A. W. Richter, dean of engineering at the Montana State College, was elected president of the Montana Society of Engineers at the annual meeting which took place at Helena on April 7 and 8.

The 722d meeting of the Philosophical Society of Washington will be held at the Cosmos Club, on April 20, when the address of the evening will be by Dr. R. A. Millikan, of the University of Chicago, on "Some Recent Aspects of the Radiation Problem." Members of the American Physical Society are invited to attend this meeting, which will be followed by a social hour.

At the regular monthly meeting of the Cosmos Club, Washington, held on April 10, Dr. W. T. Swingle delivered an address on "Impressions of a Visit to Japan."

Dr. Frederick H. Getman delivered a lecture on the "Nature of the Chemical Elements" before the Science Club of Wellesley College on April 11.

Professor W. S. Franklin delivered a lecture on "Electric Waves" before the department of Electrical Engineering of the University of Illinois on April 6. He also spoke before the Physics Club on "Some Mechanical Analogies in Electricity and Magnetism." Two other lectures were given by Professor Franklin, one on the "Curved Flight of a Baseball" and the other on "Bill's School and Mine."

Professor Liberty H. Bailey, of Ithaca; Dr. Ernest Burnham, of Kalamazoo; President Kenyon L. Butterfield, of the Massachusetts Agricultural College, and Professor E. R. Groves, of the New Hampshire College, will deliver courses of lectures at the summer graduate school of the Association of American Agricultural Colleges and Experiment Stations which will be held this year at Amherst, Mass., at the Massachusetts Agricultural College.

The anniversary meeting of the British Chemical Society was held on March 30, when Dr. Alexander Scott delivered his presidential address, entitled "Our Seventy-fifth Anniversary."

Dr. William Palmer Bolles died at Santa Barbara, Cal., on March 18. He was professor of materia medica and botany in the Massachusetts College of Pharmacy from 1874 to 1884, and instructor in materia medica and therapeutics in the Harvard Medical School from 1880 to 1884. He was until his retirement in 1908 surgeon at the Boston City Hospital.

UNIVERSITY AND EDUCATIONAL NEWS

With the exception of chemistry, all the departments of the Johns Hopkins University will be transferred to Homewood by October, 1916. The Johns Hopkins Club has contracted to take over the Carroll House on the Homewood campus.

By the will of the late Colonel E. A. Knox the New York Medical College and Hospital for Women receives a bequest of $5,000.

Dr. E. D. Ball, director of the experiment station and school of agriculture of the Utah Agricultural College has resigned to take effect at the end of the present year. Dr. Ball plans to go back into entomological work. Dr. F. S. Harris, professor of agronomy, has been elected director of the experiment station, and Dr. G. R. Hill, professor of botany and plant pathology, director of the school of agriculture.

Dr. Nellis B. Foster, assistant professor of medicine at Cornell University Medical School, has accepted the appointment of professor of medicine at the University of Michigan, Ann Arbor.

Dr. Frank Worthington Lynch, formerly associate professor of obstetrics at the University of Chicago, has been made full professor of obstetrics at the University of California, succeeding J. Morris Slemons, 1900, who has accepted a similar chair at Yale.

Dr. Ernest Laplace, who has been professor of surgery and clinical surgery in the Medico-Chirurgical College, Philadelphia, for the last twenty years, has accepted also the duties of professor of principles of surgery and clinical surgery held by the late Dr. Rodman.

GARRETT RYLAND, Ph.D. (Johns Hopkins, '98), has been made professor of chemistry at Richmond College, Richmond, Virginia.

MR. A. V. HILL, Humphrey Owen Jones lecturer in physical chemistry at the University of Cambridge, has been elected a fellow of King's College.

MR. F. P. WHITE, St. John's College, has been elected to an Isaac Newton studentship at the University of Cambridge.

PROFESSOR SIEGFRIED GARTEN, of Giessen, has been called to the chair of physiology at Leipzig as successor to Professor E. Hering.

DISCUSSION AND CORRESPONDENCE

THE CURRENT "DEFINITION" OF ENERGY

TO THE EDITOR OF SCIENCE: In a book review by Professor Millikan[1] the reviewer incidentally mentions the existing confusion in the use of the word "energy." In my judgment, Professor Millikan's remark is fully justified; for it is not only the writers of text-books, but scientific writers of the first rank who find themselves more or less entangled with the current definition of energy and the terminology to which the definition leads because the terminology is inconsistent with a logical use of the facts. Recent and present writers are not wholly to blame for this state of affairs for they have inherited a "definition" and a terminology from the pioneers in the science of thermodynamics that conflict with facts whose full significance was discovered only after the terms were introduced and their use established. Under such circumstances confusion is inevitable until the terminology is revised to fit the facts.

Many of our text-books on physics "define" energy as the "capacity of doing work" (Maxwell), as the "ability to do work," or, even as the "power of doing work." This last is particularly reprehensible, because "power," as used in physics, is the rate of doing work. As a matter of fact, even if work were a form of energy, none of these definitions would be an adequate "definition" of energy any more than a quart measure would be a definition of "space." Because heat is a form of energy it does not follow that "energy is heat," or, because our standard of mass is a piece of platinum that "matter is platinum." But the above definitions of energy are worse even than the above logical absurdities would indicate, for work, as may easily be seen, is not even a form of energy, like heat, but is in reality merely a phenomenon that accompanies its transfer or transformation. The reason why our unit of work is also our unit of energy is that all of our measurements of work are *energy-changes* involving transfers which may be *measured* by the work done *on* or *by* a body or system. The actual doing of work is always found to depend upon the existence of *energy differences;* and these *differences* are just as essential to the doing of work and the transfer of energy as the presence of energy itself. This fact, which is ignored in the above definitions, is expressed in a variety of ways by the second law of thermodynamics. "The capacity of doing work," if the words are to mean anything definite should be taken as referring to the "availability of energy"; and the *availibility* of a thing is not the *thing* available. In explaining work and energy, Professor Millikan states:[2]

> . . . it is obvious that they are not synonymous terms, for a body may possess energy and yet never apply it to the production of work. Work is done only when energy is *expended.*

If he had here used the word "transferred" instead of "expended" his statement would confirm what I have been endeavoring to present.

There is no more necessity for a "definition" of energy than there is for a definition of "matter." Both are known only by their characteristic phenomena; and these characteristics must serve to identify them and to differentiate them from each other. With the "units" of each, however, the case is quite different. They may be defined in terms of

[1] SCIENCE, October 2, 1914, p. 486.

[2] "Mechanics, Molecular Physics and Heat," p. 42.