BOOK REVIEW

ATLAS OF MICROMORPHOLOGY OF MINERAL ALTERATION AND WEATHERING. By Jean E. Delvigne. Canadian Mineralogist, Special Publication No. 3, Ottawa, Ontario, 1998, 494 p. Hardbound $125 ($100 for members of the Mineralogical Association of Canada).

This handsome color atlas of photomicrographs is similar in some ways to color guides of petrography, heavy minerals, soils, and paleosols published in recent years, but it is in some ways unique. Particularly unique is its subject matter in the *terra incognita* between the traditions of metamorphic-igneous petrography on the one hand and soil micromorphology on the other hand. Although the book opens with photomicrographs of various little-weathered igneous and metamorphic rocks, most of the photomicrographs are of mineral grains more or less obliterated by weathering or hydrothermal alteration. By the end of the book, most of the photomicrographs are of pisolitic and boxwork textures formed in thick lateritic and bauxitic soils and paleosols with near total destruction of original igneous and metamorphic textures. It is thus a book that will surprise both petrologists, who labor to obtain samples without the alterations illustrated, and pedologists, who deal with less strongly developed soils and paleosols of sedimentary parent materials.

The unique focus of this book can best be understood from the experience of its author, Jean Delvigne, who has devoted more than 40 years of detailed petrographic study to the deep weathering of igneous and metamorphic rocks of the Precambrian shields of Congo, West Africa and Brazil. The tremendous array of parent materials illustrated includes carbonatites, clinopyroxenites, nephelinites, basalts, garnet schists, and amphibolites. Although emphasis is on deep tropical weathering of the kind that produces laterites and bauxites, some examples of calcretization and hydrothermal alteration are included. This book arises from the French school of pedology, which, since the pioneering work of George Millot, has had a strong emphasis on geochemical mass balance modeling and detailed petrography of thick tropical soils. In contrast, the North American-Russian school of pedology, which can be traced back to Vasily Dokuchaev and Curtis Fletcher Marbut, is more concerned with diagnostic laboratory and field properties of soils formed under much less aggressive weathering regimes on loess and till of the last glacial maximum. Delvigne introduces a whole new world of micromorphology to those accustomed to fresh rock and thin soils of high northern latitudes.

A core contribution of this book is a deeper understanding and new terminology for pseudomorphs, which Delvigne restricts only to the replacement of euhedral mineral grains by other minerals. As we all know, most mineral grains are not euhedral, and when anhedral grains are replaced Delvigne suggests the term alteromorph. The patterns of boxwork replacement, altered-mineral extensions from grains, irregular voids, buckling of phyllosilicates, and marginal alterations are all documented in detail. The new terminology proposed is workable, but somewhat cumbersome in its use of hyphenation. For example, a phanto-alteromorph is a grain with ghostlike remnants of one alteration mineral within a groundmass of another alteration mineral. Why not abbreviate this to "phantal teromorph" or even "phantomorph"? Despite this quibble, I think the 18 new terms introduced, and handily reprinted inside each cover, are much needed. The overall effect however, can be daunting in combination with equally arcane terminology from mineralogy (rinkite, mosandrite), petrology (lujavrite, glimmerite), pedology (alloterite, isalterite), and soil micromorphology (gefuric, inaulic). I had trouble finding some of these terms in other reference works, and not all were included in the glossary. In some cases, usage in this book is subtly different from that of others. Lithorelic (spelled lithorelict by Brewer) is used here only for relatively unweathered rock fragments, which when replaced by alteration minerals become alterorelics of Delvigne. In Brewer's original terminology, these would have remained lithorelic(t)s as long as some original rock texture was preserved. Such nuances of past, current, and alternative usages are not discussed in this book, which aims at advancing a core of new and some past terminology.

Finally, the book is unique in many aspects of its presentation. The full color photomicrographs are dazzling, and convey well the beauty and variety of the material. Detail and clarity of the images reveals the charming intricacy of concrete examples. The text figures also are in bright cartoonlike colors, which aids considerably in conveying complex patterns of alteration. Color has also been used to indicate chapters by color-coded thumb tabs visible as bands on the trimmed page ends. Different color bands and colored text are used to highlight and differentiate introductory text, definitions, examples, and discussion. I found most of this a distraction rather than a help. The orange introductory phrase or word to figure captions was often difficult to read, and I found myself wondering at times is that dark purple or dark blue text? Nevertheless these various devices give a delightful air of creative play and the overall effect is visually stunning.

This is an important book chiefly because there is nothing else quite like it. It succeeds in demonstrating that there is a lot more to the weathering of high temperature minerals than is widely appreciated. Any serious mineralogist should at least press for local library access to this book. Considering the lavish production in full color, I consider it excellent value for money.

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