Inevitably in a book of this kind the reader will sometimes feel frustration at unattributed statements, but a reading list is given at the end of each chapter.

The book, although expensive, is enjoyable and useful. Young research workers in particular should find it helpful as a source of information and ideas, and as a means of sharpening their teeth. Their own efforts at the bench should ensure that their feet remain on the ground.

G. R. SMITH

The bacteria

The publication of the first volume of the treatise The bacteria, edited by Gunsalus and Stanier, in 1960 was timely because it approximately coincided with the evolution of microbiology as a separate discipline in science faculties in Britain. Previously the centres of the field had been in medical faculties. Although microbiology in the USA was similarly tied to the medical faculties, scientists there had shown a more catholic approach than the universities in Western Europe and the treatise The bacteria was one of the fruits of the American experience. The original treatise provided an authoritative approach to the procaryotic microbes although the procaryote-eucaryotic division has emerged since.

One impression of this volume 7 of the treatise is of the immense amount of knowledge that has been accumulated since 1960. Of the nine chapters, seven have analogous counterparts in volume 1 of the series. These chapters cover spores, cell surfaces, cell appendages, cell walls and bacterial viruses. Only two new topics, nitrogen fixation and chemotaxis, are added in the latest volume. This approach is disappointingly static. The new volume is subtitled Mechanisms of adaptation whereas the first volume was entitled Structure. The change in the title is misleading.

Some of the articles are massive. Those on the structure and biosynthesis of cell walls and the outer membranes of gram-negative bacteria by Tipper and Wright cover nearly 200 pages and clearly constitute a monograph on their own. There are other extensive articles on spores by Dworkin, chemotaxis by Koshland, permeation of cell surfaces by Saier, cell appendages by Sokatch. Other subjects are given light treatment. The excitement of developments in chemotaxis are conveyed although there was a tendency for the excitement to give way to euphoria.

The account of the control of cell division by Helmstetter, Pierucci, Weinberger, Holmes and Tang is timely. It gave the impression that studies in this field have reached an impasse. Could this be because the division event essentially is only one, possibly minor, of the many that make up the cell cycle? If so, the impasse may be generated by attempting to regard cell division in isolation.

This volume is a valuable work of reference for the general microbiologist and definitively treats the present position of most of the subject matter. The diligent creative research of the many bacteriologists whose work is cited calls for our admiration. The retirement of Stanier from the team of editors is a matter for regret. No doubt he will remain a source of inspiration to the new editors.

S. J. PIRT

Adhesion of microorganisms to surfaces

In reviews of microbial pathogenicity an analogy is sometimes made to life in a flowing stream. The pathogens that involve mucosal surfaces will be swept away unless they become attached to the host's cells. Most of the contributors to this symposium apparently share the belief that concepts introduced by physical chemists will explain the way in which bacteria adhere to surfaces. Biologists have profited before from the ideas of physical chemists though
biological systems are far more complex than the experimental systems used in the original work. The chemists in turn observe that their concepts are being used out of context—one has only to read Feldman’s “Use and abuse of pH measurements” (1956 Analytical Chemistry, 28, 1859) to learn who is responsible for the abuses.

This volume has something for everyone. There is good advice for those preparing for a career: “Only when the researcher is conversant with such varied subjects as microbiology, enzymology, chemistry, hydrology, geology and colloid science can he or she hope to describe the soil environment with precision”. Another author provides an aide memoire for those looking for surface structures involved in adhesion.

The authors of the chapter on bacterial adhesion as a factor in microbial pathogenicity, in an extent of only 21 pages, give a concise review of current knowledge of the mechanisms of adhesion of several different pathogens including the enteropathogenic Escherichia coli, Vibrio cholerae, Streptococcus pyogenes and Neisseria gonorrhoeae. Most of this chapter is given to a consideration of bacterial adhesins and recent work on the gonococci is a good example. A few years ago it was suggested that pilus-like structures were involved in adhesion to tissue-culture cells because the structures were present on strains that were thought to be virulent and antibodies to pili were present in the sera of patients with gonorrhoea. The difficulty with this notion is that gonococci studied directly from growth chambers or host lesions apparently lack these appendages. More recently it has been proposed that the “infectious units” are clusters of gonococci within the membranes of damaged host cells. The interest in surface components of gonococci and other pathogens is strengthened by the hunch that the protective antigens necessary for new vaccines are to be found on the surface of bacterial cells.

The writer of the chapter on microbial adhesion to teeth suggests that interesting accumulations of bacteria may occur at the interface of a solid with a liquid and air and that bacteria with hydrophobic surfaces might collect there. Does Cladosporium resinae, the fungus that attacks kerosene in the fuel tanks of aeroplanes, multiply at such a site? Is a similar flotation process involved in the consolidation of the lobe of a lung by pneumococci?

**G. COLMAN**

*Pseudomonas aeruginosa*


*Pseudomonas aeruginosa* is a pathogen of debilitated patients and can survive in damp situations. Thus, there is a need for constant vigilance against it and a need for control. In recent years information on research into clinical and biochemical aspects of *P. aeruginosa* has accumulated rapidly and this book gives the reader a chance to catch up with the many developments in research on *Pseudomonas*.

The chapters are up-to-date reviews written by international specialists in the fields of microbiology, epidemiology, taxonomy, immunity, genetics and antibacterial therapy; at the end of each there are references for further reading.

The book makes the reader aware that *P. aeruginosa* is a tricky, insidious organism that seems to have all the answers and that any scientific advances that have been made to control or contain these bacteria present them, at best, with only a transient setback. I particularly like the idea put forward by Costerton, Brown and Sturgess that *P. aeruginosa* had the capacity to alter its surface envelope to suit prevailing environmental conditions. This insight into the mechanism of survival of *P. aeruginosa* in adverse conditions offers one explanation of the persistence of these bacteria when under attack from chemicals and antibiotics. A mental picture of jelly surrounding frog-spawn comes to mind, with the bacteria as frog-spawn and its envelope the jelly. Yet this is not the complete picture, because strains of *P. aeruginosa* grown in identical environments produce different amounts of exotoxins, proteases and slime and grow at different rates. Such innate differences, combined with plasmid-mediated differences, provide an unending variety of strains of *P. aeruginosa*, and if the “right” strain finds the “right” environment it becomes firmly established and difficult to dislodge.