qualitative one. Fluctuating variations *may* be (and sometimes are) very considerable, while mutational changes *may* be extremely small. The difference between them may perhaps be best appreciated by saying that a fluctuating variation is the outcome of a changed environment on an otherwise unchanged mechanism, whilst a mutation is the result of a changed internal mechanism, and even with a constant environment the product will not be identical with that of the unchanged type reacting with a similar environment. It is the change of the vital machinery which *necessarily* will shift the metabolism of the organism into a new channel, and henceforth will produce a new form, stable, until once more the constitution, or chemico-mechanical framework of the race, undergoes further modification. The change itself may be small or it may be large, but it is essentially in its occurrence at all, and independently of its magnitude, that the production of a mutation depends. Furthermore, that to this *new constitution* is owing the circumstances that mutants are on such a different plane from fluctuating varieties so far as reversions are concerned. It may be argued that this smacks rather of hypothetical statement than of proved explanation of the facts, but it may be urged that fluctuating variations and mutations at any rate do express *distinct kinds* of variations, that these are not merely quantitatively different, and that it is therefore probable that they depend on the existence of different factors, in the two categories.

The second portion of the volume deals with plant physiology. It is written in the incisive style we have been accustomed to expect from the late Prof. Barnes; the arrangement of the material is good, and the mode of presentation appears to us to be very well suited to the requirements of those classes of students for whom it is designed. A cautious attitude which is much to be commended on general grounds is observed towards many "explanations" of physiological phenomena. Many interesting data not commonly met with in works of this kind are included, and render the book valuable to student and teacher alike.

It will be apparent from the foregoing that we expect the "Chicago Text-book" to take its place as a valuable addition to the class books of botany, and we hope the appearance of the concluding part may not be long delayed. J. B. F.

PRACTICAL ZOOLOGY.

Leitfaden für das zoologische Praktikum. By Prof. Willy Kükenthal. Fünfte umgearbeitete Auflage. Pp. viii+320. (Jena: Gustav Fischer, 1910.) Price 7 marks.

IT is a significant fact that no British zoologist has yet thought it worth while to write a text-book of practical zoology on the lines of Prof. Kükenthal's admirable work, which has now reached its fifth edition. The reason is perhaps to be found in the fact that zoology is so very lightly esteemed by those who have the ordering of our educational system. For this no doubt zoologists themselves are largely to blame. The specialisation of original research during the last twenty years has led to the accumulation of an enormous number of facts, which, though valuable and interesting in themselves, are from the educational point of view to a very large extent redundant.

The student is expected to familiarise himself with a vast mass of minute morphological, embryological, and systematic details, as well as with a great deal of more or less speculative matter, much of which has not yet stood the test of time. He can scarcely see the wood for the trees, and realises that the subject has become one of the most difficult, if not quite the most difficult, which he can take up for examination purposes. At the same time, the almost complete absence of zoology from our school curricula renders the subject comparatively useless from the point of view of the student who is qualifying himself as a teacher. In Germany the study of zoology appears to be much better appreciated, and this is probably largely due to the fact that teachers treat it more reasonably and do not expect their students to accomplish an impossible task.

The work before us affords an excellent survey of the animal kingdom from the laboratory point of view. It is divided into twenty "Kurse," each dealing with a special group of animals. We do not know how long each "Kursus" is supposed to occupy, but the subject-matter dealt with in each would in this country be regarded as far too much for a single practical class. Thus the frog, the pigeon, the lizard, and the rabbit are each dealt with in a single "Kursus," and so are no fewer than thirteen types of Protozoa. Each "Kursus" consists of technical instructions, a general review of the group or groups dealt with, and a special description of selected types.

The plan of the work is very well carried out, and the numerous illustrations are excellent. Students of Marshall's "Frog," or Marshall and Hurst's Zoology, would no doubt regard the treatment of types as very superficial, but it is at any rate an open question whether it is not more important to gain a really comprehensive first-hand knowledge of the animal kingdom than to attempt to deal with a very small number of types in great detail. It must be borne in mind that Prof. Kükenthal's book is apparently intended for students of "Hochschulen," who are only taking a single year's work in zoology. For those who are able to take two or three years we do not doubt that the mode of treatment adopted in the English text-books above named would be preferable for the first year, but a work such as that under review, sufficiently amplified, is badly wanted for more advanced students in this country. A. D.

IONISATION OF GASES BY COLLISION.

The Theory of Ionisation of Gases by Collision. By Prof. John S. Townsend, F.R.S. Pp. xi+88. (London: Constable and Co., Ltd., 1910.) Price 3*s.* 6*d.* net.

IN various papers published during the last ten years Prof. Townsend has developed a theory of the ionisation of gases by collision, and has published experimental results which give it strong confirma-