

landscape, in which she says that the artist/cartographer had ignored a prominent mountain that he could hardly have overlooked. Committed, as she is, to characterizing the Military Survey as part of an imperial effort at pacifying the local population, Kaplan characterizes the scene as lauding the disciplined work of the surveyors depicted in the painting. Her explanation of why Sandby chose to ignore the much larger mountain directly behind him is that its size would symbolize the folly of any effort to impose order on such an enormous feature. Yet, had Sandby chosen to paint the mountain in question, then one supposes that Kaplan's explanation would have shifted to instead assert that the painter's objective was to show the power science could use to bring such enormity under its dominion. This is a logic that defies challenge, because there are no conditions under which an image (or its absence) cannot be interpreted to support the preferred narrative.

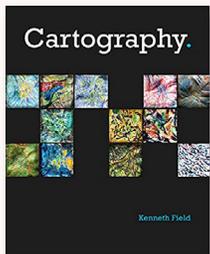
In conclusion, Caren Kaplan's *Aerial Aftermaths* utilizes insights from different disciplines to inform an account of the appearance and transformation of images drawn from

aerial observations over a span of several hundred years. While early chapters make it clear that military interest in aerial views was tenuous during the early days of aerial observation, that interest increased dramatically alongside advances in flight. The book's conclusions demonstrate the necessity of understanding both the raw destructive capabilities of current technologies, and how visual representations of that destruction inform and infiltrate the work of contemporary artists. Throughout, Kaplan exhibits a solid grasp of a broad literature from different disciplines and an abiding concern for the urgency of her subject.

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CARTOGRAPHY.



By Kenneth Field

Esri Press, 2018

576 pages, \$95 paperback, \$130 hardcover.

ISBN: 978-1-58948-439-9 (paperback);
978-1-58948-502-0 (hardcover)

Review by: Mark Denil, *sui generis*

Cartography. (pronounced "Cartography, Period" or "Cartography, Full-Stop"), is the long-awaited and much-anticipated "compendium of design thinking for mapmakers" (*title epigraph*) from Kenneth Field, the indefatigable Senior Cartographic Product Engineer at Esri.

Cartography. has no subtitle—nor should it need one, really—the single word covers it all. That title, however, includes a punctuation mark; and this little dot—in blue on the book's cover—is every inch a gauntlet thrown on the

ground. Including, and emphasizing, this bold little dot in the book's title is a brash and confident gesture that constitutes a challenge to all comers. This book, before it is even opened, has declared itself to be complete: it announces that *Cartography* is here, between these covers, and that what is beyond these covers is Not *Cartography*. Does that interpretation sound overblown? This aspect of challenge is clearly understood by the publisher: in the July 2018 edition of *ArcWatch*, Carla Wheeler wrote that "everything you need to know about how to create well-designed maps can be found in the beautifully illustrated pages of *Cartography.*" (Wheeler 2018). She also quotes the author:

"This book is boldly intended as a one-stop shop for cartography. It's the book for aspiring mapmakers that can act as a guide and a grounding in the ideas that support better mapping," Field said. "It's also the handy reference for those [mapmakers who are] more experienced."

(Wheeler 2018; *interpolated text in the original*)

One gapes at the confidence and audacity with which the claim is made. Still, given the well-deserved reputation of the author, any reader (and especially any reviewer) must take these statements seriously, and at their face value. Englishman Ken's book thus arrives on the field standing tall on its hind legs—it remains to be seen, however, if that field shall prove to be like unto Agincourt, or unto Hastings.¹

The softcover version of this publication is perfect bound (that is, it has a glued binding), but its pages are sewn in signatures like a hardbound book. This both promises longevity for the binding and helps the book lay flatter than it would with just glue on a stack of pages almost an inch and a quarter thick. It does, however, make the book's bound edge noticeably thicker than the fly edge. The hardcover version is more conventional in this regard.

The book is printed on very slick, not particularly opaque, glossy paper that provides for sharp text and images. That the paper is a bit slippery for penciled notes is not, perhaps, so important, but one should be warned that while a standard white Pentel Hi-Polymer drafting eraser will efface your pencil marks, it will also lift the ink right off the page.

The odd little graphics on the cover—twelve squares on the front, eleven on the back, and a tall rectangle on the binding—are, we discover (xx–xxi), maps of unseen and nonexistent places painted by Angela Andorrrer on the hands of various cartographers of note. Each map is based on “a short [written] extract that described the imaginary country” (xx *unexpressed*). Ken's, which appears on both the front cover and on the binding, is fetchingly Kandinsky-esque.

Kenneth Field is the only author reported on the cover and title page, but two others are included on the “Authors/cartographers” page. Field is credited there with “words, maps, illustrations, and design,” but Wesley Jones and John Nelson are noted only for “maps and illustrations.” There is also a page of “Contributors” that identifies two dozen generally well known and respected cartographers from around the world. It is my understanding that their

contribution was restricted to the map descriptions in the “Exemplar maps” thematic group (more on which, anon).

The end matter of *Cartography* includes three pages of “Sources and resources,” comprised of a reading list of books, journals, web resources, blogs, and tutorials, plus a list of societies and organizations, and another of “Selected cartographers and ‘geoviz’ experts on social media.” I have been informed by my editor that “geoviz” is a cant term of some recent coinage; still, it seems unfortunate. The book closes with seven pages of “Image and data credits” that seem to be arranged in order of appearance, but without the conventional burden of page numbers.

Unlike many books on cartography, *Cartography* is not divided into sections, chapters, and sub-chapters. Instead, Topics are arranged alphabetically as in a dictionary or encyclopedia, with illustrations and short descriptions of selected Exemplar maps interleaved between the index letters. Each topical entry is afforded a two-page spread, usually made up of a page of text on the left-hand page and an illustration on the right. In some ways, the arrangement reminds me of Bertrand Russell's *Wisdom of the West* (1959), which surveyed Western philosophy from the pre-Socratics up to Russell himself using just this sort of page-spread-per-philosophic-system tactic (only Plato and Hegel had extra spreads, as I recall, but those two were responsible for a boatload of material).

The decision to alphabetize the contents in *Cartography* is somewhat curious, as is the decision to forgo inclusion of an index. Alphabetical lists are, in themselves, somewhat problematic. As the great British filmmaker—and auteur behind the very best film ever made about maps, *A Walk Through H* (1978)—Peter Greenaway noted:

If you think about it, the index, the alphabet, is an extremely primitive way of organizing information, and in some ways it is totally absurdist. Where-ever-else, in any epistemological collection, can you put together Happiness, Hysterectomy, His Holiness, Heaven, and Hell—all completely disparate ideas—but all simply united by their initial?

(Greenaway 2002)

1. The Battle of Agincourt in northern France (October 25, 1415—Saint Crispin's Day) was a major English victory in the Hundred Years' War. In it the British destroyed the flower of French knighthood for a generation. The battle is the centerpiece of Shakespeare's play *Henry V*. The Battle of Hastings (October 14, 1066) in East Sussex, marked the beginning the Norman invasion and conquest of England. The Anglo-Saxon King Harold Godwinson (who had already defeated two rivals in the north of England) was defeated and killed by William the Bastard, Duke of Normandy (afterwards known as The Conqueror). Events leading up to and during the battle are depicted in the Bayeux Tapestry.

In this case, anyone beginning a search for information in the 573 pages of *Cartography*. is more or less trapped by the author's sometimes idiosyncratic Topic titles. It is hard to imagine a situation where someone—even an oculist—would approach this tome planning to look up, say, “Eyeball data classification.” Similarly, Topics like “How maps are made” or “Maps for children”—which appear under “H” and “M,” respectively—bury their significant keywords far away from their indexed initial. A table of Topics (alphabetical) can be found on pages xiv–xv.

While the arrangement of Topics in *Cartography*. is alphabetical, the Topics themselves are further grouped thematically, and each Theme is associated with a colour. This creates a cross-referencing scheme to allow non-sequential associations between scattered entries. Topic titles, at the top of each left-hand page, are in the colour of their thematic group, and there is a one-sixteenth inch wide, fifteen-sixteenth of an inch long, horizontal line of the same colour that bleeds off the page fly. A key to the thematic groups and their colours is provided on page xiii, and a second, thematically arranged table of Topics—“Topics (thematic),” on pages xvi–xvii—lists the heading titles ordered and coloured by theme.

Somewhat oddly, this potentially useful scheme seems to have been set up to fail. To start, there are twelve separate thematic groups, each with its own colour. The colours, however, are barely distinguishable in the one place, on page xiii, where they appear together as large, eleven-sixteenth inch circles only one thirty-second of an inch apart. Everywhere else, the colours are found only in patches or text characters that are either very small, widely separated, or on different pages altogether. The author *must* have known that this would be a problem: in the Topic “All the colours,” he flat out states that “humans are able to distinguish and remember only five to seven colours” (12). Why, then, has this basically good idea been elaborated beyond usability?

As has been mentioned, this book has no index. Obviously, an index would have added to the page count, but it is quite arguable that the space required would be well used. Without it, a search for particular information is trapped between the not-always-helpful Topic titles and the functionally invalidated Themes. It is anyone's guess what might be actually mentioned under any of the headings. Perhaps Esri Press can be persuaded to make a searchable index available online.

The Topic pages themselves are clearly organized using a well constructed text hierarchy. Page organization is all too often a major failing in Esri Press books, but these pages show the right way to architect a page. Just let the book fall open randomly, and the page texture tells you where you should look first, what is subordinate, and how to drill down into the information. Yes, there is an explanation of the page hierarchy in “How to use this book” (xii), but that is just to cover the bases: these pages really do leverage the canon of page construction to work for you. *Bravo*.

The (thematically coloured) Topic title heads the page, supported by a descriptive sub-title. The main body text is (like all the text) set flush-left / ragged-right, with each paragraph's opening sentence in boldface. The line lengths are a tad long—up to sixty or more characters—but this is preferable to the common Esri Press practice of seventy to eighty characters on a single line. This main text body is supported by a narrower column, in a smaller type size, to the right, without any bold face. Text in this column supports, expands upon, or details factors introduced in the main body. At the page foot, below the main column, in small type (like that of the right-hand column), is an alphabetic “See also” list of related Topics. Because the small characters of the Topic names in these lists are printed in their thematic colours—which often have very low contrast with the page—they are sometimes hard to read. Similarly, because the list is strictly alphabetical, one has to assume that all the suggestions are to be considered equally pertinent—something that would be extraordinary, if true.

Every Topic is accompanied by a full-page illustration—usually of something pertinent to the Topic. These illustrations range from the lush to the exuberant, and most of the time they are well chosen and skillfully executed. Many are gems of elegance. In particular, the one facing the “Aspect of a map projection” page (23) is an example anyone should be proud to emulate. By contrast, the decoration paired with “Anatomy of a map” (15) is just a colourful space-filler. Fortunately, the proportion of this latter type is pretty low.

Finally, throughout the main body of the book, in the lower left corner of each left-hand page, there is an illustration of half of a globe. Its presence is discussed as part of the “Animation” topic on page 16, but most people will instantly recognize it as an element in a flip-book

animation. Unfortunately, it does not quite come off. This reviewer suspects it is not helped by being only half a globe and bleeding off of the page edge: a full globe placed a bit away from the page edge might have given each frame a more coherent image and helped to enhance the illusion.

There are twenty-five Exemplar maps included in *Cartography.*, and the commentaries that appear with each one represent the contributions of the Contributors, plus John Nelson. These maps, too, are presented in alphabetical order by title through the book, and are listed on the “Contents” page (vii *unexpressed*). It is a fine collection of maps, as one would expect from such a fine collection of mapmakers, and represents a step towards building a documented canon of cartography as it stands today. All maps are created against a horizon of other maps, which is to say that any map owes more to other maps than it does to its data, its theme, or to anything else. Cartography, in this period of change, needs a stable and persuasively documented canon of paradigmatic exemplars selected and explained by admirable practitioners. Canons like this were first established for painting by Giorgio Vasari (1991) in 1551 and for sailing ships by Howard Chapelle (1967). This book’s descriptive blurbs—and they are too short to be called anything else—penned by the contributor who selected that map, begin to provide the expert commentary that is so sadly lacking in most recently published collections of notable contemporary maps. Conceptually, this element is a tremendous addition to the book: *bravo*, once again.

While the selections themselves are sound, the blurbs are sometimes less illuminating than one might wish. Quite a few are excellent and succinct, one or two are a bit turgid and turbid, and the majority range between these poles. At the very least, many of the entries would have benefited from the assistance of an editor.

The contribution of Henrik Hargitai, a Hungarian planetary geomorphologist and media historian, was a commentary on *The Geologic Map of the Central Far Side of the Moon* (1978), by Desiree E. Stuart-Alexander of the United States Geological Survey. By the evidence of the detail shown on pages 252–253, it is certainly an admirable production that carries a wealth of detail with superb clarity and readability, and a subtle use of well-modulated colour. The predominant focus of Hargitai’s blurb, however, is on what he calls “its Psychedelia colour scheme.” In fact, he opens his commentary by mentioning the “San

Francisco-born Psychedelic Movement,” and, in each of his three paragraphs, keeps turning back to what he calls the “dazzlingly bright [colours] showing a surface more alien than the extraterrestrial body they represent.” Reading this extraordinary appreciation, one has to wonder if Hargitai had ever seen a colour geology map before. The same basic palette Stuart-Alexander employs has, in fact, been used for geology maps since at least the advent of lithography in the mid-nineteenth century. This can be seen in the *Geological Maps* from Clarence King’s 1876 *Fortieth Parallel Survey* reproduced in *Cartographica Extrordinaire* (Rumsey and Punt 2004, 30–31), or even in the extract from *The Alluvial Valley of the Lower Mississippi River* (Fisk 1944) on page 223 of *Cartography*. One has to wonder, too, about Hargitai’s rather bizarre conception of Psychedelia.

This example is neither the worst nor the best of the lot, but it does demonstrate the unevenness to be encountered in the Exemplar blurbs. Many of them are excellent, but how is a reader supposed to know which parts are sound and which are not? The unpredictable reliability of this part of the book is quite disappointing.

We turn next to the two hundred and forty-three Topics, which are each packed as full as a nut. There is a tremendous wealth of information here, much of it of high quality, although there is a good deal that is less so. The video panel discussions in this book’s companion MOOC, or Massive Open Online Course—called, coincidentally, *Cartography.*, and reviewed elsewhere in this issue of *Cartographic Perspectives*—also contained a lot of good information mixed with a few howling absurdities, but perhaps the most significant factor for both the printed and digital fora is the simple fact that the Topics and Themes are presented and discussed in such an open, serious, and straightforward manner. For many readers of this book—as for many participants in the MOOC—this will be their first experience reading or hearing these matters discussed as serious, significant, real, prominent, and valuable concerns. *Cartography.* will be bought, and read, and passed from hand to hand, and it will have a significant impact on how a great many makers of maps think about that activity. This book sets out to be a versatile and compact toolkit: one not far short of all things to all cartographers. However, like one of those overelaborate Swiss Army knives, not all of its tools work well, and its supposed versatility may in itself hamper its value.

This is not to say that *Cartography* contains too many tools, but it does contain far too many that are too-briefly summarized. This book is an ambitious undertaking, and it would be absurd for a review to attempt to do more than to try to characterize the whole through a sampling of its parts. Perhaps a good approach would be to select some cartographic topic or other, and try looking it up in what we are told is “a sage, a companion, a guide, a friend, and a compendium of essential information” (xi).

Visual Hierarchy is a critically important element of map composition, and, turning to *Cartography*, we find an entry for “Hierarchies” on page 216. It contains a reasonable discussion of visual hierarchy (and uses that term), but one that is almost entirely restricted in application to a map layout as a whole. Why, one wonders, is the “Hierarchies” entry so confined? There are any number of other hierarchies that might well be involved in a map, such as symbol hierarchies for things like roads, among others—although text hierarchies *are* mentioned in passing. Shouldn’t *this* entry be under “Visual Hierarchy” or “Layout Hierarchies”? Be that as it may, the advice given in the article is sound, with its tactics of squinting, desaturating, and size reduction, each of which can help a reader to bypass the automatic reading of a graphic as text, and allow it to be seen as a composition of graphic elements in two-dimensional space. Turning the page upside down can work, too, but it is not mentioned.

Tucked into the small print, though, is an odd remark made in reference to what happens when you squint: “Your brain is also having to work harder to interpret what is being seen, which is the same problem you have when trying to see objects at night without ambient lighting” (216). To the best of my recollection, “ambient light” means the light that is already present in a scene, before any additional lighting is added; thus, in absence of the mention of any other light source, “at night without ambient lighting” means total darkness. Surely, that describes closing the eyes completely, not squinting.

There are five “See also” Topics listed on the “Hierarchies” page: “Contrast,” “Dispersal vs. layering,” “Focusing attention,” “Seeing,” and “Vignettes.” Of the five, only two actually mention visual hierarchy, and of the two, “Focusing attention” mentions it only in passing. The “Contrast” article tells us that “contrast and hierarchy often work hand in hand” (78), but, as that article conceives contrast as existing on a single continuum ranging from *lack* to *good*, it

is really not at all clear how this hand-holding is supposed to take place. Nowhere is the idea of *control* of contrast as a component for establishing and maintaining a visual hierarchy mentioned, or even hinted. This topical atomization is problematic throughout the book: while there is lip service paid to the *interrelation* of the Topics, there is very little scope for discussion of their *interdependency*.

In this example we see two of the primary general problems with the Topics: the downplaying of interdependency and the inclusion of almost random, patent, absurdities. The various discussions of colour contain many examples. *Why*, one asks, are the additive and subtractive primary colours shown in the illustration on page 5 keyed explicitly to Pantone® colour definitions? Pantone® colours are *spot* colours, *not* process colours (although they can be emulated in process), and, as inks, they are *certainly* not additive. Similarly, in the fine print on page 4, cyan is said to be formed by the combination of blue and green: unfortunately, this is flat out impossible—one cannot describe a *subtractive* phenomena in *additive* terms. Cyan is, in fact, *transparent* to blue and green, and *absorbs red*—it *subtracts* red from white light. Several Topics refer to CMY colours, but only once to CMYK (I *think* it is once, but cannot be sure because *there is no index*). In practice, however, CMY is used almost exclusively in *photographic* processes: CMYK is what comes off a printing press (except when using spot colours, for which there is no Topic). The K, or black, component is correctly identified as being called that in reference to “Key” but we are then told that it is called *key* because “black is usually printed first and other colours are keyed to it” (4). Little could be further from the truth. Black is normally printed *last*, and is very often overprinted on the other colours to avoid knockout shadows and to allow trapping of other, small, mis-registration errors. If this is “sage” (xi) advice, it is more of the parsley, rosemary, and thyme variety than that of a “guide” (xi).

Later, we read in “Purpose of maps” that “all maps, by definition, are reductions of reality because they represent reality at a smaller size than it actually exists” (378). This is clearly and demonstrably untrue: the map printed inside the lid of a box of chocolates is often exactly the same size as the tray of Creme tangerine, Montelimar, Ginger sling with a pineapple heart, Coffee dessert, and Savoy truffle, and that map is as much a map as any other. In the same way, a map can be at a *larger* scale than the thing mapped, in order to show details that might otherwise be hard to

see or label. Perhaps it is best to pass over the mentions of “reality” and “actually exists” in silence.

Finally, why does the author persist in using the term “map marginalia” to describe map furniture? Marginalia are marks made in the margins of a document. They may be scribbles, comments, glosses, annotations, critiques, or doodles, but they are not integral parts of the document itself. Map furniture, by contrast, is the cartographic counterpart of horse furniture. In the same way that items like saddles, stirrups, bridles, halters, reins, bits, harnesses, and martingales are what facilitates equestrianism, so too do legends, scale bars, inset maps, neat lines, graticules, projection notes, etcetera act as affordances that facilitate map usability. It is the furniture makes the employment of the map possible. The author does, in “Anatomy of a map,” warn that “the term *map marginalia* can be misleading since the various pieces are often placed within the map itself” (14, *italics in original*). This, however, merely constitutes a warning that there may be some scribbles in the map space, not that the denigrating term *map marginalia* may be inappropriate when applied to such essential features.

This recital could go on—I have pages of notes—but these are examples enough. There is a wealth of sound, valuable, and insightful information in *Cartography.*, but it is seriously marred by errors of fact (for example, about colour), of theory (“... maps, by definition ...”), and of, shall we say, nomenclature (map marginalia). This is very disappointing, and, in view of the undoubted popularity this book will enjoy, likely counterproductive.

In conclusion, *Cartography.* is an impressive accomplishment. It is especially impressive as the work of one highly competent, qualified, and capable individual, but it would be no less an accomplishment were it the product of a large team. Ultimately, it is open to criticisms of detail, approach, conception, and vocabulary, but its evaluation must not be allowed to break down into simple recitations of objections and grievances—there is too much in it that is good to allow that. This book has arrived on the scene with a high profile and a good deal of fanfare, and, as has been mentioned, it will be bought, and read, and discussed, and passed around, and consulted, and quoted for a good long time by people from around the globe. This will be due, in the end, not to the fanfare attending its advent, but to the strengths it possesses.

Its strengths are considerable, and its shortcomings are both many and manifest. Whether the balance is seen to fall one way or the other will be up to individual readers, but I cannot disguise my disappointment that this book just doesn't quite deliver on its promising potential.

Earlier, I posed the question as to whether the field upon which this Englishman's book stands would prove to be like that of the famous English victory at Agincourt, or would it be more like that of the English disaster at Hastings. That question had been penned at the beginning of the review process, and was, at the time, still open. At the end of the review, however, it seems that the field it most resembles is that of the Battle of Schellenberg (July 2, 1704), in the War of the Spanish Succession (which is called Queen Anne's War in the United States). At Schellenberg, in Austria, the Duke of Marlborough staged a frontal attack on a partly fortified hill and, although he took the hill, it cost him six thousand of his twenty-two thousand man English-Dutch army. It is debatable as whether or not this constituted a Pyrrhic victory.

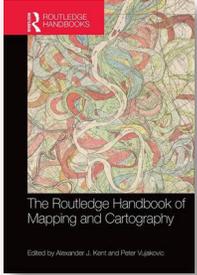
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THE ROUTLEDGE HANDBOOK OF MAPPING AND CARTOGRAPHY —



Edited by Alexander J. Kent and Peter Vujakovic

Routledge, 2018

618 pages, 283 color illustrations, \$49.46 eBook, \$295.00 hardcover.

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978-1-138-83102-5 (hardcover)

Review by: Timofey Samsonov, Lomonosov Moscow State University

The Routledge Handbook of Mapping and Cartography has appeared at an interesting time. Cartography is going through a very intensive stage of evolution. More maps are now made by people without any cartographic training than are made by trained cartographers (Griffin, Robinson, and Roth 2017), and although the data have never been precisely tracked, there is evidence that the trend is growing. The current situation is a challenge for cartography because, as Mark Monmonier states in Chapter 40, "once mapping morphed into geospatial technology, the traditional visible map became just another form of geographic information" (540).

The wide availability of easy to use cartographic tools to non-professional mapmakers has, arguably, led cartography to a critical moment in which it must rethink its place in science, industry, and society. Although bookstore shelves are well stocked with beautiful and carefully composed literature on practical cartography (Brewer 2015; Peterson 2015; Field 2018), the most recent comprehensive textbooks on the subject are now almost ten years old (Slocum et al. 2008; Kraak and Ormeling 2010). It seems that the rapid evolution of mapmaking has made the challenge of writing such a volume—one that won't be outdated the day after publication—almost too formidable a task to take on. Almost, it seems, but not quite. *The Routledge Handbook of Mapping and Cartography* is one of the few summarizing, international volumes on cartography to be released in recent years. Densely typeset on six hundred pages, it encompasses a huge amount of information

covering a wide range of theoretical and practical aspects of modern cartography.

The book is composed of six parts, containing a total of forty-three chapters. Part I contains a critical review of some key concepts and paradigms in cartography. Part II expounds major themes in the history of cartography, visualization, and representation in cultural and historic contexts. Parts III and IV are dedicated to an overview of the scientific grounds of modern cartography, revealing its methodological, technological, and practical sides. The chapters in Part V are focused on various social aspects of mapping, and demonstrate how, where, and by whom maps were used in the past and are used today. The final Part, VI, is an attempt to portray some future perspectives for mapping and cartography.

The first eight chapters outline the emergence of cartography as a science and as a social phenomenon. The opening chapter, written by Gyula Pápay, provides a detailed analysis of the impact that German cartographer Max Eckert had on the formation of academic cartography. Eckert is considered to be the founder of cartography as a science, and this chapter contains a critical analysis of his magnum opus *Die Kartenwissenschaft* ("Map Science"), published in two volumes in 1921 and 1925. Since Eckert's book was written in German and never translated into other languages, this chapter contains valuable and unique information about that seminal publication that is not otherwise found in English. Chapter 2, by Christopher Board, discusses the history of communication models in cartography and how they stimulated discourse about differences between mapmaking and cartography, and how they also provoked criticisms that led to the emergence of new paradigms such as geovisualization.

The third (by Amy L. Griffin) and fourth (by Corné P. J. M. van Elzakker and Kristien Ooms) chapters are centered on the map user—the ways in which they perceive, interpret, and apply maps for their purposes. The history of research on visual perception and cognition outlined in