

## REVIEW

*The Nature of Weathering: An Introduction*; by EIJU YATSU. P. 824, 88 tables, 84 figures. Tokyo, 1988 (Sozo-sha, \$98.00).—There are many fine books on weathering, but most of the recent ones are introductory, qualitative, heavily descriptive, or highly specialized. The last attempt at a rigorous, comprehensive monograph was Merrill's *Rocks, Rock Weathering and Soils* in 1897. With *The Nature of Weathering: An Introduction*, Eiju Yatsu attempts to fill this gap in the weathering literature. This book is aimed at geologists, geomorphologists, and soil scientists.

According to the author's preface, this book presents basic concepts of, and recent trends of research in, the study of weathering. The author clearly states that he intends to present a "framework of accumulated knowledge on the subject", a *review*, not an original treatise. *The Nature of Weathering: An Introduction* is an encyclopedic treatment, based on notes for a series of lectures delivered by the author at the University of Guelph in 1976. The field has evolved considerably since then, and the author has kept up admirably, producing a reasonably thorough and comprehensive review of the weathering literature up through 1986.

*The Nature of Weathering: An Introduction* contains six chapters: a brief historical prologue; extensive chapters on mechanical, chemical, biological, and mineral weathering, and a one-page epilogue. The entire treatment (especially the chapters on mechanical and chemical weathering) emphasizes processes (rather than "factors" in weathering, or the taxonomy of weathering features and products) and borrows heavily from the literature of engineering, materials science, and chemistry. The chapter on chemical weathering adequately covers commonly used concepts (elementary chemical thermodynamics) and omits potentially important areas that have not appeared extensively in the weathering literature (quantitative measures of thermodynamic disequilibrium, modelling of mass-transfer, effects of variable thermodynamic activity of water, and temperature-dependence of chemical equilibria).

The level of detail and the amount of critical commentary by the author vary widely from one topic to the next. The author's account of recent ideas regarding the stoichiometry of silicate-mineral surfaces, their dissolution, and rate-limiting steps in silicate-mineral weathering is long and detailed but not entirely accurate in its portrayal of the actual state of knowledge. In contrast, the discussion of the literature applying thermodynamic and kinetic concepts to field studies is little more than a reference list and consequently quite non-controversial.

The chapter on organic influences on weathering begins with a baroque review of the origin of life. The discussion of the age of the Earth and the evolution of life on it, included because such earth-historical background is ostensibly required to understand the role of organisms in weathering, consists of an array of randomly selected references, summarized without critical sifting of irrelevant minutiae. For example, the author tells us not only the age of some of the Earth's oldest rocks but also outlines their metamorphic history. It is not entirely clear why the

metamorphic history of this specific unit or the history of Archean mafic intrusions into another sequence on another continent are germane to our understanding of the geologic record of life. However, the author deserves considerable credit for the rest of the chapter—no book on weathering has ever attempted to deal with organic chemistry in such detail. The basic ideas and references of this chapter alone are a valuable resource to weathering researchers from traditional geological, geomorphological, mineralogical, and inorganic geochemical backgrounds.

The chapter on mineral weathering is the most descriptive, least process-oriented chapter of the text. Overall, it provides a fairly comprehensive overview of the English-language literature and the added bonus of a good “window” into the Japanese literature, which is not as readily accessible to researchers at most North American institutions.

Admittedly, the literature on weathering is large, and often inconsistent, but the author could have imposed some order on the unruly literature. For example, the term “montmorillonite” is used widely throughout the text, apparently wherever the original reference used it, even if such usage does not comply with current practices of clay-mineral nomenclature. Oxide and structural formulae for minerals are mixed, often in the same tables or equations. British and American spellings are mixed, and, despite detailed discussion of the etymology of the terms “topotaxy” and “epitaxy,” the author mixes correct and incorrect forms, apparently following the original sources uncritically. Several geological terms (craton, stromatolite, thin-section) are used but not defined, which will render the affected sections difficult for non-geologists. Several equations have undefined terms.

In general, the grammar is not as poor as the author’s apologetic remarks in the preface lead one to expect, although there are a few unfathomable passages and abundant typographical errors. The line drawings are generally clear and effective. However, this book will be difficult to use as a stand-alone resource; it is excellent as supplementary material and as an overview and “window” into the weathering literature, but it lacks photographs, drawings from photographs and photomicrographs, and X-ray diffraction patterns, which constitute the primary data of mechanical and mineral weathering.

Although the original sources would be better illustrated and more informative, it is easier to wade through this book than to seek out and read all the original references. Thus, this book is what it claims to be, an introduction to the literature on weathering. Despite its numerous minor shortcomings, *The Nature of Weathering: An Introduction* addresses many significant current themes and presents a reasonably comprehensive treatment of many rigorous and challenging aspects to weathering studies.

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