OUR BOOK SHELF.

Experimental Plant Physiology. By D. T. MacDougal. (New York: Henry Holt and Co., 1895.)

THIS little book is intended primarily for the use of elementary students of vegetable physiology, and the subject-matter is treated in a somewhat dogmatic fashion. *This we cannot avoid regarding as a mistake.* The elementary, no less than the more advanced, student requires to be made at the outset to *think for himself*, and this is a far more important matter than the mere following out of directions for experiments. But it is just this stimulus that we miss, in the pages before us, and in not a few instances the author has sacrificed reality at the shrine of conciseness; thus it is simply useless to compare the mechanism by which water "is taken up and forced into the root and upward in the stem" to the action of an osmometer, for the conditions are not at all the same. The state of the water, as it exists in, and finds its way upward into, the tracheids, is by no means directly comparable with that of the solution of salts as it occurs in the tube of a thistle funnel, the lower end of which is closed by a piece of membrane. Here was a good opportunity of insisting on the peculiarity of a living protoplasmic structure, and it was lost. Very few teachers, who are at all *au courant* with their subject, will accept the statements as to ascent of sap, given on pages 28 and 29. "The rectangular wood cells are in the form of a series of chains. Water transpired from the topmost cells of these chains, the cell sap becomes concentrated. . . . There is thus formed a series of osmometers extending from the leaves to the roots and capable of lifting water to any height." Surely a slight knowledge of elementary physics, combined with that of the structure of the "wood cells," should have rendered it impossible that such a passage could have been written.

Again on page 46, one is tempted to wonder whether the author can have ever tried the experiment (54) to prove that oxygen is necessary for *respiration*. Any unwary teacher who performed that experiment for the first time before an intelligent class, would probably have a hard time of it if he trusted himself to Mr. MacDougal's guidance.

The above remarks and quotations will show that there are weak points about the book. And, indeed, the general impression left on the reader's mind is the rather painful one, that an important branch of botanical study has here been but superficially handled.

Exercises in Physical Measurement. By Dr. L. W. Austin and Dr. C. B. Thwing. Pp. x + 193. (Boston: Allyn and Bacon, 1896.)

AFTER working through the experiments described in this volume, a student will have a thorough knowledge of the instruments and methods employed in physical measurement, and will be in a position to accurately investigate physical phenomena. The book is a medium between such a hand-book as the last edition of Kohlrausch's "Praktische Physik" and the elementary text-books in which mathematical formulæ are eschewed. The sixty-five exercises in the first part are all quantitative, and they cover measurements in the chief branches of physics, beginning with measures of length, and ending with experiments on polarisation; while the apparatus required for the experiments should form part of the equipment of all physical laboratories in which students can obtain scientific instruction.

In the second part of the book suggestions are given as to methods of computation and physical manipulations, while the third part is taken up with tables. The book is thoroughly practical and trustworthy, and it can be recommended as a suitable introduction to serious work in physics.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

The Age of the Wealden.

THE Wealden formation of England has long been studied, and is now well known in nearly all its features. Its stratigraphical relations and its Cretaceous age are usually regarded as fully determined, and this is true, also, of the corresponding strata on the continent.

The vertebrate fauna of the Wealden is of special interest, and has attracted much attention ever since Mantell in 1825 unearthed *Iguanodon* in the Tilgate Forest. Some of the remains, he sent, through his friend Prof. Silliman, to Yale College, where they have proved of much service. In 1865, I examined the same famous locality, as well as others on the south coast of England especially rich in vertebrate fossils, and at all of them secured interesting specimens. A study of these in connection with the collections at London and Brussels first caused me to question the Cretaceous age of the Wealden, and a later comparison of its reptilian fauna with allied forms found in the Rocky Mountains led me to the conclusion that both series were Jurassic in type, and should be placed in that division of the geological series.

At the meeting of the British Association at Ipswich, in September last, I read a paper on European Dinosaurs, including two from the Wealden, and thus the question of their geological age came up for determination. The facts I then presented, based mainly upon the reptilian fauna, strongly indicated the Jurassic age of the Wealden, and I urged a re-examination of the question by English geologists. The subject has since been taken up by Smith Woodward, with special reference to the fossil fishes. In the *Geological Magazine* for February 1896, he gives the main results of his investigation, which prove that the fishes, also, of the Wealden are of Jurassic types, thus placing the geological age of this formation beyond reasonable doubt. The concluding statement of this interesting article is as follows:

"The Wealden estuary seems to have been the last refuge of the Jurassic marine fish-fauna in this part of the world, not invaded even by stragglers from the dominant race of higher fishes which characterised all the seas of the Cretaceous period. The Wealden river drained a land where a typically Jurassic flora flourished; the only two known Mammalian teeth from the Wealden resemble those of a Purbeckian genus; and now it is clear that the fishes agree both with these and the reptiles in their alliance with the life of the Jurassic era." O. C. MARSH.

Yale University, New Haven, Conn., February 22.

The Röntgen Rays.

THE following fact regarding the X-rays of Röntgen may be of interest.

I have found that it is possible to obtain a photographic image by these rays, using a "pinhole camera," having the aperture pierced in a piece of sheet-lead backed with aluminium. The Crookes' tube was illuminated by discharges from a Thomson high-frequency coil. The photographs taken in this way show very distinctly the two electrodes, while the glass bulb, which appeared to be brightly illuminated to the eye, is scarcely perceptible. It would appear from this that nearly, if not all, the so-called X-rays proceed directly from the electrodes of the tube, and not from the glass where this is acted on by the cathode rays. It likewise affords further illustration of the rectilinear motion of the X-rays. Experiments are in progress with a broken current, and also to study the effect of a magnetic field.

Previous observation has shown that photographic effects were produced equally whether the cathode rays impinged upon the glass, or upon other phosphorescent material (e.g. aragonite) within the tube. It has also been noticed in experiments in this laboratory, that the appearance of the tube to the eye affords no criterion of its efficiency in producing the X-rays; tubes showing but little fluorescence of the glass composing them often giving admirable photographic effects, which in some cases are obtainable even from a low-vacuum Geissler tube. But the rays