THURSDAY, OCTOBER 24, 1912.

THE DAWN OF LAND VERTEBRATES.

American Permian Vertebrates. By Prof. S. W. Williston. Pp. v+145+38 plates. (Chicago, Ill.: The University of Chicago Press; Cambridge [Eng.]: University Press, n.d.) Price 10*s.* net.

IT is now evident that not only amphibians, but also reptiles with considerable diversity of habits and structure, arose in several parts of the world before the close of the Carboniferous period. It is thus becoming more and more difficult to interpret the relationships of the numerous genera—even those known by complete skeletons—which have already been described from the Permian rocks of Europe, North America, Brazil, and South Africa.

Some years ago, when only a few types were known, the direct passage from amphibians to reptiles, and that from these early groups to mammals, seemed to be almost discovered; but later researches have complicated rather than simplified the problem, and at present no satisfactory classification is possible. Realising this position, Prof. Williston and his colleagues are devoting themselves to a precise description of the numerous important skeletons and skeletal fragments which they have obtained from the Permian of Texas and New Mexico, and the small, well-illustrated volume now before us is one of the results. As Prof. Williston truly remarks, "the chief need in the palæontology of the early vertebrates is more facts," and students will gratefully accept the rich collection offered to them in his new work.

Photographs of restored skeletons of the Theromorph reptiles Varanosaurus and Casea are given to show how astonishingly similar is their general aspect to that of the contemporaneous amphibian Eryops. Other figures and descriptions suffice to indicate that there is no longer any single skeletal character by which an early reptile can be distinguished from an early amphibian; but Prof. Williston thinks that when the sum-total of characters of a skeleton is considered, there is still no difficulty in assigning the specimen to its true place in one or other of the two classes.

In some groups the various modifications of the skull seem likely to prove as numerous as those observable among modern lizards, so that caution is necessary in dealing with fragments. These and other difficulties, however, can only be recognised and overcome through the progress of such technical and detailed descriptive work as that which we welcome from the professor of palæontology in the University of Chicago.

A. S. W.

SCIENCE OF THE SOIL.

Soil Conditions and Plant Growth. By Dr. Edward J. Russell. Pp. viii+168; with diagrams. (London: Longmans, Green and Co., 1912.) Price 5*s.* net.

"HOW the chemist can help the farmer. He can analyse the soil and the crop, and by comparing the results of his analyses, can tell the farmer how to manure his land so as to grow profitable crops." The above is a quotation, as nearly as the writer can remember, which formed the preface to a syllabus on which he was asked to give a course of local lectures about twenty years ago, when local lectures were in full swing under the newly-constituted technical education committees of the county councils.

At that time there was some excuse for such misconceptions, for the literature of the somewhat hybrid subject known as agricultural chemistry was scattered through numerous periodicals, mostly in foreign languages, and by no means easily accessible to the budding lecturer. Since then many excellent text-books have been written, and are now in the hands of both teachers and students. None of them, however, go to the root of the matter, and give the substance of the classical researches which should form the foundations of the faith of the agricultural chemist, as does Dr. Russell's excellent monograph.

Dr. Russell has made a comprehensive survey of the literature of the subject so far as it deals with the relations between the soil and the plant. He has succeeded in giving the gist of the more important and fundamental contributions to the knowledge of the subject, and in pointing out with true critical spirit what is really proved to demonstration and in what directions further investigation is necessary.

His book will be of the greatest use both to the teacher of agricultural chemistry and to the investigator—to the latter especially, as it will put him in touch with the literature of the subject. It can scarcely fail to stimulate in this country the output of definite experimental work on the various problems connected with plant-growth. The chapter on soil analysis and its interpretation will be particularly welcome to the staffs of the several colleges who are engaged on soil surveys