

on March 11, in the Auditorium of the new National Museum, when there was a lecture by Mr. Wilfred H. Osgood, of the Field Museum of Natural History, who was engaged on a special investigation of the fur-seal question for the Department of Commerce during the summer of 1914. His subject was "Fur Seals and Other Animals on the Pribiloff Islands."

DIRECTOR JOHN F. HAYFORD, of the college of engineering, Northwestern University, addressed a group of graduate students and professors of the University of Wisconsin on the subject of "Isostasy" on March 1. That evening he addressed the Science Club of the same institution on the decision in regard to the Panama-Costa-Rico Boundary Dispute. Director Hayford was chairman of the committee appointed by the chief justice of the United States, which made a personal investigation and survey.

DR. LAFAYETTE B. MENDEL, professor of physiological chemistry in Yale University, addressed the Johns Hopkins Hospital Medical Society at Baltimore, March 1, on "Nutrition and Growth."

THE tenth lecture before the Harvey Society was given on March 13, at the New York Academy of Medicine, by Professor Elliott P. Joslin, of Harvard University, on "Carbohydrate Utilization in Diabetes, based upon Studies of the Respiration, Urine and Blood."

DR. CHARLES S. BERKEY, associate professor of geology in Columbia University, will give the last of the Jessup lectures on "Origin and Meaning of Some Fundamental Earth Structures" at the American Museum of Natural History on March 26. The subject of the lecture is "The Relation of Structural Geology to Practical Undertakings."

PROFESSOR EDWARD H. WILLIAMS, JR., of Woodstock, Vt., for many years head of the department of mining and geology at Lehigh and now a lecturer of the university, gave two lectures in February before the students. His subjects were "The Geology of the Lehigh Valley" and "The Formation of the Allegheny River."

THE American Association of Pathologists and Bacteriologists, of which Dr. Leo Loeb, St. Louis, is president, will meet in St. Louis, on April 2 and 3. The meetings will be held in the pathological department of Washington University Medical School and in the library of the St. Louis University. Preceding these meetings on April 1 will be held the annual meeting of the American Association for Cancer Research and the annual meeting of the International Association of Medical Museums. These meetings will be held in the laboratories of the Washington University Medical School.

THE seventh semi-annual meeting of the American Institute of Chemical Engineers will be held in San Francisco, Calif., from August 25 to 28. An itinerary is being arranged so that the natural scenery of the west may be seen and also some of the more important mining operations as well as the typical chemical industries of California.

THE senate of the Kaiser Wilhelm Society for the Advancement of Science at a session held on January 23, determined to break ground for the projected Kaiser Wilhelm Institute for Physiology and for the Study of the Brain. The Kaiser Wilhelm Institute for Biology is soon to be opened at Dahlem.

UNIVERSITY AND EDUCATIONAL NEWS

AT the convocation at the University of Chicago, on March 16, Julius Rosenwald Hall, devoted to the work of the departments of geology and geography, was dedicated. The building, a gift from Mr. Julius Rosenwald, a trustee of the university, has cost approximately \$260,000.

THE Arnold Biological Laboratory, ground for which was broken at Brown University last summer, is practically completed and will be put into use for regular class work with the reopening of college after the spring recess. The building, which is three stories in height, 117 feet long and 52 feet wide, will cost when finished \$80,000, and \$30,000 more will be expended upon the equipment. The cost of the building will be covered by a bequest made to the university for the purpose by the late Dr.

Oliver H. Arnold, while the funds for equipment have been subscribed.

PROFESSOR THOMAS S. FISKE has been designated as administrative head of the Columbia University department of mathematics for two years beginning July 1, in the place of Professor Cassius J. Keyser, who retires at his own request.

MR. MORRIS M. WELLS, of the University of Illinois, has been appointed instructor in the department of zoology in the University of Chicago.

THE Benjamin Peirce instructorships in mathematics at Harvard University, the terms of whose establishment were recently announced in *SCIENCE*, have now been filled for the year 1915-16 by the appointment of Dr. Edward Kircher and Dr. George A. Pfeiffer.

DISCUSSION AND CORRESPONDENCE

THE FUNDAMENTAL EQUATION OF MECHANICS

TO THE EDITOR OF *SCIENCE*: Professor Huntington's letter in *SCIENCE* of February 5 is an important contribution to the subject of the teaching of elementary dynamics, but the fact that he and Professor Hoskins are not in agreement on "the question whether $F=ma$ or $F/F'=A/A'$ is the better form in which to introduce the fundamental equation of mechanics" shows that something remains to be said on the subject. In my opinion neither of these equations ought to be considered as fundamental, for both are derived from more elementary equations.

Professor Huntington objects to $F=ma$ for certain reasons. He might have made other objections to it: for example, the equation is not true in the ordinary English system (foot-pound-second) until it is hybridized by valuing either F or m in some other unit than pounds (poundal or gee-pound) or a in "gravitals" (instead of feet) per second per second (1 gravital = 32.174 feet),¹ or else the letter m is

¹ The writer invented the "gravital" and also the "timal" (=1/32.2 of a second) over 20 years ago as antidotes to the "poundal," merely to serve as "horrible examples" of what might be done in the way of introducing still further confusion into our systems of units. He also invented the

explained as not being quantity of matter in pounds, but only the quotient or ratio W/g . Neither is it true in the metric kilogram-meter-second system. (I do not think the metric people have yet tried to introduce a "kilogrammal" or a "gee-kilogram.") It is of course true in the dyne-centimeter-gramme-second system, but this system is only used in higher physical theory, and it should not be inflicted on young students. The equation $F=ma$ is, however, a handy equation to work with when it is understood that m is merely a conventional symbol for W/g .

The equation $F/F'=A/A'$ may be useful for some purposes, but I agree with Professor Hoskins in not accepting it as fundamental or as the best equation to be used as an introduction of the subject. Each of the equations being open to objection, I wish that both Professor Hoskins and Professor Huntington would consider the following treatment of the subject, and let me know what objections there are to it.

Quoting Professor Huntington's words: "The first serious problem which confronts the teacher of dynamics is the problem of making the student understand the effect which a force produces when it acts on a material particle" (I would substitute the word "body" for material particle).

Let us start with the student just out of the grammar school, who has never studied physics, but who understands the simplest forms of algebraic equations, and how to make $a=F/m$ out of $F=ma$. He already knows the ordinary meaning of the words time, space, force, matter (or stuff, solid, liquid or gas). He may be told that the word "body" means a piece or chunk of stuff, and that velocity is just another name for speed. He knows that force may be measured by a spring balance, and that the quantity of matter in a body may be determined by weighing it on grocer's even-balance scale or on a platform

"massal" = 32.2 pounds, but that has got into some text-books disguised under the names of "gee-pound," slug, and "engineers unit of mass." The latter term is especially objectionable, for it has never been used by engineers.