A few examples will serve to illustrate the value of the book. Reports of botulism caused by ingestion of toxin have now been overtaken in the USA by those of infant botulism, an account of which is linked to a description of wound botulism and of what has been succinctly described elsewhere as “infant botulism in adults”. There is mention of the remarkable organisms that produce type F botulinal toxin but otherwise resemble \( C. \) \textit{barati}; of those that produce type E toxin but otherwise resemble \( C. \) \textit{butyricum}; and of those such as \( C. \) \textit{botulinum} subtypes Af, Bf and Ba that produce two toxins, a major and a minor. The exceptional nature of the C2 toxin of \( C. \) \textit{botulinum} type C, the control of C1 neurotoxicity by bacteriophage, the beginning of the end of the “subtype \( C_x \) and \( C_β \)” terminology, and the overlap between the toxins of types C and D are all admirably illuminated. The reader learns that types C and G were apparently associated with cases of sudden infant death in Switzerland; that food-borne botulism has an amazingly high incidence in Poland, and is of considerable importance in northwest China, due mainly to the consumption of fermented bean curd; and that the great predominance of type E botulism in Japan caused by the consumption of \textit{izushi} (fermented fish) was recently disturbed by 36 cases of type A botulism due to commercially produced \textit{karashi-renkon} (mustard-stuffed lotus root).

Professors Smith and Sugiyama are to be congratulated on their book, which is a mine of useful information and should be consulted by all who have an interest in botulism.

G. R. Smith

Physiological models in microbiology


These volumes represent a most useful collection of articles around a common theme, the theoretical background necessary for an understanding of microbial physiology. Thus, volume I deals with mathematical models of growth and the influence of environmental factors, whilst models of spore germination, bacterial chemotaxis, growth on surfaces, and microbial death are to be found in volume II.

Kacsar’s presentation on the regulation and control of metabolic pathways is an excellent summary of a difficult area, and one in which practical applications in fermentation technology promise great rewards. The thermodynamics of bacterial growth (van Dam et al.) is explained clearly and simply. The application of chemiosmotic principles to microbial transport processes is thoroughly discussed in the chapter by Saunders. An unusual, interesting treatment of the effects of temperature on bacterial growth rates (McMeekin et al.) develops a model that should replace the Arrhenius equation. Models of photosynthetic culture growth (Y.-K. Lee) provide insight into phytoplankton ecology and allow for better control of cells cultured for commercial purposes. The final chapter in volume I (by Kodukula et al.) investigates the influence of pH on process performance in waste water treatment plant.

Volume II commences with a general theory of microbial inactivation kinetics (Casolari) applicable to processes of inactivation by radiation, heat or chemicals; this approach is better than exponential-single hit and multi-target theories for the explanation of many experimental observations. A transition state model for the kinetics of bacterial spore germination (Lefebvre and Leblanc) suggests that the dependence of transition probability on the nature and concentration of germinants and various types of activation should help explain this very important mechanism. A useful review of the mathematics of bacterial chemotaxis leads to a discussion of its application to symbiotic bacterial associations in nature (Rosen). The final chapters are devoted to attachment mechanisms involved in the surface growth of micro-organisms (Rutter and Vincent) and biofilm accumulation (Bryers). Although microbiologists have only recently begun to devise methods for the study of the physiology of microbes attached to substrata, it is evident that in many natural and engineered situations the growth and behaviour of organisms in films is fundamentally different from that in suspension. Interactions at interfaces and the development of gradients are phenomena that dominate in spatially and temporally complex situations. Concepts of this kind find a common usefulness in investigations as diverse as those employed in studies of dental plaque and corrosion of steel structures exposed to a marine environment.

D. Lloyd