to the highlands, where the search for mountains and plains of siliceous volcanics yielded a landscape of impact breccias. Chapter 7 describes the final mission, Apollo 17, at "The beautiful valley of Taurus–Littrow." The contents list 25 subsections including one about a "Geologist-astronaut" (Jack Schmitt), and one called "Holy Grail?", which describes his totally unexpected discovery of orange soil. A later subsection titled, "So much for the fumerole," describes the dashing of Schmitt's initial hopes that the orange material might consist of volatile deposits from very recent volcanism. In fact, it proved to be an ancient accumulation of orange and black glassy spherules formed by mare-related fire-fountaining.

Chapter 8 treats the Soviet Union's robotic Luna sample-return missions and Lunakhod rovers. Chapter 9 places Apollo in a broad context, with some regrets about certain lost opportunities and the difficulties of starting over. Harland states: "Just as Apollo had come from nowhere, and held centre-stage for a decade, it disappeared from public consciousness virtually without comment, as if it had never happened; indeed, almost as if it was an anachronism." He adds: "In retrospect, it is clear that Apollo was an element of twenty-first-century exploration which was somehow drawn forward 50 years and, incredibly, implemented with early-1960s electronics technology—a fact which demonstrates the supreme mastery that the astronauts and their ground support team had over their remarkable vehicles."

The final chapter reports on the more recent missions: the Prospectors, Galileo, and Clementine and their cargoes of high-technology instruments. The text ends with a page remembering Gene Shoemaker, who played a crucial role in persuading NASA to conduct geological exploration of the Moon and whose ashes, carried aboard *Lunar Prospector*, were deposited on the Moon when it completed its mission with a crash-landing.

The narrative is not formally referenced but it is supplemented by a chronological bibliography of books and articles on the Moon that fills 28 pages of two columns each. A reader can use it as a guide to source materials on any topic in the text. There also is a 12-page glossary in which many of the technical terms not only are defined but explained in detail. The Appendix includes three tables listing: (1) the names, launch dates, and purposes of space flights that contributed to lunar exploration from the launch of Luna 1 on 1959 January 2, to that of *Prospector* on 1998 January 6; (2) the landing sites of all the robotic and manned lunar missions; and (3) data on all eleven of the Apollo missions, including the names and ranks of the crew members, the names of their Command/Service and Landing Modules, their launch and return dates, the purposes of the missions, and the timing of the activities astronauts spent on the surface. There follows a list of the numbers and weights all the lunar samples referred to in the text and a short Afterword by David R. Scott, Commander of the Apollo 15 Mission.

Many readers who followed the progress of the missions and watched the televised landings will read these chapters with fresh excitement (along with pangs of nostalgia) as they recall the hopes and anxieties they felt at each count-down to blast-off, their elation at viewing the astronauts walking on the Moon and collecting samples, and relief at the safe return to Earth of each crew. Readers who were indifferent at the time or are too young to remember the Apollo missions will find the book to be a clearly written and entertaining account of the geological field work supplemented with a greater wealth of background information than was publicly available at the time.

In his Preface, the author remarks that this book is *complementary* to all those that focus on the political, managerial, and engineering, aspects of Apollo or on the astronauts as people. With its emphasis on field geology it is a welcome addition to the literature of Apollo. Furthermore, it is fun to read.

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Perspectives in Amino Acid and Protein Geochemistry by G. Goodfriend, M. Collins, M. Fogel, S. Macko, and J. Wehmiller. Oxford University Press, New York, New York, USA, 2000, 384 pp., $85.00 hardcover (ISBN 0-19-513507-5).

The preface to this interesting book describes how it is a reexamination and update of a twenty-year-old book, *The Biogeochemistry of Amino Acids*. For those familiar with the earlier work, this is a fair description. For those who are not, the basic topic is what happens to amino acids and proteins in various geochemical settings. The single biggest part of the book, about 200 out of 355 pages of text, deals with the kinetics of amino acid racemization and application of this technique for dating of biologically derived material. Although there is a great deal of solid work discussed in this part of the book, for readers of *Meteoritics and Planetary Science* it is likely to be of less interest than the very first section of the book where three articles deal with extraterrestrial amino acids.

The first of these articles by Kvenvolden, Glavin, and Bada, in keeping with idea of a reexamination of the field, applies the very latest analytical techniques to essentially repeat the famous studies of the Murchison meteorite. This work, published back in 1970, found a number of "natural" and unnatural amino acids thought to be of extraterrestrial origin. A portion of the original samples, held for years in the dark, were extracted much as before and then their amino acid content and chiralities determined by HPLC. The modern results are compared to original results and, while the modern methods certainly improve the accuracy and precision, no major changes in what was originally published were found.

The second article is a review of the work that has gone into the determination of chirality of amino acids in meteorites.

This is of course of great importance in addressing questions about the current preference for L-amino acids and, more generally, the origin of life. The fourth article in the book also has relevance to extraterrestrial material, examining alternative abiotic synthetic mechanisms for alanine that do not involve the Strecker condensation of cyanide and aldehydes.

These articles are interesting, but probably do not justify a personal purchase of the volume if your interests are focused on the extraterrestrial. A reader with a more general interest in amino acid geochemistry would find this collection much more worthwhile. In any case, any institutional research library would be well advised to add it to its holdings.

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