

mechanics and wave mechanics; the Stieltjes integral representation for linear functionals on the space of continuous functions (1909); the theory of L^p spaces (1910); the first systematic discussion of analytic functions of operators (1913); the definition and properties of general completely continuous operators (1916); and the foundation of the theory of partially ordered vector spaces (1928). In 1952 there appeared the "Leçons d'analyse fonctionnelle", written jointly with B. Sz. Nagy, and easily the most readable introduction to functional analysis that has yet appeared.

Riesz constantly strove to simplify the presentation of the theory of the Lebesgue integral; he introduced the systematic use of step functions (1912), and he proved (1931) the famous 'rising sun lemma', which leads to an easy proof of the differentiability almost everywhere of a monotone function.

He was one of the creators of the theory of subharmonic functions. Other fields to which he contributed include the theory of functions analytic in the unit circle, orthonormal series, inequalities and ergodic theory. He gave several proofs of the fundamental spectral theorem in Hilbert space. An early paper (1908) on topology contains ideas (bicompleteness, the filter theory of limits) that had to wait until the late 1930's for their full development.

Riesz's work is characterized throughout by simple and powerful ideas and by lucidity of presentation; his papers are always easy to read. He never generalized for generalization's sake; his aim was always to put the main ideas in a setting that would illustrate their significance and their power as vividly as possible.

F. SMITHIES

Dr. Eugene C. Crittenden

EUGENE CASSON CRITTENDEN, formerly associate director of the United States National Bureau of Standards and for many years chief of its Electrical Division, died in Garfield Hospital, Washington, D.C., on March 28 at the age of seventy-five.

After graduating in 1905 and a period of post-graduate work and teaching, all at Cornell, Dr. Crittenden joined the National Bureau of Standards in 1909 and was assigned to the photometric laboratory, where he was afterwards to make many important contributions towards the establishment of modern photometric units, standards and methods of measurement. During 1921-46 he was chief of the Electrical Division and thus also became responsible for work which, in collaboration with other national laboratories, led to the replacement of the obsolescent system of international electrical units by the present system of absolute electrical units. Under his leadership the Division expanded substantially, and sections for research in radio and electronics were established which eventually became major organizational units of the Bureau—for example, the Central Radio Propagation Laboratories at Boulder, Colorado, and the former Ordnance Development Division, now the Diamond Ordnance Fuze Laboratories of the Department of the U.S. Army. In 1933 Dr. Crittenden was made assistant director of the Bureau and became concurrently responsible for supervision of its over-all research and testing activities; and in 1946, when the title was changed to associate director, he assumed the full-time responsibilities of this post, which he held until he retired in 1950. For his outstanding services to the Bureau he was awarded in 1949 one of the

first Gold Medals of the Department of Commerce for Exceptional Service. He continued to act as a consultant to the Director of the Bureau until the onset of his last illness a few months ago.

Dr. Crittenden is best known both in his own country and internationally for his many activities and services which, combined with those already mentioned, played an important part in the developments which led to the international adoption in 1948 of the present electrical and photometric units and standards. He was vice-president of the International Commission on Illumination during 1939-48 and president of its U.S. National Committee from 1928 until 1935. During 1946-54 he was the member for the United States on the International Committee of Weights and Measures, of which he was vice-president from 1950 until 1954, and he had been a member of this Committee's advisory body for electricity and photometry since 1933. He also participated in the work of the International Organization for Standardization and the International Committee of Legal Metrology. Dr. Crittenden was for many years on the Standards Council of the American Standards Association, of which he was chairman during 1945-48, and in his time he served as president of the Illuminating Engineering Society, the U.S. National Committee of the International Electrochemical Commission and the Optical Society of America, as well as associate editor of the *Review of Scientific Instruments*. He also participated in the work of the American Society for Testing Materials, the American Institute of Electrical Engineers, the American Institute of Physics and the National Research Council.

Dr. Crittenden will long be remembered by his former colleagues on international committees, for he always brought to their deliberations wise counsel based on great knowledge and experience and expounded with good humour. Photometry was the primary interest which eventually led him to become a renowned exponent of international collaboration in all matters concerned with metrology. He is survived by his wife, formerly Norma M. Snyder, a daughter and a son.

H. BARRELL

Dr. A. L. Stern

ARTHUR LANDAUER STERN died suddenly on April 26 at Chorley Wood at the age of eighty-eight. He was born on May 6, 1867, the eldest of seven children of Moritz and Fanny Stern, of Birmingham. At King Edward VI High School he was a Foundation Scholar; and in 1887 from Mason College he obtained honours B.Sc. (London). He was then Tangye Research Scholar and personal assistant under Sir William Tilden, working on compounds of phosphorus. After that, under Dr. Cornelius O'Sullivan, he worked on chemical problems of fermentation and brewing, and soon became chemist and brewer at Messrs. Bass, Ratcliffe and Gretton, under O'Sullivan. An early piece of work was to show that glucose from various sources was the same substance, and thus he helped to lay one of the foundation stones of modern organic chemistry. He obtained his D.Sc. (London) in 1894.

On the death of O'Sullivan in 1906, Stern succeeded him as head brewer at Bass's New Brewery. He reorganized the research, with prescience concentrating on the biological side (Dr. Arthur Slator was then his chief assistant). Under his direction, the rate of multiplication of yeast cells was shown to be

subject to simple mathematical laws. On the industrial side, a series of researches revolutionized the maturation of beer. It is forty years since Stern substituted metal tanks with single-feed cylinders in the racking room instead of the old single wooden casks; and his method has now become standard practice. Many technical processes were influenced by him, from the better use of fuel in breweries to the bottling of beer and its dispatch overseas so that "Bass" should arrive in perfect condition in diverse climates. Incidentally, he, under O'Sullivan, brewed the famous King's Ale of 1902.

Stern's brewery was a happy place. He was not only a master brewer, but also had happy relations with his staff, and took a personal interest in them and their families. He was a man of wide interests, and although he retired early, he never lost contact with scientific affairs.

He had a very happy married life, saddened only by his wife's death last year. He leaves seven children, all of whom went to universities, four of them following scientific careers; his eldest grandchild is about to enter Cambridge to read science.

Mr. Harold Picton

HAROLD PICTON, who died on March 21 in his eighty-ninth year, will be remembered for his contributions to science, education and international understanding.

Picton was a son of the Rev. J. A. Picton, Unitarian minister and M.P. for Leicester, and grandson of Sir James Picton, of Liverpool. After graduating at University College, London, he worked in Sir William Ramsay's laboratory. With S. E. Linder he published a series of papers on colloidal solutions. Sols of arsenious sulphide were prepared in various grades down to one in which the submicroscopic particles passed through porous pot and diffused, yet still scattered light, giving the Tyndall effect. Picton and Linder were the first to show the migration of such particles in an electric field, the arsenious sulphide moving to the anode and ferric hydroxide to the cathode. They studied the precipitation of these sols by electrolytes and showed the presence of the positive ion in the precipitated arsenious sulphide. The efficiency of the electrolyte as coagulator was also related to the charge on the positive ion. This is known as the Hardy-Schulze Law, but, as Prof. W. C. McC. Lewis wrote, it "might perhaps more legitimately be known as the Schulze-Linder-Picton-Hardy Law". This work undoubtedly laid the foundation of much of the modern view of suspensoid colloidal systems.

In 1900, after a few years as science master at Parmiter's School, Picton joined his friend, the Rev. J. E. Bennett, who had opened a small residential school, Clacton College, and shortly afterwards he succeeded him as headmaster. This was a remarkable school which anticipated many modern trends in education. A family spirit was developed both in and out of the classroom. Discipline was strict but kindly, and was based on rules laid down by an elected school council. The physical, mental and spiritual aspects of personality were provided for in a well-balanced whole. Games were played but were not over-emphasized, and boys were encouraged to take up other interests such as gardening, photography, and the study of church architecture and of

prehistoric remains. A number of worked flints and mammalian bones and teeth were collected from the Pleistocene deposit on the Clacton foreshore and this section of the school museum was afterwards presented to Charterhouse School.

From his mother (née Jessie C. Williams), who was brought up in Hamburg, Picton acquired a deep love of Germany. From 1914 onwards he strove to promote a better understanding between the Germans and the British. In five books published between 1918 and 1948 and many other writings he stressed the better elements in German life and culture. His "Early German Art and its Origins" (1939) was an important work. For six years he lived near Berlin but returned to England in 1934 after the rise of Hitler. From that time he exposed the horrors and dangers of the Nazi dictatorship; but always insisted that the whole German nation should not be condemned for the crimes of the Nazis. He worked untiringly to help refugees from Germany.

Harold Picton was a man of vigorous and many-sided personality to whom men were more important than systems. He had a genius for friendship and he gained the affection as well as the admiration of his pupils, who will never forget the debt they owe him. He did not marry but adopted a son, who survives him.

G. M. BENNETT

Dr. Harry J. Deuel, jun.

DR. HARRY J. DEUEL, jun., whose death at the age of fifty-eight occurred on April 17, had been an active force in the field of nutrition for more than a quarter of a century, his major interest being the biochemistry of lipids. His group at the University of Southern California has established a vast amount of biological data on the digestibility of fats and the lipid composition of the tissues of different animals under varying experimental conditions. This quantitative information has been, and will continue to be, of great value to innumerable workers in this field.

It is not only as an accumulator of facts that Dr. Deuel will be remembered; he also made notable contributions to advancing knowledge, especially in connexion with the composition of cerebrospines, the conversion of carotene to vitamin A, the nutritional importance of dietary fat and the effect of hormones on lipid metabolism. He had a wide knowledge and interest in all work in the lipid field, and many will recall happy hours of argument and discussion in which he took a leading part. This width of experience found expression during the past few years in his writing "The Lipids; their Chemistry and Biochemistry", two volumes of which have already been published. The third and last volume was nearing completion at the end of last year. This work is likely to become established as a standard work in this field—a fitting memorial to its author.

Harry Deuel took great delight in meeting people. As a Fulbright Fellow at Cambridge during the past year, he was able to renew many old friendships and to make many new ones. He carried through an active programme of lectures and visits, both in Britain and on the Continent. Those who had the privilege of meeting or hearing him during this past year will find inspiration, not only from the scientific contributions he made on many occasions, but also from his immense courage and fortitude. He was a man that so many of us were happy and proud to have known.

A. C. FRAZER