

due to some genetic relation between the two organisms, the one producing the other at various times and in divers places in the same way as the normal *Linaria vulgaris* from time to time and in this spot and the other produces the peloric form? Have we caught one species in the act of producing another?
E. F.

EXPERIMENTAL MORPHOLOGY.

Einleitung in der experimentelle Morphologie der Tiere. By Dr. Hans Przibram. Pp. 142. (Leipzig and Vienna: Franz Deulicke, 1904.) Price 4 marks.

THIS volume is divided into thirteen practically independent sections, and represents the "fast unveränderte Drucklegung" of a course of lectures delivered by the author during the session of 1903-4 at the Wiener University. The author has been induced to publish these lectures by the belief that all previous works of a general nature dealing with experimental embryology have either been written wholly in support of particular theories (e.g. Driesch, Haacke, Herbst) or only deal with a portion of the subject (e.g. Davenport, Hertwig, Korschelt, Maas, Morgan, Wilson, Ziegler). The present work is intended, therefore, as an introduction to the whole subject from an impartial standpoint.

In the first section, which deals mainly with the scope of experimental morphology, the author, after weighing the various names which have been proposed for the science—Entwicklungsmechanik, Entwicklungsphysiologie, kausala Morphologie, &c.—adopts Davenport's name, "experimental morphology," but defines it as including not only the experimental study of the factors determining form in ontogeny, but also in phylogeny (Umwandlungsphysiologie), so that Driesch's term "rationelle Morphologie" would seem to be more appropriate.

The uncertainty as to the proper scope of the science which this considerable choice of names exhibits is in part due to its recent growth, but it is also due in no small measure to the close connection in which experimental morphology must always stand to the other sciences.

That the author has not been more successful than his predecessors in determining suitable limits to the subject is very clearly shown by his treatment of the section dealing with the "Spezifische Bestimmung." In this section the author describes the influence of relationship in transplantation experiments, and the persistence of specific characters in the transplanted tissues. He then refers to Heape's experiment, in which normal development of an Angora rabbit is obtained, though transplanted shortly after fertilisation into the uterus of a Belgian rabbit, from which, however, the author's conclusion that transfusion of strange blood has no morphogenic influence hardly follows. Following this is an account of immunity and blood relationship experiments. If it is difficult to see why these subjects should be included in a science ostensibly dealing with the factors determining form, this difficulty is still greater when the author proceeds to consider the distribution in the

animal kingdom of the various proteid substances contained in muscle fibre.

In the fourth section, "Die Bewegung-Taxis," the author gives a series of very far-fetched comparisons between the behaviour of unicellular animals and of the higher Metazoa. The sensation of thirst is compared with the hydrotaxis of the Mycetozoa, and Davenport's example is followed in regarding as rheotaxis the behaviour of fish in swimming against the stream, the only position in which they are able to breathe. Finally, the "Thigmotaxis" exhibited by an oxytrocha moving round a spherical egg, unable to leave its surface, is compared with the retreat of a cat into the corner as a dog approaches, or to the preference shown by many people for those seats in a restaurant which have their backs to the wall!

In the twelfth section, "Die Vererbung," the author, after giving a brief account of the current theories of heredity, shows how these are in "schönster Uebereinstimmung" with our recent knowledge concerning the constitution of the nucleus. This agreement is obtained by assuming reduction to consist in the elimination of whole chromosomes during the maturation divisions, the view that this process represents the belated union of the paternal and maternal chromosomes not being mentioned.

In the final section, "Die Artwandlung," the author discusses the influence of external factors in causing transmissible variations.

The wide range covered by the book, the thirteen sections of which only average ten pages each, has resulted in a somewhat superficial mode of treatment, and neither in point of comprehensiveness nor of impartial treatment can the book be said to fill the want which, according to the author, has been left unsatisfied by all previous workers. G. C. C.

ATLAS OF EMISSION SPECTRA.

Atlas of Emission Spectra of most of the Elements.

By Drs. Hagenback and Konen. English translation by Dr. A. S. King. Pp. v+70 and plates. (Jena: G. Fischer; London: Wm. Wesley and Sons, 1905.) Price 27s.

THIS atlas comprises the results of an investigation of the spark, arc, and flame spectra of most of the chemical elements. Twenty-eight charts are given showing heliographic reproductions of photographs taken with the aid of two small Rowland concave gratings, each of 1 metre radius and 20,000 lines to the inch. One of the gratings had a ruled space 9 cm. broad, and was used chiefly for the region of shorter wave-length. The other had a breadth of 5 cm., and was used to photograph the less refrangible portion of the spectrum. For each group of metals two charts are given, one showing the normally visual part of the spectrum, the other the violet and ultra-violet region. The dispersion given by the gratings is such that the length of spectrum from the K line of calcium (λ 3934) to the D lines of sodium (λ 5893) is about 4.5 inches, or 11 cm., each scale division on the reproductions corresponding to

ten tenth-metres. The region of spectrum studied extends from about λ 2500 to λ 7000.

In the production of the arc spectrum, rods of the metal were used as poles whenever possible, though in many cases carbon electrodes were employed, and scraps of metal or salts of the metal volatilised on them. The selection of carbon as electrodes seems to us a very unfortunate one, as it is next to impossible to disentangle the real spectrum of a substance from the structure of the carbon bands. Surely a better method would be to use poles of some inexpensive metal the spectrum of which is a fairly simple and characteristic one, such as zinc, aluminium, or silver.

Among the spectra represented in the charts are several, such as boron, arsenic, the rare earths, the platinum group, phosphorus, selenium, which are reproduced here for the first time. The previously existing records relating to some of these were very meagre, and those now published will be distinctly useful. For some of the gaseous elements vacuum-tube spectra have been obtained.

The authors have not given—and it seems unnecessary to do so—complete lists of wave-lengths, but have confined themselves to a selection of the most characteristic lines for each element. The wave-lengths of these are given only to the nearest Ångström unit or tenth-metre, which is scarcely of sufficient precision for modern spectroscopic research. A chapter of notes is given at the end of the text, touching on such points as varying numbers of lines, kinds of spectra, character of lines, division into pairs, triplets, and series, lines specially prominent in any particular light source, &c.

Notable amongst the few elements not investigated by these observers is scandium. This is unique among the rarer metals in the prominence of its lines in various celestial spectra—notably the chromosphere and stellar types of intermediate temperature—and a reproduction of its complete spectrum would therefore have been of interest.

The reproductions are generally excellent; exception must be taken, however, to that of the solar spectrum, which, apparently included as a reference spectrum, is practically useless. Upon the whole, the production of the atlas is very creditable to the authors, and without being in some ways so elaborate a nature as Crew's or the recently published atlas of Eder and Valenta, it will, through its uniform treatment of all the elements investigated, be useful, as the authors surmise, to the physicist, chemist, and astronomer.

F. E. B.

OUR BOOK SHELF.

Précis d'Hydraulique—La Houille Blanche. By Raymond Busquet. Pp. viii+375. (Paris: J. B. Baillière et Fils, 1905.) Price 5 francs.

THIS book forms one of a series of little volumes which are being issued under the title of "Encyclopédie Industrielle," and treats of the principles of hydraulics and their applications, which possess an enhanced importance in view of the recent great extension of the employment of water-power for industrial purposes, resulting from the discovery that it can be economic-

NO. 1870, VOL. 72]

ally transmitted to a distance when converted into an electric current. Thus, by the development of electrical transmission, it is now practicable to use waterfalls and water stored up in reservoirs, in remote mountain valleys, as sources of power for towns, of which the Falls of Niagara, supplying electrical energy to Buffalo, furnish so notable an instance; and the author has given the name of "La Houille Blanche," or white coal, to this source of power.

The subject is discussed in five chapters, dealing successively with fundamental laws, flow of liquids in pipes, flow of liquids in open channels, hydraulic motors, and creation of a fall of water; and the text is illustrated by forty-nine diagrams and drawings. The hydraulic problems relating to the utilisation of water-power are solved by aid of arithmetic and simple geometry; and the author's aim has been, by making the book neither purely descriptive nor wholly didactic, to render it serviceable to a large number of persons. In the chapter on motors, the different forms of waterwheels and the various types of turbines are described; and, finally, the principle of the hydraulic ram is explained, as being distinct from motors, and yet transforming the fall of water into useful work by raising some of the water to a considerable height. Though reservoirs have been, and are being, formed by constructing high masonry dams across narrow gorges in the valleys of mountain streams, with the object of furnishing water-power, the final chapter of this book relates exclusively to the erection of a masonry weir across rivers, with the necessary sluiceway, closed by wooden panels, for the discharge of floods, by which the ordinary water-level of the river is raised so as to enable water to be drawn off into a branch canal for supplying water-power; and it deals mainly with the requisite calculations of the flow of the river, the discharge through the sluices, the pressure on the panels, the fall available, and the section of the branch canal and of its side retaining walls. The author entertains great expectations as to the future of water-power, and considers that, whereas last century was the century of steam, the twentieth century will be called the age of water-power, or white coal.

Catalogus Mammalium, tam viventium quam fossilium. By E. L. Trouessart. Suppl. part iv., Cetacea to Monotremata. (Berlin: Friedländer and Son, 1905.) Price 8s.

WE have much pleasure in congratulating the author on the completion of the first quinquennial supplement, whereby an absolutely invaluable work is brought well up to date, or, rather, as nearly up to date as is possible in undertakings of this nature. We notice that in the part before us references are given in the case of well-known species to passages in which they have been recently mentioned—a plan which cannot fail to be of the greatest assistance to students.

In accordance with the recent changes in nomenclature, the titles adopted for several genera differ from those employed in the original issue, as, for instance, *Orcinus* in place of *Orca*, on account of the preoccupation of the latter term. In the case of the *Edentata*, the list of names proposed by Dr. Ameghino for South American Tertiary forms looms very large, and, we fear, occupies much more space than it is really entitled to claim. In this connection it may be noted that the author follows Dr. Wortman in classing the North American Eocene ganodonts as ancestral types of the true edentates, Prof. W. D. Scott's recent opposition to this view probably not having been published in time to receive