lowed by four appendices that deal with fossils and Mesozoic stages.

Three post-Mesozoic systems (Paleogene, Eogene, and Pleistocene) are adopted "on a basis comparable to that now used for the older rocks." Does boosting Pleistocene to system rank conform to that intent? The term Tertiary is studiously avoided. It appears in Tables 3-1 and 3-4 as an old division still in use. The Tertiary series names (subsystems of Table 3-4) also are avoided as much as possible. They could not be avoided, however, in chapter 15. Middle Paleogene (Eocene) and Lower Eocene appear on the same page (p. 402). How would Early Lower Eocene be expressed in Paleogene terms?

The book shows careful editing and proofreading. It is lavishly illustrated and the reproductions are good, although Figure 9-16 is so greatly reduced that parts of it are illegible without a reading glass. The frontispiece is beguiling, and light touches unexpectedly brighten somber discussions.

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Modern Meteorology Minus Mathematics

Modern meteorology minus mathematics is authoritatively presented in **Introduction to the Atmosphere** (McGraw-Hill, New York, 1965. 377 pp., $8.95), the first new elementary textbook in the field published in almost a generation. The author, Herbert Riehl, after almost two decades at the University of Chicago, has been professor of atmospheric science at Colorado State University for the past 5 years. His book is intended for "nonspecialist 'terminal' courses" that offer "a concise yet thorough view of the field" to "students with a general science background."

For several years I have taught such a "weather" course, one which satisfies the science requirements for students who have completed college courses in the physical and biological sciences. Because the half-dozen available textbooks, all obsolescent in outlook and content, are either too elementary or too technical, I eagerly adopted Riehl's new book after a glance at the page proofs. But my students complain that "a previous knowledge of weather fundamentals is assumed"; that technical terms are used without adequate definition; that some explanations invoke material presented much later in the book; that many diagrams, while attractive, are hard to interpret; and that "too many things are covered without really going into any depth."

Such objections, also applicable in varying degree to other "elementary" textbooks, are from students whose high school and college science courses emphasized fusion, fission, and space propulsion but neglected the gas laws, specific and latent heats, and the laws of motion, with the result that many students do not comprehend casual references to these foundations of meteorology.

Synoptic meteorology is Riehl's major interest (he pioneered modern concepts of tropical meteorology) and provides the basic orientation of his book. He begins with an admirable essay, "Survey of the atmosphere," which sounds like an encyclopedia article, as do many of the other 13 chapters, which are grouped in four parts: Physical Processes (130 pp.), Weather Disturbances (54 pp.), Climate Controls and Climates (78 pp.), and Weather and Climate Applied (60 pp.). The appendices, on reading weather maps, conversion scales, and data sources, include 20 "general and special subject texts" and 7 journals. The only other references are credits for some of the 218 figures; the indexes (by subject and by location) are adequate but not exhaustive.

No formulas or equations of any kind are offered; instead, some relations are given verbally, and others are displayed on two-toned graphs, all half-page or smaller, which are generally too small and schematic for actual use. Many of the graphs have nonlinear scales, usually not identified and almost unintelligible to students not inclined to graphical thinking. Some numerical examples in the text do not specify all the variables, so that additional assumptions are needed to verify the given answer. No problems or exercises are suggested.

An amazing amount of up-to-date information is compressed into the 365 well-printed pages. Concepts and terminology are strictly current, with few exceptions; one exception is the use of "ionosphere" for "thermosphere," another is the retention of "centigrade" rather than the internationally adopted "Celsius." Metric measures are used in most cases, although English measures, especially linear, are often cited, with metric equivalents given in parentheses.

In sum, Riehl seems to have accomplished his secondary purpose—that of providing "a volume [suitable] for study and reference [use by] engineers and other professional men and women whose work requires some understanding and judgment about the atmosphere." It may be good collateral reading for courses in hydrology, historical geology, space physics, or ecology, and it can give an elementary class a superficial familiarity with the atmosphere. But it does not provide a rigorous and thorough development and explanation of basic physical principles, which are both essential to any understanding of meteorology.

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Petroleum Exploration

The applied science of petroleum exploration has an unusual literature. Many pages are published which describe single oil fields and give production statistics or news of new discoveries, but seldom is an attempt made to synthesize the data and thereby provide an explanation of where the oil came from and why it accumulated at certain places. Most of the interpretive papers that are published are pronouncements made by senior executives of petroleum companies when they retire.

In an attempt to fill this gap, the Southwestern Federation of Geological Societies held a symposium on Fluids in Subsurface Environments, in January 1964, at Midland, Texas. This volume, **Fluids in Subsurface Environments** (American Association of Petroleum Geologists, Tulsa, Okla., 1965. 422 pp., $10) edited by Addison Young and John E. Galley, is the transactions of that meeting. The conveners brought together specialists on the West Texas subsurface and research workers in the fields of organic, inorganic, and isotope geochemistry. The papers include discussions of the hydrocarbons in modern sediments, the migration of oil, the distribution of