Geology

Atlas and Glossary of Primary Sedimentary Structures. F. J. Pettijohn and Paul Edwin Potter. Translations into Spanish, French, and German by Jaun Carlos Riggi, Marie-Hélène Sachet, and Hans-Ulrich Schmincke. Springer-Verlag, New York, 1964. xvi + 370 pp. Illus. $14.75.

This handsome and lavishly illustrated book by the eminent authors of *Paleocurrents and Basin Analysis* represents a valuable supplement to that useful work and an eye-catching introduction for Springer-Verlag to the publishing scene in the United States. Written as a "*field guide* . . . for students to whom the entire subject is new and whose field study of sedimentary structures is just beginning," the *Atlas* stresses the pictorial representation of primary sedimentary structures at once significant for earth history and defying brief analysis.

As old as geology itself, the study of sedimentary structures nevertheless has undergone almost explosive growth during the past decade and more, following the evocative work of Kuenen and Migliorini on the processes and results of redeposition by gravity mass movement. This led, inevitably, to a proliferation of names (although many were not intended as formal terms) and to attempts at definition and interpretation, especially in English. Pettijohn and Potter have put geology in their debt, not only by arranging, classifying, and providing a glossary of these names, but by publishing their translation to equivalents in German, French, and Spanish (it would have been too much to hope for Russian!). They also mercifully eschew the temptation to "tidy up" in the form of a more systematic and descriptive competing terminology. The translators were faced with the problem that many features have independently been given names in other languages, or have English names that are difficult to translate exactly. They meet this problem in sensible ways that are carefully explained in each translators individual preface.

The authors wisely limit their near-inexhaustible subject and state clearly what it is limited to and where additional information can be found. Origin, top-and-bottom orientation, and directional and paleoecological significance are not elaborated upon; in this respect the book becomes a supplement to earlier works by the same authors and by Shrock. Only features produced by soft-sediment deformation (but not by chemical reorganization, frost action, or cryoturbation) are included; tectonic structures are excluded. Organic markings are given passing consideration but are considered too specialized, and too large, a subject for comprehensive treatment here.

The "Glossary of primary sedimentary structures" serves as an index to the photographic illustrations, mostly enlarged from 35-millimeter negatives, and mostly of North American outcrops. It is followed by cross-referencing indexes in German, French, and Spanish, which, like the rest of the book, will be useful in studying and reviewing for technical translation to those languages. In view of this, it is too bad that the foreign synonyms are not also given in the explanations of the plates rather than just the simple translation of the English term. The usefulness of these foreign-language indexes would also have been increased by including appropriate page and plate references.

A rough count indicates that about 350 terms are described or specifically referenced in the glossary and that about one-third of these are illustrated. Paradoxically, although the authors carefully define (and illustrate) bed, bedding, stratum, and stratification, words like varve, tillite, flysch, biohieroglyph, enterolithic folding, and equally esoteric terms are not defined in the glossary, although they are illustrated.

The great majority of the illustrations are excellent, well chosen, and so beautifully reproduced and arranged as to almost forestall criticism. Yet, to look the gift horse in the mouth, it must be said that the same space and investment could have been used to better advantage. Despite the authors' statement that "There is no duplication . . . [with] our paleocurrent volume" (p. III), a cursory check shows that plates 36, 58, 59A, and 89A were taken from identical or nearly identical localities, and are near duplicates of illustrations in the paleocurrent volume; others are very similar. Several pictures show little of interest (for example, 10A, 41A and B, and 50A), and a number of others do not notably supplement the descriptions. Ball and pillow structures (pseudonodules), flute casts, and cross-bedding are illustrated to the point of excess. And many pictures that take up an entire plate could just as effectively have been shown at half that size. Yet well over half of the structures described, some relatively unfamiliar even to experienced geologists, are not illustrated here.

Quibbles aside, however, my only real regret about this book concerns the decision of its authors not to discuss origins or elaborate on uses. True, this is done in *Paleocurrents and Basin Analysis*, but in the *Atlas* there is room between the plate explanations for a few words on these subjects, without increasing the size of the book at all. The authors and publishers would put the rest of us even more deeply in their debt by including such material in a subsequent edition.

PRESTON E. CLOUD, JR.
School of Earth Sciences,
University of Minnesota

Varenna Summer School, 1962

Space Exploration and the Solar System. *Proceedings*, Course 24, International School of Physics "Enrico Fermi," June 1962. B. Rossi, Ed. Academic Press, New York, 1964. viii + 311 pp. Illus. $13.

Two weeks of the Varenna summer school in 1962 were devoted to space physics, and this volume is based on the lectures given there. The various articles cover a wide spectrum, both in subject matter and depth of survey. Only one paper deals particularly with measurements made in space. I expect that most individual purchasers of the book will buy it for one or two of the articles, so my job here is to summarize briefly what they are about.

An excellent introduction to plasma physics is given by R. Lüst. The article is limited to a discussion of the macroscopic equations and is largely complementary to L. Spitzer's well-known little monograph. For the expert in plasma theory, S. Hayakawa and H. Obayashi have developed an elegant description of charged-particle orbits with the canonical formalism.

G. J. F. MacDonald, in the longest article in the volume, presents a fascinating account of the interior structure of the earth and then goes on to "examine the present state of ignorance regarding the moon and the [other minor] planets." One exciting topic in-

cluded here concerns the free oscillations of the earth, which rings rather like a bell, with its characteristic line spectrum, when struck hard (for example, by an earthquake).

Phenomena of the solar photosphere and chromosphere are summarized by G. Righini "for the benefit of nonspecialists." This article is based mainly on A. Unsöld's textbook and an article by C. de Jager, published in *Handbuch der Physik*. R. Lüst's brief article on the corona and solar wind appears to be essentially an expanded abstract of his fine review in *Space Science Reviews* [**1**, No. 3 (1963)]; I suspect this contribution appears here only to provide so-called "completeness."

T. Gold's discussion of interplanetary particles and fields deals with heuristic models. He suggests a variety of physical ideas, along with a number of illustrative sketches, which may be a source of inspiration to theorists more inclined to develop mathematical models. A detailed analysis of a long series of observations of solar cosmic rays, made with the Explorer VII satellite, forms the main substance of a paper by J. A. Van Allen and W. C. Lin. In addition, they discuss some modifications to Störmer theory (which applies to a steady dipole field) that are imposed by the real geomagnetic field.

A long article by R. Jastrow, on planetary atmospheres, will be useful to students entering the field. Its general utility is unhappily marred by the absence of any references to the literature. In the final article, S. Hayakawa treats x-rays and high-energy particles from the moon and planets, detectable (perhaps) by instruments on spacecraft.

As far as the book as a whole is concerned, Rossi is to be congratulated for assembling such outstanding contributors. Still, I am unfavorably impressed by the unevenness of treatment among different articles and by the absence of an index: Almost any of these articles might just as well have been published in a review journal. The main excuse for publishing this particular set of papers together is evidently a traditional or commemorative one, which is fine. But I take the view that, when I pay this kind of price (more than 4 cents per page) for a book, I can reasonably expect something special besides a hard cover.

JOSEPH W. CHAMBERLAIN
Kitt Peak National Observatory, Tucson, Arizona

Elementary Science Education

Elementary Teacher's Classroom Science Demonstrations and Activities. David E. Hennessy. Prentice-Hall, Englewood Cliffs, N.J., 1964. xii + 308 pp. Illus. $7.95.

Hennessy frankly claims that the purpose of this book is demonstration. The pages are filled with ingenious, practical, and clearly described assemblages of materials. Sources for the latter indicate their ready availability. A Foucault pendulum on a piano stool and a tack oscillating between tin cans charged with rubbed plastic are examples of interesting set-ups. The suggestion that a collecting net can be obtained from the butcher who wraps hind quarters of beef in conveniently shaped cheese cloth is useful. David Moon's illustrations are excellent. Hence, the avowed purpose is admirably achieved.

How much of a contribution the work is to today's ferment in elementary science education is another matter. On this question I feel that the score is negative.

The philosophy underlying the selection of activities is outmoded because the content does not move much beyond Newton. Even space science is related to inertia, action and reaction, and forces. More-modern science thinks of interaction of limited systems as models to describe physical and celestial phenomena. A rocket is pushed, not by Newtonian laws, but by unequal pressure of gases within it.

Living things are introduced by collecting and killing insects, instead of having the children explore the interactions with various environments. The universe is approached by concentrating on the static relation of size and distance in the solar system. Geology is presented with no thought for the tremendous sweep of time and the slow but continuous change inherent in this study.

Not one of the conceptual schemes suggested by Paul Brandwein and other modern science educators is present even implicitly in the book: ideas of energy transformation, the influences of environment and heredity on living organisms, the immensity of change in the universe.

The pedagogy advocated is not the sort that promotes learning by children. The teacher shows and tells. The explanations offered in the sections labeled "Discussion" are often unacceptable as modern scientific thinking: atmospheric pressure tries to fill a partial vacuum (p. 94); bodies attract or repel each other; the suggestion that the Sphinx moth has a long tongue so that it can reach the nectar and help pollinate the flower at the same time (p. 36).

The author does not seem to recognize that children learn best through free exploratory manipulation of materials followed by articulation of their discoveries. Children parallel the procedures of scientists in that they ask questions raised by their own experiences and find answers in many ways.

BRENDA LANSDOWN
Department of Education, Brooklyn College

History of Technology

Rudolf Diesel: Pioneeer of the Age of Power. W. Robert Nitske and Charles Morrow Wilson. University of Oklahoma Press, Norman, 1965. x + 318 pp. Ilus. $5.95.

The story of Rudolf Diesel and his engine should make a good book if a sympathetic writer who understood the engine would explain its development carefully. The engine has been responsible for the transformation of sectors of our economy, and it is historically interesting as a rare example of the way science is supposed to be applied to engineering—the Diesel engine began as a pure idea. The man Diesel is also an interesting figure, a proud, over-rational neurotic, with chronic headaches and occasional breakdowns, a driven man with a mission to do for the 20th century what James Watt had done for the 19th. In 1893 he published a book in which he set forth the abstract principles of his rational heat engine, as he called it, before he had any hardware at all. He got into deep trouble because the engine did not turn out to be what he said it was, but he was nevertheless able to sell his pure idea to manufacturers for a handsome fortune, which mysteriously disappeared before he had a commercially viable engine. He also undertook to reconstruct society on rational principles, or at least he wrote down the principles in his book *Solidarismus*, but he could find no one to implement these ideas.

That story could stand on its own feet without being glamorized, but the