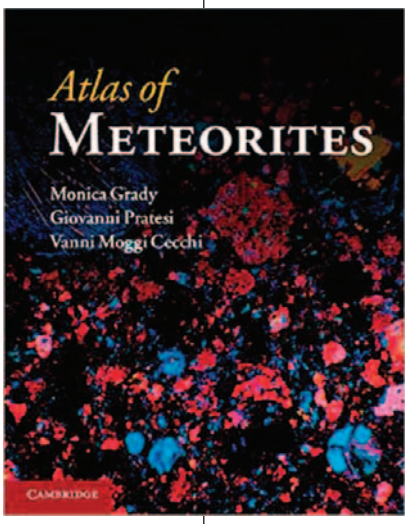
ATLAS OF METEORITES*



The *Atlas of Meteorites*, by M. Grady, G. Pratesi, and V. Moggi Cecchi, is a beautifully illustrated volume that encompasses the detailed mineralogy, petrology, and geochemistry of all of the major meteorite groups currently known. Recognizing the importance of textural information—as revealed by optical microscopy—the authors' stated aim was to provide a textbook akin to *An Atlas of Rock-Forming Minerals in Thin Section* by W. S. MacKenzie and C. Guilford (1980; Longmans), in the hopes that it will do for meteorites what MacKenzie and Guilford did for understanding the petrology of rocks from Earth.

The authors have done an admirable job of compiling virtually all the relevant information required to classify meteorites; this information is complemented by more detailed summaries of the stable and radiogenic isotope geochemical features, as well as currently held views on the genesis, evolution, and potential parent bodies of each major meteorite class. Such details make the *Atlas of Meteorites* suitable for use as a textbook in an upper-level undergraduate or graduate-level course in meteoritics. If such a course is fortunate enough to have a lab component that includes thin sections and polished mounts of the major meteorite classes, then this book would be ideal.

The book begins with an introductory chapter about the naming of meteorites, the characteristics of the major components of chondrite meteorites, and the background on the types of geochemical analyses that are relevant to meteorite classification and research, including noble gases, geochronology, and cosmic ray exposure history. The historical background included in this chapter will be an education both for novices and for experienced meteoriticists alike. It also demonstrates the adage that classification schemes become increasingly complex and burdensome the more specimens of different types that are discovered. While some might long for the heady days of the 1860s Mineralogical Museum in Berlin, when the choices were few (chondrites, eucrites, howardites, and chassignites), the authors of the *Atlas of Meteorites* guide the reader clearly through the current classification scheme in Chapter 1.

The organization of the other chapters intuitively progresses from the most primitive meteorite classes (carbonaceous, ordinary, and enstatite chondrites) through primitive achondrites (e.g. acapulcoites/lodranites, brachinites, ureilites, aubrites) to howardite–eucrite–diogenite (HED) meteorites (possibly derived from asteroid 4 Vesta), to meteorites

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dominated by metallic iron (mesosiderites) and which may represent asteroid parent body interiors (pallasites and irons), to the planetary meteorites that have come from the Moon and Mars. The authors caution against the extent to which the diagrams may be used for classification purposes. But I found them to be of significant practical value: for example, I was readily able to place a new iron meteorite on which I am working into its geochemical group (IVA) using Figure 15.2 and Table 15.4.

While much of the information provided in each chapter may be found elsewhere, what sets this book apart are the full-color plates illustrating the textures of each meteorite class and of most of the groups within each class. The plates are arranged in the same order as in the text in the same chapter (for example, by increasing petrologic grade in the case of chondrites), making it easy to find photomicrographs of your favorite meteorite type. Notably, many of the meteorites that have been used to name classes of meteorites are represented in the plates, e.g. Acapulco and Lodran (for acapulcoites and lodranites), Novo-Urei (for ureilites), and Aubres (for aubrites). Almost all of the photomicrographs are provided at the same scale, in plane polarized light, in cross polarized light, and in reflected light, as well as in cathodoluminescence for the enstatite chondrites—an aspect of these meteorites that is new to me and which I found both stunning and fascinating. Color reproduction is good, as judged by certain examples of note such as ringwoodite in Tenham. Rarely is back-scattered electron imaging resorted to; the authors have accomplished their goal of highlighting the continued importance of optical microscopy in the study of meteorites. The only thing missing are little check boxes next to each meteorite name … for us curators to use as we expand our collections!

Full color is used throughout the book, including in all figures, diagrams and tables. Diagrams illustrating, for example, the Urey–Craig plot (oxidized iron/Si vs reduced iron/Si; used to show the diversity of redox conditions in the Solar System represented by meteorites) employ a rainbow of colors to represent the different meteorite groups, which seems odd at first view. However, this aspect provides a ready means for comparison of the many different geochemical characteristics among the different groups. The color scheme is consistent throughout, allowing the reader to flip between chapters to make their own comparisons.

It should be noted that the authors assume that the reader has a certain background level of knowledge, commensurate with that of an upper-level undergraduate student who has completed courses in mineralogy and geochemistry. Users of the *Atlas* may need a mineralogy reference in which some of the lesser-known Ca–Al-rich inclusion (CAI) minerals (e.g. hibonite, melilite) may be found, although the authors do not leave the reader helpless when it comes to the formulae for enstatite chondrite phases such as oldhamite, djerfisherite, or caswellsilverite. The same is true for discussions of organic chemistry, and, to a certain extent, on radiogenic and stable isotope geochemistry. Typos are few and far between. There is no Index of Terms, unfortunately, which would have assisted in some cases—I could not find where GO ("granular olivine"; a textural term used to describe chondrules) was first defined. And any meteoriticist will find points of contention or omission: What about chondrule formation models? Why is that new Martian breccia not listed? Why is my work not cited? But there is really very little to quibble about. The *Atlas of Meteorites* is an essential reference for any petrologis—regardless of level of experience—and thoroughly deserves its place next to *An Atlas of Rock-Forming Minerals in Thin Section* on the bookshelf closest to the petrographic microscope.

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