

THE PHYSICS OF GLACIERS. By W.S.B. PATERSON. Oxford: Pergamon Press Ltd., 1981. Second ed. 380 p., illus. Available in hardcover or flexicover. No price indicated.

This compact book of 15 chapters is an extensively revised version of the original 12-chapter edition published in 1969. Much has evolved in the subject over the last decade, so it would be well worthwhile investing in the latest edition and, if applicable, trying to trade in your first edition. Firstly, some points concerning the production of the book. My review copy is the flexicover (paperback) version. The text is photo-reduced author's typewriter script and at 1 mm for the lower case is barely $\frac{2}{3}$ the size of the typeset 1969 hardcover edition. While acceptable for those with normal vision it may tax some readers' eyes. The binding is close and some equation numbers have an awkward habit of hiding well into the cusp. Frequent flattening of the flexicover version may tend to damage the spine, therefore the hardcover version would seem to be preferable. Typographical errors are almost nil. The only one that came to my attention is in the last equation on p. 259 where w should evidently be ω , the angular frequency. Although far from critical, the associated figure has a (b) missing on the phase log curve. Because a colleague mentioned that his copy was lacking part of the index, it would be advisable to check out your copy thoroughly before buying.

The book could serve two useful purposes: as the basic text for a glaciology course (where the study of glaciers is the focal point) and as a refresher or instant reference for practicing glaciologists (this is already alluded to in the preface to the first edition). If used for the former purpose, a good companion text would be *Glacier Ice* by Post and La Chapelle. This latter, largely pictorial book would balance the more serious content of the former whose only relief is provided by appropriately witty but brief quotations appearing at the head of each chapter.

Most of the text is authoritatively written, although there is still an understandable bias towards subjects more familiar to the author: thus (as also alluded to in the original preface) the coverage and the standard of the text tends to vary between individual chapters. For instance, the new chapter 11 ("Structures and fabrics in glaciers and ice sheets") contains largely descriptive and graphic material (but still no coverage of the Thule-Baffin type moraines suggested as a worthy topic by an earlier reviewer¹). It is immediately followed by "The response of a glacier to changes in mass balance", which is an excellent mathematical summary of Nye's extensive work on the subject.

The order of some of the chapters is rather unexpected: for instance the new chapter 14: "Heat budget and climatology of glaciers" appears *after* "The mass balance of glaciers" (Chapter 4), "Hydrology of glaciers" (Chapter 8) and "Distribution of temperature in glaciers and ice sheets" (Chapter 10), whereas it would appear to be more logically placed before these topics. Though material in that chapter is quite relevant, we might also expect to look, in appropriate detail, at analogous conditions existing in the material over which glaciers are flowing. This is only touched on in the chapter on "Glacier surges". The chapter on hydrology is perhaps not a completely fair coverage of such an important practical topic: most of the mathematical treatment is devoted to Nye's classic model of Jokulhlaup hydraulics. There are few omissions of authors' works relevant to the subject, except one noticeable one: that of K. Hutter, although the mathematical standard of his treatments is probably too advanced and too generalized for this text. The English is generally immaculate except when one reads (p. 196): "Temperate glaciers are widespread in the literature . . ." and (p. 225) "If only one principal stress . . . is tensile, crevasses should open up in the direction of that stress." Their traces of course *form* perpendicular to the stated direction, and this becomes evident by reading further. Again, (p. 275) referring to surges ". . . a chaotic *mass* of crevasses and ice pinnacles . . ." would be better appearing as ". . . a chaotic *array* . . ." (crevasses obviously have no mass except for the air they contain). Further (p. 289) referring to a *creep* instability analysis, the statement: "only the heat transfer equation was considered; ice dynamics were (was?) ignored", seems to be incompatible with a model involving a creep phenomenon.

In the introduction we read ". . . a mere handful of mathematical physicists . . . have contributed far more to the understanding of the subject than have a hundred measurers of stakes or recorders of advances and retreats of glacier termini." This may be a nearly true statement, judgemental though it is, but should not the situation be viewed a little more tolerantly? What is a theory worth if there is insufficient data with which to test it? In such an interdisciplinary field as glaciology, interaction between theoreticians and experimentalists is mutually beneficial and the record seems to show that. Theoretically-based papers may be

found which, if not actually inspired by some previously published field data or observation, owe their final impact to the fact that some data exist from which a plausible (numerical) result may be extracted. Many theories have subsequently been modified by necessity as data have accumulated over periods of many years. The ideal solution, as Paterson later points out, is a coordinated approach, but this is a *modus operandi* seldom realized because of limited resources in this field.

Frequent criticisms of important works may be found in most chapters. Where is justified, this is good material for student consumption, but a quick check shows that the numerical modellers come in for a disproportionate amount of criticism at such an early stage in their development. The Nye-Weertmanian glacier mechanics slowly evolved from over-simplified models, and though they usually had an "exact" solution this did not necessarily ensure an entirely realistic result. Finally, although the book does not have a strong historical thread (most of the early history is found in the three-page introduction), it makes up for this by lively critique as the science is laid forth.

REFERENCES

¹BULL, C.B.B. 1970. (Book Review). *The Physics of Glaciers*. Arctic 23(2):141.

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SOIL AND PERMAFROST SURVEYS IN THE ARCTIC. By K.A. LINELL and J.C.F. TEDROW. Oxford Science Publications, Monographs on Soil Survey. Oxford and New York: Clarendon Press, 1981. 279 p. incl. appendices, author and subject indices. US \$69.50.

Linell and Tedrow state in the preface that most books on soil mechanics and pedology give little attention to frozen soil conditions. They draw upon their own experiences and the experiences of other experts to give the overdue attention to frozen soils. The monograph brings together two well-known authorities in arctic research; Linell is known for his permafrost engineering studies and Tedrow for his research on arctic pedology. Such a monograph written by two of the giants in arctic research should be eagerly anticipated. Generally, one is not disappointed. Linell and Tedrow set about discussing the application to the arctic environment of information often well known about subarctic and temperate areas.

The authors indicate at the outset of their discussion that there are three main distinct features of the Arctic — widespread permafrost, unusual terrain, and extreme climate. The first several chapters of the monograph introduce these distinct features and set the background for applied, practical aspects of arctic survey work. Linell and Tedrow utilize a good technical approach and apply it in focusing on the special problems associated with surveying arctic soils and permafrost areas. The examples chosen illustrate the concepts very well. The monograph demonstrates the need to examine soils in the context of site selection and construction for such arctic installations as roads, airfields, pipelines and buildings. The discussion includes examination of soils for the northern extension of agriculture, for other land uses, and for conservation.

The monograph contains little discussion on the climate (air) of the Arctic: one's initial reaction is that the climate chapter is too short. However, in keeping with the applied nature of the monograph, Linell and Tedrow proceed to demonstrate how climatic conditions relate to the thermal regime in the soil, to the character of the permafrost, and to the applications of climate data to various uses of permafrost soils. The discussions of thermal regime and thermal stability of permafrost are done well.

The last four chapters of the monograph are all excellent because the authors compile some of the best pieces of practical information needed for arctic research in a meaningful, useful manner. The discussion of "field organization" includes the factors to consider when preparing to conduct a survey in the Arctic. The discussion of "field procedures in pedology" in the Arctic offers sound advice on the methods that will

work in such adverse areas and on what methods will not work. "Terrain evaluation" includes ways of evaluating and interpreting characteristics of landscapes in the Arctic, especially features which are unique and may be of particular concern to those persons working in the region. The discussion of "route or site selection and development" includes step-by-step suggestions on how to choose routes or sites, and the information needed that will save construction and maintenance costs.

Valuable information on engineering soil testing in the Arctic and monitoring soil and structural behavior is in the first two appendices. Linell and Tedrow have included sources of more technical literature about the Arctic in the third appendix.

Although the monograph contains excellent practical and applied information on soil and permafrost surveys in the Arctic, there are some minor drawbacks. One can question the organization: the chapter on "thermal stability" comes six chapters after the one on "thermal regime"; the chapter on "northern agriculture and conservation" is sandwiched between chapters on soil engineering; and the chapter on "soil mechanics" is too short (2½ pages) to stand alone and might better be included in the chapter on "engineering characteristics of soils in cold regions". The fact that the discussion of Canadian soils does not use the latest nomenclature (cryosols) is unfortunate, because the change in nomenclature came in 1978 and because a number of the soil examples come from the Canadian Arctic.

The drawbacks are inconsequential, and overall the chapters are well written and contain quite useful information. The monograph is an excellent starting point for those persons embarking on arctic endeavors involving soils and permafrost.

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THE LANGUAGE OF THE INUIT: HISTORICAL, PHONOLOGICAL AND GRAMMATICAL ISSUES. Edited by LOUIS-JACQUES DORAI. Québec: Laval University, 1981. *Études/Inuit/Studies* 5 (Suppl.). 124 p. \$8.00.

The book consists of seven articles, with an introduction by the editor, who is also one of the contributors. They cover the gamut of Eskimo linguistics, both areally and topically. The book could be characterized by the now standard "slender volume", but it makes up in quality for quantity. The articles are almost uniformly good and instructive and of high quality. The study of Eskimo linguistics is most definitely advanced by this publication.

The first article ("Endoactive-Exoactive Markers in Eskimo-Aleut, Tungus and Japanese — An Investigation into Common Origins", by Michael Fortescue, 36 pp.) deals with deep-level historical linguistic of the Eakaleut family. As the author admits, and as Dorais adumbrates in the introduction, it does not prove anything, but it certainly is thought-provoking and very strongly indicative of long-standing and deep-level culture contacts of Eskimos and Proto-Eskimos over a wide area. It should be required reading for all anthropologists.

The second ("Some Notes on the Language of East Greenland" by Louis-Jacques Dorais, 37 pp.) deals with East Greenlandic. It is well and meticulously done. Its major contribution, this reviewer thinks, is in the socio-linguistic realm, though the close attention to phonetic details should not be slighted. Dorais's explanation of lexical differences, centering on the need to control (in this case by linguistic means) the very precarious environment, is excellent and, in my view, in keeping with Eskimo culture, personality and religion. It is a good revision of the older, much too crude, formulation that all lexical substitutions could be attributable to 'taboos' associated with death.

"Greenlandic as a Three-Vowel Language" by Jørgen Rischel, the third paper (9 pp.), deals with the phonemics of Greenlandic as related to the phonemics of Eskimo languages generally. It uses diachronic and synchronic evidence and makes a convincing case for development of the Greenlandic dialects' system(s) in situ.

"On Yupik-Inupiaq Correspondences for *i*: A Case of Inupiaq Innovation" (the fourth article, 8 pp., by Lawrence Kaplan) deals with somewhat the same materials, but in the western end of the language area, where the ubiquitous *i* archophoneme is still alive. Kaplan comes to the conclusion that Yuxpiq preserves an older (fourth vowel) form.

The fifth paper ("Place of Articulation Assimilation and the Inuktitut Dialect Continuum", 8 pp., by Chet Crieder) traces the distribution of some phonological distinctions, determines which are innovations, and then maps them. He reinforces Rischel's contention that innovation went on in the East.

The sixth contribution (Lawrence R. Smith's "Passive as a Two-Cycle Process in Inuktitut", 12 pp.) deals with a favorite of linguistically inclined Eskimologists, or Innuktitun-oriented linguistics, i.e., the much-discussed subject of the passive and/or passive-like expressions, and is as much an exercise in generative/transformational grammar using Eskimo materials as it is the investigation of Eskimo linguistics. As such, it again examines the problem of how to handle passive or passive-like expressions of Eskimo.

The final piece ("The Logical Semantics of Only: Tuaq, Innaq and Tuinnaq", 9 pp., by J. Peter Denny) is semantic in content and demonstrates that semantic domains can vary from language to language, demonstrating very cogently and correctly that what we gloss as 'only' (and differentiate into a congeries of linked domains by where we position 'only' in the sentence) can mean three distinct things in Eskimo. He uses glosses valid from the Bering Straits to Greenland to demonstrate the distinctness of the three different dictionary entries found in the title. Use of "logical grammar" as an analytical tool is productive.

At this juncture I will avail myself of the reviewer's prerogative to make a few negative remarks. First article (Fortescue): Some of the 'genealogical bridges' he builds are a bit shaky. I am intrigued by the Eskimo-Aleut *immuk*, 'cheese/milk'; why cheese in a historical article? Third article (Rischel): No mention of M. Swadesh who gave some attention to this problem quite early on? Fourth article (Kaplan): Again no credit given to Swadesh's priority. Is the Diomedede dialect 'retention', or could it be (re)borrowing from across the Straits? As a linguist well versed in phonological matters, how does he motivate 'an' before 'history'? Fifth article (Crieder): Still uses Swadesh's outmoded 'Inupik' (which Swadesh gathered in the Eastern U.S. from a Yuxpiq-speaking member of a traveling sideshow). Is the 'h' of 'hinik' really an 'h' or an 'x'? Overall criticism: Why should an excellent book such as this one perpetuate the inappropriate use of the R (R, r) symbols to a predominantly English audience who will, because of their perception of English orthography, be reinforced in their penchant to commit such barbarities as pronouncing Birnik "Beer-nik"?

Overall conclusion: anthropological linguistics has for too long been in the doldrums of safe particularism, and it is about time we again try out some ventures into real theory, coupled with good scholarship. This book does so.

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THE TRADITIONAL ESKIMO HUNTERS OF POINT HOPE, ALASKA: 1800-1875. By ERNEST S. BURCH, JR. Barrow: North Slope Borough, 1981. x + 89 p., 12 illus., 25 figs., 16 tab., bib. Paperbound, US \$10.00. (Order from North Slope Borough, P.O. Box 69, Barrow, Alaska 99723.)

In the spring of 1980 the author was commissioned by the North Slope Borough, an organization of Alaska natives, to produce a base-line study of land use by the Tikerarmiut of Point Hope in northwest Alaska. The Borough could not have selected a more dedicated or qualified student of Alaskan Eskimo culture. This opportune selection provided the author with an opportunity to pull together the results of more than ten years of field and ethnohistorical research centered on the native inhabitants of northwest Alaska.

The stated purpose of this study is to present a comprehensive account of land use by the people of the Point Hope region between about 1800 and 1875. This period was chosen because it is the latest in which native activities reasonably can be considered to have occurred with a minimum of Euro-American influence. Burch emphasizes, however, that his study is actually a model of traditional Point Hope land use rather than a true description since the nature of his research and the limitations inherent in his methodology preclude the compilation of an historical account satisfying all the criteria of the western European intellectual tradition.