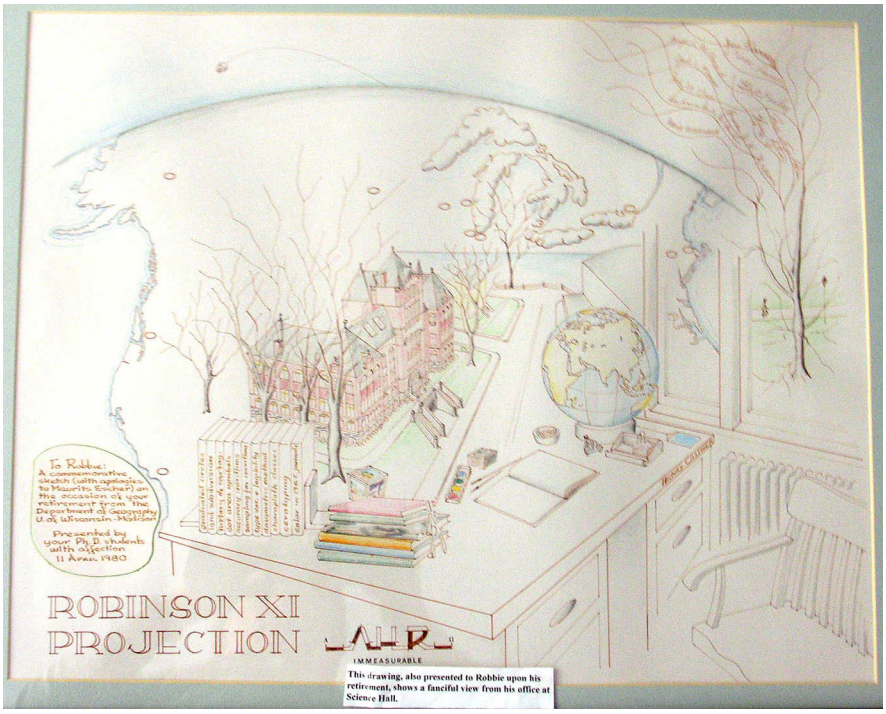


Figure 2.