even making a former low-grade body of sufficient value to work.

It may be concluded that later enrichment of mineral veins is as important as the formation of the veins themselves, particularly from an economic standpoint. In many cases the enrichment proceeds along barren fractures and makes bonanzas. The enrichment is usually due to downward-moving surface waters, leaching the upper part of the vein and precipitating copper, silver, etc., by reaction with the unaltered ore below. As a consequence of this, veins do not increase in richness in depths below the zone of enrichment.

In the *Transactions* of the American Institute of Mining Engineers, Volume XXX., which is just being distributed, Mr. S. F. Emmons has a paper bearing upon this same subject of 'Secondary Enrichment of Ore Deposits.' The author draws upon his wide experience in calling attention to the many cases of secondary enrichment. The main theme discussed is summed up in the opening paragraphs, when he says that, 'admitting fully the general truth of the statement that the descending surface waters exert an oxidizing action, and hence that oxidation products within reach of the surface waters are the result of alteration by the latter, I have been led to believe, by observations now extending over a considerable number of years, that, under favorable conditions, the oxidation products may be changed back again into sulphides and redeposited as such, thus producing what may be called a sulphide enrichment of the original deposits. * * * Being rather a searcher after facts than a theorist, I am not deterred from accepting what may appear to me the correct reading of observed facts because it seems to contradict generally accepted theories.''

The same volume of the *Transactions* contains a practical application of Mr. Weed's theory to Montana deposits, under the title of the 'Enrichment of Gold and Silver Veins.' Attention is especially called to the dependence of such enrichments upon the presence of iron sulphide in the primary ore, and to the structural features which control the circulation of the enriching solutions below water-level. The process may be briefly described as follows. Leaching out of the metals from the portion of the vein lying above ground-water level is to be considered as the main source of the enriching materials. The leaching is due to superficial alteration, and leaves the iron as a gossan, while the waters carrying the gold, silver, copper and other metals in solution trickle downward through the partially altered ores into cracks and water-courses which penetrate the ore body below the water-level. In weathering, the sulphides oxidize according to their relative affinity for oxygen and inversely as their affinity for sulphur. It is inferred from the evidence that ore bodies lacking in iron pyrite will not show enrichment, thus explaining the absence of any such phenomena in the pure silver-lead bodies of the Coeur d'Alene district and elsewhere.

Charles R. Keyes.

RECENT ZOO-PALEONTOLOGY.

VERTEBRATE PALEONTOLOGY AT THE CARNEGIE MUSEUM.

During the past summer three parties from the Department of Vertebrate Paleontology of the Carnegie Museum have been operating in our western fossil fields under the direction of Mr. J. B. Hatcher, the Museum's curator of vertebrate paleontology. One of these parties, in charge of Mr. O. A. Peterson, was sent to northwestern Nebraska to examine the Oligocene and Miocene deposits of that region. The work carried on by this party has been quite successful,—as might be expected from any party in charge of so experienced and skilled a collector of vertebrate fossils as is Mr. Peterson. Among other material secured may be mentioned as of especial value, skeletons of *Hoplophoneus*, *Daphænus*, *Oreodon*, *Procamelus* and *Merycochœrus*, all, it is believed, sufficiently perfect to admit of mounting as complete skeletons. A second party, in charge of Mr. C. W. Gilmore, was despatched to southern Wyoming to continue the work which has been carried on by the Museum for the past two years in the Jurassic deposits at Camp Carnegie, on Sheep Creek, in Albany Co., Wyoming. This party has met with the usual success attending the two previous expeditions

to this locality, and owing to the skill and energy of Mr. Gilmore the value of the Museum's already important collections of Jurassic dinosaurs has been greatly enhanced. The third party has been in charge of Mr. W. H. Utterback, who has been engaged since November last in reopening the old quarry near Canyon City, Colorado, so long worked by the late Professor Marsh. From this quarry Professor Marsh obtained much of his best material of Jurassic dinosaurs. The bones at this quarry are imbedded in a very hard sandstone, which renders the work of securing them exceedingly difficult and tedious. Already a considerable portion of the skeletons of *Morosaurus* and *Stegosaurus* has been secured, along with other valuable material. Within the last month the work of reopening the quarries near Canyon City, which were operated for a number of years by the late Professor Cope, has been commenced by Mr. G. F. Axtell, also of the staff of this Museum.

DISCOVERIES IN NORTHERN AFRICA.

IN the September number of the *Geological Magazine* Dr. Chas. W. Andrews* publishes details of his discoveries in the Western Desert of Egypt which mark the beginning of a new epoch in mammalian paleontology. The first visit to beds of upper Eocene and Oligocene age resulted in the discovery of a Sirenian (probably *Eotherium*), of *Zeuglodon*, a primitive Cetacean, and of Crocodilia, Chelonia and Amphibia. In later visits still more important fossils were secured, which Dr. Andrews has made the types of three new genera. *Palæomastodon* is a trilophodont proboscidean with five grinding teeth in the lower jaw, therefore much more primitive than the oldest Miocene mastodons of Europe. *Mœritherium*, found in older beds of supposed Upper Eocene age, is bilophodont and is probably correctly regarded by Dr. Andrews 'as a generalized forerunner of the mastodon type of proboscidean'; the upper and lower incisors are in pairs, the outer being tusk-like, as we should anticipate. A third, more aberrant type is *Bradytherium* 'which in many respects resembles *Dinotherium*, but in others reminds one of some of the gigantic Amblypoda of North America.' The resemblance to the Amblypoda is in our opinion unreal because all amblypods have triangular teeth, whereas this animal has quadrate bilophodont teeth and reminds us truly of *Dinotherium* as the author suggests. A strong resemblance is also seen to the great gravigrade sloths such as *Megatherium* or more correctly to their American Eocene ancestors with incisors and enameled teeth such as *Psittacotherium;* the depth of the jaw, the early wearing of the enamel, the position of the coronoid process on the outside of the lower molars, all tend to support this likeness. We shall therefore eagerly await the determination of the actual affinities of this animal. The epoch-making character of these discoveries consists in the promise they afford that Africa will prove to be the home of all those families of mammals such as the elephants, hippopotami, giraffes and antelopes, as well as of earlier types, which suddenly appeared in Europe without known ancestry. This would accord with an hypothesis independently advanced by Rütimeyer and Osborn that Africa was an isolated center of mammalian evolution and radiation in the early tertiary, and subsequently contributed great migrations of its fauna to Europe and America.

* 'Extinct Egyptian Vertebrates,' *Geol. Mag.*, p. 400, Sept., 1901.

NOTES ON PRIMITIVE AND FOSSIL BIRDS.

PYCRAFT'S fourth paper in his 'Contributions to the Osteology of Birds,'* treats of the grebes and divers or Pygopodes. As regards the affinity of the Cretaceous toothed bird *Hesperornis* to this order (rather than to the separate order Odontornithes) he believes with D'Arcy Thompson that there can no longer be any doubt (p. 1041). The paper is supplemented by an excellent key to the comparative osteology of this group, a plan also followed in his extensive memoir† on the morphology and phylogeny of the *Paloægnathæ* (*Ratitæ* and *Crypturi*) and *Neognathæ* (*Carinatæ*). In this memoir the pterylography, osteology and soft anatomy of the Tinamous (*Crypturi*) and of the various stru-

* *Proc. Zool. Soc.*, London, Dec. 19, 1901.

† *Trans. Zool. Soc.*, London, Dec., 1900.

thious forms (ostrich, rhea, dinornis, aepyornis, emeu, cassowary, kiwi or apteryx) are thoroughly examined and lead the author to unite these two groups into a new division *Palæognathæ*, differing from all the remaining orders (*Neognathæ* equals *Carinatæ* minus *Crypturi*) especially in skull structure.

His conclusion is that the various 'struthious' forms are widely separate in origin; the emeus and cassowaries are on the whole the most primitive, the true ostriches being a later branch from the same stem; the moas are distantly related to the aepyornithes; the kiwis (Apteryges) are highly aberrant. The interrelationships of the higher birds are not discussed, but an appended phyletic tree represents *Hesperornis* as one of the Pygopodes and *Ichthyornis* as related to the Steganopodes (pelicans, tropic birds, cormorants, etc.).

H. F. O.

THE BRITISH ASSOCIATION AND THE DEATH OF PRESIDENT McKINLEY.

We reproduce the letter addressed by the President of the British Association for the Advancement of Science to the United States Ambassador to Great Britain and the latter's reply:

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

BURLINGTON HOUSE,
LONDON, W., Sept. 19, 1901.

To his Excellency, The Hon. J. H. Choate, Ambassador of the United States of America.

Sir, The General Committee of the British Association for the Advancement of Science, assembled this year in Glasgow, desire me to express to you the horror with which they heard of the attack upon the late President of the United States, and their deep sorrow at his death. On the first day of the meeting in Glasgow the Association telegraphed to Mr. McKinley the assurance of their sympathy and of their earnest hopes for his recovery.

These hopes have not been fulfilled; and it is now my sad duty to inform you that the tragic fate of the President of the United States has cast a deep shadow over our meeting. Together with all our fellow-countrymen we share in the sorrow of the great sister nation which you represent; and we desire, through you, to inform the men of science of America that the members of the British Association are bound to them not only by ties of blood, not only by the links which unite all students of nature, but by the deeper feelings which draw together those who are partners in a common sorrow, and mourn one of the leaders of our common race.

I am, sir,
Your obedient servant,
A. W. Rücker,
President.

AMERICAN EMBASSY,
LONDON, Sept. 23, 1901.

Sir,

I have received with heartfelt gratitude the kind expression of condolence and sympathy at the death of President McKinley which you have forwarded to me on behalf of the General Committee of the British Association for the Advancement of Science.

I shall duly advise my government of its receipt, and it will be highly appreciated by them and by Mrs. McKinley. Your kind message and hundreds of other similar communications from all parts of the British Dominions, carry an assurance of national friendship and goodwill which will be most welcome to the American people.

Yours sincerely,
Joseph H. Choate.

A. W. Rücker, Esq.,
President.

SCIENTIFIC NOTES AND NEWS.

Among the scientific men who have expressed their intention of being present at the Yale bicentennial exercises are Professor Simon Newcomb and Professor Charles S. Minot.

Professor Bashford Dean, of Columbia University, has returned from his sabbatical year, spent in studying the marine zoology of Japan, and in visiting China and the Philippines. He has sent to the American Museum of Natural History a fine collection of Ainu materials, also a series of glass sponges and of the Japanese long-tailed fowls. For the Zoological Department of Columbia he brings back extensive research and exhibition collections.

We regret to learn that Dr. J. H. Hyslop, professor of logic and ethics in Columbia University, is ill, and has been given leave of absence for a sabbatical year which he will spend in the Adirondacks. Dr. A. L. Jones, as lecturer, will take his courses.

Professors Mitsuru Kuhara and Hanichi Muraoka, occupying respectively the chairs of