

In the Bridger formation, Professor Cope has not achieved such great things as in the earlier periods. Nevertheless, the sections on the reptiles, the rodents, and the tapiroids Hyrachyus and Triplopus, are notable contributions to the subject.

In closing this very brief and inadequate sketch, we must call attention to the beautiful series of miocene carnivores with which part i. ends. Nothing can exceed the perfection of their preservation, and they enable the paleontologist to follow the evolution of the group without difficulty. Professor Cope says with much truth, "No fuller genealogical series exists than that which I have discovered among the extinct cats."

As is unavoidable in the case of a volume nearly five years in course of printing, this book contains much that riper judgment and fuller knowledge have modified. Thus have arisen the occasional contradictions between different parts of the book; and in recent articles in the *American naturalist* the author has expanded and modified many of his conclusions. But, aside from these, some of his results are open to serious question, and with scarcely any of his phylogenetic tables can we fully agree. His tendency seems to be to generalize too hastily from the study of some special structures, as the dentition or the feet, to the exclusion of other important parts. The book has been rather carelessly printed, and shows many typographical errors; and the references to the plates are frequently and annoyingly wrong, compelling the reader to a tedious search. The plates themselves cannot be praised: many of the figures are badly drawn, and in one case, at least, the drawing is ludicrous (woodcut, fig. 25a). With few exceptions, the lithographic work is not up to the usual standard of the Sinclairs, and contrasts unfavorably with the exquisite workmanship of Professor Marsh's volumes.

But, in spite of these drawbacks, Professor Cope has done a grand work, which is an ornament to American paleontology, and must ever remain a landmark in the history of the science, as well as "a monument to the labor and genius of its author."

PHILLIPS'S ORE-DEPOSITS.

CONSIDERING the immense importance of the mining industries, it is remarkable that there have been so few treatises on the manner of

A treatise on ore-deposits. By J. ARTHUR PHILLIPS, F.R.S. London, Macmillan & Co., 1884.

occurrence and origin of the various ore-deposits.

With two or three noteworthy exceptions in Germany, and one or two in France, the literature on this subject is confined to the vast number of special papers. Whitney's 'Metallic wealth of the United States,' a model work which has been of great usefulness, treated, in its descriptive part, only of our own country. Mr. Prime's translation of von Cotta's 'Erz-lagerstaettenlehre' has been for years the only general work on the subject in the English language. Since that was written, our manifold mining industries have assumed an importance that will be best understood when we say that during the year 1880 there were nearly ten thousand mines of all kinds and sizes operating east of the 110th meridian. This does not take into account the mines of the precious and other metals of the west, which must number over three thousand. There is a pressing need of a general work based on a survey of our own rich field.

Pending the appearance of such a work, this book by Mr. Phillips, who has visited many American mines, draws largely, both for facts and theory, from the American experience of its author, and will be found to be very serviceable.

In its general plan and appearance it recalls von Cotta's work. The first hundred pages are devoted to the general classification of deposits. The remaining five hundred or more pages describe in detail the noteworthy and instructive occurrences throughout the world.

The classification adopted is well chosen, and is as simple as is consistent with our knowledge of the subject.

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| I. Superficial. | { | a. Deposits formed by the mechanical action of water. |
| | | b. Deposits resulting from chemical action. |
| | | a. Deposits constituting the bulk of metalliferous beds formed by precipitation from aqueous solutions. |
| II. Stratified. | { | b. Beds originally deposited from solution, but subsequently altered by metamorphism. |
| | | c. Ores disseminated through sedimentary beds in which they have been chemically deposited. |
| | | a. True veins. |
| | | b. Segregated veins. |
| | | c. Gash veins. |
| III. Unstratified. | { | d. Impregnations. |
| | | e. Stock-works. |
| | | f. Fahlbands. |
| | | g. Contact deposits. |
| | | h. Chambers, or pockets. |

In the general part, which follows, these different forms are discussed in the light of the latest investigations.

The forming of the siliceous gangue in fissures by lateral secretions is illustrated in the

chalk where the infusorial silica occasionally segregates into cracks instead of into flint nodules.

The breaking-down of the material of the walls of vein-fissures, its alteration, and incorporation, in place, into the gangue, are briefly but well described, and illustrated by drawings made from thin sections under the microscope. Much weight is given to the results of Sandberger's researches, which seem to establish quite firmly lateral secretion as the generally most important method of vein formation and enrichment. Mr. Phillips gives in this connection a very instructive *résumé* of some of Sandberger's results, which show the widespread distribution of both the heavy metals and the elements of the gangue substances in the constituent minerals of the common rocks.

Not less interesting are the instances cited to show the sufficiency of causes acting now and in recent times at the surface of the earth, to cause the concentration and fixation of minerals to form ore-bodies.

Thus the fact shown by Sandberger, that all lithia micas contain tin, taken in connection with the finding, in various Cornish stream-works, of deer's antlers completely replaced by crystallized oxide of tin, points at once to the existence of sufficient sources of tin in surface rocks, and to the possibility of derivation from those sources, and concentration in veins and stock-works, under conditions now prevailing at the surface. So, also, in the instances of metallic gold which have been found deposited on the woodwork of Australian mines, we have similar evidence of metallic deposition now in progress.

While Mr. Phillips considers that the evidence is largely in favor of assigning to lateral secretion the generally most important part in forming fissure-veins, he recognizes the probable action of ascension, and also of sublimation, in many individual cases. The portion of the book—about five hundred pages—devoted to the description of typical forms of deposits throughout the world is full of information desired by the economic geologist and the statistician.

The illustrative instances are well selected, and the latest available statistics of production are given, apparently, in all cases. Aside from the fact that it brings the description of the countries treated by Cotta down to the present time, the book is particularly valuable for its descriptions of practically all countries which, for various reasons, received little or no attention in Von Cotta's work.

THE MICROSCOPE IN BOTANY.

THOSE students who have been waiting for an English translation of Behrens's book on botanical methods can but be disappointed now that it has appeared. Not that the book does not contain much that is extremely valuable, nor that it is not put in an attractive form by the publishers, but that it has been made cumbersome and expensive by an inordinate amount of 'padding' not found in the German text. Figures and descriptions of American instruments are introduced with such careful discrimination, that doubtless the volume must prove eminently satisfactory to their makers, while the author's remarks on the more useful stands of continental make are entirely suppressed, possibly from a laudable wish to further home protection. The maxim of the author, that "he is the best experimenter who does his work with the simplest possible apparatus," is frequently outraged by the description of gimcracks easily dispensed with, and more properly advertised in an instrument-maker's catalogue than in the pages of an expensive handbook.

Yet, notwithstanding the fact that a two-dollar-and-a-half book has been evolved into a five-dollar book by a process the reverse of natural selection, the translation must prove a boon to the few investigators who have not sufficient command of German to use the original; and it is unquestionably more convenient for college students, who, as a rule, dread manuals in any language but their own. Those who use the book in either form will probably agree with the author that the chapters on reagents and their application in microchemical work constitute its most valuable feature, rendering it, indeed, indispensable in the laboratory where careful work is carried on. A chapter on the preparation of specimens for examination and preservation is also extremely useful, and especially the portion treating of the preparation of fossils and other hard objects.

Though a few more or less deserved slurs on English microscopists, and the author's all but complete forgetfulness that Americans ever look through the instrument, may touch the pride or appeal to the belligerence of an Anglo-American, the book is, in the main, written well and in good taste, and shows a working familiarity both with the subjects handled and the literature pertaining to them.

A guide to the microscopical investigation of vegetable substances. From the German of Dr. JULIUS WILHELM BEHRENS. Translated and edited by Rev. A. B. HERVEY, A.M., assisted by R. H. WARD, M.D., F.R.M.S. Boston, Cassino, 1885.