

Microbial life in extreme environments

Thermophilic Microorganisms and Life at High Temperatures. By T. D. Brock. Pp. 465. (Springer: New York, Heidelberg and Berlin, 1978.) \$29.70; DM54.

THIS book collates the ecological studies Professor Brock initiated and directed on microbial life in the hot springs of Yellowstone, some 1,200 miles from his University campus and at an altitude where water boils at 92 °C. The scope of the project was admittedly limited initially, but in the light of discoveries of unknown microbial species adapted to live in a variety of extreme environments, research ramified to include man-made thermal habitats and hot springs on a worldwide scale.

The objective was to study the structure, biochemical and growth characteristics, evolution and dispersal of such bacteria, blue-green algae and eukaryotic algae which seem to set the limits for life with respect to pH and temperature. Such natural model systems, with the relative constancy of their features, would then make possible deductions about long term ecological consequences of man-produced thermal and chemical pollution of the environment.

The cover picture showing the run-off channel of a Yellowstone hot spring is more suggestive of the scope of the book than its title. *Exploring Microbial Life in Hot Springs* might be a more appropriate title, which better expresses the 'adventure' character of the book.

The book stamps a record of personal achievement by drawing a demarcation line from earlier or contemporary work; it aims at helping future researchers, especially in Yellowstone, with the detailed description of the sites studied (chemical, physical and topographical). Furthermore, it includes valuable unpublished observations, suggests areas for future research and provides a wealth of ideas for *in situ* research approaches and improvised techniques that proved useful where conventional methods could not work or were unavailable. The author's confessions of being often misdirected or "fooled", for example, by *Thermoplasma*, when in fact a new bacterium, *Sulfolobus*, had been isolated, illustrates the complexity and very often deceptive nature of working in an area where no precedent existed.

The seminar style of the book gives the reader both pleasure and a good share of the fascination and excitement

of the field work. The personalised manner in which the book was written is highlighted by the author's comments on his original paper on the genus *Sulfolobus*, that was rejected twice by the *Journal of Bacteriology*; and by the final chapter "Some Personal History" that includes a family and research team photograph.

The book illustrates effectively how research orientation can become usefully multi-directional in the way discoveries developed in a multi-disciplinary fashion, thereby becoming of interest to ecologists, environmental scientists, biochemists and geologists

Liquid structure in relation to their crystalline solids

The Molten State of Matter: Melting and Crystal Structure. By A. R. Ubbelohde. Pp. 454. (Wiley: Chichester, UK, and New York, 1979.) £23.50.

THIS book may mark the end of an era: or it may not. Scientific eras overlap, and a severe decimation of the time scale may be needed before the transition between them is marked with any definiteness. Knowledge of the figure of the Earth did not much assist the search for the sources of the Nile, and the Nile is still imperceptible on the geoid. This book is about liquids, and Ubbelohde has chosen its title to emphasise the fact that he will consider their structure in relation to that of their crystalline solids. Thus, attention is focused on phase change, and the relationship between the phases between which the change occurs: but one will find no mention here of the renormalisation group, or the names of Peierls, Landau, Wilson or Kadanoff, nor even, rather surprisingly, of Bernal and Fowler: which is not to say that there is not a wealth of references here to work in the present decade as well as past decades. Conversely, one may read a book about the renormalisation group and find mention of only three or four particular substances, if that. Ubbelohde deals with particular substances, and many comparative tables of the melting parameters of particular classes of substance are a feature of the book. These are instructive, and would be more so if one knew how much confidence to place in them. They seldom contain estimates of error, and sometimes fail to indicate source: there are discrepancies, sometimes minor and sometimes substantial, between values for

alike. The author did not even miss the opportunity to comment on his observations on the effects of pH limits on the existence of higher organisms, including insects, frogs, birds, fish and plants.

Finally, this book, if read from cover to cover rather than used as a reference source, has all the elements that make it useful to ecologists. It would also make inspiring introductory reading for new researchers in microbial ecology. **G. D. Anagnostopoulos**

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the same physical quantity in different tables: for example, the entropy of fusion of NaCl is 6.7 e.u. in Table 8.1 and 6.23 e.u. in Table 8.34. There are quite alarming discrepancies between heat capacity data for solid and liquid alkali metals in Table 9.1 and data for sodium in Fig. 9.1. Contradictory information about the magnetic susceptibility of iron phases at high temperature is given in Fig. 9.7 (p263) and the text on p264.

On p103 the reader is told, as though he should believe it, that for a second-order phase change two free energy surfaces must touch and intersect, with never a mention of bifurcation. Naive readers must be warned against chapter 14, on "Liquid Crystals", shot through with misconceptions which should never have survived the classic paper of G. Friedel (1922).

Pleas for more observational data are a recurring refrain, and often justified: but, although on p90 the author complains about the lack of information regarding domain formation in order-disorder transformation, he never mentions antiphase boundaries, a keyphrase which could have led him to a wealth of material in the metallurgical literature.

It becomes apparent that several distinct and separate cultures grow on the one substrate of phase transitions. Of these, this book provides a useful literature guide to a substantial part of the physicochemical culture. Those readers who will take the trouble to check and amend the data will be in possession of a well-planned survey of empirical melting parameters, and some liquid properties for various classes of material. Considering the price to be charged, this should have been attended to by the publisher's editor.

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