zones to which they attribute the greatest importance (relieving the reader of the burgeoning mass "of learned technical terms which are practically never used"); the importance of paleogeography; the chronologic value of biozones; correlation which they emphasize is impossible without fossils; migrations and faunal provinces (wherein they introduce a number of elegant new terms such as *prochorèse, esbolie, cathistémèse, métachorèse*, and *allagie*, as if ecology and paleoecology were not already choking on their terminology); and the implications of paleomagnetism at which they look slightly askance and for the present leave as the offspring of *géophysiciens anglo-saxons*. The whole of these 13 pages constitutes an interesting and remarkably succinct statement of their stratigraphic faith. The reader is warned that he will not find any representations of actual cross sections, for they are considered as being only raw material, and it is deemed more rational to establish the vertical successions of beds restored to the horizontal and to present these in the form of tables (124 of them) of columns detailing the sequences in countries where they are best known or otherwise significant. This does not, however, allow any graphic presentation of phase and facies relationships which are so important in stratigraphic interpretation.

In dealing with what is after all a subjective problem—the delimitation of the geologic periods and their first order subdivisions—the authors are not iconoclastic. Their framework uses the familiar terminology, with Termierian variations. Thus, beginning with the earliest rocks of the Cambrian, each period is subdivided into what they consider natural, episodic units to each of which is assigned a roman numeral: Cambrian I (Eocambrian), Cambrian II, and so on, through Cambrian VIII. They attempt to resolve the position of the Tremadocian by calling it Tremadoc IX. The Ordovician continues the succession from X to XIII, the late Silurian-early Devonian is Siluronian XVI, the latest Devonian-earliest Mississippian is Strunian XXII, the latest Paleozoic is Permian XXVIII; presumably the Mesozoic and Cenozoic will continue this numeration. This first volume terminates with the Siluronian XVI. Each unit or epoch is the subject of a chapter in which the authors give a brief historical analysis and present what is known of absolute age determinations, tables of sequences with commentary, earth movements, petrogenesis, sedimentation, climates, paleogeography, and organic developments, and provide an extensive bibliography of more recent papers (many through 1963). So far as is practical the major geographic areas are given equal treatment, but naturally the best-known are more extensively considered. Particularly notable are the analyses of the great Paleozoic sequences of the U.S.S.R. and northwest Africa. Unlike too many French treatises, this volume has an index, and a good one.

No work of this sort can possibly be wholly correct in detail, and the stratigrapher, when he turns to the treatment of his favorite strata, will surely find factual errors or inconsistencies and what he will consider to be misinterpretations. To mention a few, I find *Maclurea, Maclurites*, and *Maclurina* (all the same genus) in Ordovician X; the Manhattan Prong is said to be on the right bank of the Hudson; West Canada Creek is labelled "W. Hudson"; Monroe County, Pennsylvania, is said to be the type region of the Monroe Series; the Pittsford shale is far from Otisville, New York; the Helderbergian of New York is not given the discussion it merits, especially after the recent work of L. V. Rickard; the authors seem to accept without question Dombrowski's cultivation of bacteria from the Salina salt of New York, although one of his bacteria is identifiable as the commonest stray bacterium in laboratories; here and there one finds a reference in the text which is not cited in the bibliography; and, although I am admittedly ignorant of the refinements of sedimentological terminology, I could find no clue as to what the *aleurolites* of Cambrian V in the Ukraine might be (this is not in the index although "water-lime" is). But in view of the appalling nature of the task, these are trifles, and the authors are to be congratulated on their achievement.

It is lamentable that this great and highly useful work is so expensive—true, 35 years ago Haug seemed so at $10—that few of those who should possess it, graduate students especially, will be able to afford this volume, as well as the future volumes in the series, unless some foundation should award copies in the agreeable fashion of the prize books of the past.

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Geometry and Calculus

Analysis. vol. 1. Einar Hille. Blaisdell (Ginn), New York, 1964. xiv + 626 pp. Illus. $10.

This book is an analytic geometry plus calculus text which contains far less differentiation and integration drill than the standard texts and practically none of the time-honored engineering applications. It is a mathematics text instead of the usual engineering training text. The book is intended for "college students who have developed aptitude and maturity in mathematical reasoning," and for "honors students and future mathematics majors." The first volume covers plane analytic geometry, differentiation and integration of functions of a single variable, infinite series, and plane curves. Functions of severable variables and related topics are left to the second volume. Although there are many exercises, the book is definitely not a drill text.

The treatment of each topic is rigorous. Limit operations are developed through uniform convergence. Real variable theory is developed through an introduction to functions of bounded variation and their relation to curve rectifiability. Complex analysis is treated in enough detail to enable the author to prove the fundamental theorem of algebra and to give a good discussion of partial fraction expansion of rational functions. Although analytic geometry is severely pruned, the discussion of the geometry of plane curves is carried unusually far. An attractive feature of the book is its historical remarks. Whenever a topic is introduced, even one so specialized as an inequality, associated names, dates, and sometimes background comments are given.

Hille's book is more difficult for a student than a classical drill text, but in a few places the book is more difficult because it lacks the sophistication one would expect. In a book in which rectifiability is discussed one need not confuse the reader by repeating the old chestnut that "a straight line is the shortest distance between two points" (p. 389). A straight line is a geometric configuration, not a distance. In a book in which details about functions and their domains are discussed one expects less confusion than usual about sin x. Is x here a geometric configuration [an angle or a circular arc (see p. 389)] or a number? In the first case the sine function

is a set function, but then what does $(\sin x)/x$ mean? In the second case are there two sine functions, and if not, what does one do about degrees and radians? The author defiantly states that "although purists make a great point of distinguishing between the function f and its value $f(x)$ at x . . . even purists retrogress occasionally and we shall make no excuse for suiting ourselves." This attitude is reasonable; the only question is where one draws the line. To the reviewer it appears that, in many places, students will find comprehension hindered by retrogression.

But these criticisms are small points. Hille's book, which for all its rigor is written in a breezy readable style, indicates that it is possible to teach calculus both rigorously and usably.

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Neuroendocrine Mechanisms

Neuroendocrinology. Ernst Scharrer and Berta Scharrer. Columbia University Press, New York, 1963. xiv + 289 pp. Illus. $8.50.

Ernst Scharrer and Berta Scharrer are a remarkable if not unique scientific team, and one whose early collaborative efforts constitute pioneering contributions to the currently burgeoning field of neuroendocrinology. The direct or indirect participation of the central nervous system in endocrine function has become widely recognized during the past few years. Perhaps nowhere is the intimate relationship better seen than in the insect and crustacean, and Berta Scharrer's publications on the localization of neurosecretory cells in the *Limulus* first appeared more than 25 years ago. Ernst Scharrer's interests in the subject are of equal duration, but in recent years have leaned somewhat more to neurosecretion in the mammal. The paper read by the Scharrers at the Laurentian Hormone Conference in 1953 [*Recent Progress in Hormone Research*, vol. 10. Academic Press (1954), p. 183] stands as a classic in the field, perhaps most of all because it brought out the concept that the role of neuroendocrine systems may well be comparable in many species. In the mammal the phenomenon of the production of secretory material by neurons of the supraoptic and paraventricular nuclei, the transport of the secretory material down the neuron, and its release into the blood vessels of the neurohypophysis was (and remains) the best documented example. This concept, the formation of which came largely through the Scharrers' work, met with some scepticism when it was first presented, but is now well accepted.

The Scharrers were expected to write a book on the subject of their mutual interest, and their wide experience well fitted them for such authorship. *Neuroendocrinology* sums up many years of thought and study. There is a wide scope of coverage, with consideration of many species and a real effort to demonstrate the common pattern of neuroendocrine mechanisms as they occur across the animal kingdom. The clear-cut demonstrations of control of maturation, reproduction, and certain metabolic functions by neurosecretion in the simpler life-forms leads one to look for analogous mechanisms in the mammal, and the Scharrers have sought out and attempted to define such analogies. This is perhaps the greatest value of the volume. For example, the regulation of metamorphosis in the insect by a balance of stimulatory and inhibitory hormones under the control of the central nervous system may not be so different from the regulation of sexual maturation in the mammal. It is regrettable that some of the newer information on the synthesis and secretion by the pineal gland of methoxy indoles (apparently under the control of sympathetic fibers) which inhibit gonadal activity in the mammal [*Science* **141**, 277 (1963); **142**, 1071 (1963); **143**, 1328 (1964); **145**, 63 (1964)], strong evidence in support of such a notion, was not available at the time of publication. There is reason to believe that continued research along these lines will reveal other analogous situations and further support the kind of thinking that the Scharrers have been doing for so long.

The reader may find the early chapters—"Afferent pathways," "Integrative centers," "Efferent pathways," and "Target organs"—a little thin. It is only when the authors dig deeply into the experimental evidence, in the chapters on reproduction, growth and development, and metabolic processes, that the full import of their message becomes apparent.

It is not easy reading. There is much concentrated fact, though occasionally a bit of delightful humor appears. The illustrations come out well, but are disappointingly scanty considering the large amount of anatomical material available to the authors. The bibliography is excellent. The cost of the volume is not at all excessive. *Neuroendocrinology* is a worthwhile addition to the library of the biologist, the endocrinologist, and the physiologist, and, for that matter, to the library of anyone interested in the science and the mysteries of life.

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Space Science

The Physics and Astronomy of Meteors, Comets, and Meteorites. Gerald S. Hawkins. McGraw-Hill, New York, 1964. x + 134 pp. Illus. $2.50.

This excellent paperback, which can almost be tucked in one's pocket, will interest both the layman and the student. Written primarily for a junior or senior undergraduate in the physical sciences, this book presents in clear concise sentences an account of the bodies that move in the regions between the planets. There is special emphasis on those bodies that have direct contact with the Earth—meteors, meteorites, and micrometeorites—because scientists have greater knowledge of these objects. Hence, comets are discussed in only two of the nine chapters, although, owing to the close relation between comets and meteors, and between comets and micrometeorites, reference is often made elsewhere to comets.

The distinguishing characteristics of meteors and meteorites, and the different origins of these two types of bodies, are clearly pictured in words, drawings, and photographs. The student will enjoy the equations and the theory offered as proof of most of the statements. Meteors, comets, meteorites, and micrometeorites are real objects. They exist today as well as in the past and are truly messengers of the evolution of the solar system, if we can interpret them correctly. The author has attempted to present a picture with the pertinent knowledge that scientists now have of these interplanetary bodies. It should stimulate further study and thereby increase our