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Patrick J. Moore
Assistant Professor
Department of Anthropology and Sociology
University of British Columbia
6313 NW Marine Drive
Vancouver British Columbia, Canada
V6T 1Z1

SNOW ECOLOGY: AN INTERDISCIPLINARY EXAMINATION OF SNOW-COVERED ECOSYSTEMS. Edited by H.G. JONES, J.W. POMEROY, D.A. WALKER, and R.W. HOHAM. Cambridge: Cambridge University Press, 2001. 398 p., b&w and colour illus., index, bib., glossary. Hardbound. US\$80.00.

The predominance of precipitation as snow is a central factor in the biogeophysical environment of the world's polar, boreal, and alpine regions. The presence or absence of snow and its seasonal variability in these systems have dramatic effects on climate, energy, hydrological regimes, and biota. Most studies of snow have revolved around estimating water resources and subsequent availability rather than exploring the relationships between biota and snow. For too long, ecological phenomena occurring on, in, and under snow were considered to be unimportant (because of freezing temperatures) or too difficult to study. Fortunately, an appreciation of the biological aspects of snow-covered ecosystems has been gaining momentum, and this book is an outstanding example of this trend.

According to the editors, the purpose of this text is to introduce readers to multidisciplinary studies of snow-covered ecosystems. They address this goal by presenting the physical, chemical, and biological processes of these ecosystems while retaining focus on their interconnections. The first two chapters cover the physical aspects of snow. Through most of the first chapter, the authors discuss changes in snow cover over time (from the 1970s forward) and the role that snow has in modifying local and regional climate. Speculations follow on the effects of global change on snow cover and feedbacks to climate. In the second chapter, the authors efficiently explain the physical processes, characteristics, and dynamics of snowpacks. The chemical components and processes associated with snowfall and snowpacks are detailed in chapter three. Chapters four through seven feature biological aspects of organisms living in, above, and below snow. These chapters address microbial ecology, insects and small animals, snow and tundra vegetation interactions, and determination of past snow regimes using tree ring measurements, respectively.

While the editors present the physical, chemical, and biological stories individually throughout the early chapters, they achieve their goal of holistic integration by frequently relating and referencing between chapters to produce a comprehensive picture. The text does a particularly effective job of communicating the interrelationships between physical features of snow (insulative properties, chemical components, snowmelt) and the ways in which they influence species distributions, morphological and physiological adaptations, and ecosystem processes. Furthermore, it illustrates how biological organisms, through feedbacks, play a key role in affecting local patterns of snow distribution and snow characteristics, both chemical and physical. A striking example of this is related in chapter two, where the effects of tree canopies on snow cover and sublimation are discussed. This strong feature gives the reader a more complete idea of how organisms respond to physical phenomena, and how organisms moderate these phenomena. The most enlightening aspect of this text is its portrayal of snow's biological importance at different times of the year. During the winter, snow insulates fauna and flora from large temperature fluctuations and provides habitat for insects and small mammals. In the spring, snow comes alive with algae, bacteria, and fungi. Eventually, it melts to supply water and nutrients to plants and aquatic organisms.

Snow Ecology is well edited, organized, and cited. The book is thorough and rich in useful resources for people interested in learning more about ecological processes occurring in and around seasonal snowpacks. The book is of particular interest to those who work in Arctic, boreal, and alpine systems. It aggregates information gleaned from a diverse set of studies and written by authors with unique research interests. Every author develops a clear objective and coherent message that complements the rest of the book and the editors' stated goals. With a few rare exceptions, the figures are clearly explained in the context of snow ecology and help the reader understand concepts communicated by the authors.

It is clear to me that this book is a valuable reference and that it is likely to long serve as a source of information on this topic. I do regret the lack of a more extensive section in chapter one describing methods employed to measure or model snow cover and depth in seasonally snow-covered systems. While there is some mention of remote sensing and snow course data, a deeper discussion of the different methods and problems of acquiring data on snow cover, depth, and properties would be useful. Another criticism is that some of the chapters include jargon-laden vocabulary, requiring more explanatory background than information provided on the topic of interest. In a few small sections of the book, I suspect that the targeted audience can be inundated in specific terminology related to algal pigmentation or insect anatomy and physiology. Fortunately there is a good glossary. Also, a few figures adapted from other works require more explanation or development. Most of the figures are excellent for communicating desired ideas,

but in some cases the information about the figure and the study inspiring it is too limited and leaves the reader thinking that the authors overestimate the audience's understanding. Lastly, this book concentrates mostly on Arctic and alpine research—especially with regard to vegetation. This focus is understandable because these areas have been examined more than others and these authors have been responsible for many of those contributions. However, snow is also important outside of Arctic and alpine areas (e.g., in sagebrush-dominated landscapes or high plains), and it would be nice to see a general section comparing and contrasting all of these areas and their relationships with snow.

Snow Ecology is an excellent textbook, and I would recommend it for readers ranging in expertise from students to experts who are interested in snow-covered systems. Ecologists working in areas seasonally covered with snow will value this book as a source of research ideas and as an indispensable reference. This text is a pioneering contribution to snow-covered systems; it is enlightening and very readable. One of the biggest assets of this book is that it allows people of one discipline to learn about and appreciate other disciplines efficiently when the unifying theme is snow.

*Christopher A. Hiemstra
Department of Botany
University of Wyoming
P.O. Box 3165
Laramie, Wyoming, U.S.A.
82071-3165.*