study of how and where vitamins function is that methods be available for their quantitative determination. Though each individual substance presents its peculiar problems it is safe to say that microbiological methods are destined to play a highly important role in the future determination of "B vitamins." The microbiological methods can be rapid and fairly accurate, and at the same time they can be applied to extremely small amounts of material.

Workers now associated with the writer have described acceptable assay methods for three of the "B vitamins," namely, riboflavin, pantothenic acid and biotin. Methods for others will be forthcoming shortly from our laboratory at the University of Texas. E. E. Snell, in the writer's laboratory, has been a pioneer in this field. The usefulness of these methods is particularly outstanding when the available material to be tested is far too little to be used in animal tests and even too small for most chemical tests, in case such are available.

Investigations with microorganisms have made it seem apparent that the "B vitamins" (or at least some of them) are more fundamental and of more far-reaching importance than the other vitamins. This is true in the sense that they function in the mechanisms of diverse forms of life. I believe there is no reason to think that vitamins A, D, E, K, or even C, function in the life of yeast cells, and for other microorganisms also they may be unimportant. The recent observation that cockroaches can be raised to maturity without vitamin A and that an assay of their bodies indicates its absence, is further evidence regarding non-universality at least of this one fat-soluble vitamin. On the other hand, so far as thiamin, pantothenic acid, nicotinic acid, biotin and riboflavin are concerned, the evidence indicates that they may be present and function in all forms of life from the highest to the lowest. These five have not been investigated with equal thoroughness. The two other "B vitamins," pyridoxin and inositol, have been investigated even less thoroughly but appear to be very widespread.

*Summary:* In spite of a general lack of emphasis on this field, yeasts and other microorganisms have been used in the discovery (and/or isolation) of four out of seven of the recognized members of the "vitamin B complex."[1] Their use in the study of how vitamins function shows much promise, particularly in that methods have been worked out or are in process of development for determining quantitatively on a micro-scale practically all the members of the B family of vitamins. Indications are cited that the "B vitamins" are unusually important, *i.e.*, for all forms of life, in contrast to the other vitamins which appear not to be universally distributed.

# OBITUARY

## HERBERT FREUNDLICH
1880–1941

HERBERT FREUNDLICH was born in Charlottenburg, Germany, on January 28, 1880, and died suddenly in Minneapolis, Minnesota, on March 30, 1941, of a coronary thrombosis.

Professor Freundlich was the son of Phillip and Ellen (Finlayson) Freundlich. He graduated from the gymnasium in Wiesbaden in 1898. He studied general science for one year at the University of Munich and then specialized in chemistry at the University of Leipzig under the distinguished leadership of Professor Wilhelm Ostwald. Here in 1903 he took his Ph.D. degree with a dissertation dealing with the coagulation of colloidal sols by electrolytes.

For the following eight years Professor Freundlich remained at the University of Leipzig, teaching analytical and physical chemistry, attaining the rank of Privatdocent in October, 1906, on the basis of his studies on adsorption from solution.

He was called to the professorship of physical chemistry and inorganic technology at the Technische Hochschule, Braunschweig, in the autumn of 1911. Here he remained until February, 1916, when at the invitation of Fritz Haber he joined the staff of the Kaiser Wilhelm Institut fur Physikalische und Electrochemie at Berlin-Dahlem to conduct and direct research work on the adsorption of war gases and to study charcoals and other adsorbents for use in gas mask canisters. In these studies he achieved notable success.

In January, 1919, he resigned his professorship at Braunschweig to remain permanently at the Kaiser Wilhelm Institut as chief of the Division of Colloid Chemistry and Applied Physical Chemistry. Still later he was appointed associate director of the Institut.

In 1923 he was made honorary professor of chemistry at the University of Berlin, and he received the same honor in 1930 from the Technische Hochschule of Berlin. In 1925 he accepted the invitation of the University of Minnesota and the Colloid Committee of the National Research Council to be guest scholar at the second National Colloid Symposium held at the University of Minnesota, and he remained in residence at Minnesota, giving a series of lectures on colloid chemistry in the following summer session. Here he captivated his American colleagues by his charming personality and established many enduring friendships. The invitation to be foreign guest scholar at the fourteenth annual National Colloid Symposium at the Uni-

versity of Minnesota was repeated in 1937, and again he remained at the university for a series of lectures in the following summer session.

Following the rise of the Nazi régime, Professor Freundlich was ordered in the spring of 1933 to dismiss all his associates who were not of the "pure Aryan" race. As a result of this order he resigned in protest and soon left his native land for the greater intellectual and scientific freedom which England afforded. Here in England he became associated with University College, London, through funds provided by Imperial Chemical Industries, Ltd., on the initiative of Professor F. G. Donnan and other eminent British scholars. In this post he remained until January, 1938, when he was called to the University of Minnesota as distinguished service professor of colloid chemistry in the graduate school of the university without college or departmental assignment. In this new and unique position Professor Freundlich could and did accept major responsibilities for graduate students from a variety of fields such as physiological chemistry, biochemistry and physical chemistry, and was frequently consulted by other students working in physics, physiology, etc. In the short time that he held this post at Minnesota, besides carrying on teaching and research in his own specialized field, he came also to fill the post of an "elder statesman" who was frequently consulted by both colleagues and students and from whom sound and disinterested advice was always available.

Professor Freundlich's scientific career lay almost wholly in the field of colloid and capillary chemistry. This field, since Thomas Graham (1805–1869), had lain largely dormant in the years which saw the rise of both synthetic organic and physical chemistry. In 1903, when Freundlich published his doctorate thesis, only 23 titles dealing with colloids or colloidal behavior appeared in all the world's chemical literature. This year (1903) the names of Freundlich, Jean Perrin, W. O. Pauli, G. Bredig and W. B. Hardy bespoke the inauguration of a new era, and not the least of these masters was Herbert Freundlich.

Freundlich's interest in colloids and colloidal behavior developed from his fundamental interest in biological phenomena and he, like Sir W. B. Hardy, turned to colloid chemistry in the hope of finding tools with which to attack a study of the mechanisms underlying protoplasmic behavior.

His classical studies on the coagulation of colloidal sols by inorganic and organic electrolytes was shortly followed by his studies on adsorption from solution and his demonstration that this represented a true reversible equilibrium which was obeyed by systems of the most diverse sorts. These studies culminated in his discovery that adsorption was another manifestation of the Gibbs theorem relating the interfacial concentration with interfacial energy relationships.

In the more than 200 papers and in the several books which he published we find important original concepts relating to almost every field of colloid research or technology. His studies of the electrical behavior of colloids and his fundamental concept of the zeta-potential are classical, as are his studies on the optical properties of sols, especially systems containing anisotropic and anisometric particles, which field bids fair to become a new area of optical science. His studies on the mechanical properties of sols and gels, swelling pressure, thixotropy, rheopexy, dilatency and ultrasonic behavior in colloid systems have all introduced new and fundamental concepts and technics.

While many of his contributions to colloid science have already received their merited recognition, we are still probably too close to others to properly appreciate their importance. This, however, can not be said for his "Kapillarchemie," which has gone through four German editions (1909–1932), numerous reprintings, and English (1926) and Russian translations. This book alone would have justified the high scientific eminence which Freundlich attained.

Professor Freundlich received many honors for his scientific contributions. Besides being elected to numerous scientific societies and academies he was honored by the University of Utrecht in 1936 with the degree of doctor of philosophy *honoris causa,* and in 1940 while at the University of Minnesota he was elected a foreign fellow of the Royal Society.

In 1908 he married Marie Mann, daughter of an apothecary in Mainz. Two sons and two daughters were born from this union. Three children survive, Herbert Freundlich, Jr., a radio research physicist now residing at Cambridge, England, a daughter, Marie, in Holland, and a daughter, Kate, of Rochester, Minnesota. His wife Marie died in 1917 and Professor Freundlich in 1923 married Hella Gellert, who survives him.

This appreciation would be incomplete without a word regarding Freundlich the man. Professor Freundlich was modest, unassuming, always ready to assist any one who came to him for advice or counsel on either scientific or private affairs. His advice was always freely given, the thought of receiving credit for ideas never crossing his mind. Such personal traits endeared him alike to his colleagues and his students; the latter often referred to him as "Uncle Herbert." He was an accomplished pianist and greatly enjoyed the world of music. His early scientific interests in entomology were continued through life. His literary interests were wide and profound.

To-day many of those who have worked with him hold leading positions in the realm of colloid science. We who have prepared this note are confident that these former students and colleagues would wish to join with us in mourning the passing of one of science's noblemen.

ROSS AIKEN GORTNER
KARL SOLLNER
THE UNIVERSITY OF MINNESOTA

# SCIENTIFIC EVENTS

## THE INSTITUTE OF GEO-BIOLOGY IN PEKING

DURING the summer of 1940, the laboratories, the library and the most important specimens of the Huangho-Paiho Museum, founded in 1915 and directed for twenty years by F. Licent, have been transferred to Peking, where the work will be continued under the name of "The Institute of Geo-Biology."

Officers of the institute at Peking are P. Teilhard de Chardin, geologist-paleontologist, honorary president, and P. Leroy, zoologist, director. Members of the staff are M. Trassaert, geologist, and J. Roi, botanist.

An official statement has been issued which reads:

In itself this change of location, decided for external circumstances, is purely material. But, more deeply, it means an internal transformation resulting from the natural growth of the institution.

The original idea of F. Licent, when be began pioneering in China, was to collect and study in Tientsin all possible data concerning the natural history of the Huangho basin. Following this trend of activity, we had come to the conviction that China was the place for an Institute devoted to the systematic development of what might be called the Science of "continental evolution." From both geological and biological points of view, Continents represent a kind of natural unit. Either in their building under tectonical and eruptive forces,—in the nature of their sediments,—in the formation and the shifting of their basins,—in the modelling of their topographical surfaces,—in the variations of their climates,—or in the development and the distribution of special vegetal and animal groups, they can only be studied "as a whole." And, if understood as a whole, they may introduce us to a renewed and better conception of the mysterious "concrescence" of Land and Life which is the Earth around us.

Hence the idea of an Institute of Geo-Biology where an associated Group of Geologists, Zoologists and Botanists would try, using the exceptionally distinct continental features of Asia, to draw, along as many directions as possible, a series of "blockdiagramms" expressing the joint evolution of rocks and organisms over China in the course of time. In a next-Memoir, for instance,[1] one of us (P. Leroy) will experiment with this method for the thick-shelled Unionids of Eastern Asia. Similar studies will follow, we hope, tracing, in the case of Mammals, the development of Asiatic Mole-rats (Myospalacinae), Duplicidentata, etc.

Being, as told above, the direct continuation of the Huangho-Paiho Museum, the Institute of Geo-Biology is not, strictly speaking, a new creation. Still less does it involve any shadow of competition with such sister-institutions as the Geological Survey of China, the Cenozoic Laboratory of Peking, the Fan Memorial Institute, the Heude Museum of Shanghai, the Natural History Society of China, etc. In fact, for the time being, the Institute will not print any publication of its own, but merely will distribute, as separates, its various contributions to the already existing scientific periodicals in China.

To cooperate, just as we did before, with the general effort of our friends, but with a more definite and more efficient line of investigation, such is the aim of the Peking's Institute of Geo-Biology.

The institute will be grateful for any exchange of publications, and "it is heartily ready to communicate any data, which might lead to a better understanding of the life of a continent."

[1] To be published in *Palaeont. Sinica.*

## THE ELLEN H. RICHARDS INSTITUTE

THE trustees of the Pennsylvania State College have established the Ellen H. Richards Institute as a consolidated working research unit covering some of the investigations formerly carried on in the departments of chemistry and of home economics and in the Agricultural Experiment Station.

Studies in textile technology, which have been carried on at the college in the department of chemistry since 1919, will be included in the work of the new institute. These have been concentrated on investigations on the durability of textile articles in relationship to fabric construction and types of dyes, and on methods of laundering and dry cleaning. Research fellowships are maintained at the college by the Pennsylvania Association of Dyers and Cleaners, the Pennsylvania Laundryowners Association and the Pennsylvania Institutions of Welfare, Public Instruction, Health and Military Affairs.

Research studies in human nutrition, begun at the Pennsylvania State College in 1935, will also be continued in the Ellen H. Richards Institute. These include an investigation on the relationship of dietary intake to family nutritional status, and a similar study in child nutrition begun cooperatively with the Department of Health of the Commonwealth in 1936. Efforts to change nutritional status for the better by such means as parental or child education and the provision of a school lunch have been tried and the results measured.

Investigations of the suitability of many new materials for the construction of houses or parts of houses,