shorter core from the same place showed the enormous potential of ice cores for paleoclimatic studies. For the first time it was clear that the large ice caps were archives of more than just the last few thousand years of climate. Very recently the Russians have penetrated through the last Interglacial in eastern Antarctica. Perhaps several glacial pulses are buried there.

Some of the problems confronting ice drillers include the world's lowest temperatures and the fact that ice, unless compensated, will fill the hole behind the drill if the hole exceeds about 400 m. This means the design of very special drills working in toxic liquids that keep the borehole open.

The Calgary workshop brought together some of the world's experts on ice drilling to present and discuss their various approaches to wresting ice cores from the world's ice caps and ice sheets. This book presents the papers presented at the second workshop on ice drilling. It comes almost a decade after the first workshop, which was held in Nebraska. An introductory overview of ice drilling technology by Hansen briefly looks at the history of ice drilling in a statistical way and serves to introduce the reader to the volume.

There are two basic types of ice drill, one that melts and the other that cuts its way down through the ice. The drills may differ slightly, depending on whether they are used for temperate glaciers (i.e., where the temperature throughout is close to 0°C) or polar ice. Boreholes of less than 300 m can be drilled without a filling liquid. Below that, the requirement for a filler to prevent borehole closure increases design complexity. This volume shows that there is still no agreement on whether the thermal drill is superior to an electro-mechanical drill for deep (>500 m) holes. The very complete paper by the Danes on their drill initially slants the reader in favour of cutting rather than melting. They successfully drilled just over 2000 m in southern Greenland with excellent core recovery. This drill is the only one that packs its cutting power at the drill head rather than transmitting it the full length of the cable from the surface. This feature has obvious benefits when compared to all the other drills. It carries a very light cable and its total weight, including the winch and tower, can be packed in a STOL aircraft, which has an obvious advantage for operations in the world's most remote regions. However, the French (Donnou *et al.*) appear to be moving in the thermal direction in their Antarctic operations. Furthermore, the Russians (Kudryashov *et al.*, Bogorodsky *et al.*) have already exceeded 2000 m depth in the world's coldest ice in Eastern Antarctica with a thermal drill. Drilling continues there with a thermal drill of improved design.

Rufli's contribution to drilling is seen in at least three papers, where the electro-mechanical intermediate (20–500 m) drills owe something to his designs.

New materials that can be used to decrease the weight but not the weight of drills are discussed (Koci) and have been used in an encouragingly light shallow-drill. This drill has been used in Greenland, Peru and Antarctica (Koci) as well as Alaska (Benson). It has already proved its worth and should be used for any cores destined for analysis of recent pollutant trends in polar ice.

Hot water drills are being used increasingly these days either for access holes to the water underneath ice shelves or to string sensors between the ice surface and bedrock. Taylor considers the theoretical approach to these drills and describes their use in temperate ice. There is, however, an astonishing range in the power requirements of these drills. These range from megawatt inputs in the Browning jet-drill (Koci) to a blowtorch in the Russian one (Morev *et al.*). One needs several C-i30s to transport it, while the other needs only a small sled. They do, of course, have quite different performances, but the larger one seems guilty of overkill.

The main value of this book is that it brings together, more than any other single volume, the latest state of the art in ice drilling. Any organisation starting in this discipline can use the volume to guide it toward the most appropriate approach, using, of course, the associated references. There are no papers on handling or the analysis of ice cores; this could be the subject of a workshop in itself. Many of the papers are well backed up with drawings of the equipment, although a few of these are barely readable. My main criticism is that it is sometimes difficult to get at all the information. Some authors do not give a meaningful weight of the equipment, and this is important in a field discipline. Some give total equipment weights but others only give the drill weight or the tower and winch weight. If each author had been asked to include a formatted table of drill specifics the volume would be worth a lot more. The Japanese drills (Suzuki) are well described in this respect, with a page-length table. It is similarly difficult to find the power requirements of many drills, although it is clear that some of the PICO and Russian drills have power requirements that only a major or well-established station provide. As might be expected with multi-national authorship, the units are inconsistent. For example, in one operation we are told that 89 *m* of casing was removed one year but 45 *ft* added the following year. Breaking loads are quoted in N, KN, kN and kg. Considering that engineers with their unconventional units are involved, one should, perhaps, not complain.

The volume is not expensively produced and not sturdily bound. I would not criticise the modest quality of production but I would much prefer a sturdier binding; pages will soon come out if you use the book a lot.

To sum up, if you are in the business of ice drilling you should have this book. The organisers, especially Holdsworth, deserve congratulating on convening the workshop and putting together such a useful volume.

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OUR ARCTIC YEAR. By VIVIAN and GIL STAENDER. Anchorage: Alaska Northwest Publishing Co., 1984. 149 p. Softbound. US$12.95. Cdn$15.50.

This book is an intimate anecdotal record of a "once-in-a-lifetime" experience shared by two persons who have a profound reverence and respect for wild life and its habitat. The story they tell shows their deep concern about the damage that can so easily and thoughtlessly be done in a region where the balance of nature is extremely delicate and scars heal slowly. To read this book is to have much more than an intellectual experience.

The objective is surely to convey to the reader a sense of awe at the beauty of the Arctic and to arouse concern that a great natural resource could easily be lost. A main theme is the growth of a feeling of deep satisfaction when one's life is lived in harmony with nature, realizing that all life is a consistent system in delicate balance.

The less environmentally sensitive but intellectually curious reader would be well served if the narrative were set in a framework of broad factual knowledge of the Brooks Range region of Alaska, where the Staenders spent their arctic year, and of the Arctic in general. The introductory chapter of the book in its present form is inadequate, in the opinion of this reviewer. As the reader gets into the book, curiosity is aroused as to the locale of this adventure in wilderness living. We can understand the necessity for official silence, but it would be satisfying to see a map of Alaska in the book, with the general area of the Brooks Range clearly designated in relation to the Arctic Circle. We would like to have a comprehensive basic framework of meteorological, geographical and biological facts of the region. Is −70°F likely to be the thermometer reading some morning in the depth of winter? What about blizzards and the likelihood of being "snowed in"? How rugged and high are the mountains? What threat to human habitation do wolves present? What great migrations are likely to be observed? What is of special interest about the geology of northern Alaska?

We would like to know something more about the unique threats to

human survival in the Arctic: the health hazards that must be considered in planning a prolonged stay in a region of nearly continuous night and then of almost continuous day, where long periods of extreme cold must be expected. In addition to the personal objective of self-testing, we would like to have a clear statement of the authors' scientific objectives.

This reviewer feels that an opening chapter giving broad coverage to the background material referred to above would enhance the book by making it more comprehensive and hence more appealing to the reader, who is naturally curious as to why such a risky adventure would be undertaken. Knowledge of the context in which the personal experiences took place would compensate for an over-simplistic account of events intrinsically more threatening than they were described to be. A case in point is the account of the incident in which Gil broke through the ice on the big river. What preparations had been made to counter the potential disaster of getting wet in January on an arctic river? Was the grizzly hazard taken too lightly on the trip into the blind canyon? The sense of ever-present danger is perhaps not sufficiently stressed in some parts of the story.

But having said these things, we must emphasize that this book gives the reader a unique vicarious experience. It has been said that beauty is in the eye of the beholder. But this book gives such a vivid portrayal of the beauty of the Brooks Range region that we, who are not actual beholders, can hardly fail to see and feel what Viv and Gil saw and felt. Their sense of dismay and alarm becomes ours when we read of the senseless killing of the wolf by trigger-happy intruders and of the scarring done by oil exploration crews. Their feeling of awe at the view from the summit when the summer solstice occurs becomes something we feel ourselves when we read: "Just after midnight the sun hid itself behind a distant spire. An aura of mystery prevailed as we waited for the sun to reappear.... Pink puffs of clouds hung over the Arrigetch. Each peak seemed to be an active volcano...." Read this and gaze at the two magnificent colored plates of this event, and the meaning of vicarious experience becomes clear. Vivid portrayal by word and picture is unquestionably a very strong positive feature of this book: Viv is a powerful and entertaining writer and Gil is an expert and discerning photographer. The color plates, beautiful in themselves, have been carefully selected and arranged to enhance the text. They are so varied that one could obtain a satisfying appreciation of what the Staenders did without reading the running account of the day-to-day events.

This is not a scientific treatise on an area in northern Alaska. It does not attempt to be anything other than what it is — a personal record — but it does contain an excellent summary of identified plants and animals, which would be valuable to a professional ecologist, and which testifies to a degree of scientific purpose in the wilderness-living project.

The physical qualities of the book must be highly praised. The quality of paper, the typeface, the arrangement of text and illustrations are such as to rate the book very highly from the technical point of view.

The book can be recommended without reservation to the professional ecologist and to all who have a concern for the environment. But it is not a textbook in the strict sense of the term.

If one were to attempt a final remark to describe the motive of the Staenders in carrying out their project, it would be to quote Coleridge's lines: "O happy living things; No tongue their beauty might declare."

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THE TRANSFORMATION OF SWISS MOUNTAIN REGIONS. Edited by ERNST A. BRUGGER, GERHARD FURRER, BRUNO MESSERLI, and PAUL MESSERLI. Bern: Verlag Paul Haupt, 1984. 699 p. Maps, diagrams, illus., index. Softbound. SFr69. DM84.

Like many other areas of the world, within the present century the Alps have experienced the transformation from a remote, traditional, rural, primarily agricultural society to a modern one tied in with the rest of the country, with an economy based increasingly on tourism and exhibiting many urban characteristics. Brugger *et al.*'s *The Transformation of Swiss Mountain Regions* is a collection of 54 articles, each of which focuses on particular aspects of this transformation. Thirteen of the selections are abstracts of chapters that have appeared in a companion volume edited by the same authors: *Umbruch im schweizerischen Berggebiet* (*Revolution in the Swiss Mountain Regions*).

None of the accounts of socio-cultural changes in the Alps that have appeared in the English-language literature within the past 10 to 25 years has the breadth of scope of the present volume. It covers the structural changes that have occurred in the various economic sectors (agriculture, forestry, mining, tourism, industry, hydroelectric power, and transportation) as well as in the society and cultural life of the inhabitants; environmental stresses engendered by these changes; the causes of and mechanisms responsible for them; and the political decision-making process. Conclusions are also drawn regarding future policy and planning practices.

The book is organized into four parts. Part I presents the fundamental problem and points of departure for the analysis. Part II describes the transformation of the landscape, land use, and settlements; the ecological stresses and changes; and the socio-economic and the socio-cultural changes. Part III is dedicated to analysing the processes involved in the transformation: ecological, economic, functional division of space, socio-cultural, and political. Part IV is concerned with strategy and contains conclusions for policy and practice.

In spite of the diversity of topics dealt with, the orientation of the writers is remarkably uniform; all address the fundamental problem of striking a balance between development and non-development. Taken as given are the Swiss societal aims, which are: to remove economic disparities among regions and social groups within the country, to maintain and promote cultural diversity and differentiation, to strengthen democratic rights and responsibilities by reinforcing local and regional governmental structures, and to maintain a settlement structure enabling the forests and agricultural lands to be managed in a way that will protect landscapes and maintain the ecological balance. To deal with the basic problem of development vs. non-development, three questions are posed: 1) To what extent is the fulfillment of these basic societal aims being affected by the type of change going on in mountain areas? 2) What chain of cause and effect is tied to both desirable and undesirable processes and mechanisms? and 3) How can the undesirable aspects of change be influenced so that development goals can be attained? These questions are addressed by using two dialectics, or positions in the discussion: autonomy vs. dependency, and the tension between economic and ecological values.

As a reference, this work provides reasonably easy access to such diverse topics as visual and aesthetic aspects of landscape changes, land use changes and their ecological effects, potential agricultural production in highlands, forest potential, migration patterns, sectoral shifts in economic structure, the contribution of industry to the development of mountain areas, functional and areal division of labor, the endangered "capital" of tourism (landscape), mountain railways and cross-alpine routes and their effects, regional dynamics and identity, tourism development policy, the control of tourism development, and politics in mountain areas.

How were these topics, each with its individual complexities, brought together into such a comprehensive framework? This result is due partly to the expertise of the editors, who have wrestled with the fundamental problem for years, and partly to drawing on experts from a variety of scientific fields, each dedicated to a multidisciplinary approach. But perhaps more important is that each contributor appears to be sincerely concerned with helping to solve the fundamental problem.

This does not mean that the book is unblemished. On the contrary, there are numerous difficulties, but they are mostly technical rather