

Review

DAVIS, T. N. 2001. *Permafrost: a guide to frozen ground in transition*. Fairbanks, AK, University of Alaska Press. 351 pp. ISBN 1-889963-19-4, hardback, US\$35.95.

Books on permafrost published in English are something of a rarity, so, when a new one appears, it is a significant event. Neil Davis' *Permafrost: a guide to frozen ground in transition* is, moreover, very different from previously published studies. It is aimed not at the permafrost specialist, nor even at college students, but at the general public and high-school students. It is written for the widest audience possible, even those who have never even heard of permafrost. Engrossing an audience in a subject with which it is unfamiliar is a difficult task, but the author does a good job, making his material easy to understand and interesting. His success probably owes much to the fact that he has had significant experience in explaining various aspects of science to the general public through his regular newspaper columns during the 1970s and 1980s.

Dr Neil Davis, Professor Emeritus of Geophysics at the University of Alaska Fairbanks, is not a permafrost specialist. Most of the material presented in his book is adapted from several classical books on the subject. However, he brings to bear his expertise as a physicist and geophysicist in trying to find a solid physical reason for each of the permafrost phenomena and processes described in the book. Thus, after a short introduction to permafrost and seasonally frozen ground in chapter 1, in the two following chapters (as well as in appendix A) he devotes a good deal of attention to a discussion of water and water properties, processes of water freezing both as free water and water in soils, water migration during soil freezing, and the formation of segregation ice. All of this information is important for understanding permafrost behavior, especially when applied to engineering and ecology.

Chapter 4 portrays various landforms and features related to permafrost and seasonal frost. Special attention is paid to such fascinating features as polygonal ice wedges, pingos, solifluction, rock glaciers and thermokarst landforms. The text is illustrated with excellent photographs, both color and black-and-white. Many of these were taken by the author himself and are published for the first time here. Chapter 5 deals with interactions between frozen ground and humans. It is full of examples of how human activities destroy permafrost (often inadvertently) and how permafrost pays humans back. Again, an excellent collection of photographs supports the text. The sixth and final chapter, "Permafrost in Transition", ought to be the most important given the book's title.

However, except for the introductory chapter 1, it is the shortest chapter in the book. While it provides a brief but interesting and consistent excursion into the last several million years of climatic change, it fails to produce a coherent picture of permafrost reaction to these changes. The explanations of the relationship between climate and permafrost dynamics are vague and sometimes confusing. Erroneous predictions of the dramatic northward movement of the southern boundary of permafrost as a result of doubling of atmospheric CO₂ are repeated. These predictions ignore the fact that permafrost has considerable thermal inertia, and "elimination of virtually all permafrost within the present discontinuous zone" will take many centuries, and perhaps even millennia.

Unfortunately, due to a number of errors and oversights I cannot recommend this book as a textbook for college undergraduates in geology and geophysics. For example, chapter 3 states that the lowest temperatures in permafrost are -10°C in northern Alaska and -13°C in Siberia, though it is well known that winter temperatures at the permafrost table can drop to -20°C and lower. There are many speculations in the text about the possibility of water migration within the upper 20 m of already existing permafrost and related epigenetic build-up of segregation ice even in connection with ice-wedge formation. Such speculations are unsupported by any published data. In addition, the book has a bias toward segregation ice, with less attention paid to the other types of ground ice. Another example of an oversight is the inclusion of the erroneous statement that 3.3 m of frost heave occurred in one year (p. 94 and fig. 3.21). This information came from a published work by T. Péwé. Unfortunately, the number is the result of a typographic error overlooked in the original manuscript. From figure 3.21 it is apparent that the total heave that accumulated during many years was only 1.5 m.

Despite these technical shortcomings, however, this is the first popular book on permafrost published in English, and deserves to be on the library shelf of anyone interested in the topic.

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