dustry products was increased from 34 billions to 62 billions, while in 1914 the value of the American chemical products was $1,299,085,000, and in 1929 that had increased to $3,315,228,000. That is, both the value of the goods produced in our chemical industries and the energy consumed have increased nearly 3 times against the all-industry increase of only twice.

In the industries to-day the development of chemical operations has reached the point where none of our factories can operate without chemicals. In a few cases we have emphasized this as in the case of agriculture which is dependent upon fertilizers and insecticides, and the textile industry which requires bleaching materials and dyes. These examples could be greatly extended, to say nothing of transportation, communication—the telephone, telegraph and radio—medicine, the electrochemical industry, and even the arts—all must have their essential chemical supplies.

As gunpowder disrupted the seemingly impregnable alliance of kings, barons and bishops which sustained the feudal system; just as the machine inaugurated the industrial revolution which opened up such vast resources for production, so chemistry is moving the foundation of our present system. "The chemical revolution will bring lower costs, a growing multitude of new products and the increasing replacement of familiar wares by superior synthetic articles." The chemical revolution will make possible greater and broader consumption which will "enable us to transcend splendidly the progress of the past century."

OBITUARY

GILMAN A. DREW

1868–1934

THE death of Gilman A. Drew at his home in Eagle Lake, Florida, on October 26, after a lingering illness, will recall to the minds of American zoologists first of all the great services that he rendered to their science by his work at the Marine Biological Laboratory over a period of twenty-five years from 1901 to 1926. At the end of that time ill health forced him to give up his work at Woods Hole, and he retired to his orange grove in Florida. He was active in the work of his grove and in connection with agricultural affairs in Florida until about two years ago.

Drew was a student of W. K. Brooks at Johns Hopkins University, and his assistant for two years after obtaining his Ph.D. degree in 1898. There he acquired his interest in mollusks and laid the foundation for his subsequent investigations. His publications were not many in number, but they were remarkable for their finished technique and accurate delineation and description. He had the mind of the naturalist rather than of the analytic experimentalist or philosopher; and he combined studies of anatomy, behavior and embryology in gaining a total view of the life history of the species under consideration.

His study of the breeding mechanisms and behavior of the squid, Loligo, is one of the most finished and complete studies of reproduction in any animal. In this he began with breeding behavior, which is faithfully described; and proceeded thence to an examination of the structure and mechanism of the extraordinarily complicated spermatophores of the male, the method of their use and their correlation with remarkable structural peculiarities of the female which provide a double insurance of fertilization. He described very minutely the manner in which a long series of structural and functional mechanisms of the reproductive apparatus of the male produce these beautiful adaptive structures, timed to discharge a fertilizing flow of spermatozoa long after their attachment by a special cementing segment on the appropriate spots of the body of the female. He shows in a most complete way how structure, function and behavior combine to produce the perpetuation of the species. If Drew had never done any other work, this alone would mark him as one of the really accomplished naturalists of his time. It is unfortunate that this work is not better known to students of animal behavior.

Drew was also a stimulating and resourceful teacher. He was professor of biology at the University of Maine from 1900 to 1911; but his best opportunity was in the course in marine invertebrates at Woods Hole, which he directed from 1901 to 1909. In the field trips he was one of the most active of all the party; in spite of his lameness, with his one powerful leg and his trusty crutch, no one could go farther or better than he on land, over boulders, or in the shallow water collecting. In the laboratory he was equally active. A book for students which he published on this subject has enjoyed a wide reputation.

Drew became assistant director of the Marine Biological Laboratory in 1909, and after two years he resigned his professorship in the University of Maine to devote his whole time to this work. It would be difficult to do full justice to the value of his services during the seventeen years devoted to administration, within which the great material developments of the laboratory took place. In the splendid modern buildings of the Marine Biological Laboratory the marks of Drew's minute supervision, ingenuity and in-

ventiveness are everywhere apparent; he was at once the architects' best collaborator and the investigators' chief reliance, in construction and equipment. He introduced and perfected the new system of accounting that the larger operations demanded, and was constantly at the service of investigators in the satisfaction of their multifarious needs.

Drew was an upstanding, unselfish, conscientious, uncompromising, energetic man, enjoying the confidence of all, and the affectionate regard of many friends. His election as president of the American Society of Zoologists in 1920 testifies to the respect of his confrères. His memory deserves perpetual preservation in the minds of American biologists.

FRANK R. LILLIE

RECENT DEATHS

DR. EDWARD RENOUF, from 1890 until his retirement in 1911 collegiate professor of chemistry at the Johns Hopkins University, died on November 14 at the age of eighty-six years. Dr. Renouf had been connected with the university since 1885, when he was appointed assistant in chemistry.

DR. ERIC VON FUELNEGG GEBAUER, organic chemist, of Gary, Ind., formerly assistant professor in the Medical School of Northwestern University, died on November 18, from inhaling hydrochloric acid gas, while carrying out an experiment in his laboratory. He was thirty-three years old.

DR. KARL RITTER VON LINDE, who developed the Linde process for the manufacture of liquid air, died on November 16, in his ninety-third year.

HENRY ATTWOOL ALLEN, formerly a member of the staff of the British Geological Survey, died on October 3 at the age of seventy-nine years.

SCIENTIFIC EVENTS

THE WAITE AGRICULTURAL RESEARCH INSTITUTE

AN account of the history and development of the Waite Agricultural Research Institute from the year 1925, when its activities first started, up to 1932 has been issued by the University of Adelaide and is summarized in *Nature*. Although the chief objective of the institute is to conduct research on plant and soil problems, it also provides an advisory service to the Department of Agriculture in plant pathology and entomology and gives specialized courses of instruction for the agricultural degrees in the University of Adelaide.

The scope of the scientific work undertaken at the institute covers a wide field. As might be expected, the limited rainfall and the development of a system of cereal and grassland management to suit such conditions forms one of the major problems, and a study of the water requirements of plants under various manurial treatments and the differences exhibited by improved varieties of cereals and leguminous plants in this respect has led both to increases in yield being obtained and also to the extension of the area capable of supporting the crop. Pasture problems are being investigated both from the agricultural and the chemical point of view, special attention being paid to their mineral content and improvement by means of the introduction of superior species and strains.

Survey and classification of the various soil types in Australia forms a further branch of the work in the chemical section, and fertility problems, particularly in the irrigation settlements, are also being investigated. Entomological work has only been in progress since 1929, but already much valuable information has been obtained with regard to various pests of pasture, cereal and orchard crops. Diseases of agricultural crops inevitably form an important branch of the work of the institute, and deficiency diseases due to a lack of some mineral element have also been successfully investigated. Breeding experiments with the view of securing varieties with improved resistance to fungus diseases form a natural corollary to the work of the plant pathology section.

Besides the land devoted to agricultural experiments, a certain area is reserved as a permanent park. Advantage has been taken of this to plant a portion as an arboretum, one section being used for indigenous, and another for introduced, species. The report includes a list, with abstracts, of the one hundred and forty-one papers published from the institute during the years under review.

ELM DISEASE IN GREAT BRITAIN

THE London *Times* writes: "The conclusion this autumn of the seventh annual survey of the elm disease permits a review of the extent of attack by this insidious and at times highly virulent malady of the elm genus." During the past summer the disease has made definite progress in nearly every area examined, but the severity of attack is still below that of the peak year, 1931.

Infected trees have been recorded in three new counties, Lancashire, Merionethshire and Cornwall. If the counties of England and Wales are classified according to severity of attack the following position is