journals, publishers, libraries, professional societies, and other organizations, including universities and research foundations (*11, 12*).

Industrial and governmental laboratories have had for some years, and at an increasing rate are establishing, science communications groups whose functions frequently embrace independent research and teaching, as well as service. No such units exist in academic and other nonprofit, nongovernmental institutions, so far as I am aware (*13*), although I have suggested such groups (*14*). Since, with the exception of the American Chemical Society, organizations of laboratory and clinical scientists do not recognize professionally the experts in communications in their fields, academic scientists are excusably hesitant to enter communications work lest it jeopardize their chances of advancement. The existence of a national communications group made up primarily of scientists might encourage literature science developments in academic staffs.

This proposal is fundamentally in the field of education and was presented accordingly before Section Q. The encouraging reception there is reminiscent of the fact that the Division of Literature Chemistry grew out of the Division of Chemical Education of the American Chemical Society. The proposal is not restricted, however, to the advancement of educational technology; as conceived, it concerns the entire function of the AAAS—the advancement of science.

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Book Reviews

Marine Geology. Ph. H. Kuenen. New York: Wiley; London: Chapman & Hall, 1950. 568 pp. $7.50.

Professor Kuenen states that in preparing a work on marine geology he wished to "introduce university students of geology to an important branch of the science," to provide a guide to students who wish to explore the field, and to advance science by presenting achieved results and the problems remaining to be solved. He seems to have accomplished his objectives, but the problems remaining to be solved are far greater in number than the certainly achieved results.

To discuss in detail the many subjects covered in the book would involve pages not available for a review. Only some of the high lights can be noticed. In successive chapters there are considered: physical oceanography, the sea basins. Indonesian deep-sea depressions, sources and transportation of marine sediments, the formation of marine sediments, coral reefs, geomorphology of the sea floor, and eustatic changes of sea level. The author emphasizes that many problems of marine geology await solution, and, although he presents many of them with sympathetic consideration of the views of others, Kuenen has no hesitation in stating objections.

Discussion of the movements of sea water is rather complete, but parts are not easy reading. It is shown that the movements are generally quite complex because of various factors involved. Places of little or no movement of marine waters are designated "poorly ventilated"—for example, the Black Sea and the fiords of Norway—but there are other fiords of similar character to which no reference is made. Consideration of poorly ventilated basins is timely, because they are rich in hydrogen sulfide, and though almost barren of life other than anaerobic bacteria they commonly contain much organic matter. The sediments are termed "euxinic." Overlying surface waters may be abundantly populated and, if the remains of the organisms living there settle on the bottom, perfect preservation is likely. Sediments of this origin are responsible for some black shales. The Baltic Sea is stated to have poorly ventilated bottom waters and to have hydrogen sulfide temporarily present, but nothing is said of the limans of the East Baltic, in some of which hydrogen sulfide is so abundantly formed that the odor may be carried for miles. Brief comment is made on the possibility that, under some climatic conditions different from those of the present, the deep bottoms of the sea might become poorly ventilated.

The author is of the opinion that the ocean basins have been permanent since the far distant past. Respectful consideration, however, is given to the views of other geologists who have suggested a lesser degree of permanence. Three oceans are distinguished: Pacific, Atlantic, and Indian. The Antarctic Sea, North Polar Basin, and Norwegian Sea are considered parts of these oceans. Other waters are marginal and inland seas, which may be deep or shallow. The

shallow seas are thought to have been important sites of deposition of ancient sediments. The problem of origin and the characteristics of the continental shelf are examined, and it is concluded that the origins, though far from being explained, are likely to have been different on different coasts. The terrace on the Atlantic coast of America seems to have been formed by fill, with some erosion, whereas on the Pacific coast faulting played an important part.

An entire chapter deals with the Indonesian deep-sea depressions, which have been studied for many years by Dutch geologists—among whom are Molengraaf, Brower, Kuenen, and his associates—and also by others. Eighteen basins ranging from shallow to very deep have been differentiated. The deep basins are either V-shaped or U-shaped, and comparison is made with fossil sedimentation basins. This chapter includes some consideration of geosynclines, and Kuenen very wisely does not add any new names to the many that have been coined for structural depressions. The question is raised as to whether any of the ancient sedimentation basins were abyssal in character, and it is noted that our knowledge of the depths of deposition of fossil sediments is limited to the evidence provided by diagnostic foraminifera, which indicate whether a sediment was deposited in 500–1,000 meters rather than 5,000–6,000 meters.

The sources of sediments and the agents delivering them to the sea are the atmosphere, which brings meteoritic particles, volcanic matter, and wind-blown sand; rivers; coastal erosion; glaciers and ice; skeletons and tests of organisms; and chemical precipitates. Some sediments are derived from erosion of the bottom. Transportation is accomplished by waves and currents, slumping, and turbidity currents. The last are considered important.

Kuenen fully appreciates the importance and complexity of the marine profile of equilibrium in the deposition, erosion, and preservation of sediments. Unconformities, disconformities, and diastems are defined. The reviewer is not sure that he agrees with Kuenen's understanding of the diastem, which, it is stated, may be recognized by bedding planes, sudden alterations in composition of sediments, and presence of broken or attached shells; but it is also very wisely noted that not one of these criteria is decisive. The reviewer knows of no criteria by which a diastem may be recognized, and of no way by which it may be distinguished from a disconformity. There is agreement with the view of Barrell that the sum of the time intervals recorded by the sediments in many sections is much shorter than the times represented by lost intervals. This would apply particularly to sediments deposited on bottoms that remained for a long time near the base level of deposition but not to bottoms that remained much below that level for a long time.

It is refreshing to note the importance ascribed to environments in the deposition of marine sediments, and to the complexity of environmental factors. Environments are littoral, neritic (0–200 m), bathyal (200–1,000 m), and abyssal (greater than 1,000 m). It is also noted that distance from land is at least equal in importance to depth in determining the characteristics of the sediments. Other environments considered are the euxinic, delta, tidal flat, and estuarine. The last three are defined as transitional to land environments.

Sediments are described under names that are current in the literature. New names are not proposed. Destruction of stratification by mud-eating organisms is noted in several places, but the impression is left that its importance is underestimated. Rhythmic stratification and cyclothems receive brief consideration. Radioactivity of recent sediments and its absence in older sediments are explained, and attention is given to rates of deposition, particularly of those sediments deposited beneath the deep sea, the volume of which is shown to be large. The geoeconomy of several common elements is examined: for example, it is stated that silica is now accumulating on the continents, and that calcium carbonate is being, and for a long time has been, removed from circulation through deposition over the deep bottom of the sea and that within 100,000,000–150,000,000 years it may become a scarce substance.

Coral reefs and coralline deposition are described with many illustrations drawn from Kuenen's work in the East Indies. The work of algae in the construction of reefs is noted but does not receive the emphasis that it is currently believed to deserve. Theories of barrier reef and atoll formation are reviewed. The thorough treatment of coral reefs seems out of proportion to their importance, but it reflects the current emphasis on reefs in petroleum geology.

The chapter on the geomorphology of the sea floor is largely concerned with submarine valleys, which are classified as shelf channels and submarine canyons. The former are stated to be drowned river valleys, of which a well-known example is the Hudson Channel off New York City. The rather striking relation between some submarine canyons and rivers on the adjacent land is noted, but there are also many large rivers without canyons, and some large canyons are aligned with small rivers. The author supports Daly's view that the canyons were produced by turbidity currents during the Ice Age, but the reviewer doubts that turbidity currents are competent to erode canyons to the great depths that have been noted. The views of Davis, Sheppard, Johnson, and Bucher are considered and rejected. Here, too, the extended consideration seems out of proportion to importance.

Changes of sea level are dealt with in the final chapter. Possible recent eustatic changes are noted, but it is pointed out that the data supporting them are not completely trustworthy. Attention is given to glacial and postglacial eustatic changes of sea level resulting from extraction of water to make the glaciers and return of the water when the ice melted. It is noted that the data in general are little more than estimates. Stratigraphy is claimed to prove the occurrence of eustatic movements in the geologic past,

though the reviewer doubts that there have been many worldwide rises or falls of sea level. Kuenen concludes that the cause must be sought in changes in the cubic capacities of the basins, and he decides that deposition of sediments and diastrophism are inadequate to account for the movements that are known. He concludes that even the lesser eustatic movements "cannot be accounted for by processes operating in or at the surface of the crust," and that the principal cause must be found in internal factors acting below the crust.

The book is almost encyclopedic in character and illustrates the wide experience and thinking of the author, although it is difficult reading in places, partly because of deficiencies in the writing. Stratigraphy and sedimentary geology had their inception and early development through the work of students who had little knowledge of the sea, and many of them had never seen the sea. During the past three quarters of a century more and more scientists have seen the sea at work. To most students of earth science, for whom this has not been possible, *Marine Geology* will be a welcome volume. Many geologists will find sections to which they will wish to take exception, but to all the work should be of great service. The science of geology owes a debt of gratitude to Professor Kuenen for having brought the work to completion.

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Lehrbuch der Theoretischen Physik: Struktur der Materie, Vol. II. Walter Weizel. West Berlin, Germany: Springer-Verlag, 1950. Pp. 772–1,540. DM 69.90 bound, DM 66 paper.

The art of *Handlehrbuchwriting* is a typical German one, of which this is a very fine example. Whereas many books slide easily over certain subjects, depending on the author's preferences and opinions, the presentation in Professor Weizel's book marches forward with calm, heavy steps, leaving no stone unturned. The student will not be annoyed by statements such as "it can be easily shown that," or "after some simple calculations we obtain," since every derivation is described in all its painful detail. On the other hand, the book lacks the individuality characterizing the writings of authors of great contributions to the subject—a quality that may be of some value to a student struggling through many compactly printed pages. The text really helps, however, to fill the vacuum that existed in the physical literature in this field.

The presentation begins with a discussion of the elements of atomic theory, including a treatment of hydrogen and more complex atoms, by means of simple wave equations. The next chapter is devoted to the detailed development of modern quantum theory, and includes discussions of matrix method, statistical interpretation of wave mechanics, and the relativistic theory of electron spin. This is followed by chapters on molecules and valency forces, quantum statistics, theory of gases, and the theory of solids. In every instance the subject is discussed in great detail, providing a complete picture of our present knowledge.

In contrast to the rest of the book the last chapter, devoted to the problems of elementary particles and nuclear physics, is extremely sketchy and incomplete. For example, it contains lengthy discussions of the mathematical formalism of the meson theory of nuclear forces and the structure of the deuteron, but completely omits such important topics as Fermi's theory of β-decay. The treatment of nuclear reactions occupies a scant four pages, and nuclear fission is mentioned only by name.

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