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had been variable in the grade immediately below. He must also realize that in the interval between these impulses some minor characters in the families similarly acquired fixity in their prime, until old age and extinction approached. The general conclusion is, that if the unknown influence which Cope has termed "bathmic force" were able to act without a succession of checks from the environment and Natural Selection, animals would form much more symmetrical groups than we actually find, and their ultimate grades would display still more instances of numerical fixity in multiple parts than can be observed under existing circumstances.

This result almost tempts a palæontologist to risk the pitfalls of reasoning from analogy and to compare organic evolution with some purely physical processes. It has already been pointed out more than once that the initial stages of animal races resemble the nascent states of chemical elements in their particular intensity of vigour and unwonted susceptibility to influence; while Cope himself has hinted that the "expression points" in the evolution of races may, perhaps, be compared with the phenomena of latent heat in the inorganic world. It now seems reasonable to add that each "phylum," or separate chain of life, bears a striking resemblance to a crystal of some inorganic substance which has been disturbed by impurities during its growth, and has thus been fashioned with unequal faces, or even turned partly into a mere concretion. In the case of a crystal the inherent forces act solely upon molecules of the crystalline substance itself, collecting them and striving, even in a disturbing environment, to arrange them in a fixed geometrical shape. In the case of an organic phylum, the inherent forces of the colloid germ-plasm act upon a consecutive series of temporary outgrowths or excrescences of colloid substance (the successive individual bodies or "somata"), struggling not for geometrically arranged boundaries, but towards various other symmetries and a fixity in number of multiple parts. Palæontology thus contributes to Biology by placing the oft-repeated comparison of life with crystallization in an entirely new light.

BIBLIOGRAPHICAL NOTICES.

A Descriptive Catalogue of the Tertiary Vertebrata of the Fayûm, Egypt. By CHARLES WILLIAM ANDREWS, D.Sc. Pp. xxxvii+324, pls. 26, and text-figures. London: Printed by Order of the Trustees of the British Museum. 1906. Price 35s.

DR. ANDREWS is a zoologist in the widest sense of the term, and hence it is that this bulky volume is something more than a mere

catalogue of dry bones; though even had it been no more than this, from the extraordinary character of these bones the book he has just finished would have been one of exceptional importance: and this because, for the most part, the remains which he describes are missing links for which palæontologists and students of phylogeny have long been seeking, desiring without hope.

Though Dr. Andrews had not, in many cases, the good fortune to unearth the first specimens of these remains to be discovered, it is to him that we owe their determination: to him that the credit belongs of interpreting the true nature of the puzzles they presented. But he has himself done much work in the burning deserts of Egypt, and many of the most important remains described here are due to the masterly intuition he displayed in the arduous work of fossil-hunting; many of the biggest prizes were obtained from ground that others on the same quest had already surveyed and pronounced barren!

The greater part of this volume is concerned with that most important group, the Ungulates; and, undoubtedly, the most striking of these is the bizarre creature which has been named *Arsinoitherium*. A considerable number of bones, including skulls, of this animal have been obtained, representing different ages, so that, as Dr. Andrews remarks, "this extraordinary mammal is now almost completely known, so far as this is possible from the bones alone."

In general appearance somewhat resembling a large and heavily built rhinoceros, it differed therefrom in having an enormous pair of horns placed side by side above the nose and a smaller pair above the eyes. From the corrugations on the surfaces of these cores it would seem certain that they were ensheathed in horn; and in this, of course, *Arsinoitherium* differed fundamentally from the Rhinoceros; while, from their dentition and other cranial characters, it would appear that these ponderous animals are descended from the same ancestral stock as the Hyracoidea.

The great feature of this Catalogue, and of Dr. Andrews's work, is, however, the section devoted to the Proboscidea. Hitherto the origin and evolution of this group has been shrouded in mystery: to-day the veil is lifted. It is no small thing to have done this; and those who will turn to the pages of this work will find that Dr. Andrews has brought to bear upon his task a subtilty of analysis and a grasp of complicated facts that most of us can but envy.

Till now one of the strongest and most telling object-lessons in the Evolution Theory has been furnished by the Horse; but Dr. Andrews has now provided an even more striking piece of evidence. To attempt, even in outline, to describe the nature of this evidence would be impossible in the space at our disposal; for the author's discoveries do not end here, and of these other achievements we must also speak. The most important of these concerns his contentions with regard to the origin and evolution of the Sirenia, which he holds are to be regarded, as De Blainville suggested years ago, as intimately related to the Proboscidea. But

while De Blainville advanced this view rather as a pious opinion, Dr. Andrews has brought forward a mass of skilfully marshalled facts which leave but little room for doubt on the question.

With regard to the question of the descent of the Cetacea, he shows, conclusively, that these most remarkable mammals are derivatives of that primitive group of Carnivora known as the Creodonts.

The bird-remains found by Dr. Andrews in the beds (Lower Tertiary) which furnished the materials for this Catalogue were scanty, though in their way important, inasmuch as among them he found remains apparently of a Ratite (*Eremopezus*) which lived in this district during the Upper Eocene period. But since neither skull, pelvis, nor sternum has so far come to light, there is no evidence to show whether this was really a "Ratite" (Palæognathine) form; nor can much that is profitable be said as to whether it was more nearly allied to the Struthionies or *Æpyornithes*.

With regard to the Reptilia, little of phylogenetic importance has come to light; but from a distributional point of view some very significant facts will be found recorded. Thus, giant Land-Tortoises near akin to the recent Mascarene forms were found, as well as remains of pleurodiran species; and since these last are now confined to the Southern Hemisphere this discovery is of very great significance—tending as it does, Dr. Andrews believes, to support the view that during Jurassic times Africa and S. America formed a continuous land-mass.

But, surely, enough has now been said to show that this "Catalogue" may be said, without exaggeration, to mark an epoch in the history of Vertebrate Zoology. W. P. PYCRAFT.

Die Tierischen Gifte. Von EDWIN STANTON FAUST.
Braunschweig, 1906. Pp. xiv, 248.

THIS is a comprehensive treatise on animal poisons, dealing both with those animals which bite or sting, those the flesh of which is poisonous, and those from which poisonous drugs or arrow-poisons are obtained. The structure of the poison-glands is described and the various symptoms produced by the poisons, and their chemical characters are also discussed. The greater portion of the volume is devoted to Ophidia, Amphibia, Pisces, Arthropoda, Vermes, &c., and certain portions of the subject seem to have been purposely excluded. Thus, *Platypus* is the only poisonous mammal included, and we do not notice anything about hydrophobia or glanders, on the one hand, or the carriage of infection by rats &c., on the other. The carriage of infection by mosquitoes and the tsetse-flies is only briefly alluded to, nor are parasitic insects noticed. Within the limits which the author seems to have imposed upon himself, his book will be found very useful to those interested in animal poisons from a medical and chemical point of view. W. F. K.