

encountered during the process of field data collection. It is an easily readable book and explains the many concepts in a concise manner. This is not, however, a recipe book: it cannot be taken into the field and a plan directly executed from it. This is a good quick reference guide but not an all-encompassing text.

Remote Sensing for GIS Managers

Edited by Stan Aronoff

Redlands, California: ESRI Press, 2005.

xiv, 487 pp., 505 figures, 33 tables, footnotes, bibliographies, index

\$69.95. Hardbound

ISBN 1-58948-081-3

*Reviewed by Daniel G. Cole
Smithsonian Institution
Washington, DC*

Upon seeing the title of this book and noting its editor, this reviewer, as a GIS manager with a background in remote sensing, knew that this tome would likely be worth reviewing. The field of GIS management has had Stan Aronoff at its helm since his publication of *Geographic Information Systems: A Management Perspective* in 1989. In his introductory chapter, he sets out the following plan for the book: "*Remote Sensing for GIS Managers* provides an introduction to remote sensing history, technology, and applications tailored to the needs of GIS managers and practitioners" and "introduces remote sensing with the goal of promoting its use in the production of useful geospatial information" (p. 7). This review will analyze how well he met those basic goals.

The book is divided into 13 chapters with three appendices, and while 15 authors contribute to the work, much of the book has Aronoff's signature. He is the single author of seven of the first nine chapters, plus two of the appendices; he co-authors two additional chapters and is one of the twelve contributors to the applications chapter. Except for the introductory and concluding chapters, all chapters have separate bibliographies and most have internet addresses for further information. As the editor, Aronoff has done a decent job of cross-referencing topics between his and others' chapters.

Chapters two and three deal with remote sensing history and basics, respectively. Aronoff expresses the valid concern that many "GIS users are often unaware that much of the data they use is generated using remote sensing technology or that much more information can be obtained from these sources" (p. 9). Fortunately, he addresses these concerns here and throughout the following chapters. In discussing the

background of remote sensing, he doesn't bother to 'reinvent the wheel' regarding illustrative figures, but, instead, borrows extensively from authors of remote sensing college textbooks. He seems especially indebted to editions of Lillesand and Kieffer's classic work, *Remote Sensing and Image Interpretation* (2nd and 4th eds.).

The fourth and fifth chapters cover remote sensing image characteristics. Aronoff notes the confusion between ground sample distance (GSD) for digital imagery versus ground resolving distance (GRD) for aerial photography, and how GSD changes with resampling while GRD changes with enlargement or reduction of the photos. Within chapter four, he covers the four concepts of resolution: spatial, spectral, radiometric and temporal. A discussion of costs important to managers includes costs per unit area, for mosaicking, and for attaining visual thresholds necessary for mapping at various scales. He also relates the importance of positional accuracy to national map accuracy standards.

Chapter five, by Aronoff and Petrie, points out the importance of orthorectified imagery in a GIS environment. Here, they delve into the characteristic differences of digital versus film frame camera sensors while discussing different camera formats and stereo aerial photography. They outline the usefulness of aerial videography as well.

Line scanners are discussed in chapter six, with Aronoff outlining the differences between whisk-broom (across path) versus push-broom (along path) scanners and between multispectral versus hyperspectral scanners. This review is followed, in chapter seven, by an overview of current and historic, low to high resolution, satellite-based scanners with descriptions of each and of their data products. Aronoff finishes this chapter with a section, of import to managers, on the suitability for use of, and future of, high resolution imagery.

Chapters eight and nine cover the active sensors: radar, lidar and sonar. Aronoff and Petrie provide the principles of radar, including polarimetry, interferometry, penetration capabilities, elevation generation/accuracy assessments, and seafloor mapping from radar altimetry. They also point out the differences between imaging and non-imaging radar, and between real and synthetic aperture radar. The characteristics of lidar operations, sensors, imagery, and applications are described and followed with a discussion of sonar principles encompassing side-scan, acoustic lens, single beam, and multi-beam imaging systems as applied to bathymetric mapping.

At this point in the book, a problem with organization appears. Appendix A, by Petrie, which deals with rectification and geo-referencing of optical imagery, is found at the end of the book but might seem instead to fit better as a chapter here in the main text. This

appendix, at 33 pages, is written like a chapter with figures, references and notes. Regardless, Petrie properly covers image geometries of frame cameras, line scanners, and radar imagery. He then discusses the equations involved in rectification and geo-referenced 2D and 3D imagery.

The tenth chapter deals with the visual interpretation of aerial imagery where Campbell limits the focus to scales of 1:40,000 or greater. He writes about imagery from archival sources and current custom acquisition, along with the advantages and disadvantages of each. He describes elements of image interpretation (shape, size, tone, texture, pattern, shadow, site, and association), as well as image interpretation tasks (classification, enumeration, measurement, and delineation) and strategies (field observation, direct recognition, inference, interpretive overlays, photomorphic regions, image interpretation keys, mosaics, and image maps). Critically, he discusses accuracy assessment of any interpretation with field observations, or ground-truthing, to discover errors of omission or commission. The author provides several pages of application examples and finishes with recommendations on finding image interpretation services.

Piwozar gives an extensive review of digital image analysis in chapter eleven. While several pages concerning image rectification at the beginning of his manuscript overlap Appendix A, the rest of his chapter provides much needed information on image enhancement, classification, analysis, and modeling. The first of these is divided into sections on brightness and contrast enhancement, edge enhancement, band and temporal selection for composite generation, and indices to enhance image quality. This last item is expanded upon in two subsections concerning: (1) the normalized difference vegetation index (NDVI) and the more recently developed enhanced vegetation index (EVI); and (2) indices of image characteristics such as image texture measurements and principle components analysis. Piwozar logically notes that "development of a rigorous and complete set of class definitions is critical to the success of classification analysis" (p. 307). He then follows this discussion with others about land-use versus land-cover mapping, different types of supervised and unsupervised digital classification schemes, and accuracy assessments. Other details on classification approaches, including hybrid-, contextual-, and fuzzy-classifications, along with spectral mixture analysis, artificial neural networks, and object oriented classifiers are also presented. The next two sections of this chapter deal with change analysis and modeling, with examples of descriptive modeling (Southwest Regional Gap Analysis Project) and predictive modeling (Gypsy moth damage potential in Minnesota). The author finishes up with his concerns regarding remote sensing imagery integrated in the

GIS environment, file exchange formats, data volumes and class filtering. Concerning file exchange formats, an update (2004) on JPEG2000 should have been cited here (<http://www.jpeg.org/apps/sensing.html>).

Reading the above chapter points out a major omission in the book, i.e., no discussion, much less any mention, appears here or in the appendices in regard to different image processing programs such as ERDAS Imagine, PCI Geomatica, Intergraph ImageStation, TNTmips, ENVI/IDL, ER Mapper, or IDRISI. This book is not intended for students; rather, it is obviously directed to managers who would appreciate a set of tables comparing the features of the above software packages. No commercial promotion is necessary but any manager needs to know which product might best serve his or her project needs.

Chapter 12, dealing with remote sensing applications, is the longest chapter in the book, and rightly so. It is divided into eight sections and case studies, each with different authors and its own bibliography. Aronoff himself starts with the agriculture section covering regional crop condition monitoring and precision farming implementations of geospatial technology. Wulder et al. cover forestry applications including detailed forest inventories, forest health and natural disturbances, and landscape ecology, habitat and biodiversity. This section is followed by two case studies: (1) analysis of jack pine budworm defoliation (Hall); and grizzly bear habitat mapping and modeling (Franklin). Here, and elsewhere in this chapter, are included valuable summaries of end-products, time frames, and costs. Geologic applications are handled by Berger and Fortin, who describe the key geologic structures as detected on remotely sensed images, as well as direct detection of hydrocarbons. Their case study involves an integrated analysis of the Gabon sedimentary basin. Next, Gallo gives a quick overview of the appropriate satellites involved with atmospheric, oceanographic and land products. Madry discusses archaeological applications such as archaeological site discovery, and regional archaeological environmental analysis, with case studies on Burgundy, France and St Johns County, Florida. The next two sections, military applications (Aronoff and Swann) and intelligence analysis (Last), inevitably overlap while dealing with reconnaissance and military intelligence. The former section provides a table of applications and specific military uses of remotely sensed data while the latter gives a case study of military intelligence scenarios. The last application section (Hipple and Haithcoat) concerns urban infrastructure and business geographics and includes subsections on planimetric base mapping, detailed topography, land cover/land use, urban forest/greenspace, infrastructure condition assessment, development monitoring, emergency response and disaster management, and business development,

planning and analysis.

The concluding chapter on remote sensing and the organization (Merchant) contains a wealth of good advice packed into a few pages. In writing about the implementation phase, when he addresses assessing needs, he promotes the potential benefits of remote sensing while cautioning the reader to recognize the difference between experimental success versus operational applications. In addition, he recommends determining the organization's information requirements through the creation of pilot projects. Concerning human resources, the frequency of use of remotely sensed data using image processing programs demands in-house capabilities, along with a commitment by management to training so that staff will stay up-to-date with current technology. He suggests that most, if not all, GIS shops need at least one full-time staff remote sensing expert. This suggestion is made so that proper oversight is maintained regardless of whether or not remote sensing work is done in-house or contracted out as is the case with small shops, infrequent users, or when special skills are involved. This oversight would include quality assurance awareness of data analysis strategies involving various modes of image classification so that misapplication of an incorrect technique is avoided. Developing partnerships or working as part of a consortia are also forwarded as a means of building on each other's strengths, especially with an interdisciplinary focus, so that data, imagery, personnel and costs are shared. Needless to say, he concludes with "Remote sensing is a potentially powerful compliment to GIS technology." (p. 419).

With Appendix A already noted above, Appendix B provides the characteristics of 17 selected satellite sensors in tabular format. Appendix C lists remote sensing and related resources, including: 15 educational web sites, 17 tutorials, eight books, 17 periodicals, six associations, five remote sensing and earth science web glossaries, data resources from seven international government agencies and eight commercial satellite and radar sources, and eleven image galleries on the web.

As an edited work, some unevenness and overlap expectedly occurs, although Aronoff wisely cross-references statements and sections between chapters. While I have noted some problems with the book, my complaints are mostly quibbles, and I will wholeheartedly recommend this book, especially if future editions include tables comparing the capabilities of different image processing software packages.

Literature, Mapping, and the Politics of Space in Early Modern Britain

Ed. Andrew Gordon and Bernhard Klein. Cambridge: Cambridge UP, 2001. 276pp; 30 ills. Hardbound. ISBN# 0-521-80377-2. \$85.00.

*Reviewed by Brooks C. Pearson
University of Central Arkansas*

This book is nicely bound and wrapped in a rather outdated dust jacket reminiscent of the 1970s. Both binding and jacket house a very peculiar assemblage of essays loosely unified by their treatment of one or more of the themes indicated by the book's title. None of the entries attempts to engage all titular themes, while several only seem to stab unsuccessfully in the general direction of one or other of them. The book's twelve contributing authors are primarily scholars of English literature; none are geographers. No chapter engages period historical cartography in a fashion recognizable to cartographic scholars, although a few make a cursory attempt to apply the conventions of literary criticism to a deconstructive analysis of atlas frontispieces or map cartouches. Most chapters make some effort to engage ideas that could be construed as "geographic," although – as with the book's "cartographic" inquiry – these efforts are nearly without reference to the relevant geographic literature. Overall, this book will likely be very unsatisfying to cartographic scholars, specifically, and to geographers, generally.

Articles in this book frequently flirt with ideas long established in the geographic or cartographic literature without any apparent awareness that such a body of knowledge exists. The first chapter is a good example of the scholarship typical of this work. Oliver Arnold's "Absorption and Representation: Mapping England in the Early Modern House of Commons" attempts to use Parliamentary records and other primary sources to outline the British lower house's conceptualization of itself as a mirror of the Realm in the late 16th century. Arnold seeks to establish that the physical layout and customary procedures of that political body were consciously analogous to the citizenry and social relations of the nation. All this is accomplished without reference to the wealth of literature on mental mapping, activity spaces, and similar geo-cartographic themes which could have greatly informed the discussion. A similar lack of awareness of the relevant literature also handicaps the book's two articles on the role of mental mapping in Edmund Spenser's *The Faerie Queen*. Bernhard Klein's "Imaginary Journeys: Spenser, Drayton, and the Poetics of National Space" and Joanne Woolway Grenfell's "Do Real Knights Need Maps? Charting Moral, Geographical, and Representational Uncertainty in Edmund Spenser's *The Faerie Queen*"