lands in working out the problems of the twentieth century. Scientific research has not always found the most congenial atmosphere in American universities. It has not been as thoroughly appreciated as it might be and as it should be, and the American university of to-day, like Oxford and Cambridge, stands at the cross-roads. Shall it be an enlarged and amplified high school, or shall it become a center for the evolution of knowledge and discovery. Has not the state the right to ask of its university the very best knowledge possible upon every subject in which the welfare of the people may be involved?

My friends, my heart, always larger than my head, overflows with the emotions which my poor tongue can not adequately express. I desire to thank all of you for this highly appreciated, but, I fear, poorly deserved, tribute.

SCIENTIFIC BOOKS.

A Text Book of Plant Physiology. By George James Peirce, Ph.D., Associate Professor of Plant Physiology, Leland Stanford Junior University. New York, Henry Holt and Company. 1903. 8vo. Pp. vi + 292.

The author of this work in his preface, which bears date of December, 1902, says that the book is the outcome of his own work in Stanford University, and that after the material had been worked over for some time in lectures it finally took form in the present volume. His intention is 'to present the main facts of plant physiology and the saner hypotheses regarding them, striving to express safe views rather than to echo the most recent, attempting here and there to suggest definite problems for investigation and everywhere trying to avoid giving the impression that the science or any part of it has reached ultimate knowledge and final conclusions.' This intent on the part of the author has been well carried out, and we may congratulate him upon the book which he has added to American botanical literature. He has made no attempt at giving directions for experiments, 'believing that a laboratory manual and a text-book must meet such different needs that the style of the one is impossible for the other.' However, the author insists that actual laboratory work must be carried on under the guidance of a teacher in the study of the subject.

Dr. Peirce gives his ideas as to the aim of physiology in the following words, which we may well quote:

"According to Pfeffer, 'the aim of physiology is to study the nature of all vital phenomena in such a manner that, by referring them to their immediate causes, and subsequently tracing them to their ultimate origin, we may arrive at a complete knowledge of their importance in the life of the organism.' Physiology is a study not merely of structure, though to its successful pursuit a knowledge of structure is indispensable; nor of organized bodies, though a knowledge of the laws which govern their organization (structure and form) is important. It is the study of the living organism."

On a later page he says: 'The physiologist is now striving not only to know the functions which are the manifestations of the life possessed by complicated living structures or organisms, but also to determine the causes, both of structure and of functions.'

These quotations will sufficiently indicate the spirit in which the book is written.

In the introductory chapter there is an instructive summary under the heading 'The Conditions Essential to Life' as follows:

"1. Proper Food—(*a*) the source of the materials of which the body is built, and (*b*) of the energy by which the body is built and operated.

"2. Water—(*a*) the vehicle of the food-materials and of the foods absorbed into the body and transferred from part to part, and also (*b*) an indispensable component of actively living protoplasm.

"3. Proper Temperature—which makes possible the vital, *i. e.*, the chemical and physical, changes which must go on within the body, and in all of its parts, lest inaction and death ensue.

"4. Proper Illumination—which furnishes the organism with the forms of energy—physical and chemical—thermal, luminous and actinic—of which it is directly or indirectly in need.

"5. Proper Freedom—freedom from mechanical and other disturbances which would interfere with its supply of food, water, warmth and light, and prevent it from carrying on its natural functions."

And again, under the heading 'The Living Matter and the Actively Living Structure,' the author says:

"As Hertwig has so strongly emphasized, the living and active protoplasm is to be regarded not as a chemical compound or an association of chemical compounds, but rather as an orderly arrangement of these into a definite structure, of which water is an indispensable constituent. Some of the water contained within the cell should be considered to be as much a constructive constituent of the living protoplast as the water is of the crystal of copper sulphate. As, without a certain amount of water, one can never have crystals, no matter how much copper sulphate may be present, so also, without the necessary amount of water we can never have active protoplasm. When the water of constitution is withdrawn, all the activities of the cell cease with the demolition of its structure."

In the carrying out of the author's plan he devotes one chapter to nutrition, another to absorption and movement of water, still another to growth, one to irritability and one to reproduction. In the chapter on the absorption and movement of water the author's treatment of transpiration is interesting. Thus, on page 136, we find the following:

"From all their surfaces exposed to the air, plants give off water-vapor. This is a physical necessity, for water-vapor will be given off from any mass, lifeless or living, which contains water, whenever the surrounding air is not saturated with moisture, or when the mass has a temperature higher than that of the air, or when the mass, in relatively dry air, is not enclosed in a waterproof covering. Other things being equal, the amount of water-vapor given off will be greater the greater the exposed surface in proportion to the mass. With like conditions of humidity, temperature, surface-composition and surface-area, equal masses of different composition, will dry, *i. e.*, lose water by evaporation, at different rates, a gelatinous or slimy mass more slowly than a woody one, for example. The living plant differs from a dead one of exactly the same dimensions in being able to control four of these five factors, and to that degree it is able to control the rate and the amount of evaporation. Because evaporation from the body of the living plant is controllable within certain limits by the plant itself, and to this extent is a physiological process, it has been given the separate name of transpiration."

After a little further discussion he says: 'Transpiration is, therefore, a physical process controlled but not carried on by the living plant. According to circumstances it may be more or less rapid than simple evaporation.' This view of the nature of transpiration is one which the present reviewer has held for many years, contrary to the views of many of the older physiologists, and it is gratifying to find that Dr. Peirce holds this physical view of the transpiration process.

In passing we notice with interest what the author has to say with reference to ecology, to which he refers very briefly on pages 252–253. Of it he says: 'Meantime it is more or less the fashion under the name of ecology to view things in the large way, and by feeling rather than by the application of exact physiological methods, to reach conclusions regarding the effects of environment and of association.' We gather from this that the author has little use for the looser ecological methods, and in this again the present reviewer must heartily agree with him.

The volume is full of original suggestions, and differs quite markedly from the old-time works devoted to plant physiology. We congratulate the author upon the success which we are sure must attend the publication of this book.

CHARLES E. BESSEY.
THE UNIVERSITY OF NEBRASKA.

Caterpillars and their Moths. By IDA MITCHELL ELIOT and CAROLINE GRAY SOULE. New York, The Century Company.

In this handsome book of more than three hundred pages we have a very valuable contribution to the literature of popular entomology. The authors have mapped out for themselves a special field and have occupied it to excellent advantage. The caterpillars chosen for treatment are those of the larger moths, especially the more common ones, no