pened after the event, during the time the camera shutter was open, plus that which happened during the 1/25th of a second prior to the event. In this way it is possible to obtain records of disturbances, such as are back in a rectifier, which give not only the full history of the event but also the circumstances which led up to it. This instrument is being used to study the behavior of rectifiers and Thyratrons.

The production and use of high rotational speeds: J. W. BEAMS, University of Virginia (introduced by S. A. Mitchell). The use of air-driven turbines supported on air bearings to produce high rotational speeds is outlined. A few simplifications and improvements in the method[1] of spinning rotors in a vacuum as well as in gases at various pressures are described. The maximum rotational speed is limited only by the strength of the rotor. The rotor spinning at high speed in a vacuum or in gases at comparatively low pressure is shown to be suited to problems in centrifuging. Since the attainable peripheral speed of the rotor is well above the average speed of the molecules for most gases at ordinary temperatures, it may be used as a velocity selector for molecules. A method is proposed for the separation of isotopes which takes advantage of the combined separation due to centrifuging and this velocity selection. The adaptation of high-speed rotors to several other uses, such as the very rapid rotation of mirrors or the measurement of the velocity of ions and fast particles, are briefly discussed.

The optical constants and photoelectric emission of potassium: HERBERT E. IVES and H. B. BRIGGS. A theory of photoelectric emission from thin films of photo-active material on a specular metallic base, proposed some years ago,[1] predicts the photo-emission to be conditioned by the optical absorption of the photo-active material. In order to calculate this absorption a knowledge of the refractive indices and extinction coefficients of the materials involved is necessary. These data have not been available for the alkali metals, which are the most important photoelectric emitters, in the region of the spectrum which is crucial to the above theory, namely, the ultra-violet. An apparatus for polarimetric analysis has been constructed with quartz elements, and used, by the photographic method of Voigt,[2] to determine the optical constants of a layer of potassium deposited on the back of a specially selected 60° fused quartz prism. Complete data for the visible and ultra-violet spectrum have been obtained. Applying these data in the theory, a very striking agreement with experimentally determined potassium photo-emission through the spectrum is obtained. The sharply marked maximum of emission in the ultra-violet is predicted at the right wave-length, and the enormous enhancement of emission when the incident light is polarized with the electric vector parallel to the plane of incidence is an immediate consequence of the unusual optical properties of the alkali metal.

The international adoption of the Giorgi System of M. K. S. units by the International Electrotechnical Commission, June, 1935: A. E. KENNELLY.

Heights and weights of 275 public school girls in ten consecutive years: EDWIN B. WILSON.

Studies on new narcotics: LYNDON F. SMALL. In the course of a systematic search for new drugs capable of replacing morphine, many interesting variations of the morphine structure have been made, and several consistent relationships between constitution and physiological action discovered. The similarity in general physiological effect between certain of the structural and configurational isomers of morphine and codeine leads to the hypothesis that position of groups in space is more important than nuclear location of functional groups in this series. The hypothesis has been supported by results obtained with dihydropseudocodeinone and dihydroisomorphinone, isomers of Dicodid and Dilaudid, synthesized by the application of special hydrogenation technique. A functional group in the 6-position of the morphine nucleus appears to affect physiological activity to a much greater degree than the same group in the 8-position. When, however, the group at the 8-position is of such nature that it lies out of the plane of the nucleus, it may through a favorable configuration exert a physiological action greater than that of the group having an unfavorable configuration in the 6-position. By treatment of dihydrothebaine with methylmagnesium iodide, a new type of codeine derivative, containing a methyl group in the hydro-aromatic ring III has been prepared. The Grignard reagent adds at the ether linkage and the enol ether double bond of dihydrothebaine, and the enol ether group immediately undergoes hydrolysis. A phenolic ketone results, and by the action of bromine and sodium hydroxide on this ketone the 4,5-ether ring can be closed again. Reduction of the ketone group gives a codeine homolog designated as 7-methylcodeine.

(*To be continued*)

OBITUARY

WALTER HOUGH

THE United States National Museum lost one of the oldest and most highly esteemed members of its scientific staff when Dr. Walter Hough died suddenly of heart failure, in his seventy-seventh year, on September 20, 1935. Entering the service of the Museum as a copyist in January, 1886, he won advancement, through constantly increasing familiarity with museum problems and through his ready knowledge of many widely diversified subjects, to a succession of positions that culminated in his appointment as head curator, department of anthropology, on March 1, 1923. His successful administration of this latter office was recognized by three separate extensions beyond the established age for retirement of federal em-

[1] Beams and Pickels, *Rev. Sci. Inst.*, 6: 299, 1935.
[1] *Phys. Rev.*, 38: 1209, 1931.
[2] *Physik. Zeitschr.*, 2: 303, 1901.

ployees. For fifty years, lacking only three months, he was continuously in the public service.

Walter Hough was born in Morgantown, West Virginia, on April 23, 1859, the son of Lycurgus S. and Anna Fairchild Hough. As a child he was fascinated by the accounts his mother read to him of explorations in Palestine, the Near East and elsewhere. Seeking in his own way to emulate these adventures in antiquity he roamed the nearby hills and woods, discovered for himself old Indian camp sites whereon he found the arrowpoints, stone artifacts and pottery fragments that formed the nucleus of his boyhood collection. His father's library provided the inspiration that turned his enthusiasm from one youthful interest to another, but definitely fixed in his mind the idea of a career in science. Throughout his school years geology received major attention, owing, perhaps, to the sympathetic encouragement given by such eminent leaders as I. C. White, state geologist of West Virginia; William Maury Fontaine, celebrated professor of geology at the University of Virginia, and J. J. Stevenson, of New York, then a recognized authority on the geology of the coal measures of Pennsylvania and West Virginia. For Dr. Stevenson the boy Walter collected fossils from the Carboniferous formations near his home town and received, in exchange, fossils from other areas. But geology and paleontology eventually yielded to a deeper interest in primitive peoples and the rise of civilization in various parts of the world. His collection of Carboniferous plants and invertebrates, treasured since school days, was finally presented to the National Museum in 1897.

Following graduation from West Virginia University in 1883, Hough returned to take his M.A. in 1884 and his Ph.D. in 1894. After teaching for a year in a boys' school at Alton, Illinois, he was appointed to a position under Dr. Otis T. Mason in the division of ethnology at the National Museum, became assistant curator in 1894 and curator upon the death of Dr. Mason, in November, 1908. Hough was not only representative of the Smithsonian Institution but a member of the U. S. Commission to the Columbian Historical Exposition at Madrid in 1892–3, at which time he was designated a Knight of the Order of Isabella of Spain. In the selection and installation of exhibits, he participated actively in nine other national or international expositions between 1907 and 1926. Between 1901 and 1933 he conducted ten Museum expeditions, chiefly to the southwestern United States, in pursuit of ethnological or archeological information.

Although he wrote of aboriginal peoples, historic and prehistoric, in both hemispheres, Dr. Hough is perhaps best known among anthropologists for his studies of fire as an agent in human culture. Beginning with "An Eskimo Strike-a-light from Cape Bathurst," published in the *Proceedings* of the U. S. National Museum for 1888, his bibliography of over one hundred titles (omitting numerous reviews, notes, biographies, the annual reports of his department, etc.) includes no fewer than eighteen papers on fire-making, illumination, heating and lighting apparatus, etc. But the wide range of his interests is only partially illustrated by his published works. He was an authority on old English, French, Italian and American china, on old lace, on violins and early pianos.

His scientific affiliations included membership in the American Association for the Advancement of Science (M89, F90; vice-president of Section H, 1904); the American Anthropological Association (president, 1924); Anthropological Society of Washington (president, 1908–9); Washington Academy of Sciences; Archeological Society of Washington; The American Museums Association; Société d'Anthropologie de Paris; Society of Anthropology and Geography of Sweden; Phi Beta Kappa (W. Va., 1914); the Cosmos Club, Washington, D. C.

By nature generous and helpful, Dr. Hough gave freely—perhaps too freely—of his time to his subordinates and to casual museum visitors on queer missions. With astounding patience he would listen to the very end of long dissertations about inconsequentials; rarely did he have the heart to destroy pet theories built upon the sands of insufficient knowledge. The personification of gentleness, he frequently and knowingly permitted himself to be imposed upon. His personal charm, his unfailing courtesy, his responsiveness and understanding endeared him to all who had the privilege of meeting him, either at his office or in his home. He loved young people, and they, in turn, put faith in him. He was never so occupied that he could not interrupt to admire the fragments of Indian arrowheads and potsherds proudly brought in by school boys for his inspection, and he always took time to point out the significance of these finds and to draw comparisons between them and the products of other, more distant cultural areas. These very human qualities won for Dr. Hough throughout his half century with the National Museum a host of friends to whom he was always an inspiration.

He married Myrtle Zuck, of Holbrook, Arizona, on December 29, 1897. Mrs. Hough, two sons and a daughter, and seven grandchildren survive him.

NEIL M. JUDD

HENRY ETTER STARR

ON November 2, following a brief illness, Henry Etter Starr, head of the department of psychology and director of the Psychological and Mental Hygiene Clinic of Rutgers University, died unexpectedly at