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 ⅔ 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 verison 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 reviewer[1]). 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 analagous 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 theoreticists 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 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

[1]BULL, 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