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THE FUTURE OF THE CRELLIN LABORATORY[1]

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ABOUT twenty years ago, to house the division of chemistry and chemical engineering, which was beginning its rapid expansion under the direction of Professor Arthur A. Noyes, there was constructed the Gates Chemical Laboratory, the gift of Mr. Charles W. Gates and his brother, Mr. Peter G. Gates. This marked the beginning of the period of development of the California Institute of Technology as an advanced scientific school. The second unit of the Gates Laboratory was built ten years later. In view of the personal interests of Professor Noyes, who was the leader in the introduction of the new methods of physico-chemical research in America forty years ago and the founder of the Research Laboratory of Physical Chemistry at the Massachusetts Institute of Technology, it is not surprising that the men whom he gathered about him were primarily interested in the field of physical chemistry and that it was in this field that their principal contributions to knowledge were made.

Professor Noyes, however, recognized the great importance of organic chemistry, and especially of that branch of organic chemistry dealing with substances which are physiologically active, such as vitamins and hormones; and he made plans for the development of the work of the division in this new direction. In my file of letters from Professor Noyes there is one, written in 1929, which contains a detailed chart of the course on which the division is now embarking, nine years later.

It was the interest taken in the work in chemistry at the institute by Mr. and Mrs. E. W. Crellin, leading to the construction of the Crellin Laboratory, which made the initiation of this new program possible. The Rockefeller Foundation, recognizing the need for fostering research in America in the border-line field between chemistry and biology and the suitability of the California Institute for this work, then made a large grant of money to support the researches to be carried on in the Crellin Laboratory during the next six years.

Organic chemistry was developed into a great science during the nineteenth century, and it seems probable that all or nearly all its fundamental principles have now been formulated. There is, however, a related field of knowledge of transcendent significance to mankind which has barely begun its development. This field deals with the correlation between chemical structure and physiological activity of those substances, manufactured in the body or ingested in foodstuffs, which are essential for orderly growth and the maintenance of life, as well as of the many substances which are useful in the treatment of disease. These various physiologically active substances are often extremely complex. Their chemical investigation has been made possible only by the development in recent years of highly refined techniques, permitting the organic chemist to determine the molecular structure of a very complex substance, even though it may be available only in minute amounts. In his attack on a recalcitrant molecule he may find it necessary to strengthen his forces by calling on the physical chemist, who during the past quarter century has developed powerful methods of studying the structure of molecules.

There are many ways in which chemistry is contributing to physiology and medicine—by the development of new general anesthetics, such as ethylene, vinyl ether and cyclopropane, of local anesthetics and of pharmaceuticals of all kinds, including such substances as sulfanilamide, with its extraordinary efficacy in the treatment of streptococcal infections—and continued progress will be made in these fields in the coming years. Considering the great advances in the study of vitamins and hormones since the time a decade ago when the synthesis of not one vitamin had been achieved, we may predict that success will soon reward the men who are now carrying on the attack on vitamin E and that many important discoveries will be made.

These substances are complex—containing twenty, thirty or forty atoms in the molecule—but not so complex as to make the determination of their structure by existent methods impossible. There is, however, a class of substances of the most extreme importance of life, the proteins, whose molecules contain thousands or tens of thousands of atoms. The proteins occur everywhere and serve the most varied purposes. The class includes such varied substances as pepsin, hemoglobin, albumen, globulin, keratin and insulin. The organic chemist has not succeeded in determining the configuration of any protein molecule, and it is doubtful that his methods alone can be applied with success, because the forces which hold the molecule in its characteristic configuration are probably not the primary valence forces with which he is accustomed to deal. Although there has as yet been little indication of a method of attack which might be successful, I feel that

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

the important steps in the solution of this great problem will be taken during the next ten years, through the cooperation of the organic chemist and his colleagues in associated sciences.

In the Crellin Laboratory the organic chemists occupy the second and third floors and the auxiliary rooms on the roof. Conveniently close, occupying the first floor, basement and sub-basement, are the physical chemists, with their appliances for the study of molecular structure by the methods of photochemistry, magnetochemistry, spectroscopy and x-ray and electron diffraction.

For twenty-five years Professor Howard J. Lucas alone has ably carried the burden of instruction in organic chemistry at the institute, and he and, more recently, Dr. J. B. Koepfli have worked effectively on a research program. During the present year there has been increased activity in this field. There was given in March and April a series of lectures on the chemistry of vitamins by Dr. Alexander R. Todd, of the Lister Institute for Medical Research in London, 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.