tions. In the final estimation they are apt to prove of greatest value in the determination of the specifically active groups in natural as well as artificially altered proteins. Striking examples of this are specific inhibitive reactions of optical isomers and the discovery of Wormall, who applied this analytical method to halogenated proteins, that the active group in iodized protein is apparently 3:5 diiodotyrosin.

Landsteiner's investigations of the natural complex antigens have proceeded *pari passu* with the researches on the artificially prepared protein-chemical compounds. One phase of the work has been advanced by discoveries in the other phase in such a way that a separation of the two is somewhat forced. Landsteiner has studied chiefly the Forssman heterogenetic antigen, but has also investigated the complex antigens of bacteria, similar to those discovered by Avery and Dochez and Zinsser and Parker. It seems established from these researches that the individually specific and heterogenetic antigens of animal cells are chiefly compounds of protein and lipoid-like substances, while the specific cellular antigens of bacteria are proteins conjugated with polysaccharides. In both cases, the protein serves the function of immunizing, eliciting the formation of antibodies, while the lipoidal or carbohydrate fraction, the hapten, incapable of giving rise to antibodies, reacts in a number of ways with these antibodies in the test-tube and in the animal body. Aside from this important bearing upon specificity, these lipoidal and carbohydrate haptens have been shown to have important anaphylactic effects in actively and passively sensitized animals, effects which may explain the origin of shock following the systemic introduction of protein split products and decomposition products of various organisms. Their effects suggest numerous new investigations of phenomena of hypersensitivity. In addition, these haptens in themselves are substances of considerable biochemical interest. In attempts to determine the nature of the lipoidal fraction of the Forssman antigen, Landsteiner and Levene have discovered hitherto unknown lipoids, which yield on hydrolysis a reducing sugar and components of lipoids. From such experiments by Landsteiner it is inevitable that chemistry will be enriched by new compounds and that serology and immunology will advance both as a science and as a practically serviceable field of knowledge for man and animals.

In order to give the researches of Landsteiner upon the specificity of antigens their proper setting it would be necessary to review the many biological processes in which specificity is the inner mechanism, to recapitulate at least the evidences for a conception of the evolution of proteins correspondent with the evolution of species. Even without a detailed review of these subjects, it is obvious that his work may have a bearing upon such diverse processes as specific ferment action, resistance to infection, systematic zoological and botanical classifications, and the serology of heredity. Landsteiner, fully aware of the manifold implications of his discoveries, has pursued a course of rational experimentation, describing many facts, expressing generalizations when fully justified, and occasionally suggesting an hypothesis. He is entirely worthy of the name experimenter in the sense in which Claude Bernard used it when he said, "To be worthy of the name, an experimenter must be at once a theorist and practitioner. While he must be completely master of the art of establishing experimental facts, which are the materials of science, he must also clearly understand the scientific principles which guide his reasoning through the varied experimental study of natural phenomena."

Those who have known Dr. Landsteiner best have expressed their high appreciation of his rare personal characteristics of simplicity, sincerity, gentleness and charm. The writer of this review, who has had less opportunity than they to know him, can nevertheless join cordially in the universal expressions of admiration of his accomplishments and in the regard and veneration felt for him by his friends all over the world. This review itself is clearly an inadequate summary of his work. It is presented in the spirit in which Dr. James addressed his Medicinal Dictionary in 1743 to the great Dr. Meade, "Sir: ——— you are to consider this address, if it be agreeable to you, as one of the rewards of merit; and if otherwise, as one of the inconveniences of eminence."[2]

OBITUARY

LOUIS HERMANN PAMMEL

THE death of Dr. Louis Hermann Pammel marks the passing of a pioneer in the field of botany in the upper Mississippi Valley. Dr. Pammel served as the head of the department of botany at Iowa State College for forty years. He died on March 23, en route to Ames from California, where he and Mrs. Pammel spent the winter.

[2] In the collection of material for this review of Dr. Landsteiner's work I have been greatly aided by Dr. Peter K. Olitsky. I acknowledge with sincere thanks his constant willingness to assist me generously and am obliged to him for many helpful suggestions.

Dr. Pammel was born at La Crosse, Wisconsin, in 1862 and graduated from the University of Wisconsin in 1885. The year following was spent in the laboratory of Dr. W. G. Farlow at Harvard University. The years of 1887, 1888 and 1889 were spent at the Shaw School of Botany, Washington University, where he received the degree of Ph.D. under the direction of Dr. William Trelease.

The staff of the botany department at the time he began his work here in 1889 consisted of one member, himself. The present staff of thirteen specialists, offering sixty-six courses, attests to the growth of the department under his leadership. Many of the workers in this field in the state colleges and the U. S. Department of Agriculture received their training and inspiration for botany from this teacher.

The field of taxonomy was Dr. Pammel's specialty, and he made a number of intensive studies of the flora found in the plains region and in the Rocky Mountains. The major portion of the herbarium of this institution, comprising 180,000 sheets, was collected by him.

Dr. Pammel's earlier activities were in the field of plant pathology. In the early 80's he made a study of the cotton root rot. His contribution on Ozonium root rot of cotton led the way in the then unexplored field of soil plant pathogens. His studies of black rot of cabbage established the fact that it was a bacterial vascular parasite, a contribution to a virgin field.

He was the author of numerous bulletins and two books, "Weeds of the Farm and Garden" and "Poisonous Plants." A third volume, "Honey Plants of Iowa," in collaboration with Miss C. M. King, was in preparation at the time of his death.

Dr. Pammel's last major activity, and the one by which he was best known to the public, was in the field of conservation. He wrote the Iowa conservation bill and served as the first chairman of the Iowa Conservation Board. During his régime thirty-six state parks were acquired, and the lakes of the state were placed under the control of the Conservation Board, making a total area of 10,000 acres dedicated to state park purposes. Pammel Park, named in his honor, was dedicated the past summer.

He was an active member and a past officer in numerous scientific and honorary societies.

Dr. Pammel is survived by a widow and six children.

A. T. ERWIN

IOWA STATE COLLEGE

MEMORIALS

A MEMORIAL tree, a Norway spruce, has been planted near the path to Eaton Library on the Tufts College campus in commemoration of the late Dr. Fred D. Lambert, of the department of biology. A rough boulder bearing a suitably inscribed bronze plate will be placed at the foot of the tree with appropriate ceremony.

A MOUNTAIN peak with an altitude of 13,601 feet, on the boundary between Inyo and Fresno counties, California, has been officially named in memory of the late Professor Alfred Prater, of the department of mathematics at the University of California at Los Angeles. Prater Peak was discovered and charted by Professor Prater and Mrs. Prater during a trip in the summer of 1928, shortly before his death.

MR. C. C. PATERSON, president of the British Institution of Electrical Engineers, on June 5, in the Sunderland Central Library, Museum and Art Gallery, unveiled a plaque to the memory of Sir Joseph Wilson Swan, inventor of the first practical incandescent electric lamp and a pioneer in the science of photography. The plaque was presented to Sunderland, Swan's birthplace, by the institution. The institution and a number of citizens of Sunderland have formed a committee with the object of founding Swan memorial scholarships in electrical science. An appeal has been made for a sum not less than £5,000. Over £2,500 has already been received.

A REMEMBRANCE stone built into the new Battersea Power Station, London, was unveiled on April 23 to commemorate the centenary of the discovery by Michael Faraday in which lay the origin of the dynamo and starting point of the utilization of electric power. The Governor-General of Canada, Lord Bessborough, formerly director of the London Power Company, called for the unveiling of the stone in a speech telephoned from Ottawa, which was transmitted to a large company by amplifiers.

RECENT DEATHS

DR. KARL JOSEPH BELAR, research associate in biology at the California Institute of Technology, who was thirty-six years of age, was killed on May 25 in an automobile accident.

MR. EMIL TORDAY, known for his work on the anthropology of Africa, died on May 9, aged fifty-six years.

Nature reports the death of Professor J. E. Edwards, principal and professor of mathematics and physics at Queen's College, London, author of well-known text-books on the calculus, on May 16, aged seventy-seven years, and of Professor T. R. Glynn, emeritus professor of medicine in the University of Liverpool, on May 12, aged ninety years.