

The book is organized along traditional ecosystem component lines, carrying the reader through the abiotic components, primary producers and consumers to the decomposers, and finally to an attempted synthesis of all these components into an ecosystem model, or submodel. The major sections of the book and some of the topics discussed in each section are:

*Abiotic components*, 6 papers: permafrost, soils, bedrock geology, microclimatology and hydrology.

*Vegetation history and plant communities*, 2 papers: palynological investigations and plant community classification.

*Primary producers*, 5 papers: detailed studies on selected plant communities or groups of primary producers, their ecology and primary production.

*Primary production processes*, 4 papers: gas exchange, energy budgets, nitrogen fixation and annual vascular plant production.

*Invertebrate consumers*, 5 papers: energy flows, population dynamics, nematode densities, invertebrate respiration and energy budgets.

*Vertebrate consumers*, 5 papers: arctic birds, lemmings, arctic hare, muskox productivity and carnivores.

*Decomposition and microbiology*, 3 papers: nature and functioning of community in tundra ecosystem, turnover rates of muskox dung, and growth characteristics of 3 soil bacteria.

*Limnology*, 1 paper: morphometry, thermal regimes, metabolism, and limnology of selected lakes.

*Ecosystem models*, 2 papers: mineral nutrient cycling and the limitation of plant growth, energy budgets and ecological efficiencies.

At this point in the book the editor breaks with the general tone of the previous sections by injecting two sections which have a distinct human element and a broader orientation than the small 43 km<sup>2</sup> study area where most of the other studies were conducted. The first of these sections deals with Inuit utilization of wildlife and the second deals with industrial development and terrain disturbance.

The author of the disturbance study paper states in his introduction that "Much of the impetus toward a comprehensive study of a high arctic ecosystem was based on the concern that industrial development . . . was likely to trigger irreversible environmental damage. . . . Direct examination of some of the effects of human encroachment was thus incorporated as a part of the Devon Island study" (p. 647).

The book concludes with an excellent project summary of the Truelove Lowland ecosystem. It highlights some of the major integrative findings, relates them to general high arctic ecosystem function and discusses their implications for land use management.

The book covers an impressive diversity of topics dealing with a little known area of the globe. It is extremely well referenced and indexed, making it very easy to use. Professor

Bliss has obviously put a great deal of effort into editing for both continuity of thought and writing style.

Although some of the more vociferous minions of criticism will no doubt find areas to implement their art as they read through this volume, they cannot deny that the book definitely deserves a slot within easy reach on the bookshelf of any serious arctic researcher. Professor Bliss and his colleagues must be congratulated and thanked.

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LICHENS OF THE ALASKAN ARCTIC SLOPE. By John W. Thomson. Toronto: University of Toronto Press, 1979. i-ix, 314 pp. Glossary, taxonomic index. Cloth. \$35.00.

In spite of the fact that there are more species of lichens in the Arctic than there are species of algae, fungi, bryophytes or higher plants, and that lichens have considerable ecological significance, and are more predominant in the Arctic than in any other area of the world, they have consistently received scant notice by northern scientists. This is true for a number of reasons: they are often small and identification, in many cases, can be carried out only with the aid of a microscope; few biologists have any training in lichenology and most lack the knowledge to be able to identify lichen species; and, until now, there has been an almost complete lack of easy-to-use, English language, keys to the Arctic species.

Dr. Thomson has for many years been one of the world's leading lichenologists. He has published a widely used book on the lichens of the important genus *Cladonia* and written numerous papers on other lichen topics; taught such lichenological greats as Mason Hale and William Culberson associated closely with fellow workers; and helped many who have sought identifications or advice. His long-time interest in Arctic lichens had its first major start in 1958 when he devoted the summer to collecting and studying lichens at many places along the North Slope of Alaska. Since that time his research has turned more and more to topics related to the Arctic.

Dr. Thomson's book starts out with discussions of the area and its lichen ecology, then comes a key to genera, descriptions of families, genera and species and keys to species. The book ends with a glossary and taxonomic index. Though written in a scientific style, the writer has taken pains to avoid unnecessary complexity and the text is easy to read and understand. It is remarkably free of errors.

Perhaps the most remarkable feature of the book is that it covers the crustose or micro-lichens as well as the foliose, fruticose and squamulose macrolichens. Crustose lichens are generally avoided and are not covered in such basic sources as Hale's "How to know the lichens".

The book covers the 504 species known to occur in the area but the writer cautions that these represent only about one-quarter of the approximately 2000 species that have been reported from arctic regions. His long-range plans to produce a treatment on the lichens of all of arctic America will eventually lessen this problem.

This book will be widely used and should be in the hands of all arctic biologists.

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**WESTERN AND ARCTIC CANADIAN BIOSTRATIGRAPHY.** PERCIVAL SYDNEY WARREN MEMORIAL VOLUME. EDITED BY C. R. STELCK AND B. D. E. CHATTERTON. The Geological Association of Canada, 1978. Special Paper No. 18, 602 p. Price: Members, \$18.50, Non-members, \$22.00.

The seventeen papers in this volume represent, in part, contributions made at the Percival Sydney Warren Biostratigraphy Seminar which was sponsored by the Paleontological Division of the Geological Association of Canada in Edmonton in 1976. As such, it does not represent an exhaustive overview of the biostratigraphy of Western and Arctic Canada, as prospective readers might, perhaps, infer from the title. For instance, none of the papers deals specifically with Cambrian or Triassic geology and while a wide variety of organisms is dealt with (ranging from palynomorphs to vertebrates), conodonts and brachiopods receive most attention while corals are not treated — does this mean they have had their day, at least in the west? Several papers having little direct bearing on northwestern Canadian biostratigraphy are included yet only two papers present any volume of new data from the Arctic islands.

Aside from these minor quibbles on emphasis, it is pleasing to note that most papers provide much valuable new data on occurrences of individual taxon-groups in restricted parts of the stratigraphic column. Presumably because of constraints imposed by length and costs, details of taxonomy and illustrations have been kept to a minimum. Since some authors have used as yet

undescribed taxa as a basis for new zonal schemes which should be of considerable international significance, there is urgent need for monographic treatments of these Canadian fossils. It is hoped that the authors responsible have such works well under way and can get them published with a minimum of delay; the prolific Devonian ostracode faunas described by Braun are a good case. Only through such publications will it be possible for other workers to check, refine and extend geographically these proposed zonations.

Much of the work recorded in these papers is a first attempt to use given fossil groups as a basis for zonal schemes for parts of the stratigraphic column in northwestern Canada. As these zones are extended to other areas and, no doubt, undergo modifications, it is hoped authors will try to show correlations with zonal schemes based on other fossil groups. This calls for increased co-operation between specialists from various institutions across the country at all stages of a study, from planning to publication. The relating by Anan-Yorké and Stelck of Albian microfloral zones from northeastern British Columbia to the previously recognized ammonoid zones goes a long way towards such a synthesis. A major contribution describing foraminiferal zones for the Cretaceous of the Interior Plains and their correlation with ammonoid zones by Caldwell *et al.* is exemplary: for each zone and subzone the constituent taxa, geographic and stratigraphic distribution, designated stratotype and age are all systematically laid out along with bibliographic references and additional commentary.

Some papers deal with more general aspects of biostratigraphy that will be of interest to all paleontologists. In an analysis of Middle Ordovician trilobite faunas from the southern Mackenzie Mountains, Ludvigsen uses depth-related trilobite biofacies to recognise transgressive events in fine-grained, platform carbonates. Such events affect the use of faunas for correlation and offer an alternative to plate movements as an explanation for breakdown in faunal provinciality. A discussion of difficulties in recognising real provinciality of benthic faunas due to the nature of sampling, in its broadest sense, is included in a paper by Perry and Lenz which deals with Emsian brachiopods. Evolutionary and migratory events within the late Paleozoic brachiopod subfamily Spiriferellinae are evaluated in terms of climatic changes by Waterhouse *et al.*

The editors are to be congratulated in establishing and maintaining a fairly consistent style for illustrations throughout this volume — no small achievement with such a variety of