

ing mass, one gets a good feeling of the subject by considering constituent effects rather than a cumbersome dynamic-interaction model. The chapter is hence well suited to its aim.

The third chapter dealing with ungrounded ice is Ashton's presentation on freshwater ice growth, motion, and decay. The emphasis is on river and lake ice; the subject is introduced by consideration of thermal energy balance for river ice in terms of heat flux and mixing of the ice-covered water and of thickness changes and ice growth driven by the heat flux. These sections are clear and very well presented. Ashton next presents the problem of ice floe accumulation and initiation of an ice clog in a river. Particular solutions defining the criteria by which a clog is able to resist fluid shear are not available, yet an amazing amount of interesting flow dynamics is presented by considering rheological changes in the fluidized ice mass. This leads logically to motion of the river ice. The complications of ice motion in open channel flow are presented and dealt with very clearly. However, one is left realizing that a great amount of theoretical, experimental, or field work is ripe to be done. A good summary is presented on ice jam breakup, but rigorous treatment is not available. A shorter but similar treatment is then given to lake ice formation and motion. Very little work has been done on this subject due to its inherent complexity, so this section is review in scope. The final two sections cover primarily the effects of thermal effluents on river and lake ice. The presentation is detailed but again summary in scope with some application to navigation problems. A final summary brings in a few additional references on subjects not covered here.

The last two chapters deal with snow dynamics. Male's chapter on the seasonal snowcover is basically a presentation of thermo-mechanics of dry and wet snow with a large section devoted to the dynamics of blowing snow. Dry metamorphism is covered in terms of compaction, of equitemperature density changes, and of thermally driven changes. These sections are well presented and replete with references. A major section of this chapter is devoted to blowing snow. Both turbulent diffusion and saltation are discussed in detail drawing from both field and theoretical studies. Russian studies, notably that of Dyunin, are discussed briefly and introduce the importance of snow sublimation during transport. Sublimation is apparently a small contribution to mass redistribution, but depends critically on particle size, air temperature, and humidity — little work has been done yet. The transport, accumulation, or erosion/ablation of snow is important for large ice sheet mass balance studies, but also is of great significance for snowpack equivalent water studies and hydrology. Thus, the blowing snow section provides a prelude to a second extensive section on snowmelt and hydrology of wet snow. These sections are packed with summary information and references, and are a very good introduction to particular works or symposia volumes. It appears that all subjects of interest and tractable in a review sense are discussed, and the sections on waterflow through snow tend to synthesize much of the previous information.

The final chapter is that of avalanche release, motion, and impact, contributed by Ron Perla. The chapter is an excellent follow-up to Male's snow cover presentation, and in fact the two chapters seem to mesh together as well as Paterson's and Raymond's do on glacier dynamics. Basically, Perla presents a two-part chapter covering (a) mechanisms of avalanche initiation and (b) avalanche motion, acceleration, and impact pressure. A generalized discussion on loose snow and slab avalanches precedes a well presented section on stress analysis for slab release. Boundary conditions are significant for avalanche initiation because they determine not only the inherent stability of the snow (or ice) mass at a given slope but also the degree to which external factors (wind, water percolation, and so on) must work in order to overcome boundary sustaining stresses. Perla's presentation is clear and well organized. Ice avalanches are discussed which ties this presentation back to that on valley glacier dynamics. Following initiation the motion of avalanches is basically determined by a balance of gravitational acceleration of a changing mass and frictional drag both at the base (ignoring cushioning) and from air drag across the descending head. Despite the potential detailed complexities in such analysis, Perla points out that the basic physics for modelling can be significantly reduced (based on observations) and the motion model he summarizes is succinct but quite clear. Flow velocity and runout-distance models are calculated given different cases of entrainment rate and frictional drag. This analysis leads ultimately to a discussion of impact pressure during transport, but before that discussion, Perla presents additional analysis pertaining to the channelized fluid flow analog model of Voellmy and a summary of laboratory modelling to avalanche flow (similar to submarine turbidity flow modell-

ing). The Voellmy model is apparently used by Swiss engineers to great predictive success even though the model is simplified and particular assumptions are poorly justified. Perla points out that the Voellmy model is perhaps best suited to wet avalanches, but a complete discussion is given showing differences in drag for wet or dry avalanches. A brief discussion of development of local shock surges is presented. The section on laboratory modelling discusses similarity transforms between model and nature and flume experiments. The section on impact pressure presents an interesting area of research, that of measuring or calculating impact during flow or as the avalanche comes to rest. Data are provided for impact pressure both from experiments carried out on avalanches and by damage observations. The theoretical problem is complicated because the dynamic component of the load peaks before the static component does: static compaction of the original low density flow will peak after the avalanche comes to rest, and Perla shows that this component may be a dominant part of the load. A summary of the factors to be considered in calculating the dynamic contribution shows this to be an area for keen future research.

The entire book is very well presented, the subjects are thoroughly covered and the level of mathematical description is sufficient to clarify arguments but is far from being cumbersome. It is indeed a fine contribution to the glaciological literature and will be used by many scientists, engineers, and students as a classic reference and introduction into the several fields of snow and ice dynamics. Dr. Colbeck and all contributors are to be thanked for their efforts.

David E. Thompson  
Planetary & Oceanography Section  
Jet Propulsion Lab  
California Institute of Technology  
Pasadena, California, U.S.A. 91109

STORIES FROM THE CANADIAN NORTH. Edited by MURIEL WHITAKER. Edmonton: Hurtig Publishers Ltd., 1980. 191 p., illustrations. \$12.95.

The literary imagination, like maple syrup and crankcase oil, flows more readily in warmer climates. At least, such would appear true after briefly surveying the horde of contemporary novels set in the Canadian North. By way of distinguishing creative writing from such nonfictional varieties as travel and biography, we customarily refer to it as "imaginative literature," yet in spite of this convention, few traces of imagination can be found in the bulk of northern fiction. Iron-jawed trappers, their teeth glinting preternaturally from deep within ice-rimmed beards, repeatedly gaze off across miles of vast, empty spaces; the primordial struggle between man and his environment is so often reduced to its most elemental level that the reader no longer cares who wins, as long as the battle comes to an end; the temptation to succumb to the delicious sleep beckoning the exhausted traveller as he lies face down in the drifting snow has appeared so frequently that the reader himself will surely give in to Lethe's charms, even though the northern hero manages to withstand them. If "imagination" can be said to be working at all in such stories, it is certainly one of severe limitation, one that scarcely reshapes a handful of plots acted out by a few stock characters. At best, the easily entertained reader can expect several hours of fanciful escape. In themselves, these circumstances create no serious problems, as we all need some bulk in our literary diets; the difficulty lies in the smokescreen that this plethora of second- and third-rate novels casts over northern writing in general. The reader who wishes to stimulate his imaginative faculties while he feeds his northern curiosity is too easily lost in an uncharted wasteland of arctic thrillers where he is destined to wander aimlessly from one stereotype to another.

*Stories from the Canadian North* establishes some major landmarks in this wilderness. Edited by Muriel Whitaker, a professor of literature at the University of Alberta, the collection brings together the work of fourteen writers who draw their material from Canada's northern latitudes. This anthology — a sampler of writing that is northern in focus and imaginative in execution — includes such household names as Jack London and Farley Mowat, but its greater value lies in the less familiar writers it brings to light, names such as R. M. Patterson, George Whalley, and Rudy Wiebe. Nearly all of these tales about the Canadian North are told by Canadians, in itself a refreshing change; more crucial still, these tales are rich with creative energy and originality.

Wiebe's "The Naming of Albert Johnson" demonstrates how even well-worn material can be imaginatively recast. Avid readers will be familiar with Dick North's *The Mad Trapper of Rat River* and Thomas Kelly's *Rat River Trapper*, two previous accounts of this mysterious recluse. Wiebe begins, however, where these two chroniclers left off. It is not so much *what* happened that intrigues Wiebe, but *why* it happened. Accounting for Johnson's sudden and extreme violence by framing it within the primitive belief that one falls prey to evil forces if his name is discovered, Wiebe succeeds in linking these two principal features of the Mad Trapper legend — his violent end and his mysterious identity. The story becomes more than a series of historical and bizarre events in 1932; the treatment transforms it into a timeless and universal comment about human experience.

Several other selections in *Stories from the Canadian North* make clear that the imaginative faculties are not restricted to fiction alone. R. M. Patterson's "The Dangerous River" lucidly illustrates the importance of imagination in travel writing. Without it, the daily record of the traveller's experiences will make reading as exciting as a grocery list. Similarly, George Whalley's "The Last Journey," excerpted from his longer work *The Legend of John Hornby*, bears out that biography, although accurate and based on fact, does not have to be uninteresting or divorced from imagination. The imaginative scope provides an interpretation, a frame through which to view a thousand unrelated events. Once introduced to Patterson's writing or the enigmatic figure of John Hornby, the reader will find himself on the path to a wealth of new literature that is both stimulating and entertaining.

Some reservations need to be made, if only to temper my general enthusiasm for the book. First, the illustrations are totally inappropriate. They exude a technical naiveté that has nothing to do with the simplicity and economy of Eskimo art, and seems remarkably out of place in this collection of sophisticated and intelligent writings. Second, although Whitaker has commendably chosen imaginative treatments of the northern struggle to survive, her selections, with the exception of two or three humorous pieces, rarely admit of any other experience. For example, Patterson's full book *The Dangerous River*, from which a small segment is excerpted in this edition, devotes the introductory chapter to relating the notion of the legendary haunted Headless Valley, a popular misconception of the Nahanni River that is shown to be completely inaccurate in the remaining six chapters. In fact, Patterson's reason for writing the narrative is to dispel this false belief. Significantly, only this initial chapter appears in *Stories from the Canadian North*. Much the same is true of Whalley's "The Last Journey." Although *The Legend of John Hornby* tells in twelve chapters of Hornby's lifetime in the Northwest Territories, only his fatal winter on the banks of the Thelon River — admittedly a powerfully dramatic episode — receives attention here. Our relationship to the North has changed considerably in the last few decades, and it is perhaps time we stopped seeing it solely as a land of impending death, for to admit of no other experience is to restrict our understanding and appreciation. Like any other geographic region populated by human beings, the North offers a broad range of human experiences.

These experiences have been the subject of a growing number of good writers, many of whom are represented in *Stories from the Canadian North*. Whitaker's anthology not only leads us to these authors, but to many evenings of stimulating and rewarding reading for the reader whose imagination has outgrown the hackneyed stereotypes of most northern thrillers.

Richard C. Davis  
Department of English  
University of Calgary  
Calgary, Alberta, Canada  
T2N 1N4

#### WORLD GLACIER INVENTORY WORKSHOP (PROCEEDINGS).

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The World Glacier Inventory project slowly came to life in the 1960's as an outgrowth of the International Hydrological Decade. The project, now under the auspices of the International Commission on Snow and Ice, is designed to generate a data base that can be used for studies of water resources, climate change, etc. An international workshop on the inventory project was held in Switzerland in September 1978 to deal with

techniques and problems of inventory, and this proceedings volume of 42 short papers is one result.

Rather than being restricted to methodology papers, the book is best described as a mixed bag of things glaciological, including such interesting but not-too-relevant subjects as shapes of glaciated valleys and models of climate/glacier relationships. Many of the papers do deal with methodology: each participating country seems to have encountered its own particular difficulties regarding glacier mapping, and many of these problems are outlined by respective authors. A significant amount of coverage is given to the problems some countries (such as Canada) are having trying to conform to the standard classification scheme prescribed by the ICSI. Other difficulties mentioned include lack of decent base maps and the killing of a field assistant by irate Afghans. A number of papers dwell at least in part on problems of distinguishing glacial from non-glacial ice, and estimating ice volumes beneath debris covers.

Other papers present preliminary results of inventories in various countries; many of these are of particular interest as they deal with regions little-known to most Westerners, such as the Tibetan Plateau and Chilian Shan regions of China. Russia and the Himalayas of India, Nepal and Pakistan are fairly well represented. These papers are not consistent with regard to subject matter; some concentrate on numbers and surface areas of present-day glaciers, others on present and/or past equilibrium-line altitudes or mass-balance variations. One deals with iceberg counts in Greenland, another with snow and sea ice over the whole world.

Of great value in this volume are the bibliographies that follow most of the papers; these lists include an abundance of literature on glacier distribution, mass balance, and related topics in foreign journals that North Americans would not ordinarily run across. Also of interest are transcripts of discussions that followed some of the original presentations at the workshop. The only editorial problem I perceive in the book is that several of the abstracts are quite useless in terms of the amount of information contained in them.

The book has at least something of interest to just about any glaciologist, and would be useful as well to global lumpers, splitters and counters in other fields (insofar as it shows that no two countries can agree on how an inventory should be run). It may be ordered from the IAHS Treasurer, 2000 Florida Avenue N.W., Washington, D.C. 20009, U.S.A.

Dr. G. Osborn  
Department of Geology/Geophysics  
The University of Calgary  
Calgary, Alberta, Canada  
T2N 1N4

HUDSON'S BAY TRADER. By LORD TWEEDSMUIR. London: Robert Hale Ltd. Toronto: Nelson Foster & Scott, 1978. ISBN 0-919324-37-1. 188 p., photographs, map. \$8.95.

*Hudson's Bay Trader* is a republication of the original edition issued in 1951. The book is the diary kept by the author during a year (1938-1939) in the service of the Hudson's Bay Co. at Cape Dorset, Baffin Island. In the introduction, the author points out that at first, while writing the diary, he did not have the intention to publish it. (p. 15; the reference numbers in parentheses are given for information only, because it does happen that one theme recurs many times). Therefore, one should not expect a structured and exhaustive description of the life in Cape Dorset, but one can find here a lively review of the events that particularly impressed the author. It is his father, John Buchan (writer and high-ranking official who was at the time Governor-General of Canada), who initiated the publication of this diary.

The purpose of Lord Tweedsmuir's stay on Baffin Island was very likely due to a need to recover his health after a long tropical disease (16). This convalescent man who recovers his strength little by little embarks on many exciting outings, tours and hunting trips. His descriptions, however succinct, form the structural body of this book.

The author quite easily wins the reader over because he expresses such rare honesty towards his misadventures; he falls in freezing waters (55), recognizes that he is cold (87), is wounded by his own ship (139), loses a mitt (154), draws many cartridges before getting his prey (155). But his inexperience is not eternal; he makes progress and becomes more and more autonomous; the fruit of his hunting keeps improving the meals at the trader's post (115).