

been generally recognized. They say that: "The Brown Institution was founded under the will of Mr. Thomas Brown of Dublin, who died in December, 1852, and left about £20,000 to the University of London for the purpose of 'founding . . . an institution for investigating, and, . . . endeavoring to cure maladies, distempers and injuries, any quadrupeds or birds useful to man may be found subject to.' . . . The institution, at 149 Wandsworth-road, was opened in 1871. Many of its researches have been carried out at the instance and on behalf of government departments, and the diseases investigated have been numerous and diverse in character, including anthrax, actinomycosis, hydrophobia (for the Hydrophobia Commission), vaccinia (for the Local Government Board), tuberculosis, swine fever (for the Board of Agriculture), and sleeping sickness. We may refer particularly to the research on John's disease of cattle by Mr. F. W. Twort, the present superintendent of the institution, and Mr. G. L. Y. Ingram, who succeeded in growing outside the animal body the causative bacillus of the disease. The work had to be curtailed owing to the fact that the institution was unable to provide the funds necessary for the keep of infected animals for experimental purposes. We are thoroughly in agreement with the Berks and Oxon Chamber of Agriculture that such investigations are best carried out in a place like a university. We beg further to point out that in the Brown Institution the University of London has the nucleus of exactly such a research department as is required, and that nothing but adequate funds are needed for its further development."

#### UNIVERSITY AND EDUCATIONAL NEWS

At the celebration of the centenary of the foundation of the Yale University Medical School, large gifts were announced in addition to the \$500,000 from the General Education Board. These included a provisional gift of \$500,000 for the Anthony N. Brady foundation and \$600,000 from donors not officially named.

By the will of James Campbell, the St. Louis University Medical School will receive

his entire estate after the death of his heirs, who have a life interest in it. The present value of his estate is estimated to be from \$15,000,000 to \$40,000,000.

By the will of Thomas W. Holmes, of Troy, Rensselaer Polytechnic Institute is bequeathed the sum of \$50,000.

By the will of the late Dr. Joseph D. Bryant, professor of surgery in the University and Bellevue Hospital Medical College, a trust fund of \$1,000 is established for the benefit of New York University. The directions regarding it left by Dr. Bryant were as follows: "The income of this fund shall be devoted to instilling in the minds of the senior class the principles of ethics of the American Medical Association." Upon the death or remarriage of his widow, one seventh of Dr. Bryant's residuary estate is to be given in trust to New York University, and one seventh in trust to the New York Academy of Medicine. One contingent bequest of \$10,000 is to be devoted to opposing the efforts of anti-vivisectionists in New York State.

MISS SUSAN MINNS has given \$50,000 to the department of botany of Wellesley College, in memory of Susan M. Hallowell, the former head of the department.

SIR GEORGE KENDRICK has given \$90,000 to the University of Birmingham to endow the chair of physics in memory of the late Professor John Henry Poynting.

THE trustees of Columbia University have appointed Dr. Warfield T. Longcope, to be Bard professor of the practise of medicine to succeed Dr. Theodore C. Janeway, who goes to the Johns Hopkins University. Professor Longcope is also nominated medical director of the Presbyterian Hospital. The department of therapeutics has been merged with that of clinical medicine and Dean Samuel W. Lambert, formerly professor of therapeutics, has been appointed professor of clinical medicine. Dr. Charles C. Lieb has been appointed assistant professor of a new department of

pharmacology and Dr. William Darrach has been appointed assistant professor of surgery.

DR. ROSS A. GORTNER, since 1909 resident investigator in biological chemistry at the station for experimental evolution of the Carnegie Institution of Washington, has been appointed associate professor of soil chemistry in the University of Minnesota.

DR. KARL F. MEYER, whose special field is the tropical diseases, has been promoted to be professor of bacteriology and protozoology in the University of California.

DR. J. HOWARD AGNEW, formerly first assistant in the department of medicine, University of Michigan, has accepted the full time professorship in medicine in the University of Alabama, School of Medicine, at Mobile.

At Dartmouth College, Drs. E. J. Rowe and E. S. Allen have resigned as instructors in mathematics, the latter to accept an instructorship at Brown University. Dr. R. D. Beetle, of Princeton University, and Dr. L. C. Mathewson, of the University of Illinois, have been appointed instructors in mathematics.

D. K. PICKEN, professor of mathematics in Victoria College, University of New Zealand, has been appointed master of Ormond College, Melbourne University.

#### DISCUSSION AND CORRESPONDENCE

##### DADOURIAN'S ANALYTICAL MECHANICS

IN the issue of *SCIENCE* of April 3, Dr. Dadourian replies to my criticism of his "Analytical Mechanics." His reply was read with interest. It was hoped that he would clear up several points in this reply that seemed to the reviewer as unsatisfactory. I do not wish to get into a controversy, but it seems to me that his standpoint is untenable. He says in his reply:

It is a fact that I have applied vector addition to forces *without hesitation*, but I have shown as little hesitation in treating velocities, accelerations, torques, linear momenta and angular momenta as vectors. Why did not Professor Rettger accuse me of having assumed the "parallelograms" of these magnitudes? Is the "parallelogram of forces" more of a dynamical law than the parallelogram of torques, for instance? The parallelogram law ap-

plies to any vector and is not at all a characteristic of forces, therefore, it is not a dynamical law. It does not even deserve being called a "law" when applied to a special type of vectors. In its most general form the "parallelogram law" is the principle of the independence of mutually perpendicular directions in space, a purely geometrical principle. . . . After devoting an entire chapter to vector addition and after defining force as a vector, to introduce the "parallelogram of forces" as a new law, as Professor Rettger would have it, could serve only to show that the man who did it could not have a clear conception of the meanings of the terms he was using.

Let us assume that a body, originally in the position  $O$ , moves first through a distance,  $a$ , in a given direction and then through a distance,  $b$ , in another direction. Assume the body finally to be in the position  $C$ . The resultant displacement then is  $OC = c$ . The body would be in the same position,  $C$ , if it had moved first through the distance,  $b$ , and then through the distance,  $a$ , that is, its final position, or its final displacement is independent of the order in which the two displacements take place. They may take place, therefore, simultaneously, and the final or resultant displacement is still equal to  $c$ . If then we recognize that the two displacements have no mutual effect on each other, or, what amounts to the same thing, that the displacements are independent of each other, then the resultant displacement may be represented by the diagonal of a parallelogram of which the two displacements are adjacent sides. As soon as this "Principle of Independence" is once recognized, then the "parallelogram law" can be proved to hold also for velocities, accelerations and other conceptions of kinematics. The parallelogram law as applied to these quantities is then equivalent to the "principle of the independence of motions" and as such is a purely "geometric principle." These quantities, displacements, velocities and accelerations are therefore vectors in accordance with the definitions of a vector, and the principles of vector analysis may be applied advantageously.

Vector analysis may be called an algebra that rests on certain (arbitrary) assumptions, and the "parallelogram of vectors" is one of