BOOKS: OCEANOGRAPHY

Where Sea Meets Sky

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The Sea Surface and Global Change. PETER S. LISS and ROBERT A. DUCE, Eds. Cambridge University Press, Cambridge, 1997. 519 pp. $95. ISBN 0-521-56273-2.

The sea surface microlayer has been operationally defined as the top 1 millimeter of the ocean surface. Its variable nature and the difficulty of noninvasive probing make this region one of the last frontiers in oceanography—although advances in microsensors and remote sensing techniques promise substantial progress in the next decade. *The Sea Surface and Global Change* presents three working group reports and 13 individual contributions arising from a workshop held in February 1994. The editors and conference organizers assembled an eclectic group of researchers familiar with the physics, biology, and photochemistry of the sea surface microlayer. The resulting book is unrivaled in its scope and will serve as a good reference for investigators wishing to broaden their view of microlayer processes. The working group reports on physical processes, biological effects of chemical and radiative change, and photochemistry at the sea surface are, to a large extent, summaries of the participants' views—generally discussed in greater detail in the later chapters—and do not attempt to establish priorities for research. The conclusions and recommendation sections of these chapters are broad and stress the importance of field observations—in large part, because of the general sparsity of knowledge about the sea surface.

The remaining chapters can be broken down along the lines of the working group topics. The chapters on physical processes concentrate on air-sea gas exchange. The contribution by Frew on the role of organic films in such exchange presents many previously unpublished results and convincingly shows how even extremely low concentrations of surfactants can substantially reduce the rate of gas transfer, not because of film coverage but rather because of the influence of the film on surface turbulence. Empirically, the mean square wave slope appears a more robust measure of air-water gas transfer than do parameters such as wind speed. Asher contributes a speculative chapter on the global influence of the microlayer on air-sea gas transfer, suggesting a significant inhibitory effect for gases of low solubility. The chapter by Woolf on the role of bubbles describes another kink in the conventional thinking about air-sea gas exchange. The work on bubbles is less novel than that focusing on surfactants, but this review is one of the better and clearer discussions of the subject. Although limited in scope, the chapter by Gladyshev shows that, in addition to indirect effects of biological exudants on surfactant concentrations, the swimming motions of zooneustron can physically enhance gas transfer in quiescent environments by increasing turbulence at the interface.

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The chapters on biological and chemical processes in the sea surface microlayer concentrate on enrichment. The magnitude of observed enrichment is, to a large extent, a function of the method of sampling the microlayer and the concentration profile of the analyte near the surface. Samplers often inadvertently include the properties of bulk water in their analysis. Surprisingly, as discussed in the chapter by Hunter, enrichment factors are generally less than 1.5, with the exception of (coastal) regions with high anthropogenic input from the atmosphere or spills. Trace metals and anthropogenic compounds in these area can be enriched by three orders of magnitude, as described by Hardy. Despite such modest enrichment, the microlayer has a distinct character, in part because of ultraviolet-induced oxidation near the surface. With possibly increased levels of ultraviolet radiation at high latitudes and increased anthropogenic input, stress to surface-dwelling organisms and larvae, which often concentrate near the surface, can be substantial. The chapters by Blough and Ehrhardt provide a comprehensive overview of photochemical reactions in the surface microlayer that will be sensitive to changes in the amount of radiation reaching the sea surface.

Several chapters are devoted to remote and noninvasive probing of the sea surface. Korenowski describes new research on the characterization of surface slicks and compounds at the interface by laser spectroscopy. Robinson contributes an overview of global sensing with a variety of satellite-mounted sensors. He suggests that breakthroughs will come from interpretation of the combined remotely sensed signals.

This book is a definitive reference for the whole spectrum of surface microlayer processes and will broaden the insights of specialists. Although frequent reference is made throughout the book to the possibility that global change will affect microlayer processes, a speculative introduction on this topic would have been a welcome addition in order to do justice to the second part of the title.

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Vignettes

Variant Classifications

Sexual Behavior in the Human Male; Sexual Behavior in the Human Female: the titles imply an inquiry specieswide in scope. And, indeed, the authors were professional zoologists. But the Kinsey Reports, as these studies came to be called, were based on interviews with a highly particular zoological sample: men and women in mid-twentieth-century North America, overwhelmingly the cultural products of the United States. The deflation of the universalist pretensions of these studies began almost immediately upon publication of the first of the two volumes in 1948. It was the destiny of the Kinsey Reports to become artifacts in an animated and enduring discourse not about humankind but about a particular society and its culture. Librarians were obliged to catalogue them in the science section; at home, however, individuals found good reasons to shelve these fascinating tomes next to David Riesman's *The Lonely Crowd*, Gunnar Myrdal's *American Dilemma*, and Henry Nash Smith's *Virgin Land*. What started out as zoology ended up as American studies.

—*David A. Hollinger*, in *Scientific Authority and Twentieth-Century America* (Ronald G. Walters, Ed.; Johns Hopkins University Press)