

BOOK REVIEWS

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SLEIGH, M. A. [ED.] 1987. **Microbes in the sea**. John Wiley & Sons, Inc., New York. 241 p. \$59.95.

The authors in *Microbes in the sea* were keynote speakers at the third symposium for European microbiologists held in Bangor (U.K.) in September 1987. P. J. LeB. Williams outlines the history of this pan-European conference in a short foreword and dedicates the book to George Floodgate. Although the conference may have been pan-European, this book has a decidedly English accent with its six British (not counting the editor), three Scandinavian, and two American chapters. Nonetheless, the book does capture some of the great diversity of marine microbiology within its short span of 241 pages. The quality and style of the chapters vary greatly, ranging from a breezy transcript of an oral presentation (so it seems) to a thoughtful literature review. Several chapters would educate readers of this journal, and what is not covered is almost as noteworthy.

John Sieburth and Henry Blackburn have contributed much to marine microbiology and are no strangers to *Limnology and Oceanography*. In his usual stimulating style, Sieburth argues in the first chapter that we have been overlooking the importance of the production and consumption of methane in oxic waters. He speculates that methanogenesis is occurring in anoxic microenvironments of particles suspended in oxic waters. That may be true, but it is hard to believe Sieburth's comment that 13-60% (mean of 28%) of the cells in the upper waters of the Sargasso and Caribbean are devoted to consuming methane. In the second chapter, Blackburn gives us a progress report about the microbiology of sediments in the North Bering and Chukchi seas. This chapter is packed with data, much of it not published previously, and touches on several important issues, e.g. macrofaunal utilization of detritus and the effect of C:N ratio on detritus mineralization.

To varying degrees several chapters mention bacteria-substratum processes. Egan gives the obligatory lesson about DLVO theory and its application to understanding bacterial attachment to surfaces. The rest of the chapter discusses fouling of heat exchangers. Biocorrosion is an interesting problem in pure and applied microbial ecology which is currently receiving much attention. Hamilton gives a short introduction to anaerobic biocorrosion, focusing on the role of sulfate-reducing bacteria, "SRBs" in the biocorrosion business.

Kjelleberg and Hermansson discuss how bacterial attachment to surfaces may be an adaptive strategy to deal with starvation. But the chapter has more meat than just that hypothesis, which was first proposed by

ZoBell in the 1930s. These authors discuss some of what we know about the molecular mechanisms by which bacteria adapt to low nutrient environments. Now microbial ecologists tend to emphasize how well bacteria are growing in the sea and lakes. Yet, recent work in the open ocean has found that bacteria sometimes are growing very slowly, with doubling times exceeding a week. The terms "dormancy" and "starvation" may not be entirely accurate descriptions of open ocean bacteria, but clearly the issues raised by Kjelleberg and Hermansson are relevant to the study of the open oceans if not other pelagic systems.

In their chapter entitled "Ecology on the micro-scale," Wimpenny and Peters discuss microbial films. But most of the chapter argues for the use of experimental models, such as agar gels to model small-scale interactions in sediments. In fact, more than a third of this book is concerned with methodology. Sargent et al. discuss lipids as indicators for different microbial groups and include a listing of the fatty composition of a variety of microorganisms. I learned much about flow cytometry in the chapter by Burkill, although the number of reviews about flow cytometry potential seems high compared with the number of original research papers that describe the use of flow cytometry. In a balanced, well-reasoned chapter, Gustafsson discusses the pros and cons of microcalorimetry. The technique seems useful for pure cultures and in limited experiments with mixed species assemblages, but it is hard to imagine this approach gaining much popularity with field-oriented microbiologists. In fact, with the exception of flow cytometry, this book has much about older, infrequently used techniques and does not mention at all the new biochemical and molecular approaches now being applied to examine bacterial assemblages in the sea.

The chapters by Southward and Colwell do not fall neatly into any category. Southward's chapter is a thorough and thoughtful literature review on that ever-fascinating topic—symbiotic chemoautotrophs in benthic invertebrates. Near the middle of this book the reader stumbles onto a 6-page chapter by Rita Colwell on the fate of genetically engineered organisms in the ocean and possible genetic exchange by marine bacteria. Although the chapter was stimulating, the topics beg for more discussion, analysis, and hard facts.

So this volume is a curious collection about some of the microbes in the sea and about some of the questions that marine microbiologists seek to answer. A North American collection would be quite different from this volume, but that would be due to the size and diversity of marine microbiology, not some nationalistic tendency. I don't think the book adequately reflects the current excitement in marine microbiology,

but it's worth a browse. Quite likely you will encounter a viewpoint you hadn't considered before.

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BECKEL, A. L. 1987. **Breaking new waters.** A century of limnology at the University of Wisconsin. Trans. Wisc. Acad. Sci., Arts, Lett. (Spec. Issue). Available from Center for Limnology, University of Wisconsin, Madison 53706. 122 p. \$10.00. Soft-cover.

This small volume, written by Beckel with a contributing chapter by Frank N. Egerton, will have an impact far beyond its size and scope. As a documentation of the beginnings and maturation of the science of limnology that centered in Madison, it is a lesson for all. As a compilation and compendium of the work of a leading university in a specialized branch of knowledge, it illustrates what should be meant by "center of excellence." And as a biography of three of the leading lights in the field, its contribution to the history of science is exemplary.

The book is a chronicle of three men, one living and two long since gone. Edward Asahel Birge, an early giant in the field of limnology, had a long and illustrious career, culminating in his presidency of the University of Wisconsin. There continues to be some question, however, of what his contribution might have been without the collaboration and almost constant companionship of Chancey Juday. Together, the two built a broad scope and long-term program in lake investigation that became one of the most productive efforts in science and in higher education. Following their lead, and building on their foundation, Arthur Davis Hasler succeeded in bringing limnology into a modern experimental and theoretical framework whose fruits are still being harvested. This volume, then, is a panoply, and in some sense, a potpourri, of the life, times, and work of this outstanding triumvirate.

The book is organized into only five chapters, cryptically titled "Beginnings," "New waters," "New directions," "Expansion," and "The Wisconsin limnology community," the last by Egerton, a noted and prolific contributor to the history of ecology. Between chapters 4 and 5, pages 57 through 84 carry 32 photographs, spanning 70 years (1917-1987), many of historical interest (including a photo of John T. Curtis, my own major professor, at the Trout Lake Station in 1935!), that show the development of both facilities and program. The figures are well chosen and pertinent to the volume, although they are not tied to the text. Consequently, there are only 94 pages of text (crammed with information, to be sure), including references and a 7-page appendix listing the students, with dates and thesis titles, of Chancey Juday and Arthur Hasler.

Three related events contributed in immeasurable ways to the production of this volume. The first was an address, "A house half built," by E. A. Birge to the Madison Literary Club in 1936. The text survives and is perhaps the closest thing we have to a Birge autobiography. Second, a major conference was convened in Madison in 1983 with a focus on the "History of limnology in Wisconsin." This meeting brought together many former students in the program and enabled present staff at the Center for Limnology to conduct both formal and informal interviews with the participants. As a marvelous source of anecdotal material, this conference is perhaps unequaled in the history of science and, of course, was the springboard and catalyst for this volume. Finally, the continued activity and good health of one of the key players, Art Hasler, permitted a great deal of interview and interaction throughout the development of *Breaking new waters*. Each of these contributions to history comes through in shining array, with excerpts and interview quotes woven skillfully into an amazingly readable text. Both history and biography have a (partly) deserved reputation for dryness, but this book does not share that drawback. It is exciting reading and, to a degree, makes the protagonists come alive in the narrative pages.

Two items of note in a century of limnology are most evident. The first is the concentration of Birge and Juday on the physical and chemical environment of inland lakes, in contrast to the more biological thrust of Hasler and his students. The second is the obvious shift from descriptive to experimental and theoretical limnology. Not that Birge and Juday ignored theory or neglected biology. It was simply an approach to the study of lakes that prescribed an environmental description in early attempts to relate structure, function, and behavior of the biotic community to the physicochemical constraints of the "lake as a microcosm."

Egerton's chapter on "The Wisconsin limnology community," the longest (at 30 pages) of the five, is an excellent summary of the century of limnology, although there is a good bit of redundancy with preceding sections. Also, for unknown reasons, Egerton sets up the state of Michigan as a straw man and asks why Wisconsin succeeded where Michigan failed. The comparison with the University of Chicago-University of Nebraska beginnings of plant ecology is strained, and one wonders why the attempt was made. Egerton's grasp of scientific history, however, particularly focused in and around Wisconsin, and in limnology and ecology, is abundantly clear, and adds perspective and interpretation to the contents of the volume.

Scientific societies always play a role in the development of schools, programs, and new science. It is noteworthy that Juday was the first president of the American Society of Limnology, serving one term (1935-1936) in an appointed capacity, and elected for the 1936-1937 year. Art Hasler followed as President of the American Society of Limnology and Oceanography in 1949-1950. Perhaps illustrative of the close connection with ecology, both men also served as presidents of the Ecological Society of America, Juday in 1926-1927, and Hasler in 1960-1961.

Recent interest in the history of ecology has spawned a wealth of new books, including both histories and