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deserves more than the superficial description which the author gives. It is difficult to conceive how the budding process could have been overlooked, for in *Entamoeba* under culture on agar, this process is apparently the most common method of reproduction. It is quite probable that development of the extruded so-called "spores" as described is the actual development of such buds. The finer details of structure were not made out, the origin of chromidia granules and their fate are not described, owing, possibly, as the author admits, to faulty technique (p. 418). Much dependence is placed upon the *cyst*, but there is no evidence to indicate that the author is cognizant of the difference between temporary and permanent cysts. Many instances among protozoa might be cited of the wide difference existing in the two types and in the same species, and Schaudinn and others have previously called attention to these differences in the parasitic rhizopods. Hence the cyst, as a feature in the identification of species as Walker gives them, loses its value. Walker's long list of species finally, while a convenient summary of the described amoeboid parasites, can not be accepted as established, and his several "new" species must share the same fate, for in no case has the full life history—the only adequate basis of species—been made out. When the full history is worked out, these many so-called species will probably be reduced to mere varieties, or to a few species of the genus *Entamoeba*.

G. N. C.

EXPERIMENTAL ZOOLOGY

Regeneration.¹—Professor Korschelt has brought together in compact, yet readable form, the more important results on regeneration and transplantation in animals and plants. No small amount of discrimination is required to put into 170 pages all the results so far obtained on regeneration both of animals and of plants; yet Professor Korschelt has shown unusual judgment in selecting the essential and typical results of the old and the recent work. Necessarily, much detail has been pruned away, yet the author has succeeded in bringing into proper correlation many widely scattered facts. The more theoretical and analytical sides of the problem occupy a very

¹ Regeneration und Transplantation. By E. Korschelt. 1907.

secondary place in the present treatise, yet have by no means been entirely left out of account. We venture to think, however, that the more valuable outcome of the experimental study of regeneration lies less in a descriptive account of what takes place than in the attempt to give an analysis of the problems involved.

The second half of the book, some 75 pages, deals with Transplantation, or grafting, as it is more generally called. The more limited data in this field receive ample consideration.

The extensive literature of both subjects is arranged under topical headings—an arrangement that will recommend itself in the present case as preferable to the more usual methods of giving selected bibliographies at the end of each chapter or *en bloc* at the end of the book. We can not refrain, in passing, from calling attention to a slight misprint in one of the English titles that reads “The international factor in the regeneration of the tail of the tadpole.”

Passing to a more detailed examination of Professor Korschelt's book, we find that while the formation of new growths in plants—more especially those cases where the new growth does not come from latent buds—is included under the heading of regenerative processes, the development of parts of the egg and the regulative changes that take place in isolated blastomeres and in fragments of the segmented egg are not included, despite the fact that the restoration of the whole form by a nucleated piece of a protozoon is described in some detail. Such limitations of the subject are, in the opinion of the reviewer, rather arbitrary; for, while it is unquestionably advantageous to limit certain fields, and to bring together certain groups of more closely related subjects, the fundamental problems of regeneration involved in all cases where a part produces a new whole have so much in common that the study of the subject gains rather than loses by taking as broad and as general an aspect of the subject as possible.

The most recent work on the regeneration of entire plants from leaves, as illustrated by the work of Goebel, Hildebrand, Winkler, Vöchting, Nemeč, Figdor and others is given in some detail in the opening chapter. It is pointed out that in many of these cases the new plant does not come from preformed buds, and not even from merismatic tissue in the case of *Drosera* according to Winkler, but directly from one or more cells of the epidermis of

the leaf. The problem of localization of the new growth in such cases is not discussed, nor have we, in fact, as yet any sufficient clue to the matter.

The growth of broken crystals in saturated solutions is dwelt on at some length. The remarkable similarity of this process to regeneration in organisms is emphasized, more especially in the light of the remarkable work of Lehman on fluid crystals. The author apparently suspends judgment concerning the interpretation of the resemblances of the two processes—whether we are dealing with only an analogous process or whether the two phenomena have fundamental properties in common. “Das Für und Wieder kann hier nicht erörtert werden.”

Korschelt thinks that the loss of power to regenerate is a general accompaniment of the degree of organization (Organisationshöhe), yet he points out that this is not universal, as shown by the absence to regenerate in some forms and its presence in other closely related ones. In fact, the time-honored statement of such a relation has very little weight in the face of recent facts to the contrary. When, for example, such a complex organ as that of the eye of a salamander can regenerate from a piece of the bulb, while the head of the planarian, *Dendrocoelum*, fails to regenerate behind a certain level (where no obvious change in Organisationshöhe is apparent) we may well hesitate to lay any especial emphasis on such a generalization.

The discussion of the phenomenon of regeneration as an adaptation occupies only seven pages of the book. By adaptation is meant in general not so much that the process is useful—a fact too evident to dispute—but that *in some way* regeneration has been acquired on account of its usefulness. Our author would not, of course, adopt a teleological explanation, but assumes instead the supposed alternative of the Darwinian explanation of the origin of usefulness. Most students of the subject have rejected this interpretation on what the reviewer believes to be sufficient evidence. Korschelt's somewhat cautious attitude is summed up in the following statements. “Despite all the difficulties that have been raised one can not escape the impression that the power to regenerate and the liability to regenerate stand in a causal relation to each other.” “We find that it is also the opinion of competent botanists that the interpretation of regeneration as an adaptation is little to the point. They agree with the zoologists mentioned above in this regard.”

“If we look upon the power to regenerate as a property immanent in the living substance, which seems not improbable, owing to its wide occurrence, we may still suppose that this property has within certain lines of evolution been strengthened by adaptation and selection.”

The origin of the new material from the old, the process of transformation (*morphallaxis*), the curious phenomenon of compensatory regulation, the occurrence of polarity and the development of heteromorphic structures are adequately dealt with from an objective standpoint, although in our opinion all too briefly considering the importance of the theoretical problems involved. These parts of the book are followed by a discussion of the factors of regeneration. The nature of the subject and the uncertainties of the theoretical problems involved make it difficult to treat such theoretical questions briefly and definitely, yet one could have wished that so admirable a review and so judicious a treatment of the descriptive processes might have been followed up by a more illuminating or at least suggestive discussion of the fundamental problems of regeneration as the title of this section might lead one to expect.

Under the heading of transplantation the grafting processes in plants is first briefly described. The important and recent results of grafting in animals receive careful attention. The interesting experiments on hydra by Wetzel, Rand, Peebles and King are sympathetically considered, and the equally important work of Korschelt's pupils, Joest and Rabes, are clearly and forcibly dealt with. Born's classical experiments with tadpoles, that have led to so many far-reaching experiments in recent years, occupy, as is their due, an important place in this field. The later work of grafting in amphibians, especially that of Harrison and Spemann, is described; but the author, while referring briefly to the important experiments of Lewes, has failed, in our opinion, to give them their proper place.

The author considers in some detail the modern work of transplantation of small portions of the tissues and has brought together in readable form the results of the literature of the subject, that is widely scattered, often in journals little accessible to zoologists. Korschelt's review will prove a useful source of information in such matters.

We cordially recommend Professor Korschelt's book as one of the most recent, most judicious and fair presentations of the

subjects of regeneration and grafting. The yearly reviews of Barfurth in the *Ergebnisse für Anatomie und Entwicklungsgeschichte* will supply special students with the numerous details that the study of regeneration is bringing to light. The more analytical and philosophical discussion of the problems involved will be found in the recent reviews and writings of Driesch. The general reader and layman who is less concerned with these details or with "the higher criticism" can not do better than give Korschelt's book a careful reading.

M.

PARASITOLOGY

A Chinese Parasite.—Looss has recently demonstrated¹ that under the old name "*Opisthorchis sinensis*" two human parasites have been confused by all save Baelz, whose differentiation of the two species in 1883 has been generally disregarded. For these forms the new genus *Clonorchis* is created with *C. sinensis* (Cobbold, 1875) as type. This species is the *Distomum inoocum* of Baelz and is chiefly a Chinese parasite, though it occurs rarely also in Japan. The other species is the *Distomum endemicum* of Baelz, which now becomes *C. endemicus*; it is the form usually described in text-books, etc., as "*Opisthorchis sinensis*." According to existing records it is very common in Japan and presumably so in Annam and Tonkin also. It seems to be confined to localities on the sea-shore. I would suggest that this appears to indicate infection through fish, as is the case with *Opisthorchis felineus* in the territory adjacent to the Baltic.

H. B. W.

¹ *Ann. Trop. Med. and Par.*, 1, 123.