

to Finished Pipe" (illustrated with motion pictures), by Mr. C. F. Roland, New York representative, metallurgical department, National Tube Co. March 2, "New Method for Nitrogen Fixation," experimental, showing utilization of home-made apparatus, by Dr. J. E. Bucher, professor of chemistry, Brown University. March 16, "Chemical Structure and the Biological Function of Tissue Elements," by Dr. P. A. Levene, Rockefeller Institute. March 23, "The Conservation of Pine Forests through the Methods of Chemical Research" (illustrated by specimens and stereopticon), by Dr. Chas. H. Herty, editor of the *Journal of Industrial and Engineering Chemistry*. March 30, "The Getting of Wisdom," by Dr. H. K. Mees, director research department, Eastman Kodak Co. April 13, "Colloids in Pharmacy" (illustrated and experimental), by Dr. John Uri Lloyd, manufacturer, chief chemist, investigator and novelist. April 27, "Some Chemistry of the Tropics" (illustrated from recent observation), by Dr. L. H. Friedburg, professor emeritus of the College of the City of New York.

DR. THOMAS H. HAINES, professor of nervous and mental diseases at Ohio State University, has five months' leave of absence from his work at the university and from the Bureau of Juvenile Research, and is making a state survey of mental defectives in Kentucky. A state commission on the feeble-minded was appointed in May, 1916, by Governor Stanley in accordance with a resolution adopted by the General Assembly in March, 1916. Dr. Haines was appointed director of the survey and sent to the commission in Kentucky by the National Committee for Mental Hygiene, and the Rockefeller Foundation, without cost to the state of Kentucky. Kentucky presents a peculiarly fertile field in which to secure social economics in the management of defectives. By the terms of the Pauper Idiot Act, the substance of which has been on the statute books since the second year of the commonwealth, 1793, any person who is proved to be without estate and mentally feeble, to the satisfaction of a jury, and is so certified to the state auditor, may draw annually from the state treasury, through his committee seventy-five dollars for

his maintenance. Last year more than twenty-two hundred such pauper idiots cost Kentucky by this means alone \$165,000. This method is said to encourage the propagation of the mentally incompetent.

MR. AND MRS. GILBERT H. GROSVENOR have given to the American Association to Promote the Teaching of Speech to the Deaf a trust fund of \$5,000 to establish an "Alexander Graham Bell Grosvenor Memorial Fund," in memory of their second son, who died March 6, 1915. In accepting this memorial fund the directors resolved that the income shall be used in paying for the publication and distribution of literature that will help parents to intelligently train and teach deaf children in the home prior to school age, and that every publication paid for from the income of this fund shall bear on the title page an inscription stating that it is a publication of the Alexander Graham Bell Grosvenor Memorial Fund. Following a suggestion from the donors, the directors decided to offer \$300, a sum equivalent to the first year's income, for the best essay on the subject of "Teaching and Training Little Deaf Children in the Home." A decision on the essays submitted will shortly be made by the judges, who are Mr. and Mrs. Edmund Lyon, Rochester, N. Y., Dr. and Mrs. A. L. E. Crouter, Mr. Airy, Philadelphia, Pa., and Mr. and Mrs. Gilbert H. Grosvenor, Washington, D. C.

UNIVERSITY AND EDUCATIONAL NEWS

WASHBURN COLLEGE at Topeka, Kansas, has just added \$500,000 to its permanent endowment fund. Of this sum \$200,000 was contributed by citizens of Topeka, \$200,000 consists of contributions secured by President Womer outside of Topeka and \$100,000 was given by the General Education Board.

THE University of California is to receive \$10,000 as a library endowment by bequest from Horace Davis, president of the university from 1888 to 1890.

It has been decided to make the erection of new science buildings for the University College of North Wales, Bangor, the North Wales

memorial to men fallen in the war. The cost of the scheme will be £150,000.

WE learn from *Nature* that Mr. D. M. Forbes, who died on December 13 last, has bequeathed to the University of Edinburgh his books relating to the Philippine Islands, and the residue of his property, which, with the property abroad, will amount, it is understood, to about £100,000, for the purposes of education.

THE council of the University of Liverpool has recently received from a donor who desires to remain anonymous a sum of money sufficient partially to endow a chair of geography. The council has felt justified, under the circumstances, in establishing the chair, and a professor will be appointed in a few weeks.

WALTER A. PATRICK, Ph.D. (Göttingen), of Syracuse University, has been appointed associate in chemistry at the Johns Hopkins University. After two years spent in physical chemical research at the Massachusetts Institute of Technology, Dr. Patrick spent a year with Freundlich, at Braunschweig, a year with Zsigmondy at Göttingen and a year as private assistant to Professor Donnan, at University College, London.

DR. HOWARD T. KARSNER, professor of pathology, has been elected secretary of the school of medicine, Western Reserve University. Dr. Russell J. Collins, demonstrator of pharmacology, has resigned because of ill health.

THE University of Cambridge will hereafter grant the degrees of master of letters and master of science for somewhat the same qualifications as the doctorate of philosophy is awarded by German and American universities. A proposal that the degree of doctor of philosophy be awarded was rejected.

DISCUSSION AND CORRESPONDENCE

WHEN IS A FORCE NOT A FORCE?

THE article by Mr. Gordon S. Fulcher in *SCIENCE* for November 24, 1916, calls attention in a most timely way to the vagueness which characterizes the discussion of the idea

of force in most of our modern text-books of physics, but does not make clear just how he would "use force only in the single definite sense implied in the laws of motion." Let us take the following simple case: a ball is attached to a rubber cord, say three feet in length. A person grasps the ball and pulls it with a force F , stretching the rubber cord to a length of five feet. The strain in the cord is produced by the two forces $+F$ and $-F$ acting at the ends of the cord. The third law of motion covers the case.

Now suppose the person swings the ball around his head at the end of the rubber cord until its velocity is great enough to stretch the cord again to a length of five feet. The stress in the cord is the same as before. The question is, what is the nature of the "reaction" which the ball is exerting on the cord to stretch it? It is certainly a "force" F (otherwise the cord would not be stretched as it is), and it is in one sense balancing the equal "action" of the cord on the revolving ball, which we know as centripetal force. Is the "centrifugal force" (inertia-reaction of the ball) in this case a force in the "single definite sense implied in the laws of motion"? Does the third law also cover this case?

We usually define force as that which produces (or tends to produce) a change in the condition of motion of a mass, either in magnitude or in direction. Certainly inertia-reaction might not come under this definition, but undoubtedly our definitions of force are intended to describe ordinary forces—mechanical, magnetic, electrical, etc.—which can do three things: (1) oppose other forces, (2) produce acceleration, and (3) produce deceleration. The force called friction can do only the first and third of these things; it can not produce acceleration (except in indirect ways). Is friction a force in good and regular standing in the "single definite sense implied in the laws of motion"?

Inertia-reaction can do only the first of these three things; it can not, by its very nature, produce either acceleration or deceleration. And yet even while it is opposing the restoring stress in the rubber cord mentioned above, we