water. He was thoroughly familiar with spectroscopy. He conceived the idea that this heavier isotope of hydrogen must exist in quantities too small to detect, but that continued fractional distillation of hydrogen would produce a concentration. He joined forces with a physicist at the Bureau of Standards at Washington who had developed extensive machinery for liquefying hydrogen at very low temperatures. Fractionation in this apparatus gave material with a new spectral line, faint, but unmistakably at the position where calculations showed that it should be if it had a mass of 2. A physical chemist at the Bureau of Standards conceived the idea that electrolysis of water might be a simpler way of concentrating this heavier isotope of hydrogen, and, together with the discoverer of heavy hydrogen, he started to electrolyze a large quantity of water and let it go for a few months, as a side issue. Sure enough, the residue of this electrolysis gave water of slightly increased density.

Immediately well-equipped and forceful departments of chemistry, at California and at Princeton, at Columbia and elsewhere started to electrolyze on a large scale. A communication from the California laboratory to the editor of the American Chemical Society two years ago announced that the separation could be carried very far and that pure isotopic hydrogen might be obtained. Immediately many chemists all over the world dropped their tools and started investigations in this most intriguing field.

In the meantime other investigators were helping unknowingly to advance this field. Commercial electrolysis of water for the production of hydrogen and oxygen had left residues richer in the heavy hydrogen, and these now suddenly became important. A young mining engineer from the West, with a quick mathematical mind, became interested in chemical kinetics, and he was able to visualize energy levels in molecules in the same way that he visualized topographical lines on a map. With this he was able to go far towards predicting reaction rates, and heavy hydrogen proved a fruitful field in which to apply and test these mathematical concepts. Physicists in various parts of the world had been trying to obtain higher and higher voltages in order to smash atoms. Heavy hydrogen gave a new projectile by means of which this smashing could be effected. And now in several laboratories one can actually see and hear the individual atoms as they are transmuted in accordance with the ancient dream of the alchemist. Chemists are attacking the problem of reaction mechanism along new lines, for they can now label the hydrogen atom and follow it through various reactions.

Looking back on this three-year development of heavy hydrogen, my claim is that no one could have had the wisdom to direct research along these different lines in such a way as to produce better results. Each of these different contributors to scientific research was impelled only by his interest and enthusiasm in creative work, and any regimentation would have been fatal. We must not interfere with our scientists. We must not starve them nor frighten them, for the progress of the world depends upon them. Research in science has been one of the few outstanding successes in the human race, and we need not less, but more of it.

SCIENTIFIC EVENTS

THE ELECTROSTATIC GENERATOR AT THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

ADVANCES in the development of electrostatic generators and the application of high voltage direct current electricity at the Massachusetts Institute of Technology were announced on May 23 by Dr. Karl T. Compton, president of the institute, at a meeting of the board of directors of the Research Corporation in New York.

The giant electrostatic generator built at the research station of the institute on the estate of Colonel E. H. R. Green at Round Hill, Mass., by Dr. Robert J. Van de Graaff and his associates, Dr. Lester Van Atta and Dr. Chester Van Atta, has been equipped with accurate voltage and current controls as well as vibration eliminators. It is now ready for the vacuum discharge tube, in which experiments in atomic disintegration are expected to begin this year. The generator develops approximately 7,000,000 volts, one of the limitations on higher voltage being flash-over to the roof of the airship dock in which it stands.

During the past year the Round Hill research staff has been engaged principally on the design and construction of the vacuum discharge tube now being prepared for operation by the generator. Much of the progress of the past year has been made possible by grants from the Research Corporation. During the coming year this vacuum tube unit will be employed in a series of experiments on nuclear disintegration in the lower voltage range, while the other additional units of the tube, which will permit extension of the experiments to higher voltage ranges, are under construction.

In the laboratories of the institute at Cambridge, under the supervision of Professor Van de Graaff and Dr. John G. Trump, attention has been concentrated on the ability of a vacuum to sustain high voltages.

An important result of these investigations has been the construction and preliminary test of apparatus for generating very penetrating x-rays, which possesses several advantages as compared with machines hitherto available. The penetrating x-rays have their practical application in the treatment of internal cancer. The present apparatus consists of a Van de Graaff belt generator, coupled with a modified Lauritsen x-ray tube, in which all aspects of the equipment have been satisfactorily tested for production of x-rays up to 700,000 volts.

SYMPOSIUM ON IONIC PHYSICS AT CORNELL UNIVERSITY

ARRANGEMENTS have been made for holding a Symposium on Ionic Physics at Ithaca, N. Y., during the week end immediately preceding the opening of the Cornell 1935 Summer Session.

A three-day program (July 4, 5, 6) devoted to a discussion of photoelectricity and thermionics has been prepared. It is the purpose of this symposium to provide a comprehensive survey of these fields, with ample time and opportunities for discussion.

The various phases of the subjects will be introduced by the following invited papers:

Thursday Morning, July 4, 9:30 o'clock (E.S.T.)

"The Present Status of Thermionics," Saul Dushman, General Electric Company.

"Surface Ionization Potentials," J. A. Becker, Bell Telephone Laboratories.

Thursday Afternoon, 2 o'clock

"Optical Factors in the Photoelectric Effect," H. E. Ives, Bell Telephone Laboratories.

"Photoelectric Conductivity," F. C. Nix, Bell Telephone Laboratories.

Friday Morning, 9 o'clock

"Photoelectricity, Experiment *versus* Theory," L. A. DuBridge, University of Rochester.

"Theory of Metals and Electron Emission Phenomena," J. C. Slater, Massachusetts Institute of Technology.

Friday Afternoon, 2 o'clock

"Fluorescence and Photochemistry, Applied to the Assimilation Process of Carbon Dioxide," J. Frank, The Johns Hopkins University (visiting lecturer in physics, Cornell Summer Session).

Saturday Morning, 8:30 o'clock

"Electron Optics," C. J. Davisson, Bell Telephone Laboratories.

"Properties of Thoriated Tungsten Filaments," W. B. Nottingham, Massachusetts Institute of Technology.

"The Electrical Properties of Adsorbed Films on Metals," Irving Langmuir, General Electric Company.

There will be a registration fee of one dollar for those attending the symposium.

Arrangements will be made for housing the group in attendance, including families, in one of the university dormitories for the nights of July 3, 4 and 5, at $2.00 per night per person ($5.00 per person for the three nights). Reservations for such rooms should be made in advance with the Manager of Residential Halls, Morrill Hall, Ithaca, N. Y. For further information, address Professor R. C. Gibbs, Rockefeller Hall, Ithaca, N. Y.

MEETINGS OF SIGMA XI

A CHAPTER of Sigma Xi was installed at Smith College on May 1. Dr. Harold Clayton Urey, of Columbia University, was the guest lecturer; Professor George Howard Parker, of Harvard University, national president, and Professor Edward Ellery, of Union College, national secretary, were the installing officers. In addition to those already members of Sigma Xi, fourteen members of the faculty were initiated. Delegates from Sigma Xi chapters of thirteen colleges attended the installation ceremony.

Dr. E. C. Stakman, plant pathologist at the University of Minnesota, was guest speaker on May 16 at the Sigma Xi initiation banquet at Cornell University. He spoke on the subject "Routing the Red Scourge of Wheat." Dr. Stakman also gave a public Sigma Xi lecture on "Rubber Growing in Liberia and the East Indies" on May 17. He was the guest of the department of plant pathology during the entire week.

At the first annual meeting of the Tulane Chapter of the Society of the Sigma Xi twenty-one associate members were initiated. The annual address, entitled "A Problem of Three Bodies," was given by the retiring president, Professor Herbert E. Buchanan, head of the department of mathematics of Tulane University. The officers for the coming year are as follows: *President,* Dr. Ernest Carroll Faust, professor of parasitology; *Vice-president,* Professor William B. Gregory, of the department of sanitary engineering; *Secretary-Treasurer,* Dr. Harley N. Gould, head of the department of biology, Newcomb College; additional members of the *Executive Committee,* Dr. Nola Lee Anderson, department of mathematics, Newcomb College, and Dr. Edward S. Hathaway, head of the department of zoology, Tulane University.

The District of Columbia Chapter of Sigma Xi at a meeting on May 14 elected the following officers: *President,* Dr. William Bowie, chief, Division of Geodesy, U. S. Coast and Geodetic Survey; *Vice-president,* Dr. Frederick V. Coville, Bureau of Plant Industry; *Secretary,* Dr. V. A. Pease, Bureau of Chemistry and Soils; *Treasurer,* William Lerch, National Bureau of Standards. At this meeting the following