given to the balance between incoming short wave radiation and outgoing long wave radiation and resulting heat budgets. This leads into chapters on terrestrial and freshwater environments, where conditions are determined by temperature, wind and precipitation. Soil formation, vegetation and fauna of arctic land masses show a variety and richness that is nowhere shared by antarctic lands, even in lower latitudes. The 35 pages on polar marine environments are based on the few comparative studies and on specific reviews of either arctic or antarctic seas. The marine chapter is without over-simplification but avoids overburdening the text by facts. The author's partiality for polar mammals and birds results in a certain imbalance. More would have been welcome on sea ice biota and on the different regions of polar waters as determined by seasonal changes in the extent of the pack ice.

A brief chapter on survival in polar regions concentrates mainly on land organisms which have immigrated from the temperate zone and are pre-adapted to polar life. For plants and arthropods, aridity and extreme seasonality of light conditions are more important than low temperature. In polar homeotherms, including man, temperature and wind chill are the determinants for survival and metabolic demands. The chapter on man and the polar regions deals not only with physiological aspects of human life in the cold, but also with arctic folk — their circumpolar distribution and integration into the arctic ecosystem, and recent disturbances by additional exploitation. The 200 years' history of exploration, and the exploitation and management of the Antarctic, are presented in a brief and comprehensive manner.

A textbook of a little over 200 pages on the broad topic of polar ecology cannot cover all major aspects equally well. Stonehouse decided against including the biogeography and evolution of polar organisms, communities and ecosystems, and consideration of primary and secondary productivity and its relevance to exploitation, sedimentation and to global climate. Climatic changes, both long-term and short-term, affect the glaciation of polar land masses and the distribution of sea ice and oceanic circulation, and might be keys to the understanding of present-day polar flora and fauna. Furthermore, comparative life history studies of certain taxonomic groups will reveal differences between Arctic and Antarctic in evolution, and in responses to different environmental conditions. So there are more text books still to be written.

Stonehouse's book is a good start to a new comprehensive and comparative bi-polar approach. It lays the foundation by emphasizing descriptions of the environmental conditions. Several of the graphs will be used by many future lecturers on the subject of polar environments. The photographs are well-chosen but their reproduction is no better than could be expected from the quality of the paper. Why not rely on line drawings, etc., in such books which must be produced at reasonable cost? (G. Hempel, Alfred-Wegener-Institut für Polar- und Meeresforschung, Columbus-straße, Bremerhaven D-2850, FRG.)

RUSSIAN-AMERICAN TELEGRAPH

CONTINENTAL DASH: THE RUSSIAN-AMERICAN TELEGRAPH. Neering, R. 1989. Ganges, BC, Horsdahl and Schubart. 230pp, illustrated, hard cover. ISBN 0-920663-07-9. Can $22.95.

One of the great undertakings by private enterprise during the 19th century was the attempt to build an overland telegraph line across northwestern North America and Siberia, to link the United States with Europe and Great Britain. The project was conceived in the apparent failure of Cyrus Field's transatlantic cable in 1858, and abadoned eight years later because of Field's eventual success in making the undersea cable work.

Hiram Sibley, head of the Western Union Telegraph Company in the United States, raised the capital. As his superintendent, he hired Colonel Charles S. Bulkley, a veteran of the military telegraph service of the Union Army in the American Civil War. Bulkley, from his headquarters in San Francisco, marshalled his forces and equipment and dispatched separate expeditions to what was truly *terra incognita* — the wilderness of British Columbia, then a crown colony, and to Russian America and eastern Siberia, where his men coped under extremely primitive conditions.

The intriguing character was Perry McDonough Collins, a San Francisco business man of the post-gold-rush era. Enamored with the possibility of developing the trans-Pacific trade, he wangled an appointment as the US commercial agent for the Amur River area in eastern Siberia. From Moscow, he crossed Russia and Siberia by sleigh, and dreamed of building a railroad and telegraph line along that route. After returning to the United States, he negotiated for concessions from the British and Russian governments, and sold his rights to Sibley and Western Union. One wonders if the Western Union Telegraph Extension, as it was called, would have failed from the sheer immensity of the job and the difficulties of communication at that time. The only portion of the line that ever functioned was in central British Columbia, and Western Union sold it to the B.C. government. The costs of the ill-fated enterprise were eventually assumed by the company's shareholders. Collins himself came out of it well fixed, living his last years as a near-recluse in a New York hotel and dying in 1900. This is a little-known story well told. (Jerome F. Sheldon, 525 East Roy Street, Apartment 203, Seattle, Washington 98102, USA.)

RECORD OF THE ICE SHEETS

THE ENVIRONMENTAL RECORD IN GLACIERS AND ICE SHEETS. Oeschger, H. and Langway, C. C., Jr. (editor). 1989. Chichester, John Wiley. 403 p., illustrated, hard cover. ISBN 0-471-92185-8. £47.50.

For the last 25 years ice core research has established itself as one of the most successful techniques available for obtaining environment and paleoenvironment information. This book, subtitled 'Report of the Dahlem Workshop on the Environmental Record in Glaciers and Ice Sheets' results from a workshop organized by Dahlem

Konferenzen to summarize past accomplishments, identify priorities and technological needs, and make recommendations for future work. In short, it is a comprehensive review at the state-of-the art level. The book comprises 20 papers written by some of the most respected scientists in the field. There are sixteen background papers on such topics as the dating by physical and chemical seasonal variations and reference horizons (C. U. Hammer), ionic deposits in polar ice cores (H. B. Clausen and C. C. Langway, Jr.), past environmental long-term records from the Arctic (W. Dansgaard and H. Oeschger), long-term environmental records from Antarctic ice cores (C. Lorius and others), and the deposition mechanisms of atmospheric contaminants to snow surfaces (C. I. Davidson). At the workshop the participants were divided to examine the following questions: 1) how do glaciers record environmental processes and preserve information?; 2) what anthropogenic impacts are recorded in glaciers?; 3) how can an ice core chronology be established?; and 4) what does the long-term ice core record tell us about global changes in the environment? Four important review papers with similar titles complete this book.

It is a book to be highly recommended and an essential reference for ice core researchers in the years to come. The price is reasonable for a well-illustrated hard-cover book. (Jefferson Cardia Simões, Scott Polar Research Institute, University of Cambridge, Lensfield Road, Cambridge CB2 1ER UK.)

ANTARCTIC MICROBIOLOGY

MICROBIAL ECOSYSTEMS OF ANTARCTICA. Vincent, Warwick F. 1988. Cambridge, Cambridge University Press (Studies in Polar Research). 304 p, illustrated, hard cover. ISBN 0-521-32875-6. £37.50.

The 1980s have seen accelerating increases in our knowledge of micro-organisms in the Antarctic. Emerging from a phase of species isolation and description, Antarctic microbiological research is now concerned with processes of community function and with biochemical and physiological adaptations to the singular nature of Antarctic environments. Warwick Vincent has compiled a summary and synthesis of knowledge up to 1988, drawing upon some 500 sources.

The book systematically considers eight major habitat types covering the glacial, marine, freshwater and terrestrial. Each chapter treats environment, microbial communities, microbial processes and trophic structure. Keeping the book to a reasonable size has meant each main ecosystem being limited to about 20 pages (except 'Lakes and Streams', which get a double share), so the information provided is necessarily selective rather than comprehensive. There is emphasis upon studies on continental high longitude Antarctica, understandably from a New Zealand author, and rather less upon those on the Antarctic Peninsula and sub-Antarctic islands with which European scientists are perhaps more familiar. In an informative chapter on microbial strategies, Vincent rightly emphasises the importance of adaptations to diel, seasonal or irregular fluctuations in environmental variables, including a useful discussion on the value of Arrhenius curves in the study of temperature relations. Regrettably the interesting applications of Ratkowsky's equation by Franzmann and others at the University of Tasmania are not mentioned in this context.

The book concludes with a consideration of medical and pollution microbiology in the Antarctic, a huge subject in itself which can only be of increasing significance in future years. A useful glossary and compendium of environmental data are appended. This book is not a critical research review, but serves the probably more valuable function of making its subject accessible to the wider readership of general microbiologists and environmental scientists; it will also find a place in graduate and undergraduate teaching. It is highly enjoyable and readable. (Humphrey G. Smith, Biological Sciences, Coventry Polytechnic, Coventry CV1 5FB UK.)

UNDERSTANDING ICE

LIVING ICE: UNDERSTANDING GLACIERS AND GLACIATION. Sharp, Robert P. 1988. Cambridge, Cambridge University Press. 225p, illustrated, hard cover. ISBN 0-521-33009-2. £15.00, $29.95.

In this book Robert Sharp, Professor Emeritus at the California Institute of Technology, gives the reader the benefit of his 40 years of research and teaching experience in glaciology and glacial geology in a nontechnical style of writing. The purpose of the book is "to touch upon some basic aspects of glaciers, their behavior, and the principal ways they shape the landscape. Information is presented in an informal, conversational manner ...". The author has done the job well. The title *Living ice* is an indication of the manner in which one can associate with the dynamics of glaciers and the work they perform. Indeed, glaciers are hard workers, as evidenced by the products of their toil.

The book is, in some respects, a takeoff from *Glaciers*, an earlier publication of Sharp's published in 1960 by University of Oregon Press. Many of his excellent photographs and illustrations appear in both. *Living ice* is well illustrated with 76 black-and-white and eight colour photographs, most of them taken by Sharp and his colleagues to show examples of glaciers and related features in mainly Alaska, Yukon Territory and Blue Glacier in Washington, USA. A useful aid throughout the text is the boldface type for terms defined later in the glossary, which lists about 360 of them. An annotated list of 13 references is included for supplementary reading.

The book consists of nine chapters, beginning with how a glacier is made (take a lot of snow, as much as possible), followed by chapters on the types of glaciers and how they move. Later chapters are on erosion and its products. Each chapter concludes with a summary. The final chapter deals with the past and the future; that is, the most recent continental ice ages and their proposed causes, and what the future holds.

The conversational style of writing is especially appealing, enhanced with numerous similes and metaphors