

The results of theoretical reasoning are always stated with scrupulous care, and their limitations clearly expressed, and no attempt is made to press conclusions based on idealised premises further than the case will warrant. A striking instance of this is furnished by the way in which, after developing his theory of the evolution of the earth-moon system with justifiable enthusiasm and evident faith, he takes care frankly to point out that other agencies must probably be sought to account for the origin of the satellites of the exterior planets and of the planets themselves.

H. L.

RECENT ADVANCES IN THE GENETICS OF PLANTS.

Einführung in die experimentelle Vererbungslehre
By Prof. E. Baur. Pp. vi+293. (Berlin: Gebrüder Borntraeger, 1911.) Price 8.50 marks.

PROF. ERWIN BAUR is well known to students of genetics as a most successful investigator. The fifteen lectures included in the present volume were delivered as a course in Berlin, and they constitute an admirable text-book of the subject, which will do much to familiarise Continental biologists with the methods of Mendelian analysis and the deductions to which it has led. The coloured pictures are exceptionally good. No clearer or better illustrated account of the present state of knowledge of these matters could be desired.

Some years ago Prof. Baur began a series of researches into the nature of variegation in plants, without any special intention of investigating Mendelian phenomena, but, like so many others engaged on special problems, he soon found that a knowledge of heredity was indispensable to a proper understanding of his subject. The breeding experiments then instituted, though begun as a side-issue, have illuminated the whole field. His first success was obtained in a study of the golden-leaved *Antirrhinum*, which he proved to be a heterozygous form, possessing only one factor for greenness. Self-fertilised, it gives two yellows to one green, the missing term in the series being the homozygous albinos which perish on germination.

This led to a comprehensive examination of the inheritance of flower-colour in *A. majus*, a subject also studied by Miss Wheldale in this country. The series of types is very large, seeming at first sight almost continuous, and the analysis was exceptionally troublesome, but it is satisfactory to know that though working independently, both observers have arrived at practically the same conclusions as to the factorial composition of the several forms. In this book *Antirrhinum* is naturally taken as the typical example of the effects of combinations of long series of factors, and the reader who masters this example will have encountered most of the complications which ordinary Mendelian inheritance presents.

From this work on the varieties of a single species Baur has gone on to less familiar ground, and in this book he gives the first results of his experiments on the interrelation of forms which are quite distinct species in the systematic sense, especially *A. majus*

and *A. molle*. The F_1 plants are fully fertile, and F_2 shows a long series of diverse types resulting from the recombination of segregating factors, but the analysis is still to be completed. One observation of extraordinary interest is announced, namely, that the self-sterility of *A. molle* is a recessive. This announcement must be regarded as preliminary, but if established, the discovery will constitute a striking advance. Self-sterility is one of the greatest paradoxes in nature. If it is true, as we are almost forced to believe, that a self-sterile plant can be fertilised by the pollen of any other individual but not by its own, then each individual is differentiated by virtue of its individuality, and there are as many classes as individuals. The notion once suggested by de Vries, which I also had formerly entertained, that there are in reality several classes of individuals and that probably fertilisation was inoperative only within each class, is negated by such experiments as have been made by others and by myself (on a small scale in *Linaria vulgaris*). If self-fertility be a dominant, the main mystery is still unsolved, but we have a new fact of great consequence which may lead to a solution.

The most important chapters are those in which Baur describes his discoveries regarding the inheritance of the several forms of "Chimæra," the term Winkler has introduced to denote patchwork or mosaic individuals. In a variegated *Pelargonium*, for instance, the albino parts of the vegetative organs may be sectorial forming radiating patches of white, or periclinal, in which case the external layers of cells may be green and the internal white; or conversely the internal may be green and the external cells white. Baur has shown that the colour of the offspring, whether green or white, depends on the nature of the subepidermal layer of cells from which the parental germ-cells were derived. If in the periclinal chimæra the two peripheral layers of cells are green, the offspring (of self-fertilisation) are all green; if the peripheral layers are albino the offspring are all albino, and, of course, perish. If only the outer cell-layer is white the offspring are green. In either case the particoloured character does not reappear in the offspring. From the sectorial chimæras the inheritance is more complex, and much remains to be cleared up. This discovery of the significance of the subepidermal layer is one of very great importance, and we may anticipate that it will lead to remarkable extensions. It may not improbably lead to a reconsideration of the generally accepted doctrine that segregation takes place in gametogenesis.

Baur has applied these observations to the interpretation of the curious "graft-hybrids" between *Solanum nigrum* and the tomato, first made by Winkler. Some of these were obviously sectorial patchworks of the two species, but Baur suggested that of the others some were actual periclinal chimæras, in which a foundation of tomato was enclosed in one or in two cell-layers of *S. nigrum*, or conversely *S. nigrum* enclosed in an outer sheath of tomato tissue. This conclusion was at first strongly resisted by Winkler, but in a preliminary communication he has since announced the proof that it is correct, having himself by cytological investigation of the growing

points of the periclinal forms been able to prove that some of the layers have the chromosome numbers proper to *S. nigrum*, and others those of *Lycopersicum*. We can scarcely doubt that this remarkable series of observations will pass into the classics of biology.

On similar lines Baur proposes to elucidate the old problem of *Cytisus Adami* and *Crataego-mespilus*, the two traditional examples of "graft-hybrids." The former, for instance, is regarded as a Laburnum enclosed in a sheath of *C. purpureus*. On occasion, as when the exterior is wounded, the Laburnum can come out and develop. Baur's idea is doubtless a part of the truth, but I cannot clearly apply it to all the phenomena which *Adami* presents, especially to the sexual vagaries which it shows in this country at least. In it the *Adami* flowers have good pollen but no good ovules; the *purpureus* flowers have the female parts developed, but the anthers bad; while the *Laburnum* flowers are perfect and set seed in plenty. Nor do I clearly understand the origin of the *purpureus* branches. One can scarcely help suspecting that in the segregation by which these phenomena are produced there is some complex repulsion between the sex-factors and the factors for colour or form, comparable with the distinctions now known to exist between the genetic constitution of pollen and ovules of the same individual in several cases, e.g. Stocks and *Petunia* (Miss Saunders), or *Oenothera* (de Vries).

The only point in this excellent book which calls for criticism is, in my judgment, the rather crude representation of segregation as effected by chromosomes. These pictures will live in the memory of the reader, and tend to limit his imagination of the possibilities more closely than the known facts at present warrant.

W. BATESON.

THE RUSTING OF IRON.

The Corrosion of Iron and Steel. By Dr. J. Newton Friend. Pp. xiv+300. (London: Longmans, Green, and Co., 1911.) Price 6s. net.

THE author gives a concise account of all the important work that has been carried out in connection with investigations relating to the causes of corrosion of iron and steel. The book is a model of its kind, since the references to original contributions to knowledge are exhaustive and will serve to direct the investigator to the literature of that branch of the subject in which he is specially interested. After dealing with the action of air, of water and of steam on iron, the various theories which have been advanced to explain corrosion are discussed, and the conclusion is drawn that "the most recent experimental results are entirely in favour of the acid theory of corrosion."

The action of acids and of alkalis, and the influence of solutions of salts of various kinds on iron are next considered, and a short chapter is then devoted to the action of oils on the metal. In dealing with the subject of the passivity of iron the author has failed to make clear the fact that the immersion of the metal in chromic acid must necessarily bring about the removal by oxidation of such impurities as manganese sulphide, which exist on the surface, and form

acids on exposure to moist air. The metal by such treatment must in consequence be rendered more resistant to corrosion irrespective of any question of passivity. Nor is attention directed to the fact that the surface of iron immersed in chromic acid must necessarily remain bright whenever the acid is sufficiently concentrated to dissolve any rust which might be formed, and in this connection it may be noted that ferric hydroxide dissolves readily even in dilute solutions of chromic acid. Moreover, H. B. Baker and others have clearly shown that whatever properties are given to iron by immersion in dilute chromic acid immunity from rusting is not one of them, and it is extremely doubtful if previous immersion in chromic acid of any strength is a protection against atmospheric oxidation of iron.

The last three chapters of the book deal respectively with the influence of chemical composition on the corrodibility of iron, with electrical effects and with the relative rate of corrosion of iron and steel. The first of these might with advantage have been considered at an earlier stage—the author states that it is of paramount importance—since an explanation of that troublesome form of corrosion known as pitting in water-tube and other boilers must be sought mainly in the chemical composition of the iron of which they are made. The chapter on electrical action opens with the unfortunate statement that, "as is well known, when an electric current passes through water, the latter is readily split up into its constituent elements, oxygen and hydrogen." This erroneous inclusion of water amongst electrolytes may produce confusion in the minds of some readers, and is greatly to be regretted.

The book is well illustrated throughout, and will appeal to the general reader of scientific literature since it contains matters of interest apart from technical detail. For instance, an account is given of the Iron Pillar of Delhi, dating from 912 B.C., as an example of iron which has for centuries resisted atmospheric attack. There is, however, no record of the very rapid corrosion of the steel pipe line which conveys water from Mundaring to the Kalgoorlie Goldfield in Western Australia, and represents an outlay of upwards of 3,000,000l. sterling. Some account of the reports presented to the Government of Western Australia on this matter might with advantage have been cited, and the suggested treatment of the water by deaeration and liming, involving an expenditure for machinery of 187,000l., discussed.

G. T. M.

ASPECTS OF THE EARTH'S STORY.

The Changeful Earth: an Introduction to the Record of the Rocks. (Readable Books in Natural Knowledge.) By Prof. G. A. J. Cole. Pp. x+223. (London: Macmillan and Co., Ltd., 1911.) Price 1s. 6d.

IT is refreshing to turn from the ordinary text-books of science—useful and necessary as such works undoubtedly are—to a booklet like that now before us. Science manuals in their efforts after inclusion and compression, in order to meet the wants of examination candidates, tend to become dogmatic in their