To summarize the institution's achievements would be to write the later history of science in twelve major departments. The colossal instruments of Mount Wilson have extended the visible heavens, so that we now regard the Milky Way as but one of many universes. Terrestrial magnetism, thanks to the cruises of the non-magnetic ship *Carnegie,* is now a recognized branch of geophysics, with a mass of facts so well correlated that the secular changes which occur in the mariner's compass can now be scientifically corrected. The institution's Cold Spring Harbor station has attacked the difficult task of determining how the thousands of different plants and animals originated and how they are still evolving, with results that would even now enable man to improve himself biologically and socially if he had the courage to apply them. In the Geophysical Laboratory discoveries have been made which enable us to form a truer picture of the process to which the earth was subjected when rocks and oceans were formed from a molten globe. Man's mechanism for converting food into tissue and energy is less mysterious than it was, thanks to the researches of Dr. Benedict and his associates. Mainly through the efforts of Carnegie archeologists have we been able to envisage the magnificence of the vanished Mayan civilization of Central America.

Mindful of its obligation to the public, the institution has placed its volumes in the principal libraries and has periodically issued simply worded statements which have been widely disseminated as news. Thus the great reading public and specialists have been welded to form a constituency for pure science. 'As it takes stock of its accomplishments the institution may pride itself on having faithfully carried out both the letter and the spirit of Andrew Carnegie's purpose, as expressed in the articles of incorporation approved by Congress, "to encourage, in the broadest and most liberal manner, investigation, research and discovery, and the application of knowledge to the improvement of mankind."—*The New York Times.*

SCIENTIFIC BOOKS

Die Pflanzenreste des mitteldeutschen Kupferschiefers und ihre Einschaltung ins Sediment. Eine palökologische Studie, by PROFESSOR DR. JOH. WEIGELT. 198 pp., 14 text figs. and 35 plates. Gebrüder Borntraeger. 1928.

THIS interesting and important contribution is an attempt to explain the manner of origin of the Kupferschiefer, largely from the evidence of the contained plant fossils—a subject that has been actively discussed, chiefly from other points of view, both by paleontologists and economic geologists, as is evinced by the bibliography of 171 titles. Much of this discussion has been concerned with the origin of the copper ores, a subject outside the scope of the present discussion, although Weigelt presents some evidence of the syngenetic origin of these ores.

The Kupferschiefer is a black bituminous shale, remarkable for its areal extent, which is said to be over 60,000 square miles, and for its slight but uniform thickness of between two and three feet. In places copper ores are abundant enough to have given rise to a mining industry, as along the flanks of the Harz. The Kupferschiefer lies on either a seven-foot conglomerate or on a white sandstone—the Weissliegendes, beneath which are several thousand feet of mostly barren red sandstones and shales of lower Permian age—the Rothliegendes. The latter includes coarse conglomerates as well as coals, and porphyritic and diabasic effusives and their associated tuffs.

Above the Kupferschiefer is a twenty-five-foot magnesian limestone with marine fossils, and this is overlain by thick saliferous beds of the upper Permian, with anhydrite, rock salt, carnallite, etc. Weigelt considers the area to have been land locked except on the east, with the Fennoscanian land mass on the north, the rising Armorican mountains on the west and the Variscan mountains on the south, the two last joining at almost right angles in the Auvergne, representing a period of folding frequently called the Hercynian, especially in France.

Weigelt derives the Rothliegendes from these rising mountains and considers them to have been sufficiently high to have brought about extremely arid conditions in the German basin, thus accepting the orthodox view that red sediments are indicative of deserts. The Kupferschiefer deposition was inaugurated by a transgression of the sea from the Russian region. This sea was very shallow and is considered to have been bordered during its transgression southwestward by a marginal zone of vegetation back of which was desert. The Weissliegendes, because it contains dreikanter, is interpreted as largely reworked dune sands and not a humic bleaching of basement sands. The plant fossils are believed to have been washed into the basin of deposition by occasional floods. Subsequent to Kupferschiefer time the connection with the open sea to the eastward was chocked, either by palustrine vegetation or a change in the attitude of the land, and its evaporation furnished the middle Zechstein salt deposits. This phase was followed by a renewal of sea connection and a second isolation resulted in the upper Zechstein salt deposits.

Most of the widely distributed plant débris consists of wood fragments or twigs, of prevailing coriaceous plants, profuse in individuals but sparse in species.

Much space is devoted to an analysis of their attitude and condition, as to degree of compression or maceration, the extent to which the twigs had lost their leaves or been otherwise dismembered. Over 130 pages are devoted to the plants, which are very thoroughly discussed and profusely illustrated, and the author's strictures on the multiplication of species by the older authors, especially Geinitz, are well deserved.

The plant material has come out of the mines almost entirely, and its impregnation with bitumen results in the rather rapid deterioration of features, thus rendering the older types almost worthless and necessitating the study of fresh material, of which Weigelt studied over 1,200 specimens and figures nearly 500. The chief plants comprise fragments of fern-like plants (probably seed ferns) among which Callipteris is predominant; pinnules of Taeniopteris —which may be a seed fern or a cycadophyte; Calamite branches and foliage (Asterocalamites); leaf fragments of Baiera; a new type named Archaeopodocarpus, which includes most of the earlier material called Ullmannia; various cones; Voltzia twigs, and considerable pollen.

The book is exceedingly thorough and the evidence is considered from a number of angles, so that it is very stimulating. It also eliminates from the literature of paleobotany many of the pseudospecies of older authors. Whether Weigelt's general picture of the history and ecology will stand, only time will tell. One wonders if the Hercynian folding may be confidently considered to indicate high mountain barriers; or if the Rothliegendes with its coal seams is necessarily a desert deposit because it is prevailingly red in color, although I suppose it is difficult for any one at Halle to think otherwise; also what became of the flood sediments that uprooted and swept the vegetation into the Kupferschiefer, and if the enormous amount of salts in the middle and upper Zechstein could have been furnished in the relatively simple way that Weigelt postulates.

Be this as it may, the book is a model of painstaking research in a relatively new and difficult phase of paleontology, and discusses a region of surpassing interest.

EDWARD W. BERRY
THE JOHNS HOPKINS UNIVERSITY

What is Life? By AUGUSTA GASKELL. Charles C. Thomas, Baltimore, Maryland. 1928. 324 pp.

THIS book challenges the attention by reason of the problem considered and the objective verifiable nature of the solution promised in the early chapters. The author endeavors to solve the immediate problem of abiogenesis and to account for all the characteristics of living forms, not only those thought of as physical but the so-called psychical qualities as well.

The essence of the theory is that at certain critical times the hydrogen atom has formed an unusual physical configuration. In this peculiar atomic condition organic chains are added in an intra-atomic union. These configurations, referred to as the Z systems, are the basis of life phenomena.

Gaskell does not hold to a strictly evolutionary scheme. She holds that the appearance geologically of newer and higher forms followed as a result of tremendous upheavals in the physical environment, which offered opportunity for new and more complex Z systems to arise. Evolution appears to be a genetic progression from lower to higher forms, the more complex Z systems, as an outcome of the law of probability, arising more infrequently than the simpler systems and later.

A point of interest to the psychologist is the dualistic system suggested by the theory. The Z system has definite material properties analogous to those of the ordinary physicochemical system. In addition it has the attributes of the unique Z configuration which are the life properties.

Intelligence is determined by the complexity of the Z system, whose maturation is inversely proportional to its complexity. Gaskell holds that, as a result, the length of the period of infancy must be accepted as a standard of measurement for rating the intelligence of a race or people.

Among the miscellaneous problems theoretically solved by Gaskell is the cause of cancer. Injury to certain cells of the body results in the formation of indifferent cell material in which a critical concentration of ions develops, affording the opportunity for the growth of a neoplasm. The inference is that the conditions following the trauma determine a local independent Z system.

In considering the value of the theory it must be pointed out that Karl Compton, in the Introduction, speaking from the physicist's point of view, states that we know nothing about the assumed Z combination of protons and electrons, and consequently we may consider such a theory possible. It is evident that Gaskell's theory lies wholly within the conjectural realm. The method of unique assumptions affords the possibility of building any number of logical systems in the explanation of any phenomena. The biogen molecule is an attempt to explain vital phenomena in terms of a unique physicochemical situation. A number of other examples of similar attempts in the history of science could be cited.

Notwithstanding a chapter devoted by the author to the possibilities of experimental verification of her theory, we find no evidence that such verification is