

instructed writers in the lay Press, according to whom natural selection is nothing but a discarded fashion of the mid-Victorian period, as obsolete to-day as the pork-pie hat and the crinoline. But he is none the less a disbeliever in the Darwinian account of the origin of species.

High as are the merits of Mr. Lock as an expositor, there are points, as we think, on which his arguments must fail to carry conviction. The phenomena of adaptation we hold to be of supreme importance in the interpretation of evolutionary process. It is difficult to exaggerate the extent to which adjustment to the circumstances of life prevails in every department of organised nature. This is a fact which the advocates of "mutation" do not fairly face. Mr. Lock is too candid not to admit that "organic beings on the whole are, as a general rule, very closely fitted for the conditions in which they have to pass their lives." But after adducing certain well-known instances of "animals having peculiar habits, and possessing at the same time special organs which render them well fitted for these habits and no others," he manages to convey the impression that such cases are not very common, and that, considered as evidence of the power of natural selection, the best of them are open to criticism. Then, after a sketch of the theories of mimicry and protective resemblance, he adds that it is "uncertain whether this principle [of natural selection] can hold good as the true description of the origin of any sort of resemblance."

"Perhaps a still more serious criticism," he goes on to say, "of the methods of those who spend their time in seeking out or devising cases of adaptation has been made by Bateson, who points out the logical difficulty that we can never make any quantitative estimate of the amount of benefit or the reverse which any particular structure may afford to its possessor." Most biologists will allow that quantitative methods should be used wherever possible for the solution of the problem, and it is curious that Mr. Lock should apparently not be aware that there are several instances in which this has been done. We do not see where the "logical difficulty" lies; on the question of fact we regret to differ from Mr. Bateson, if his opinion is here correctly stated.

The underlying idea in all that Mr. Lock has to say on the subject of adaptation by selection is the doctrine that specific differences arise by way of "mutation," or *de novo*, and not by the accumulation of continuous or "fluctuating" variations. The position is ably argued, and the results of the laborious experiments of de Vries and of the remarkable work of Johannsen are brought to bear with the skilful touch of a genuine investigator who is personally conversant with the matter in hand; nor does Mr. Lock's general attribute of fairness here desert him. A point, however, on which we should like to be satisfied is this: the author asserts that "no one questions the validity of natural selection as a means of exterminating types which are unfitted for their environment"; further, he thinks it at least probable that certain types have survived in conse-

quence of their "fitness." But, since these latter types arose, as he would say, suddenly or discontinuously, how did it happen that they sprang into being in such exact harmony with their surroundings? Would Mr. Lock have us fall back upon the theory of "directed variation," or, what comes to the same thing, Paley's view of "contrivance" by special creation? If it be replied that a well-adapted type must have arisen, not by one or more large mutations, but by a series of mutations both numerous and minute, we should wish to know how such mutations are to be distinguished from continuous variations. To say, with de Vries, that selection of individual differences is powerless to raise permanently the mean of a species, seems perilously like begging the question. As soon as the mean had been permanently raised, the result would be claimed as a mutation.

We have space only for one further remark. If Mr. Lock will take his Aristotle again, and read, with its context, the passage he has quoted on p. 116, we think he will see that he has mistaken that philosopher's meaning, as, indeed, Darwin did before him.

F. A. D.

NOTES ON WATER PLANTS.

Biologische und morphologische Untersuchungen über Wasser- und Sumpfgewächse. Part ii. By Prof. Hugo Glück. Pp. xvii+256. (Jena: Gustav Fischer, 1906.) Price 18 marks.

THIS work forms the second instalment of the author's studies on water plants. It deals chiefly with the European species and varieties of *Utricularia*, and, as was perhaps inevitable, one result has been to increase the number of the forms hitherto recognised as distinct. A prominent feature of the book lies in the attention devoted to the so-called *Turions*, or propagation buds, which occur so frequently in aquatic phanerogams.

Several other aquatic genera also are dealt with, e.g. *Ceratophyllum*, in which Prof. Glück finds a specialised form of shoot provided with anchoring leaves, much reduced in character, which serve to fix the plant in the mud. These leaves differ from the ordinary foliage leaves in the absence of chlorophyll and in the almost complete suppression of the intercellular spaces so characteristic of the latter.

The conclusions reached as to the morphological interpretation to be placed on the different parts of the *Utricularia* plants do not essentially differ from those drawn by Goebel about sixteen years ago as the result of an extensive series of investigations on tropical as well as on European species of this remarkable genus. The special feature of interest attaching to them lies in the impossibility of establishing a consistent distinction between the stem and leaf in these plants. One can pass into or be replaced by the other in the most irregular manner, and either of them may in turn be represented in position by one of the bladders that form so characteristic a feature of the genus. As Prof. Glück remarks, the

morphological distinction so commonly insisted on as between axial and foliar structures is largely the result of preconceived views as to their essentially separate nature, or, as we would prefer to put it, of the general experience that they are distinguishable. But morphological differentiation is really not irrevocable. There are many ways in which the normal (hereditarily transmitted) form may be changed if the sequence of those internal chemical changes that determine the structure at any given time and in any given instance can be interfered with, and this consideration should put us on our guard against the introduction of transcendental ideas into our morphological conceptions.

In the lower plants, in which the sequence of structural change has remained less stereotyped, it is sometimes easy to control the course of development, and, within limits, to induce considerable modifications in organisation. As an illustration we may recall the well-known case of the influence of light in determining the dorsiventrality of *Marchantia*. This plant produces lens-shaped brood bodies or gemmæ, and when these are allowed to germinate, the surface (whether upper or lower), which is illuminated, assumes the structure of the normally dorsal, the less, or non-illuminated, surface that of the ventral aspect. The behaviour under experimental conditions of *Aneura ambrosioides*, another liverwort, may also be quoted. This plant forms beautiful tufts or sheets of pinnate thalli spread over the surface of the wet rocks or banks on which it occurs. But by appropriate methods of cultivation the plants can be made to grow erect, and then the ends of some of the pinnæ turn downwards to grow and ramify in the soil. The change thus induced is not necessarily permanent, and a restoration of the normal environment at once causes further growth to advance along the previous lines. But the interest attaching to such an experiment is enhanced when it is known that there are other nearly allied species the response of which to the influence of the ordinary environment takes precisely that form assumed by *A. ambrosioides* as the result of the introduction of certain special conditions. Many other examples of a similar kind will occur to those who are familiar with the results of the so-called "experimental morphology."

In the higher plants a certain degree of latitude of organisation is generally recognised, but its limits do not, as a rule, exceed the chief morphological barriers. The genus *Utricularia*, however, stands out amongst the flowering plants as one that has pre-eminently broken loose from the trammels of hereditary tradition. The chain of events which in the vast majority of plants are linked together in a sequence so orderly that the final result—differentiation into stem and leaf—seems invested almost with the sanctity of a law of nature is here rudely interrupted. It is to this very circumstance that the *Utricularias* owe their great importance from the biological standpoint, and any contribution to our knowledge of the group is assured of an attentive reception.

J. B. F.

A NEW ATLAS

The M.P. Atlas. A Collection of Maps showing the Commercial and Political Interests of the British Isles and Empire throughout the World. Forty plates. (Edinburgh and London: W. and A. K. Johnston, Ltd., 1907.) Price 25s. net.

THIS atlas consists of a series of maps chiefly representing the British Empire. They are very clearly printed, and some of them are decidedly good specimens of cartography. The bathymorphological map of the British Isles is particularly worthy of notice. It is beautifully clear, and in every way an excellent piece of work. The special feature of this map is the orographical colouring, the effect of vertical relief being obtained by means of a system of colour-tinting in shades of brown, the shades increasing in density with the elevation. The bathymetrical colouring is in shades of blue. As this is such an effective map, it is a pity the same scheme of colouring was not adopted for the other physical maps, as in comparison they, and particularly that of India, are much inferior productions.

Throughout the atlas there is, unfortunately, a lack of uniformity in the style and execution of the maps which detracts in no small degree from their artistic merit. The collection is composed of engraved and lithographed maps, and the contrast between the fineness of the former and the coarser work of the latter is in many instances very pronounced, more especially when examples of the two styles occur on the same sheet, as on Plate 36. This variety in the method of production and certain inconsistencies which are to be found in the maps make it quite obvious that they have not been drawn specially for this atlas, but collected from various sources. There would be nothing to say against this system of using the same maps for different atlases, provided, of course, that they have been completely revised and brought up to the date of publication. But there is a great objection to the inclusion of old, or only partially revised, maps in a new atlas, and there are not a few in the "M.P. Atlas."

Quite a large number of the maps have already appeared in other atlases published by Messrs. W. and A. K. Johnston, most of them in the well-known "Royal Atlas," and many require much more thorough revision to bring them up to the date on the title-page. For instance, on the map of Asia (Plate 20), the physical features are shown exactly as in the same map in an edition of the "Royal Atlas" published fourteen years ago, notwithstanding the considerable alterations and additions recent exploration has made necessary. Then, again, there are railways and political boundaries that require correction. With regard to the latter, attention may be directed to a discrepancy between the boundary of northern Nigeria as shown on the general map of Africa (Plate 29) and on the map of the West African colonies (Plate 34). But no doubt these matters will receive the publishers' attention in revising the atlas for a future edition.