This hefty book, now in its eighth edition, has evolved over the past 40 years from an entertaining read about map use, reading, analysis, and interpretation into a formidable textbook on these subjects. The Preface tells us that “this book offers a comprehensive, philosophical, and practical treatment of map use in three primary ways” (ix). “First,” the authors write, “we define a map as a graphic representation of an environment that shows relations between geographic features … second, we make a clear distinction between the tangible cartographic map and the mental or cognitive map of the environment … third, we reference commercial products and services of special interest to the map user” (ix–x). As an afterthought, they also promise to show how map use is relevant to daily life. This review will look to see if this book achieves its goals.

The text is organized into three parts: Map Reading (eleven chapters), Map Analysis (seven chapters), and Map Interpretation (four chapters). Each section has a two-page preface, and every chapter is led with a preamble somewhat less than a page in length. Rather than providing a single reference section at the end of the book, the authors place lists of selected readings at the end of each chapter. In addition, the authors note that “several of the new illustrations are linked to online animated and interactive maps through QR codes” (x).

The Introduction covers, in variable depth, several basic topics, including: Mental Maps, Cartographic Maps, The Map Transformation Process, What Makes Maps Popular?, Functions of Maps, and Map Use. It cautions the reader that “maps, even more than the printed word, impress people as authentic. We tend to accept the information on maps without question. This blind acceptance is potentially disastrous when using maps indiscriminately…You should also question the credibility of maps” (8). This warning is to alert the reader to the range of possible distortions, errors, generalizations, and biases on the cartographer’s part. It should be noted that these topics are discussed without ever mentioning the term “critical cartography.”

Part I starts with map reading, which involves determining what the cartographer has depicted and how to discover the map’s message. As the introduction to Chapter One points out, maps “tell you where things are and let you communicate this information efficiently to others” (25). In the first two chapters, the authors succinctly and logically cover the Earth & its coordinates and map scale, respectively. In Chapter One, they discuss the Earth as a sphere, the graticule, the Earth as an oblate ellipsoid, the differences between geocentric versus geodetic latitude and longitude, and the Earth as a geoid; the explanations are clear and useful. Likewise, Chapter Two features good explanations of expressing scale, large and small-scale maps, converting scale, and determining an unreported scale. Table 2.1 “Commonly used ways of expressing map scale” (43), is especially helpful by covering not only US, but also UK and Canadian practices.

Chapter Three covers projections—a difficult subject for many map users—with sufficient clarity to allow the reader to understand map projection processes, as well as their properties, families, and parameters. Illustrations in this chapter are quite well designed and informative. The fourth chapter discusses different types of grid coordinate systems. The text deals with Cartesian coordinates, UTM, Universal Polar Stereographic, state plane, state grid, and other grid systems (although the Ordnance Survey National Grid [OSNG] dominates the “other” category), and how these systems are used and determined around the world. Grid coordinate determination on maps and grid cell location systems, such as the Military Grid Reference System, US National Grid, OSNG, and proprietary grids are also described. Land partitioning, described in Chapter Five, covers the history and logic behind irregular systems such as metes and bounds, French
long lots, Spanish and Mexican land grants, and donation land claims. Discussions of regular systems follow this section with the ancient Roman centuration system, the US Public Land Survey System (including its problems) and the Canadian Dominion Land Survey. Lastly, the authors efficiently deal with various types of legal and technical documents: surveyed land records, subdivision plats, the cadaster, cadastral maps, engineering plans, and land information systems.

The sixth chapter, new to this edition, is on map design basics, and begins with an introduction warning readers against the use of tools that enable quick and cheap map production, but which do not “automatically result in well-designed maps that communicate your message clearly and accurately” (121). The chapter divides its discussions into three sections: Cartographic Abstraction, Map Design Considerations, and Web Map Design. Cartographic abstraction is broken down into the elements of cartographic selection, vector and raster generalization, classification, and symbolization. In the first element of the first section, the authors promote personal responsibility on both sides of the cartographic transaction: “Although it is the responsibility of the mapmaker to choose the themes and features wisely, it is the map reader’s responsibility to understand that only a limited selection of all possible features is shown on the map” (123). The map design considerations section is separated into 12 components with appropriate discussions. The third section, on web map design, outlines the ways web maps are special and provides four basic design considerations (size and resolution, geographic extent and scale, projection, and symbols and text) of concern for maps used on desktop and laptop computers versus tablets and smartphones.

Nearly all of Chapter Six is well written, and would likely instill in students a desire to seek out and pursue a full map design course. However, minor complaints about several figures intrude. Figure 6.2, borrowed from Thematic Cartography and Geographic Visualization (Slocum et al. 2009), is unjustifiably fuzzy, with badly degraded text. The scale-dependent effects of generalization operations shown in Figure 6.3 practically disappear because the illustration has been reduced in size by some undisclosed, but apparently dramatic, amount (it was “resized to fit the page” [125]). The resizing renders the whole illustration nonsensical. Figure 6.7 is another that caught my eye: the figure caption and the text state that map is “centered correctly at 96 degrees” (128) and “positioned correctly with the central meridian” (129), respectively, but this is clearly untrue. The central, vertical meridian is obviously the 90° line.

Chapter Seven considers qualitative thematic maps, with helpful presentations of the concepts of homogeneity, principles of symbolization, single-theme, and multivariate maps. The chapter finishes with introductions to mapping qualitative change on static and dynamic maps. Again, scan resolution is problematic in Figures 7.8 and 7.11, two maps from the Atlas of Oregon (Loy et al. 2001). The eighth chapter deals with quantitative thematic maps. Unfortunately, three more figures copied from the Atlas of Oregon (Figures 8.2, 8.4, and 8.46) display the same problems as the examples in Chapter Seven. Nonetheless, Chapter Eight quite adequately covers the differing types of quantitative data for points, lines, and areas, as well as the variety of classification schemes available, noting the advantages and disadvantages of each. The important distinctions between choropleth and dasymetric maps are covered, while cartograms, prism maps, and continuous surface maps are also presented in their various types and styles. Plenty of warnings are given, such the authors’ note that “incorrectly made dot density maps can be confusing, if not downright misleading” (200). In addition, multivariate maps and multiple display maps are presented in their many forms, and several varieties of quantitative change maps are discussed.

Chapter Nine treats the topic of relief portrayal and presents a logical overview of the different absolute and relative relief mapping methods, oblique perspective maps, combined methods, and stereoscopic views. Examples of different relief shading views of Mount Saint Helens provide clear demonstrations of relief reversal and single versus multidirectional hillshading. I would suggest, however, that the image pairs in Figures 9.18 and 9.19 could have been combined in one three-image figure, because both use the same left-hand image and yet are placed side-by-side. Specific digital and dynamic portrayals of relief are handled with discussions of fly-throughs, interactive methodology, Shuttle Radar Topography Mission data, the National Elevation Dataset, Coastal Relief Model, and Lidar.

Image maps, or maps made from satellite imagery and aerial photography, are concisely considered in Chapter Ten. The authors provide appropriate coverage of black and white, color infrared, and high and low altitude photography, along with the potential geometric distortions to
which photographs are subject. They also discuss ortho-
photo maps, and satellite image maps from various public
and private sources. This chapter finishes with a discussion
pointed at dynamic image maps, most particularly ArcGIS
Earth. This seems unnecessarily limited, because, while
many in the GIS community use this program, it is not
nearly as widely used by the map reading public as Google
Earth, or even Bing Maps (which at least gets a mention).

Chapter Eleven covers the critical issues of map accuracy
and uncertainty on maps. The authors identify the differ-
ences between uncertainty, error, and bias, as well as be-
tween map precision and accuracy. The types of accuracy
and the sources of error are also discussed. Because the
sources of error are often difficult for the average map
reader to detect, this chapter includes helpful sections on
communicating accuracy and uncertainty through meta-
data, reliability diagrams, legend notes, symbols, and no-
tations—the last of which are the means most likely noted
and understood by map readers.

Part II deals with map analysis, the purpose of which “is
to reduce what might appear to be a muddle of informa-
tion on a map to some sort of order that you can under-
stand and describe to other people” (294). Chapter Twelve
covers distance finding, including the means of determin-
ing distances, whether by physical measurements on the
map or by coordinate distance, along with the potential
error factors of each. Also discussed is the concept of
functional distance, including travel time maps and iso-
chrones. Chapter Thirteen is concerned with direction
finding and compasses, with the relations between true vs.
grid vs. magnetic north, with magnetic declination, and
with compass direction systems. This straight-forward
chapter is completed with plenty of well illustrated guid-
ance for direction finding and determination on large and
small scale maps. The fourteenth chapter covers position
finding and navigation with a map, and with how to esti-
mate one’s ground position and relative distances to other
features. This chapter also includes a discussion of GPS
use for wayfinding and navigation. There is an overview of
GPS, describing how it works, its potential accuracy and
errors, and how its outputs are expressed. Land, marine,
and air navigation methods complete this chapter.

Chapter Fifteen, which deals with spatial feature anal-
ysis, covers areal determination with the use of grid cell
counting while maintaining awareness of measurement
accuracy. Coordinate methods are outlined, with the use
of mechanical, electronic and polar planimeters discussed,
along with the configuration of irregular surface areas.
In addition, the authors explain the concepts of area, pe-
rimeter, and centroid. It is shown how volumes can be
computed using the discrete ordinates, grid cell, and ran-
don sample methods. Lastly, the computation of shape
measure, area correspondence, and compactness values
are described. Chapter Sixteen concerns surface analy-
sis, touching on the means used to determine slope, gra-
dient, aspect, illumination, curvature, profiles, and cross
sections. The authors provide an important discussion of
how much vertical exaggeration is appropriate for partic-
ular profile and cross section scenes. Visibility analysis,
through the setting of viewpoints and viewsheds finishes
off this chapter.

Chapter Seventeen presents spatial pattern analysis, start-
ing with consideration given to the particular parameters
captured by spatial pattern measures of point, line, and
area feature counts. Most of this chapter, however, fo-
cuses on pattern analysis and on the mathematical tools
involved, followed by a short introduction to using GIS
for spatial pattern analysis. The eighteenth chapter covers
spatial association analysis, including: an examination of
the types of spatial association, how to judge association
visually with bivariate maps and scatterplots, and how to
measure it through a variety of formulas and statistics. The
authors round off this chapter with a look at the move-
ment and diffusion of point data.

Part III deals with map interpretation, and, despite being
the shortest part of the book, it is as equally important
as the others. The authors note that “interpretation is the
most demanding of all map-use endeavors. It is also the
most exciting” (478). Chapter Nineteen covers interpreting
the lithosphere, or, more properly, geomorphic and geo-
logic terrain analysis. The authors discuss and illustrate
basic landform features and types, followed by a presen-
tation on geologic maps and cross sections. The twenti-
eth chapter, interpreting the atmosphere and biosphere,
starts with basic weather maps, media weather maps, and
weather satellite image maps. I would suggest that a future
edition should include a link to hint.fm/wind, which pro-
vides a near real-time animated depiction of current wind
flow. The next section of Chapter Nineteen covers climate
maps, including average annual precipitation, monthly cli-
mate maps, climate types, heating degree-days, and solar
radiation. The last section, covering the biosphere, deals
with, and differentiates between, species distribution, range, and zone maps for species and vegetation.

Chapter Twenty-One, focused on interpreting the human landscape, provides an overview of human factors that influence the urban and rural landscapes in terms of settlements and land use/land cover, and then delves into the various means of viewing the sundry components of mapped demographics. The twenty-second, and last, chapter involves maps and reality, and opens with a caution against “putting too much faith in maps, of not realizing their limitations, and of forgetting to look beyond the symbols of the map to the real world beyond” (553). Numerous warnings like this, along with related statements largely drawn from works of fiction, make this a memorable essay. Recognition of the fact that maps have to lie, at minimum through cartographic generalization and abstraction, should remind the reader of the danger of treating maps as reality instead of as a cartographic interpretation of a selected portion of reality is a critical reminder for all. While this 12-page chapter is the shortest in the book, it is possibly the most important.

Two appendices, a glossary, and an index complete this book. The appendices include brief discussions of digital cartographic raster and vector databases from mainly US sources, some tables of measurement unit conversions (including length variations for a degree of latitude and longitude), coordinates for 50 US cities, and prime meridians used historically on some foreign maps (in DMS from Greenwich). The final 72 pages hold the glossary and index.

**REFERENCES**


**HITLER’S GEOGRAPHIES: THE SPATIALITIES OF THE THIRD REICH**

From their earliest days, the ideological masters of the Third Reich viewed cartography and spatial politics as tools for conquest. Not since the Roman Empire has geopolitics seen such grand, imperial, unbridled ambition dominate the world order. *Hitler’s Geographies: The Spatialities of the Third Reich* is a well planned, meticulously executed work that examines the Nazi mapping enterprise through a new level of interdisciplinary rigor. To this end, the editors, Paolo Giaccaria (Political & Economic Geography Professor at the University of Turin in Italy) and Claudio Minca (Cultural Geography Head Professor at Wageningen University in the Netherlands), have brought together the work of scholars from Canada,