in which Folin (with W. Denis) surmounted this difficulty is characteristic of nearly all his work and accounts for the practicability of his methods, a quality which permits their daily use in many laboratories throughout the world. Proteins and colloidal materials were precipitated without heat, the filtrate was submitted to a micro Kjeldahl digestion and the ammonia formed was determined colorimetrically by use of Nessler's reagent. This simple but skilful combination of well-known reactions into a practical method supplied the means of proving that amino-acids are absorbed directly from the intestine (a fact established simultaneously also by other investigators) and, what is perhaps of greater importance, provided a tool for the quick and accurate measurement of retention within the body of nitrogenous waste products as a result of failing kidney function.

Following his demonstration of its clinical significance, Folin's method for the determination of blood non-protein-nitrogen was immediately adopted by a number of investigators of medical problems. Its practical value as an aid in diagnosis becoming established, facilities and personnel for the performance of this and related methods were soon established in many hospitals. About the same time Folin—and others also—introduced practical methods of chemical analysis for other constituents of blood of clinical significance (creatinin, urea, uric acid and sugar). Out of these modern techniques, the earliest now only about twenty years old, supplemented by constant improvements and innovations, there has developed the present somewhat elaborate system of clinical biochemistry, practised in some degree in almost every hospital in America and rapidly spreading to other parts of the world. Although there is the suspicion, which Folin shared, that this novelty of blood chemistry is sometimes overdone, exploited or poorly performed, it represents an important advance in medicine and surgery. Any surgeon will testify, for example, to the aid given by a knowledge of a patient's blood "N.P.N." in deciding the risk of operation or in guiding preoperative care. In medical, pediatric and obstetric practise also, the information obtained by this and other methods of blood chemistry is for some conditions now regarded as almost indispensable. In this development many besides Folin have had important part, but to him is due the credit for its inauguration as well as for some of the best methods in constant use at present.

Although his methods and their practical value constitute, perhaps, Folin's principal service, it would be unjust to leave the impression that his contributions to the concepts of biochemistry are of less importance. His revision of our ideas concerning protein metabolism was fundamental and no less valuable because similar conclusions were reached simultaneously by others.

Folin took an active interest in the American Society of Biological Chemists, which he helped to found in 1906, and of which he was vice-president (1908) and its third president (1909). He regularly attended its meetings and took part in its programs as well as those of the Physiological and Pharmacological Societies, of which also he was a member.

Folin's early work appeared in *Hoppe-Seyler's Zeitschrift,* in which both his first (1897) and his last (October, 1934) papers were published, and in the *American Journal of Physiology.* After the establishment of the *Journal of Biological Chemistry* in 1905, most of his papers were sent to it. A member of its first group of collaborators, he became chairman of the editorial committee in 1920, when that journal became the property of the society. He remained until his death active and influential in the relations of the journal and the society. For many years Folin has been a member of the National Board of Medical Examiners, in charge of its examinations in biochemistry.

Among the honors bestowed upon Folin were: membership in the National Academy of Sciences; honorary membership in the Medical Society of Sweden; the honorary degree of Sc.D. conferred by Washington University (1915) and by the University of Chicago (1916); honorary M.D. by the University of Lund (1918); and the Scheele medal of the Stockholm Chemical Society (1930).

On the personal side Folin had admirable and lovable traits. Quiet and shy in manner, he did not seek wide acquaintance with people, but devoted his energy to work in his laboratory, to his departmental colleagues, to a few close friends, with whom he loved to play golf, and to his family. He possessed a quaint humor and a sane, quiet perspective toward life and work which impressed all who knew him as the qualities of a modest kindly gentleman. He was very fond of the mountains of New Hampshire, where he spent the summer months at his cottage on the slope of Kearsarge Mountain. There at its foot he is buried.

Dr. Folin is survived by his widow, their son, Grant Folin, now in business in Detroit, and a daughter, Teresa Folin, a physician now at the Children's Hospital of the University of Chicago.

PHILIP A. SHAFFER

TRIBUTE TO PROFESSOR FOLIN[1]

MY part in this afternoon's program is to speak of Dr. Folin from a dual point of view, that of an

[1] Remarks at a memorial meeting in the Harvard Medical School on November 23, 1934, at which time Professor Folin's portrait was presented.

internist acknowledging the significant value to clinical medicine and surgery of his biochemical investigations and that of a member of the medical faculty of Harvard Univeristy paying tribute to him as a stimulating teacher and leader and above all a wise, helpful and beloved colleague. Though I may not speak in mellifluous diction nor with the wisdom of the ages, I do speak with the authority of one who daily in my care of patients now for many years has utilized the methods that Dr. Folin perfected both for a better understanding of what ails sick humanity and as a guide in their therapeutic management and of one who for twenty-seven years has sat with him in faculty and committee meetings, somewhat bedevilled his peace and comfort when I used the laboratory over his head and above all in personal contacts learned to know the quality of his mind and the character of his personality.

You, my younger colleagues and students, scarce can vision medicine without the methods of blood analysis perfected by Folin and his pupils and those inspired by Folin's own accomplishments, so completely have these micro-methods of quantitative analysis become a factor integrated into the web and woof of the fabric of clinical medical and surgical lore. By such microchemical methods we follow the progress and guide the diet of those suffering from Bright's disease; using them for those approaching the period of the evils of prostatic hypertrophy, surgery has been made vastly safer; with their results at hand more successfully do we measure the needed insulin against the metabolic requirements for health in the diabetic and especially with them safely do we steer the diabetic between the Charybdis of acidosis and the Scylla of insulin shock; microchemical analysis makes possible the diagnosis of parathyroid tumors and allows the surgeon by their removal to cure serious bone disease or stay the formation in some of renal stones. Folin's studies and microchemical methods of analysis have granted us a better understanding of gout and enlightened us on the mechanism of edema in anemia, renal disease, circulatory failure and a large group of nutritional disorders.

Not all the methods have been the product of Folin's own hand or originated in Folin's laboratory, but it has been, however, from his own ingenious methods and the wisdom of his approach to important biochemical problems that has grown the whole range of microchemical analyses of the blood and other body fluids which are daily in use in hundreds of hospitals and thousands of doctors' offices the world over. He was the recognized leader in this phase of clinical laboratory technique, and some of his own methods are probably always in use, for, as it has been said of the British Empire that the sun never sets upon it, so the sun somewhere always is shining on the laboratory determining something in the blood of patients by a Folin method. As has the microscopist, so has Folin dealt with the very small, and his work has been determining accurately smaller and smaller amounts of various substances in the smallest possible bulk of blood or other body fluid. The ultimate in this would seem to be the determinations by Richards and his pupils of glucose, sodium chloride, urea, uric acid and creatinin in the fluid from a single glomerulus and from a single tubule of the kidney using micro-methods, based on Folin's investigations and perfected as a result of the guiding stimulus of Folin's work.

When Folin entered the faculty of medicine it was composed of just under 50 members. Of those men besides myself, only Cannon, Bremer, Lewis and Joslin remain in active service. We are Folin's oldest faculty friends and longest have had the stimulus of his work and his ideals, the benefit of his wisdom and the fellowship of himself. In this we have been particularly the elect, but in these intervening years many others have come to share him with us, until last year his influence was felt by 130 faculty colleagues.

Folin now is a fine tradition in the Harvard Medical School not alone to the faculty but to the members of twenty-six classes of medical students that in his laboratory have been instructed in biochemistry; his personality, his character, his wisely critical attitude toward men and their investigations, his friendly helpfulness to others, the restraint of his spoken word not failing in clarity, his modesty, his sense of humor and other qualities have endeared him to us.

In his death we have lost a truly wise colleague, who was an ideal professor. Long will the memory of him remain a potent factor in our individual activities. That he lived and worked here among us is a cause of deep gratitude in the hearts of each and all of us, faculty and students of the Harvard Medical School.

HENRY A. CHRISTIAN

SCIENTIFIC EVENTS

THE CONSTRUCTION OF A BARRAGE ACROSS THE TIGRIS

THE construction of the barrage across the Tigris at Kut has been inaugurated by the Government of Iraq. The consulting engineers for the works are Messrs. Coode, Wilson, Mitchell and Vaughan-Lee, Westminster, and the contract was awarded in September to Messrs. Balfour, Beatty and Co., Limited, who expect to complete it within three years. Ac-