

On Aquatic Microbiology Today

At the time the book reviewed below appeared, E. G. Pringsheim's concise paper assessing the present status of our knowledge of sewage purification was published in *Wissenschaftliche Rundschau* (No. 101, September 1964, p. 454). The following excerpts, translated from the original German article, seem to me significant in the present context.

"I cannot claim to comprehend the entire, vast subject; but what I do know suffices to say: It must change. . . .

"I have before me three books on sewage purification, one American, one English, and one German. All three are superficial, display a lack of knowledge, and are full of errors. Each one describes, without scientific elaboration, methods that are antiquated. In none of them can be found a critical analysis of the pertinent questions, nor indications of what are the most important problems or suggestions for possible approaches to their solution. . . .

"The evil is international and ominous. . . . The situation is reminiscent of the one that existed in agriculture at the time of the great Justus von Liebig, who castigated it in his incomparably sure and spirited manner."

This evaluation applies with equal force to the still broader field of aquatic microbiology, of which sewage purification is only one aspect. And there is little in **Principles and Applications in Aquatic Microbiology: Proceedings of the Rudolfs Research Conference** (Wiley, New York, 1964, 466 pp. \$10), edited by H. Heukelekian and Norman C. Dondero, that contravenes Pringsheim's conclusions. In fact, Wuhrmann's thoughtful chapter, "River bacteriology and the role of bacteria in self-purification of rivers" (pp. 167-192), and the remarks by Heukelekian and Dondero in the final chapter, "Research in aquatic microbiology: Trends and

needs" (pp. 441-452), provide abundant confirmation of Pringsheim's contentions. Together with the chapter by Renn "The bacteriology of interfaces" (pp. 193-201), these are the only parts of the book in which the fundamental aspects of aquatic microbiology are seriously considered.

Most of the remaining 19 chapters represent brief surveys of the microbial decompositions of particular compounds and of some special groups of bacteria. Singled out for such treatment are the decomposition of alkane hydrocarbons (McKenna and Kallio), pesticides and related hydrocarbons (Alexander), transformations of minerals (Ehrlich), the ecological role of phosphorus (Phillips), the deterioration of organic materials, restricted almost exclusively to synthetic products such as plastics, elastomers, resins, and laminates used as protective coverings for submarine telephone cables (Coscarelli), and some organic sulfur compounds (Starkey), the methane fermentation (McCarty), and the iron and manganese bacteria (Wolfe; Mulder), coliform bacteria (Clark and Kabler), actinomycetes (Lechevalier), arthrobacters (Mulder), and photosynthetic bacteria (Lindstrom). Some of these chapters are well written; but most of the information has already been published elsewhere, and they cover so narrow a range of topics that it seems doubtful that they can significantly aid in furthering our comprehension of aquatic microbiology. This is particularly evident from the fact that only scant attention has been paid to the decomposition of classes of organic substances other than hydrocarbons and plastics, or to the many types of microbes that so often predominate in natural bodies of water: the pseudomonads, vibrios, and spirilla; the stalked bacteria; and the fungi, algae, and protozoa. It cannot be doubted that these play an important role in the cycle of matter,

but its nature is still very poorly understood.

Also included are two excellent chapters on rumen microbiology, dealing respectively with the bacteria (Bryant, pp. 366-393) and the protozoa (Gutierrez and Davis, pp. 394-405). In the preface to the book the editors state that these were included "because they can contribute greatly to the solution of our problems in aquatic microbiology." This statement is amply justified; the two papers show how much has been learned about the nature and role of the rumen microorganisms, owing chiefly to the pioneering work of Hungate and his co-workers. This group has endeavored to determine, by direct microscopic counts and sound isolation techniques, the numbers of the predominant types of rumen microbes as well as their specific metabolic activities. These efforts have yielded a satisfactory, if still incomplete, picture of the transformations of matter in the rumen and of the relative contributions to this process by the various constituent organisms. It is clear, as Heukelekian emphasized in the discussion of these papers, that such an approach could rapidly advance our knowledge of aquatic microbiology. Unfortunately, the book contains little to indicate that it is being seriously pursued. Jannasch's important studies are mentioned only by Wuhrmann, who himself appears to have embarked on a program tending in this direction.

By bringing together a group of persons with diverse training and interests, the Rudolfs Conference may have clarified some of the major problems in aquatic microbiology for those in attendance. If so, it is hardly reflected in the published *Proceedings*, including the mostly trivial discussions. This raises the question whether the publication of the book serves a useful purpose other than as a record of the conference. In my opinion it does not; the half-dozen chapters that deal with fundamental problems in a critical manner could have been published without the remaining 16 papers which do not significantly contribute to guiding future work in the broad subject. The numerous typographical errors, some of them particularly confusing, may be attributed to a desire to expedite the publication.

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