corresponding to the carbids. They are formed in the electric furnace from mixtures of the carbonates with sand, and sufficient carbon to effect a reduction, or silicates of the alkaline earths and carbon may be used. When treated with water, hydrogen is evolved; with dilute acids the calcium compound evolves silicon acetylene, Si_2H_2. They are powerful reducing agents, and may find use in the dye-stuff industries. They have also been found to be effective in removing phosphorus and sulfur from molten steel.

A RECENT issue of the *Chemical News* gives a description of the electrolytic refining plant of Boston and Montana Copper and Silver Mining Company of Great Falls, Montana, and of the Anaconda Copper Mining Company. It is an excellent instance of the revolution which is being worked in many industries by the use of electricity. In these plants the ore is ground and concentrated, and the rough metal is then cast in pigs two feet square and two inches thick. These are used as the anodes in the bath, the kathodes being thin sheets of copper. The refined copper is deposited upon these thin sheets, while the refuse from the pigs falls to the bottom of the bath. This refuse consists chiefly of lead, silver and gold, and is said to be worth about $2,600 a ton. This refuse is sufficient to pay for the whole electrolytic process. The process is carried on without intermission and the effective result is seen in the dividends of these companies.

J. L. H.

RECENT ZOO-PALEONTOLOGY.

A RHINOCEROS WITH A COMPLETE SET OF CUTTING TEETH.

THE chronometer of evolution never errs. It is well known that modern rhinoceroses are distinguished by the loss of most, if not all, of their cutting teeth. On evolution principles it has been predicted that they sprang from ancestors with four cutting teeth.

A few years ago the American Museum party found a maxilla containing the ancestral upper canines, and now F. A. Lucas (*Proc. U. S. Nat'l, Mus.*, No. 1207) has described a still older type, *Trigonias osborni*, with a full set of upper cutting teeth, that is, canines and three incisors, the most anterior of which is enlarged, Fig. 1. In the lower jaw there is some evidence that the enlarged teeth, which have been usually described as canines, are really incisors, because

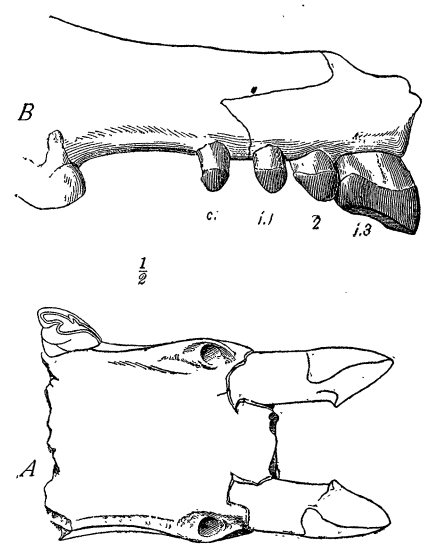

FIG. 1.—*Trigonias osborni*. *A*. Jaw showing alveoli of supposed canines. *B*. Anterior portion of cranium, showing three incisors and small canine. After Lucas.

vestiges of small teeth are present just behind them. This is a most interesting discovery from the Lower Oligocene beds of South Dakota and carries the line of the Rhinoceroses one step further back. The animal is almost as large as the classic *Aceratherium occidentale* of Leidy.

EXTINCT LEMURS FROM MADAGASCAR.

DR. C. J. FORSYTH MAJOR has described from time to time the remarkable lemurs of ancient Madagascar, a zoological region otherwise known as 'Lemuria'; they are of Pleistocene age and show a high degree of specialization or adaptive radiation. *Megaladapis* (see *Phil. Trans.*, Vol. 193, pp. 47–50, 1900) is by far the largest monkey hitherto described; as the name implies, it imitates on a large scale the well-known *Adapis* of the Oligocene of France. Another type, *Nesopithecus* (*Proc. Zool. Soc.*, Dec. 19, 1899), is remarkable in its adaptive resemblance to the Hypsiprimnid marsupials of Australia, proving that the lemurs are a group

which in past time imitated other groups more closely.

PAREIASAURIANS OR THERIODONTS IN NORTHERN RUSSIA.

A RUSSIAN naturalist, Amalitzky, has made extremely important discoveries in northeastern Russia of a Permian fauna which resembles in part that of Scotland and of this country, but still more closely that of the Permian or Perm-Trias fauna of South Africa. In a recent paper before the Society of Naturalists of St. Petersburg, Dec. 28, 1899, he reports the discovery of 39 groups of bones in concretions, 5 of which are composed of complete skeletons, with 5 others more or less complete, and 10 large groups of scattered bones. They include horned types similar to *Elginia* of Scotland and *Dicynodon* of South Africa. Although imbedded in a very difficult matrix, probably the animals are in a remarkable state of preservation and they will not only add greatly to our knowledge of this important fauna, which is ancestral to all the modern reptiles, amphibians and mammals, but they actually afford the most striking evidence of the cosmopolitan distribution of land vertebrates in Permian times.

FOSSIL MAMMALS FROM EGYPT.

AFRICA is the dark continent of Vertebrate Paleontology. With the exception of the Permian fauna of the South, and the Pleistocene fauna of the extreme North (which was virtually a part of Europe), Africa is a blank, although there is little doubt that a most important evolution of mammals was in process there from the beginning of the Tertiary period. It is therefore of great interest to record the discovery, 100 miles nearly due west from Cairo, of a species of Anthracothere to which the name *Brachyodus africanus* is given by Mr. Andrews.* The horizon is Lower Miocene and the beds are alternating fluviatile, marine and lacustrine deposits.

EXTINCT BIRDS OF PATAGONIA.

WE are also indebted to Charles W. Andrews (*Trans. Zool. Soc.*, London, October, 1899) for a very careful review of the fossil ratite birds of Patagonia, remarkable for their great size and their incomplete parallelism with the ratites of other countries. These birds do not, like many other fossils which have recently been discovered in South America, add to the series of animals which connects this continent with Australia and New Zealand. On the other hand, they are, according to Mr. Andrews, entirely of independent origin. In fact, he concludes: "In the preceding pages only a few of the types with which the fossils have been compared are mentioned, they being the only types to which any resemblance pointing to possible affinities could be made out. And even among these there are some to which the similiarity is so slight that they also might perhaps have been omitted. For instance, in the case of *Diomedea*, it is only in the structure of the palate and one or two other points in the skull that any similarity with *Phororhacos* can be detected, the rest of the skeleton being strongly against any such relationship. In fact, it seems to the writer that the only groups that really come into question are the Falconiformes and aberrant Gruiformes, Carima, Chunga, and to a less degree Psophia." The general appearance of the skull is like that of the Falcons, while the general structure of the skeleton, particularly of the pelvis and hind limbs is strongly in favor of affinity with the storks and cranes. The especial type studied, *Phororhacos*, stands in somewhat the same relation to the Cariamidæ (Crested Screamer, Chunga) as such forms as Glyptodon stand to the modern Armadillos.

RELATION OF SOUTH AMERICAN AND AUSTRALIAN MARSUPIALS.

R. LYDEKKER (*Proc. Zool. Soc.*, 1899, pp. 927), while discussing the dental formula of marsupial and placental carnivores, states as his opinion, that the Prothylacinidæ, of Patagonia, equivalent to the Sparassodonta of Ameghino, are undoubtedly marsupials and that they are not very far removed from the Dasyures of Australia, of which they may represent the ancestral type. Lydekker also recedes from his former position that all the Mesozoic mammals should be classed as marsupials in the strict sense.

He has recently described *Ibid*, p. 919 f. from Chubut, Patagonia, a new Dolphin to which

* *Geol. Mag.*, Decade IV., Vol. VI., p. 481 f.

the name Prosqualodon is given because of the resemblance of its teeth to those of Squalodon. The same author has previously described Argyrodelphis, so that this is the second primitive cetacean from this region.

LARGE TURTLES FROM THE FORT PIERRE OF SOUTH DAKOTA.

G. R. WIELAND has recently given a full description (*Amer. Jour. Sci.*, April, 1900) of his genus *Archelon* which he proves to be related to, but distinct from, *Protostega*. It comes from the Fort Pierre of South Dakota, both the skull and part of the skeleton being remarkably preserved. This great sea tortoise belongs to the family Protostegidæ Cope, but its relations to the modern sea turtles or Chelonidæ cannot yet be positively ascertained. None the less this family (Protostegidæ) is much nearer the Chelonidæ than is the existing family, Dermochelyidæ, or modern leather-backed tortoises. In other words, Wieland differs from Baur, who placed the genus *Spahrgis* near the marine turtles, and inclines to the view of Cope and Boulenger that they belong in the separate division Atheca.

DINOTHERIUM GIGANTISSIMUM.

(Anuarulu Museului De Geologia si de Paleontologia * * * 1894, 1896.)

THIS memoir is accompanied by a very interesting and complete history of *Dinotherium* and of the remarkable theories which have been entertained at various times as to the relationships of this animal. Although the genus has been known for half a century, there being three species: *Dinotherium cuvieri*, characteristic of the Lower Miocene; *Dinotherium bavaricum*, characteristic of the Upper Miocene, and *Dinotherium giganteum*, characteristic of the Lower Pliocene of Europe, little has been known of these animals except the skull, so that their relations to the other Proboscidia have been very obscure. Professor Stefanescu, of Bucharest, has recently described a species from the Pliocene, which, as its name indicates, is much larger than *Dinotherium giganteum*. The type is remarkably preserved and shows that, wholly unlike the elephant, this animal has a functionally tridactyl pes, the first digit and probably the fifth being greatly reduced. The skeleton was exhumed in Roumania, near the village of Mansati, between 1890 and 1894.

FOSSIL CAMELS OF EUROPE.

THE same author has recently described a fossil camel from Roumania, the first which has been known in Europe; previous remains have been found in the Pliocene Siwalik beds of India, in the Pleistocene of Algeria and in the Pleistocene of Siberia, the latter teeth being preserved in the Museum of Darmstadt, and described by Bojanus in 1836 as *Merycotherium sibiricum;* the fossil nature of these teeth is somewhat in question. There can be no doubt however about the discovery in Roumania because the bones were associated with those of an Antelope and a Mammoth. After a most careful comparison and description, M. Stefanescu remarks that the animal probably emigrated from Asia but did not find its way into Europe until the Pleistocene; this species therefore adds a very important new type to the Pleistocene fauna of Europe.

THE DEVONIAN LAMPREY AND THE CLASSIFICATION OF THE FISHES.

Part 1 of Vol. II. of the *Memoirs* of the New York Academy of Sciences contains an important study of *Palæospondylus* by Bashford Dean. Since its discovery by Traquair in 1890 in the Devonian of Scotland, this minute fossil has attracted an amount of attention in inverse proportion to its size. Traquair placed it with the Cyclostomes; Huxley, with the larval Coccosteans; Gill, in a new sub-class, Cycliæ. Dean reviews the discussion and re-studies all the material with great care, coming to the conclusion that the specimens hitherto found are not adult: 'It is far more likely to prove, as Huxley believed, a larval Arthrodire.' The Arthrodira include the armored fishes *Dinichthys* and *Coccosteus*, and the most striking as well as the most permanent feature of Dean's paper is a separation of these types into a new distinct sub-class, ARTHROGNATHI, distinguished by the hinged condition of the jaws both at their junction with the skull and with each other. This is probably an important advance in the classification of the fishes and it has already been accepted by Woodward and Eastman.

HENRY F. OSBORN.