To the boy who enters the engineering college fresh from high school, the reading of Arnold's "Sweetness and Light," "Hebraism and Hellenism," etc., is both stimulating and broadening. It forces the freshman to think, to sum up his own ideas concerning his relation to life and the world about him; and perhaps, before he realizes it, his outlook on life has widened. Arnold teaches him to value himself for what he is, to understand what ideal perfection is, to attempt, specialist though he be, to prepare himself for a well-balanced life. The results of Arnold's teaching I have found in impromptu paragraphs on "My Aim in Life," written in the composition class. Here, back of an occasional obvious effort to write what might please the instructor, I have seen evidence of a sincere desire on the student's part to be not only a perfect engineer, but a well-rounded man as well.

The transition to Huxley is made through his controversy with Arnold over the means of getting a cultural education. In Percival and Jelliffe's "Specimens of Exposition and Argument" which the men use in their composition course, is Huxley's address at the opening of Sir Josiah Mason's Scientific College in Birmingham. Arnold's reply is in Gates's "Selections." This controversy gives the freshman a good idea of different views of education, especially of scientific education, and paves the way for Huxley's talks on "A Liberal Education," "Principal Subjects of Education" and "On Improving Natural Knowledge."

The subject-matter and structure of Huxley's addresses appeal to the freshman engineer. This part of the course fits in particularly well with the exposition work in composition. The student learns how to fit his material to his audience, how to outline clearly, how to say things most concisely and in the strongest way; and the fact which the autobiography gives us, that Huxley at first detested writing and speaking, encourages the freshman to emulate Huxley's example and master his mother tongue, that he, too, may best put his ideas before others. As to the subject-matter, what is better fitted to interest the scientific student than "On a Piece of Chalk," "Coral and Coral Reefs" or "The Physical Basis of Life"? Such essays open up for him the great facts of nature which have come in with the "new knowledge."

The fact that this course, joined to the course in practical composition (which is another story), is required of all engineering freshmen and that it is the only course of its kind which they will ever get in college, makes the question of proper subject-matter of vital importance. I should welcome criticism and suggestions.

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The University of Minnesota,
December 27, 1910

A KINETIC THEORY OF GRAVITATION

To the Editor of Science: In reading the article entitled "A Kinetic Theory of Gravitation," which was published by Dr. Brush in Science for March 10, I was at once struck with what seemed to me a fallacy in an illustration given early in the discussion. Perhaps the point at issue has been sufficiently discussed by Dr. Kent in Science for April 21; but since it presented itself to me somewhat differently it may not be out of place to give my line of reasoning.

I refer to the consideration by Dr. Brush of the case of the transportation of a one-pound mass from the surface of the earth to a point of equilibrium between the earth and the moon, at which point there would be no tendency for the body to move either toward the earth or toward the moon. As I understand the argument of Dr. Brush he assumes that in this case there is an apparent disappearance of energy; that there is no gain in the potential energy of the system caused by raising this body from the surface of the earth to the position of equilibrium and that there is, so to speak, nothing to show for the work done in so raising it.

The point that Dr. Brush seems to have overlooked is that attraction between two bodies is mutual. If the pound mass in the position of equilibrium is attracted by earth

and moon it in turn attracts both earth and moon. The tendency for the earth and moon to approach each other is greater than before the pound mass was raised from the surface of the earth; the potential energy of the system is increased by an amount equal to the energy expended in raising it and there is no more a disappearance of energy to be accounted for than in the simpler case where a mass subject to no attraction but the earth's is raised above the earth.

E. S. MANSON, JR.

COLUMBUS, OHIO,
April 29, 1911

SCIENTIFIC BOOKS

Œdema. A Study of the Physiology and Pathology of Water Absorption by the Living Organism. By MARTIN FISCHER, M.D. Pp. 209. New York, John Wiley and Sons. 1910.

A trenchant alternative to current and generally accepted ideas of the distribution of water in the organism is presented by Fischer in this essay. The familiar reference to filtration, diffusion and osmosis as explanatory factors is notably absent and, instead, the part played by the colloids in the cells and body fluids is emphasized. That some colloids, such as gelatine, for example, are able to take up water and thus enormously to increase their volume is common experience. Such "hydrophilic" colloids Fischer has investigated with reference to the conditions which cause them to take in water or to give it forth. The degree of swelling of the colloid depends on its nature and also on the character of the solution in which it is placed. Thus both gelatine and fibrin swell more in alkaline or acid solutions than in water, both have the amount of swelling in acid or alkaline solutions reduced by the presence of electrolytes, and in both the addition of non-electrolytes fails to exert the checking effect produced by electrolytes. By extensive experiments Fischer has demonstrated that the body tissues, represented by muscle and the eyes, when immersed in water, or in acid and alkaline solutions, or in combinations of acid and alkaline solutions with various electrolytes, behave in a manner quite analogous to gelatine and fibrin.

On the basis of these experiments the suggestion is offered that œdema is induced whenever, in the presence of an adequate supply of water, the affinity of the colloids of the tissues for water is increased above what we call normal. Particularly by the accumulation of acids in the tissues is the affinity for water increased. Thereupon Fischer proceeds to show that states in which œdema develops are accompanied by an abnormal production of acid, that under such circumstances œdema can be reduced by the same agencies (electrolytes) which decrease the affinity of hydrophilic colloids for water, but remains unaffected by non-electrolytes, and that experimental production of acids in tissues results in the development of œdema.

The argument thus devised for the explanation of œdema in general is applied to the peculiar phenomena of œdema in special organs, and is then extended to other biological phenomena in which the transfer of water plays an important rôle, as in hæmolysis, growth and urinary secretion.

The experimental procedures on which the conception described in this volume is founded are of the utmost simplicity, and can be readily tested by any one. Fischer's application of these simple tests to conditions in the body is made with much ingenuity and in many instances with compelling conviction. To what extent the process can be used to explain certain results of experimental procedures which cause increased production of lymph, or which vary the amount of urine secretion, remains to be seen. Certainly the conception is highly suggestive, and well worth putting to further test.

The subject is expounded by Fischer with clearness, with enthusiasm, and with evident assurance of the adequacy of the theory to meet the demands that can be put upon it. The essay was awarded the Nathan Lewis Hatfield Prize by the College of Physicians of Philadelphia in 1909.

W. B. CANNON