who came here as visiting lecturer, and throughout the year chemical studies on vitamins and hormones were carried on in association with Professor F. W. Went and his colleagues in the division of biology. Dr. Edwin R. Buchman, who was associated with R. R. Williams in the structural investigation and synthesis of vitamin B_1 and who has been carrying on his studies of analogues of this substance at the institute, has been given appointment as research associate in organic chemistry; and Dr. Carl Niemann, of the University of Wisconsin and the Rockefeller Institute for Medical Research, has been appointed assistant professor of organic chemistry. Dr. Niemann, whose investigations have dealt with the chemistry of proteins and carbohydrates, is at present studying at the University of London and will take up residence at the Institute in July.

For the satisfactory completion of the Crellin Laboratory credit is due to the architects, Mayers, Murray and Phillip, and their representative Mr. Wayne Soverns, to Professor Robert A. Millikan, Professor W. B. Munro, chairman of the building committee, and Professor R. R. Martel, of that committee, to Professors W. N. Lacey and A. O. Beckman, who represented the division during the preparation of the plans and the construction of the building, to Mr. William C. Crowell, the contractor, and his able assistants, to Mr. Wesley Hertenstein, supervising engineer, and Mr. L. G. Fenner, superintendent of electrical construction, and to many others who contributed to the work. To all these men, and especially to Mr. and Mrs. Crellin, I express the thanks of the division of chemistry and chemical engineering, and its promise to make effective use of the new laboratory.

THE DEVELOPMENT OF CHEMISTRY AT THE CALIFORNIA INSTITUTE OF TECHNOLOGY[1]

By Dr. ROBERT A. MILLIKAN

CHAIRMAN OF THE EXECUTIVE COUNCIL OF THE CALIFORNIA INSTITUTE OF TECHNOLOGY

IN the spring of 1916 all of us scientific ground squirrels, who all over the United States come up occasionally to sun ourselves at the tops of the holes in which we are burrowing, found the news spreading from hole to hole that a new laboratory of physical chemistry was being started at Pasadena, and that this laboratory was to be under the direction of Arthur A. Noyes, who henceforth expected to oscillate between Boston and Pasadena.

The prestige of Dr. Noyes's name was what gave this news particular interest and currency, for the Institute of Physical Chemistry which Dr. Noyes had founded and directed at the Massachusetts Institute of Technology had already become, through his own work and that of the group of brilliant young men who had come out of it, the most outstanding laboratory of its kind in the country. Indeed, Dr. Noyes himself was already regarded as the most influential of the founders and inspirers of physical chemistry in the United States.

Within a few months of this time Dr. Noyes, whom I had never met before, and his old-time M. I. T. friend, Dr. Hale, whom I had known well since 1896, came to my door in the Ryerson Laboratory of Physics at the University of Chicago saying they wanted to talk over plans and discuss possible personnel for the new "Gates Chemical Laboratory." I first saw this laboratory in January, 1917, when I stopped here for a week to give a few lectures in Throop Hall on my way back to Chicago from Berkeley, where I had been giving the so-called Hitchcock lectures. Let me describe what I saw then. Just two buildings on this campus, namely Throop Hall and the Gates Chemical Laboratory, the rest weeds and dead or dying orange trees. Thirty-seven students all told had up to that date, January, 1917, taken the bachelor's degree from this institution, which in 1908 had announced to the world that it proposed to cease to be essentially a manual training high school and become one of the outstanding scientific and engineering schools of the country.

I marvelled then and I marvel now at the intrepidity, as well as the faith and the vision of the men who, led by George Ellery Hale, took the responsibility of making such an announcement. There was not a hundred thousand dollars of endowment in sight when they made it. By 1917 there were a few of them who had stepped up and backed up their words with enough of their own funds to provide some small beginnings of advanced educational facilities. Mr. Arthur H. Fleming and his daughter, Marjorie, had bought the present campus, and with the aid of other public-spirited citizens had provided for the cost of Throop Hall, erected in 1910.

The first provision for advanced work in chemistry or any other science was made six years later in 1916, when the brothers Charles and Peter Gates came forward and built the first wing of the Gates Chemical

[1] Address at the dedication of the Crellin Laboratory of Chemistry at the California Institute of Technology, May 16, 1938.

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