

lymph, by Starling, is short but good, and gives a succinct account of our present-day knowledge of this very interesting subject.

The next chapter, by Moore, on the chemistry of the digestive processes, must have entailed a large amount of labour, as the literature is overwhelming. It might have benefited by curtailment, and by the omission of such words as "flocky," "unsolvable," and some others. The mass of unproved details with which Kühne deluged physiology has been largely made use of. Those who wish to be able to criticise this work of Kühne might with advantage look up the original papers by Kühne and Chittenden and Neumeister. They will then perceive that a number of bodies there referred to depend for their separate and definite existence upon very insufficient data. The physiological chemist of a later date will smile when he reads of anti-albumid, anti-albumate, anti-albumose, and so on. A lot of details given in this paper might have been, perhaps, with advantage omitted, as after all they are only of use to those working at the subject, and later on will be merely of historical interest. Pajkull's work on the mucin of bile requires to be repeated. It is by no means certain that the mucin is a nucleo-proteid. This chapter, however, gives as good an account of the subject as any one could desire. It has been kept well up to date, including as it does such recent work as that of Nuttall and Thierfelder.

The chapter, by Langley, on the salivary glands is an excellent one, distinguished alike by its clearness and suggestiveness as well as its succinctness.

The mechanism of the secretion of gastric, pancreatic, and intestinal juices is discussed in an interesting way by Edkins, as is also the section on the secretion of bile, by Noël Paton.

The important chapter on the chemistry of the urine has been entrusted to Hopkins, who has succeeded, in the space at his disposal, in giving a most excellent account of the subject. Here, of course, an author must exercise the gift of selection, as, in order to be complete, one would require to give another Huppert and Thomas' Handbuch. It ought to have been noted that the Krüger and Wulff method for estimation of the nuclein bases and uric acid is not a trustworthy one, as other nitrogen-holding bodies are precipitated. The inorganic constituents of the urine have received but scant attention.

The chapters on the secretion of urine and on that of milk, by Starling and Schäfer respectively, are clearly written; as is also that on the secretion and absorption of the skin, by Waymouth Reid.

The chapter on the chemistry of respiration, by Pembrey, is a good one; as are also those on animal heat, by the same author, and on metabolism, by Schäfer.

It is a pity that in such a book as this there is not only a necessary repetition, but also a tendency to omission of certain facts because they fall under two headings. An example of this may be given. The relationship between leucocytosis and the excretion of uric acid and nuclein bases is referred to in the section dealing with the chemistry of the urine, and also in that on metabolism. The result has been that in neither is there a proper description of Horbaczewski's experiments, nor are the conclusions which Horbaczewski arrived at clearly defined.

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The work of Sandmeyer, on the effect of giving pancreas by the stomach to dogs that have had their pancreas removed, has not been referred to. This volume closes with an exceedingly interesting account of the internal secretions of the ductless glands and their effects upon metabolism. As one would expect from the writer of this article, the supra-renal extracts have received a good deal of attention, a little of which might have been bestowed on the thyroid therapy.

The points which have been drawn attention to in this review as perhaps admitting of improvement are few in number. The book stands as a monument of industry care and thought on the part of the editor and his coadjutors. It is, without doubt, the best book that we at present possess in English on the subjects dealt with in the first volume of what will prove to be a text-book of the greatest advantage to all interested in the subject of physiology. Before the value of such a book can be accurately appraised, it must be read carefully and intelligently, and compared with the original papers from which all such books must be built up. Those working at a special department of the subject may think that there might have been some additions or omissions; but one must remember that the subject is such a huge one, and the mass of literature to be consulted so immense, that after all such a complete text-book for the scientific worker must always remain mainly as a stepping-stone between the ordinary smaller text-book and the original papers. It is the conscientious perusal of the latter that must always remain, if the slowest, still the surest way to gain a knowledge of that most fascinating subject, physiology.

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#### VEGETABLE ORGANOGRAPHY.

*Organographie der Pflanzen.* By Dr. K. Goebel. Part i. With 130 figures in the text. Pp. ix + 232. (Jena: Gustav Fischer, 1898.)

IT is difficult to realise that this book is the work of the same author who wrote the now classical text-book of morphology. Later publications of Dr. Goebel's have been largely occupied with biological subjects, and he appears in the book before us to have abandoned the morphologist's standpoint, and assumed a physiological or, perhaps more correctly, a biological position. In making this change he admits that phyllogenetic speculations are, without doubt, more attractive than the investigation of the illusive causes, external or internal, which determine modifications of form; yet for him the recognition of the factors which bring about the unsymmetrical form of a leaf is of more importance than the construction of insubstantial theories of phyllogenetic development.

In the introduction the author further insists on the insufficiency of morphology, and quotes from Herbert Spencer to emphasise the fact that function and form are mutually interdependent. In the strict study of morphology the functions have been treated as something extraneous, and as having nothing at all to do with the characteristics of the organs.

The latter part of the introduction is devoted to a discussion of the two rival hypotheses as to the formation of the organs of plants, *e.g.* the theory of the

differentiation of indifferent rudiments and that of the metamorphosis of rudiments materially differing from one another. Dr. Goebel shows a strong bias in favour of the latter. Thus he says a foliage leaf is not a foliage leaf in the later stages of its development only, but the material constitution of its rudiment determines its development. Internal or external influences may, however, direct this development along other lines. To illustrate this point of view he describes the metamorphosis of the rudiment of a foliage leaf of a maple into a scale-leaf. But it must be confessed that although his arguments and illustrations are interesting, he fails to convince the reader that there are less difficulties in the way of the theory of metamorphosis, involving as it does some form of evolution in ontogeny, than are presented to the theory of differentiation, which in this case appears to be based on epigenesis. The indisputably indifferent nature of the cells forming the archesporial tissues and those in other positions in leaves, which are able to give rise to adventitious buds, are arguments in favour of the indifferent nature of all the leaf-cells, even in comparatively late stages of development. That no absolute material difference exists between the rudiments of different categories of organs is rendered probable by the absence of any definite demarcation between stem and leaf, as is shown by the example of *Utricularia*, which Dr. Goebel himself has investigated. Indeed in this direction Dr. Goebel goes further than the majority in maintaining that the vegetative body of *Lemna* is composed of branching leaves, and is not a leafless stem.

The purely morphological view, without regard to the functions of the organs considered, may often lead to misconception, and Dr. Goebel takes hairs as an example of this possibility. Thus according to him no sensible man would call a fern sporangium a "trichome"; for one cannot believe that either in the life-history of the individual, or of the race, that a sporangium arose by the metamorphosis of a hair. And yet the belief, which Dr. Goebel himself seems to share, that a stamen is a metamorphosed foliage leaf appears to rest on similar grounds, especially when viewed in the light of Bower's researches on spore-producing members.

Of great interest are those sections of the book dealing with the symmetry of organs and with the effect of light on dorsi-ventrality. The author finds that *Selaginella sanguinolenta* possesses leaves of two kinds, and is dorsi-ventral when subject to bright illumination; while if it is exposed to feeble light, it possesses leaves of one kind only and is radially symmetrical. The arrangement which is induced by the situation of the individual of this species, occurs normally on different parts of the same individual of other species. In these the individual is radially symmetrical in the lower portions of the stem, while the upper parts are anisophyllous. Furthermore, Dr. Goebel has been able to cause *S. helvetica*, which is normally anisophyllous, to considerably lessen the contrast between the two kinds of leaves by simple etiolation. Thus it appears that in some the adaptation is ontogenetic in its nature, and is brought about by the actual circumstances of the individual; in others it is inherited, and not materially affected by the immediate surroundings, although probably brought about by the relations of a succession of individuals to light.

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In the succeeding section, on the difference between the structures of organs in the adult and early stages of development, there is much of interest. *Polysiphonia Benderi*, one of the most remarkable examples of this difference, has been already described by Dr. Goebel. In this alga the first stage resembles the adult in possessing a cylindrical thallus. This gives rise to one or more flat structures, which apply themselves to the surface of other algæ, and which are wholly different from both the first and final stages in appearance. Only before the formation of the reproductive organs are the adult cylindrical branches developed.

Passing on to the development of the higher plants, perhaps every one will not agree with the author in his view that the simpler form of the primary leaves of seedlings is due to an arrest of development. The existence of a more complicated form in some primary leaves than in those of the adult stages, must make one hesitate before accepting the theory of arrested development in every case, and may suggest that a similar reason for the difference between the leaves of the seedling and those of the adult exists both when the former are more simple and when they are more complex than those of the latter.

The section on vegetable teratology may be noted, as in it Dr. Goebel gives his support to Beyrinck's extension of Sachs' hypothesis, that the difference in form of plant organs is due to a difference of substance, and that changes in form are referable to alterations in the nutrition of the parts involved. Beyrinck's view is that galls are caused by such an alteration in the nutrition of the part in response to the stimulation by the gall-producing animal.

The last part of the book is devoted to a discussion of the influence of correlation and external stimuli on the form of plants. It is not behind the earlier parts in interest and wealth of example. Among the more important matters touched upon in this part are Lindemuth's experiments on the production of seeds in bulbous plants, Sachs' investigations on the relation of flower-production to light, and Lothelier's observations on the conversion of the spinous leaves of *Ulex* into flattened forms, in a moist atmosphere. Dr. Goebel doubts that this modification of spines due to moisture is of frequent occurrence, and believes that Lothelier observed isolated examples.

With confidence Dr. Goebel's book may be recommended to all who are interested in theoretical botany. It is full of suggestion and novelty, and its occasionally dogmatic style in no way lessens its tendency to arouse interest and discussion.

H. H. D.

#### A GREAT NORTH ROAD.

*A Northern Highway of the Tzar.* By Aubyn Trevor-Battye. Pp. xiv + 256. (London: Archibald Constable and Co., 1898.)

M R. TREVOR-BATTYE gives in this book a very interesting account of his journey home from Kolguev, an island in the Arctic Ocean, on which he was for some time ice-bound.

The journey was undertaken in October, a time known