

The fifth volume, which deals with our knowledge of the pineal body, and the pineal eye or parietal organ, was entrusted by Prof. Oppel to the safe hands of Dr. F. K. Studnička. That authority has not only coordinated the results contained in some three hundred papers dealing with this structure, but has added much new and valuable work of his own.

The study of structure by itself and for itself is a most unprofitable occupation, and Prof. Oppel, by including a free reference to function and development, has not only added greatly to the interest, but also to the value of these two volumes.

A. K.

A TEXT-BOOK OF GENETICS.

Vorlesungen über Deszendenztheorien mit besonderer Berücksichtigung der Botanischen Seite der Frage gehalten an der Reichsuniversität zu Leiden. By Dr. J. P. Lotsy. Erster Teil. Pp. xii+384. (U. na: Gustav Fischer, 1906.) Price 8 marks.

AS the moment is favourable, may it be suggested that the branch of science the rapid growth of which forms the occasion of Prof. Lotsy's book should now receive a distinctive name? Studies in "Experimental Evolution" or in the "Theory of Descent," strike a wrong note; for, theory apart, the physiology of heredity and variation is a definite branch of science, and if we knew nothing of evolution that science would still exist. To avoid further periphrasis, then, let us say genetics.

Prof. Lotsy's lectures are a welcome contribution to genetics. They are expository and critical rather than creative, but there is plenty of room for such a work. Since it must be admitted that to most of us facts appeal "first when we see them painted," such a presentation as this book provides should attract many who would find little to detain them in original records.

There are twenty lectures in this first part, and a second part is promised. After a philosophical introduction, which must be left to the judgment of those versed in such matters, the author proceeds to a careful discussion of the evidence for direct adaptation. Though no Lamarckian in the usual sense, he has a high respect for Lamarck's penetration and breadth of view. In this revindication of a great name, naturalists of the younger generation who have studied Lamarck's writings at first hand will probably sympathise with Prof. Lotsy. In a limited sense the modification produced by environment—biometamorphosis, as Prof. Lotsy calls it—is important. No botanist doubts that the forms of plants can be profoundly changed by the conditions to which they are exposed. The normal or habitual form in which we know a species is only one of these modifications. Consequently each experimental proof of the dependence of form on environment has a direct bearing on the genesis of type. But the question of *purposeful* or adaptative modification is quite distinct, and of any transmission of purposeful modification in descent there is no evidence.

The section of the book which gives it its chief
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value is that in which an account is provided of the new developments in genetics, especially Mendelian analysis and the experiments of de Vries. The consequences of Mendelian segregation are described with great clearness, and are illustrated by some excellent diagrams, of which one (p. 101) is striking and novel. The members of the various generations are shown in a perspective view, drawn approximately to scale, in a way which should do something to remove the supposed obscurity of these phenomena. Both the description of the facts and the critical discussion of the bearing of Mendel's discovery on the earlier or Galtonian method of calculating inheritance are especially lucid and to the point.

The weaker features of this section are such as are almost inevitable in attempts to confine a rapidly growing study within text-book limits. The relative importance of the various elements is continually changing. For example, though due stress is laid on Tschermak's fine series of cases illustrating the influence of hidden factors, or cryptomeres, Cuénot's useful exposition of the part played by double factors in the case of mice seems to have been left out. Having regard to the remarkable developments which have followed, this omission is unlucky. In the same connection it is a matter of special regret to myself that the revised and simplified account of the "walnut" combs in fowls did not reach Prof. Lotsy in time to prevent a reproduction of my former and erroneous idea in his text-book.

By all who are working at genetics the discussion of de Vries' mutations will be read with interest. Till now those remarkable observations have been regarded either with indiscriminate enthusiasm, or with still more unreasoning suspicion. But on those who know that the mutations of *Cenothera* are not errors of observation, and hesitate to accept them as the single key to the final mysteries of evolution, the question begins to press: What *are* those mutations? Upon this point the teaching of genetic research is clear. Before we can form a definite view as to the nature of any given mutation we must know its gametic relations to the type from which it sprang, and to the sister-mutations. So far, these relations, as expressed by the ratios in which the forms appear, seem to be almost always irregular in the *Cenothera* cases. Experience, however, has shown that such irregularities, as in the case of Miss Saunders' *Matthiola*, may conceal an underlying regularity which fuller analysis can reveal. For instance, we know that various individuals of a form A may give respectively an F_2 ratio $9A : 7B$; or $3A : 1B$; or all A; or $27A, 9C, 28B$, and so on, and the causation or meaning of these several ratios is clear. May not such complexities be the source of the confusion which apparently besets the *Cenothera* cases? That is the opinion to which Prof. Lotsy inclines, and the position is for the most part unassailable as yet. All that can be positively asserted is that these mutations are forms arising discontinuously, and that their distinctions are exactly comparable with those that often appear to characterise species. But now that we understand what a medley of phenomena is included in the term "specific

difference" it becomes necessary to go further and to ascertain which phenomenon is exemplified in each case. That genetic analysis can alone answer that question everyone now perceives. De Vries' own discussion of his results contains manifest traces of an attempt to incorporate the Mendelian ideas into earlier and pre-Mendelian conceptions, and the result is not always harmonious or convincing. We look to de Vries and the many observers who are now at work on *Oenothera* to bring the various possibilities to a strict test, case by case, and so complete what has been begun with such astonishing success.

Meanwhile, however, it must be conceded that there are serious difficulties in the way of a purely Mendelian account of the *Oenothera*—more perhaps than Prof. Lohs indicates. Of these one of the most formidable is the behaviour of the form *nanella*, for which other cases afford no parallel. There are, further, the objections de Vries himself has urged in the passages contributed to Moll's exposition of his work—particularly, that no indication of a hybrid origin of his original stock is forthcoming. Again, though the sterile pollen grains are suspicious, I may mention that in a collection of wild *Oenothera* (? species) made near Baltimore, I found none which had not some bad pollen grains. Were all these hybrids? it may well be asked. If so, hybrids of what? Our Rubi hybridise freely, but, as Focke showed, there are pure forms with perfect pollen, and hybrid forms with an admixture of bad grains. This test should be made in America on a large scale, to discover whether any *Oenothera* is "pure" by that criterion.

But again, we know that the production of analytical varieties by a hybrid, and the production of novel forms by a mutating species, must be exceedingly similar and perhaps indistinguishable phenomena. Hybridisation cannot be regarded as the sole source of analytical variation—witness the case of *Primula sinensis* and the sweet pea, where analytical variation is rife, though no hybridisation has taken place. The interrelationship of the two sets of occurrences is still obscure; but by experimental breeding it can in great measure be elucidated, and in the course of that inquiry the meaning of mutation will probably be discovered.

Only salient features of the book have been mentioned; many others must be passed over. *Capsella* has provided (p. 180), as might be expected, good examples of the constancy of *petites espèces*. Time brings revenges, and we must hope that Jordan would have felt satisfaction in the recognition now accorded to his once discredited work, though, by the perversity of things, that work is used to complete and support those views he most detested. Strange, too, would it seem to his opponents to see Jordan's micro-species received as a valuable element in the general doctrine of mutability!

In several minor points the book is open to criticism. The *Artemia-Branchipus* story should not be repeated even incidentally without words of caution. The pictures even in these half-tone days are below the mark, and such pictures as those of peloric *Linaria* make one

long for decent woodcuts again. The figure of the Norwich canary would surprise the fanciers of that city, and it suggests that the crest is a Norwich character. Lastly there is a profusion of most distracting misprints.

W. BATESON.

TEXT-BOOKS OF PHYSICS.

- (1) *Müller-Pouillet's Lehrbuch der Physik und Meteorologie*. Edited by Leopold Pfaundler. Tenth edition. First vol. (in two parts). Pp. xiv+801. Illustrations. (Brunswick: F. Vieweg und Sohn, 1905 and 1906.) Price 7 marks and 3 marks 50.
- (2) *Cours de Physique de l'École Polytechnique*. By J. Jamin. Troisième supplément. Radiations, Électricité, Ionisation. E. Bouty. Pp. vi+420. (Paris: Gauthier-Villars, 1906.) Price 8 francs.
- (3) *Lehrbuch der Physik*. By H. A. Lorentz. Translated into German by G. Siebert. Erster Band. Pp. vi+482. (Leipzig: Johann A. Barth, 1906.) Price 8 marks.

(1) THE preparation of this tenth edition of a well-known text-book has been undertaken by Dr. Pfaundler, in succession to Dr. Wild, whose death occurred soon after the publishers had put the revision in hand. For the present instalment on mechanics and acoustics Dr. Pfaundler is responsible; but for other parts of the four volumes in which the work will be completed the co-operation has been secured of Dr. Lummer (optics and heat), Dr. Kaufmann (magnetism and electricity), Prof. J. M. Pernter (meteorology), Dr. Nippoldt (terrestrial magnetism), Dr. Drucker (physical chemistry), and Dr. Wassmuth (heat conductivity and thermodynamics).

It is intended to maintain the characteristics of the book as being essentially non-mathematical. This plan, of course, very much restricts the treatment of most of the problems dealt with, and in many cases prevents any proof being given of formulæ which are discussed. There is room, however, for a text-book of this kind, as is amply testified by the success of the previous editions. In spite of the limitation in the treatment, the author has succeeded in giving a very comprehensive account of his subject. He is very clear, and takes special pains to be so in cases where difficulties are commonly met with. For example, in connection with *mass* and *weight* he is very precise. The kilogram is a mass, and not a weight; one can only say *it has a weight*, and can call this the kilogram-weight. In stating this he is in agreement with the International Committee of Weights and Measures (Paris, 1901), whose decisions may be considered as representing the common-sense of the scientific world.

The intention is to bring out the remaining volumes quickly. It is expressly hoped that owing to the large number of collaborators, the treatise may be completed before the first volume is out of date.

(2) The second of the volumes under notice is the third supplement to the treatise on physics, commonly known as "Jamin et Bouty." The subject-matters embraced are radiations, électricité, ionisation. It is