Laboratory and Majorie Fleming provided a fund for research in chemistry. All honor to these pioneers, who ventured before there was any assurance of success. Ninety-five per cent. of all business ventures fail, and I suspect the record of philanthropic enterprises is not much better. The *"enterprisers"*—the men who start things off *and make them go*—richly deserve all the credits and all the social rewards which they ever get. Thus chemistry, through the Gates brothers, made its start at the California Institute of Technology.

The next chapter reveals the stuff of which Dr. Noyes was made. Though chemistry was his one devotion, and though the building of the Gates Chemical Laboratory gave both it and him the unquestioned leadership in the development of the scientific position of the institute, yet from 1917 to 1921 (he gave up entirely his M. I. T. connection in 1920) he threw himself whole-heartedly, along with Dr. Hale and Mr. Fleming and Dr. Scherer and Dr. Bridge and Henry M. Robinson and Robert Gillis, into the effort to get a better housed and better financed and better manned department of physics at the institute than could be immediately hoped for in the case of chemistry. This definite subordination of his own individual interests and devotions to what he regarded as the larger interests of the enterprise as a whole reveals the unusual objectiveness and greatness of soul of Arthur A. Noyes. Such men are rare, and when one appears the whole world does him homage.

The next big step in the development of chemistry at the institute began to be taken in 1925 when the Gates brothers came forward with the offer to build the second unit of the Gates Chemical Laboratory. This was completed in 1927, and expanded notably the facilities for carrying on the growing work in general, physical, inorganic and industrial chemistry, but organic and structural chemistry, the most alluring and the most promising of the newer aspects of chemical science, were still very inadequately provided for.

Mr. and Mrs. Charles W. Gates then brought the attention of their friends Mr. and Mrs. E. W. Crellin to the opportunities which they themselves had so fully grasped in the earlier chemical developments at the institute. The result seven years later is this beautiful and adequate Crellin Laboratory which we are dedicating to-day, while the maintenance needs of this new work are taken care of through generous grants from the Rockefeller Foundation, which has watched so carefully this young and vigorously growing institution, and has offered to help it substantially at a number of critical junctures. Indeed, its total contributions to the development of the institute, without including its support of the 200-inch telescope project, have now amounted all told to about four million dollars.

Thus the facilities for a frontal attack on the most pressing problems of bio-organic and structural chemistry—that is on the problems of life itself—are now provided through the joint interest and generosity of Mr. and Mrs. E. W. Crellin and the Rockefeller Foundation. With oarsmen like these and those found in the group of institute chemists "pulling at the bars," the chemical bark of the California Institute of Technology can scarcely fail to win in the race for human betterment through chemical and biochemical advances.

OBITUARY

JOHN JACOB ABEL

IN Baltimore, on May 26, 1938, the long career of a great pioneer figure in American experimental medicine ended. Besides being distinguished for his many notable contributions in his chosen fields, John J. Abel will be remembered as the "Father of American Pharmacology" and the founder of a school of pharmacologists. Those with whom he came into intimate contact will never forget his magnetic yet simple personality, his unquenchable devotion to research, his high idealism, indomitable enthusiasm and optimism, his remarkable capacity for turning apparent defeat into victory and the unique ability he had developed for dealing with minute amounts of complex chemical substances of biological importance.

Abel was born on May 19, 1857, near Cleveland. His family came from the Rhine Valley of the Palatinate. He had no scientific forbears on either side. He received his Ph.B. degree from the University of Michigan in 1883, but had an interim of three years in his college course, during which he served as principal of a high school at LaPorte, Indiana, 1879–1880, where he taught Latin, mathematics, physics and chemistry. From 1880 to 1882 he was superintendent of the public schools at LaPorte. Abel must have looked back on these years with satisfaction, for it was in LaPorte that he met a teacher in his school, whom he once described as a "very sweet mild little lady with a great deal of force." This lady, Mary Hinman, became his wife on July 10, 1883, was his companion for fifty-five years, and made possible the life of intense devotion to research which he chose to live. All who knew Abel at all intimately realize the important role which Mrs. Abel played in his successful career.

It was characteristic of the man, that after choosing scientific medicine as a life work, he submitted himself to a prolonged, broad, fundamental training. After a year in graduate study with Newell Martin at the

Hopkins, seven years were spent in some of the leading universities of Europe studying chemistry and medicine. His teachers during this period are remembered for their distinction in their various fields: in anatomy, His, Braume and Schwalbe; in physiology, Carl Ludwig; in pharmacology, Oswald Schmiedeberg; in biochemistry, Drechsel, Hoppe-Seyler and von Nencki; in chemistry, Wislicenus; in pathology, Arnold and v. Recklinghausen; and in clinical branches such men as Wagner, Kussmaul, Erb and Naunyn. His breadth of training is also evidenced by the many universities in which he studied: Leipzig, Strassburg, Heidelberg, Berne, Vienna, Würzburg, Berlin and Paris. In 1888, he received the M.D. degree from the University of Strassburg. Knowing that he had to earn his living and realizing the lack of full-time opportunities in scientific medicine in this country half a century ago, Abel now spent a year "walking the wards" in Vienna to prepare for the possibility of having to practice medicine as the only outlet of a scientific career. It must have been a great relief when he was asked to occupy the chair of materia medica and therapeutics in the University of Michigan, where he remained for two years. In 1893, he came to The Johns Hopkins Medical School as professor of pharmacology, a chair he occupied until his retirement in July, 1932. On his retirement as emeritus professor, he served as director of the Laboratory of Endocrine Research, a special creation for his work, and here he pursued active research until a few days before his death. It was typical of the man that as soon as he was established in this laboratory, a new problem, having nothing to do with endocrines, captured his attention.

During his first years as professor of pharmacology at the Hopkins, he taught physiological chemistry as well as pharmacology, and for many years thereafter the former subject remained under his direction until his former associate, Walter Jones, was made professor of physiological chemistry in 1908.

Abel's contributions to medical science cover a wide range of subjects and extend over a period of a half century. Space will not permit nor is this the place for any detailed analysis or evaluation of his work. The main theme which seems to have attracted his attention early and to which he returned again and again was the isolation of the active constituents of various endocrine glands. That he early appreciated the great significance of such contributions is best shown by a quotation from one of his addresses. "The actual findings of definite and specific chemical principles in the organs of internal secretion has in each case an importance in the way of explaining and correlating a large number of disconnected facts, only to be likened to the discovery of the etiological cause of an infectious disease." His interest in the internal secretions was intense and he was fond of emphasizing the importance of the active pharmacological substances present in our bodies in the aphorism: "We are walking drug stores."

In 1895, nothing was known about the chemical nature of any of the active principles of the glands of internal secretion. Abel started work on the extremely difficult problem of the isolation of the pressor constituent of the suprarenal medulla. The result of this work was the isolation of the hormone, not in the form of its free base but in that of a monobenzoyl derivative. As a result of this pioneer work of Abel, others later obtained the pure crystalline hormone, and this has been followed by thousands of papers by other investigators dealing with the various chemical, physiological and therapeutic aspects of epinephrine. Some years later, when examining a specimen of a tropical toad, which exudes from its skin glands a creamy secretion used as an arrow poison, Abel noticed that this secretion made on a scalpel a peculiar greenish blue discoloration. Remembering that he had seen this color years before on a scalpel used in cutting the medulla of the suprarenal gland, he set to work and soon isolated from this external secretion the now familiar epinephrine.

This pioneer work of Abel in the isolation of epinephrine, the first hormone to have its chemical nature elucidated, his brilliant success in the isolation of the pancreatic hormone, insulin, as a beautifully crystalline compound from inert constituents of pancreatic extracts, and his ingenious invention of the method of dialyzing the circulating blood of a living animal are achievements sufficient to class him as an investigator of first rank. Many other researches were conducted along these lines of the chemical nature of the principles of internal secretion, many of which he never considered worthy of record. His very few general addresses—the Mellon, Harvey, Kober and Willard Gibbs lectures—all deal with the internal secretions and emphasize the importance of chemistry in medical research; they are all examples of painstaking and prolonged preparation in presenting the subject in an erudite and scholarly manner.

In between the periods when intensive effort was directed to problems of isolation of pure crystalline active principles, we find researches of a totally different type—a rather unusual combination for a single individual. The behavior of frog's muscle to acids, pharmacological study of the phthaleins, the efficacy of new antimony compounds in experimental trypanosomiasis, convulsions in frogs produced by acid fuchsin, the influence of the lymph hearts upon the action of drugs in cardiectomized frogs, and the studies on tetanus of the last years are the main examples of this side of Abel's scientific activity. When a new field

was started older interests were for the time cast aside, and all effort was devoted to mastering the new subject. It is, to say the least, extremely rare to find an investigator on his retirement at the age of seventy-five embark on the exploration of a field requiring totally different technique and methods from those with which he had been concerned for nearly half a century. Abel, however, did just this, and it is entirely in keeping with his fearless spirit, indomitable enthusiasm, youthful outlook and receptivity to new ideas, which all of his pupils recognized.

Several of Abel's publications appear under his name alone, but on most of them, especially in later years, we find the names of younger collaborators. Muirhead, Aldrich, Davis, Crawford and Taveau are the only collaborators up to the end of the epinephrine period; Ford, Rowntree, Barbour, Macht, Turner, Pincoffs, Rouiller, Kubota, Nagayama, Geiling, Bell and Wintersteiner were collaborators in the next period until retirement; the names of Evans, Hampil, Lee, Jonas, Firor and Chalian appear on one or another of his tetanus papers. The above list by no means includes all the many pupils or assistants who were in the laboratory at one time or another, many of whom never collaborated with Abel in his researches, but developed fields of interest of their own quite different from those of "the Professor." Important contributions on other topics appeared in an unbroken stream from his laboratory during the forty years of his directorship. Many of his pupils have occupied or now occupy important chairs of pharmacology, and even clinical medicine.

Abel found his greatest enjoyment in actively carrying on research with his own hands and became completely wrapped up in the major problem engaging his interest. In spite of his wide interests, he refused to allow himself to be side-tracked from his major objective of the time, which would appear to explain why he did not figure in the usual accompaniments of a successful scientist—medical societies, committees, boards, etc. In view of this rather limited activity outside of his laboratory and study, it is curious to see his intense interest in scientific journals and in the organization of national scientific societies. He served from 1896–1905 as associate editor of the *Journal of Experimental Medicine* when it was first established. He founded the *Journal of Biological Chemistry* with Herter in 1905 but withdrew from active editorship in 1909 to found *The Journal of Pharmacology and Experimental Therapeutics,* which he edited for twenty-three years. He issued the call and addressed the first gathering at which the American Society of Biological Chemists was founded, and formed the American Society for Pharmacology and Experimental Therapeutics. Here was something which he evidently regarded as of equal value to his research. Correspondence with many friends and acquaintances both in this country and in Europe was kept up during the whole long period of scientific activity. He knew how to take a true vacation, and dropped all work, and applied himself to this as intensely as he did to his scientific research.

The Universities of Michigan, Pittsburgh, Harvard, Yale, Lwow (Poland), Cambridge and Aberdeen conferred honorary degrees upon him. He was awarded the first Research Corporation prize, the Willard Gibbs, Conné and Kober medals and the medal of the Society of Apothecaries, London. A member of the National Academy of Sciences, honorary fellow or member of six American and fourteen foreign scientific societies, he received his last honor of Foreign Member of the Royal Society, London, the day of his death.

A mere description of the scientific work and numerous honors awarded him leaves one with a very incomplete and unsatisfactory picture of the man. The spirit of Abel was far greater than any of his scientific discoveries. He exercised a great influence on many pupils, assistants and others who came in contact with him during the course of his long scientific career; he served unconsciously as a very effective catalyst for the growth of scientific pharmacology in this country. He taught by example. None of the many who at one time or another were privileged to work in his laboratory failed to profit by his intense enthusiasm for his research, his youthful outlook on science, his tremendous optimism that the morrow would yield the coveted result, his fearlessness in engaging in difficult problems or in controversies, and above all the real simplicity of a very lovable man. None of these can forget the noon hour lunch table discussions where all the workers were thrown into intimate contact with "the Professor." Here the talk varied widely, sometimes largely shop talk, philosophical discussions, heated arguments, but above all a feeling of good fellowship with a certain amount of humor. The lift of the eyebrows and the merry twinkle in his eye as "the Professor" made some statement to provoke discussion will long be remembered by those who participated in these meetings. It was a special occasion when old pupils or assistants returned to lunch with the novitiates, to tell tales of the glories of the old days and anecdotes of the former conduct of their "Professor." Abel thoroughly enjoyed these luncheons and contributed largely to their success.

Despite his great absorption in his own major research problems of the moment, the door of his laboratory was always open to any worker in his laboratory or any former pupil or scientific friend. When one came for advice, one found a man who seemed to be

working against time, but one who was quite willing to stop to give advice to a younger colleague.

His research activities seemed to fill and permeate his whole life—he regarded research as a sacred torch to be kept burning at all times. In one of his addresses he writes: "Greater even than the greatest discovery is it to keep open the way to future discovery. This can only be done when the investigator freely dares, moved by an inner propulsion, to attack problems not because they give promise of immediate value to the human race, but because they make an irresistible appeal by reason of an inner beauty. . . . In short, there should be in research work a cultural character, an artistic quality, elements that give to painting, music and poetry their high place in the life of man."

A truly great international figure has passed. His many pupils, friends and acquaintances can not help but feel the loss, but can be reconciled to it by his long life of accomplishments and by the fact that he "died in harness" as he had wished.

The words of Socrates, which he once used to describe his old teacher Carl Ludwig, might well be said of John J. Abel. "A man whose desires are drawn towards knowledge in every form and who is therefore absorbed in the pleasures of the soul—one who is harmoniously constituted, who is not covetous or mean, or a boaster or a coward and can never therefore be unjust or hard in his dealings—he has no secret corner of meanness and is a searcher after and lover of the truth in all things."

He is survived by two sons, George H. Abel, of Philadelphia, and Robert Abel, of Boston.

E. K. MARSHALL, JR.

RECENT DEATHS

DR. BEVERLY T. GALLOWAY, who retired as pathologist of the Bureau of Plant Industry in 1933, died on June 13. He was in his seventy-fifth year.

DR. ROBERT MONTGOMERY BIRD, professor of organic chemistry at the University of Virginia, died on June 4 at the age of seventy-one years.

DR. GEORGE E. BURGET, for twenty years head of the department of physiology at the Medical School of the University of Oregon, died on June 4. A correspondent writes: "Dr. Burget's distinguished service to the school was not confined to his own department but permeated the entire school and community at large. It was felt especially in all scientific meetings and in the upbuilding of the Medical School Library. His presence was a great stimulus to productive scholarship and genuine research and the reverse to pseudo efforts."

BROTHER GEOFROY ARSÈNE BROUARD, of St. Michael's College, died at Santa Fe, New Mexico, on May 25, at the age of seventy-one years. A correspondent writes that "his collections of Mexican plants were among the most extensive and important ever assembled in that country. Especially noteworthy were his contributions to knowledge of mosses, hepatics and lichens, not only in Mexico but also in Louisiana and New Mexico."

DR. WILLIAM ARTHUR BONE, professor emeritus of chemical technology at the Imperial College of Science and Technology of the University of London and inventor of the Bone system of surface combustion, which he applied to industrial heating appliances, died on June 11. He was sixty-seven years old.

CHARLES FRANCIS MASSY SWYNNERTON and Dr. B. D. Buritt, of Tanganyika Territory, Africa, authorities on sleeping sickness, were killed in an airplane crash near Singida early in June. Mr. Swynnerton, who was director of tsetse fly research in Tanganyika, had devoted the last fifteen years to its study. Dr. Buritt was the government's tsetse research botanist.

SCIENTIFIC EVENTS

THE CAMBRIDGE MEETING OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE British Association for the Advancement of Science has issued a preliminary program for the annual meeting, which will be held at Cambridge from August 17 to 21 under the presidency of the Right Honorable Lord Rayleigh.

The inaugural general meeting will take place in the Regal Cinema, on Wednesday evening, August 17, when Lord Rayleigh will deliver the presidential address on "Natural Vision and Vision Aided by Science." The address will show how, taking the eye as a prototype, most of the observational methods of modern science may be regarded as derived from it by successive modifications. A further part of the address will deal with science and warfare and will be directed to show that the relation between them is of the nature of an accidental by-product, and has in no sense been the primary goal of investigation.

The presidential addresses before the sections are as follows:

A.—Dr. C. G. Darwin, on "Fundamentals in Physical Theory."

B.—Professor C. S. Gibson, on "Recent Investigations in the Chemistry of Gold."