Advanced Geographic Information Science, edited by Chaowei Yang, David Wong, Qianjun Miao, and Ruixin Yang, 2011. xvi+485 pp. Boca Raton: CRC Press.

Geoinformation (or geographic information) science has expanded enormously since its inception two decades ago, whether measured by the number of journals in the field, the number of active researchers, or the breadth of the scientific content. So anyone thinking of publishing a book on the topic faces a daunting task in deciding what to include and what to leave out. Despite its very substantial and at times very dense content, this book has a distinct flavor, and will be valued especially for its coverage of the cutting edge of geospatial technology in such novel areas as the Geospatial Web, the Cloud, and cyberGIS. Geoinformation science has long since passed the point where its advances could be reviewed in a single book-length volume, and hopefully others are working on parallel books on spatial cognition, spatial statistics, volunteered geographic information, and uncertainty.

The book is a triumph for the group of researchers that has been assembled over the past decade at George Mason University, and no less than 23 of its 53 authors hold appointments there, including three of the four editors. Although one of the two applications chapters (Chapter 9) covers the social domain, the arguments for employing massive, distributed computing are clearly strongest when the data to be analyzed are themselves massive and distributed. Thus the context of much of the book is provided by satellite-based remote sensing, environmental modeling, and global-scale analysis.

After a broad overview, the editors devote a chapter to Earth observations, covering all of the recent developments in remote sensing as well as the rapidly evolving vision of ground-based sensor networks. The next five chapters are the book's major contribution, however, covering all of the recent applications of high-performance computing to geospatial data. Chapter 3 describes the platforms, Chapter 4 the data access systems, Chapter 6 the evolving geoinformation infrastructure, and Chapter 7 covers ontology and the representation of geoinformation knowledge. No other single source has assembled quite such a complete picture of advanced geospatial technology circa 2011.

Chapter 5 breaks the sequence somewhat, since its account of spatial data analysis has not yet changed markedly from the earlier accounts of simple, desktop GIS. The traditional techniques of spatial autocorrelation, spatial interpolation, and geovisualization seem to take little advantage of the vastly more powerful platforms that are discussed in the other chapters of the sequence. Thus the reader is left with a still unanswered question: Will the move to distributed GIS lead to fundamental changes in the nature of analysis and modeling, and the questions that researchers expect geospatial technologies to address, or will it continue to be driven solely by the need for higher performance?

The field is evolving very rapidly, and this book could not have been written as little as three years ago. It is also a very complex field, and a glance at any of the denser chapters will quickly convince the novice reader that a major effort is needed to come up to speed

and to understand the options on offer. This is a book for the technically oriented reader who is willing to invest substantial effort, if only in mastering the vast array of technologies on offer, and the rapid-fire acronyms (the first-level index lists no fewer than 167 between A and F). A less technically oriented reader might be tempted to ask whether the field *has* to be so complex, or whether there are not a small number of comparatively simple principles that will still be true five or even ten years from now -- and might be tempted to wait a while until the options sort themselves out.

To some, especially researchers in fields that require massively powerful computing to solve otherwise intractable problems, the race to build and acquire the world's fastest computer has been easy to justify. In the geospatial world, however, the case has been less obvious, and excellent early work in the 1990s on parallel geocomputation (*e.g.*, by Richard Healey) left little impact on mainstream GIS. More recent work on cyberGIS seems to have laid many doubts to rest, and this book will undoubtedly continue that trend. But just as many asked in the 1980s for compelling advances in science that could be uniquely attributed to GIS, so one suspects that the GIS mainstream will continue to call for compelling applications of cyberGIS that justify the complexity. In that sense the two application chapters are somewhat conventional, since neither specifically addresses the case for distributed, high-performance computing.

The book's format is also rather conventional -- it is nicely laid out and well edited, and includes an extensive color section. On the other hand this rapidly evolving field seems ideally suited to the kinds of rapid publication that are possible online, along with supporting online materials in the form of tutorials, example applications, models, and data. Perhaps these will be possible in future editions, or in new projects that build on this one.