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with the seagoing habits of oceanographers. Going to sea on extended cruises to conduct their research, oceanographers typically require specialized equipment and ships, both of which involve significantly greater investments of government funding. However, I am certain that the answer to this particular question lies deeper than simply the financial implications of oceanographers going to sea in ships. Eric Mill's (1989) *Biological Oceanography: An Early History, 1870-1960* picks up the story of biological oceanography where Rozwadowski's *Fathoming the Ocean* leaves off, weaving together Anglo-American traditions with influences from the European continent. Although both books provide many of the clues necessary to answer my question, neither addresses it directly. On the other hand, perhaps the sign of a really well written book, especially one devoted to history, is not only the story it tells, but also the number of intriguing questions it inspires its readers to ponder on their own.

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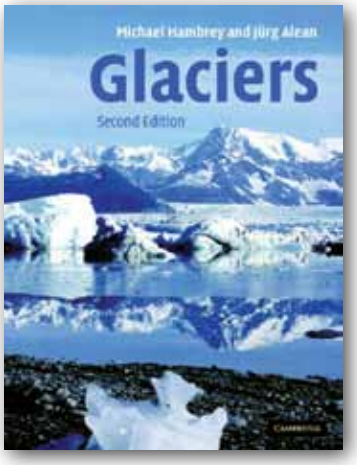
Glaciers

By Michael Hambrey and Jürg Alean
2nd Edition, Cambridge University Press, 2004, 394 pages.
Hardcover: ISBN 0521828082, $60 US

REVIEWED BY W.T. PFEFFER



Glaciers have, with dinosaurs, woolly mammoths, Egyptian mummies, and pyramids, a kind of intrinsic allure that causes people to become fascinated by them not as a particular representative of a broader interest, but simply for their own sake. Consequently, glaciologists are frequently drawn into their subject based on a life-long attraction to glaciers and the world of snow and ice rather than as geologists or physicists simply seeking an application of their skills. The authors of *Glaciers*, like so many of us, evidently fall into this category, and their book is written for an undergraduate audience already attracted to glaciers and seeking an introduction to them as a field of study. The book is qualitative in nature—not the only approach to the subject, but reasonable for this audience—and filled with inspirational photographs on nearly every page. Taken on its own terms, the book might work for an undergraduate geography or geology class. However, I am troubled by a number of aspects. A student using this as a primary text would require some rather devoted guidance on the part of the instructor to wend a path through the world of glaciers as it is presented here—the instructor being a sort of a Virgil to Hambrey and Alean's Dante.

The descriptive approach is good for an introduction to a complex subject, but description alone can become confusing without a conceptual context. The authors adhere doggedly to categorization, indicating in bold face not only the definitions of principal features such as moraines, firn, and foliation, but also those for minutiae like "basket-of-eggs topography," "ice ships," and "knock-and-lochan topography." You can even learn about the relative merits of dog-sledging, man-hauling, and mechanized transport, and the distinctions between Temporary Scientific Research Camps and Permanent Stations. This information gets disorienting after a bit, and I doubt the introductory student will have much success separating the critical concepts from the ephemera. In the chapter on mass balance, snow swamps are introduced with the same emphasis as funda-

mentals like the equilibrium line or ablation area; at the same time, many really critical concepts are absent—in this case, for example, those of summer and winter balance, balance gradients, accumulation area ratio, or balance amplitude.

More troubling to me, though, than the addition of what could be confusing detail, is the absence of fundamentals. Some fundamentals are covered, to be sure: there are excellent descriptions of glacier morphology, good chapters on the structural features of glaciers, on the geological record of glaciation, and on the role of glaciers in global hydrology. But missing is any real discussion of important topics at the level of the dynamic nature of the Antarctic ice streams, the insights gained into ice sheet/climate interaction from the GISP II/GRIP projects, and the significance of Heinrich events. An entire chapter devoted to glacial debris gives a complete nomenclature but no discussion whatever of glaciers in a global context as erosive agents or their role in global sediment transport—no indication as to why we would need such a nomenclature.

Missing altogether is any mention of numerical modeling, of the motivations for making measurements, of our knowledge of the physical properties of water in its various phases, or of the existence of a constitutive law for ice. There is no mention of the existence of a mathematical framework for thinking quantitatively about glaciers, or even a suggestion that one might want to have such a framework. The qualitative view of glaciers is both inspiring and of good scientific utility, but to allow it to eclipse the quantitative view of glaciers in this way will not serve well the needs of any new student of Earth sciences, regardless of their motivations for coming into the subject or their ultimate scientific destination.

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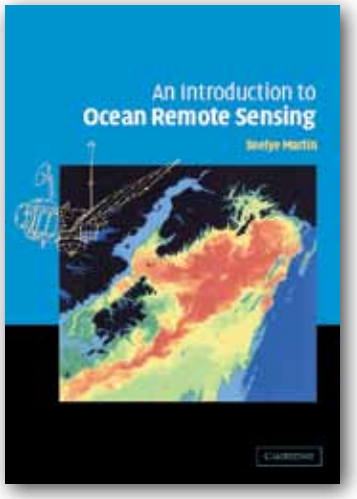
An Introduction to Ocean Remote Sensing

By Seelye Martin, Cambridge University Press, 2004, 454 pages
Hardcover: ISBN 0521802806, $75 US

REVIEWED BY KRISTINA B. KATSAROS



An Introduction to Ocean Remote Sensing by Seelye Martin is an excellent textbook for teaching remote sensing of the oceans at the beginning of the 21st century. Since 1987, Dr. Martin has taught remote sensing to graduate students and senior undergraduates. *Ocean Remote Sensing* is a classical textbook that starts with fundamentals and basic principles. It then covers the entire field, which has been difficult to do in the past because some aspects of remote sensing were better developed than others. Now, with 40 years of meteorology and oceanography from space behind us, (beginning with the *Nimbus I* satellite and the early infrared measurements of sea-surface temperature in the mid-1960s), the time was ripe for a fundamental textbook on remote sensing of the ocean. There are numerous satellite systems currently gathering oceanographic data routinely, and many more are planned. The basics of the techniques are now well understood, so that more oceanographers can rely on remotely sensed data. We have now used a broad range of the electromagnetic spectrum, from the visible and infrared wavelengths, to many frequencies in the microwave region. Remote-sensing techniques have been used in passive and active modes. The active mode has mostly been used from space in the microwave range, but lasers using visible light are being used from aircraft and are planned for satellite missions. Every graduating oceanography student should now be