glace, puis celles du sol non gelé sont présentées avant de considérer les déformations des sols gelés lorsqu'ils sont soumis à une contrainte. L'importance de la contrainte, mais aussi celle de la température, du temps, de la nature du sol, de la granulométrie, du contenu en eau, de la salinité de celle-ci, . . . sont présentées par des graphiques. Encore une fois la complexité des interactions est telle que les auteurs doivent conclure que nos connaissances restent malheureusement totalement inadéquates pour être appliquées, spécialement lorsque l'on considère ce qui se produit à des températures proches de 0°C.

Le dernier chapitre, fort bref, est une conclusion générale nécessaire dans un livre semblable mais qui n'apporte pas de vues nouvelles.

Cet ouvrage est extrêment intéressant pour tous ceux qui s'intéressent aux sols gelés même si la formulation mathématique est à première vue quelque peu rebutante. Les auteurs se sont cependant imposés d'expliquer la signification de chaque terme ce qui rend l'ouvrage très accessible. Le plus intéressant dans ce volume c'est l'analyse des phénomènes, analyse imposée par le souci d'exprimer mathématiquement ce qui se passe.

Je ne crois pas que les auteurs soient parvenus à relier souvent les connaissances des ingénieurs et celles des naturalistes de terrain. Le titre du livre est d'ailleurs le sol gelé et non ce qui se passe au moment où le sol gèle. L'absence du diagramme de phase de l'eau pure est bien l'indication que c'est le sol gelé qu'ils ont considéré et pas le sol qui gèle. La formation de la glace de ségrégation est merveilleusement détaillée dans plusieurs chapitres de ce livre. Pour la majorité des formes étudiées par les naturalistes (sols polygonaux, cercles de pierres par exemple) les considérations apportées dans le présent ouvrage sont peu éclairantes. Ce sont en effet les variations de volume présentées par les différents matériaux et les pressions dégagées au moment même de leur gel qui pourraient nous apporter les données précieuses qui nous manquent totalement pour résoudre nos problèmes de sciences naturelles. Évidement, les questions posées dans ce cadre s'écartent des problèmes des ingénieurs et la 'mystère de la solifluction' exposé dans l'ouvrage le montre clairement.

Il était cependant extrêment intéressant de confronter toutes les données qui ont été rassemblées; cette confrontation sera certainement fort utile pour beaucoup, et avant tout pour les scientifiques naturalistes étudiant les phénomènes périglaciaires.

14. CLIMATIC CHANGE AND PERMAFROST: SIGNIFICANCE TO SCIENCE AND ENGINEERING. Ted S. Vinson and Donald W. Hayley (Eds.) (1990). *Journal of Cold Regions Engineering* **4**, pp. 1–73.

This useful collection of related papers evolved from a Workshop with the same title, which was held in conjunction with the American Society of Civil Engineer's Fifth International Cold-Regions Engineering Specialty Conference at St. Paul, Minnesota. The papers present state-of-the-art reviews on the following aspects of climate change and permafrost: influence on terrestrial, coastal and offshore engineering, hydrological changes, coastal erosion due to sea level rise, destabilization of discontinuous (warm) permafrost, permafrost geothermal regime, past changes in permafrost as reflected in the sedimentary record, consequences for Arctic climate, and the effects of climate warming on pile foundations.

15. PERIGLACIAL GEOMORPHOLOGY. John C. Dixon and Athol D. Abrahams (Eds.) (1992). The Binghamton Symposia in Geomorphology: International Series No. 22. Publisher John Wiley & Sons, Chichester, (hardback). ISBN 0 471 93342 2. 354 pp.

This book aims to highlight the diversity of periglacial geomorphic research being undertaken in Arctic and alpine environments by Canadian and American geomorphologists. Periglacial geomorphology appears to be concentrated largely in geography rather than geology departments in the United States and Canada since most authors of the 14 chapters are from Geography Departments. This contrast with permafrost science (geocryology) which is largely found in departments of geology/earth science and/or government agencies such as the U.S. Geological Survey and the Geological Survey of Canada. The book contains the usual mixture of mainly process-oriented investigations, based on extensive field observations, which can also be found in any international scientific journal covering geomorphological processes and/or Quaternary studies. In fact, several contributions discuss topics which have been addressed previously by the same authors in various journal publications. The book begins with a theoretical paper by C. Thorn, which makes very interesting reading indeed. In this, he defines periglacial geomorphology in terms of a single unifying concept, that of the geomorphic role of ground ice. In spite of his convincing justification for this restricted use of the concept of periglacial geomorphology to a focus upon ground ice (and snowpack phenomena), it is doubtful that his suggestion will get many followers, especially within the European periglacial community. The dichotomy in periglacial studies, that is to say, the distinction between European Quaternary (palaeoenvironmental reconstruction)-oriented and North-American process-oriented research becomes perfectly clear when reading Thorn's paper. With Thorn's paper in mind, including his critical comments with regard to the concept of cryoplanation, it is a strange coincidence that the next paper by M. Clark and J. Hedges concerns a rather descriptive treatment of Appalachian geomorphology, in which the hypothesis, linking the origin of local broad uplands to cryoplanation, plays a major—albeit unsubstantiated—role. The following, well-

documented papers deal with geochemical denudation in a nonglacierized alpine catchment (N. Caine), freeze-thaw weathering at mountain glacier margins (J. Gardner), formation of sorted stripes (F. Pérez), the pathways of water and water quality in rock glaciers (R. Giardino *et al.*), the morphometric characteristics of snow-avalanche paths (D. Butler *et al.*), and the geomorphic significance of solifluction movements (D. Smith). All these studies are based on extensive field observations in various mountain ranges. One contribution deals with mechanical weathering in a maritime Antarctic region (K. Hall). This paper, being one in a long series of articles on rock weathering by the author, is certainly of interest to the specialist. The remaining five chapters deal with Arctic periglacial processes. A. G. Lewkowicz reports on the conditions under which active-layer detachment slides occur on Ellesmere Island. The paper by B. Hallet and E. Waddington, in which they discuss the mechanisms of patterned ground formation, seems to be of more general interest, also from a theoretical perspective. The role of buoyancy forces generated in association with freeze-thaw processes is examined as well as the role these forces may play in diapiric and soil circulation processes. W. H. Pollard and R. O. Van Everdingen describe the origin of various types of icings and seasonal frost mounds, whereas F. Nelson *et al.* contribute to the never-ending story of palsa studies. It must be said, however, that they present an excellent overview (also from a historical point of view) on the utterly confusing palsa terminology. The book is concluded by C. Burn who presents more evidence for recent ground warming inferred from the ground temperature record in discontinuous permafrost in Yukon Territory. Summarizing, this is clearly not a student textbook, although the paper by C. Thorn could well be made compulsory reading for geomorphology students. The book seems to be well-edited and will certainly find its way to the shelf of the specialist. Nevertheless, these kind of books represent an expensive way of publishing essentially journal articles.

H. M. French, E. A. Koster and A. Pissart
Editors