

on different branches of electricity, to which M. Becquerel devoted his especial attention, will be found in the Comptes Rendus of the Academy of Sciences. We may more particularly name Mémoire sur les Caractères Optiques des Minéraux (1834), Sur les Propriétés Electro-Chimiques des Corps Simples et leurs Applications aux Arts (1841), and Mémoires sur la Reproduction Artificielle des Composés Minéraux, à l'aide de Courants Électriques très faibles (1852). His researches on animal heat, and other applications of physics to physiology, on which subjects memoirs will be found in the Comptes Rendus, were of a high class.

M. Becquerel was a voluminous writer on science, the most important of his works being, Traité de l'Électricité et du Magnétisme (1834-1840, in seven vols.), Traité d'Électro-Chimie, and his Traité de Physique appliquée à la Chimie et aux Sciences Naturelles. Beyond these he published, in connection with his son, M. Edmund Becquerel, several works on meteorology, on agricultural chemistry, on the influences of forests on climate, and on the several divisions of electrical science, to which the father and son had devoted the largest portion of their lives.—*Athenæum*, Jan. 26.

M. REGNAULT.—M. Henri Victor Regnault died at Paris, almost simultaneously with M. Becquerel, on the 21st of January.

M. Regnault was born on the 21st of July, 1810, at Aix-la-Chapelle. He was a student of the Polytechnic School, and shortly after leaving that school he became Ingénieur en Chef des Mines. In 1840 he became Professor of Physics in the College of France and of Chemistry in the Polytechnic School. In the same year he was elected a Member of the Académie des Sciences, and in 1854 he became Director of the Manufactory of Porcelain at Sèvres. In 1852 M. Regnault was elected a Foreign Member of our Royal Society, and at different times the Copley and the Rumford Medals were presented to him. M. Regnault was also a Corresponding Member of the Academies of Berlin and St. Petersburg. In the Annales de Chimie et de Physique and in the Comptes Rendus des Séances de l'Académie will be found numerous memoirs by this eminent chemist. One of the most important works published by M. Regnault appeared in the twenty-first volume of Mémoires de l'Académie des Sciences, under the title of Relation des Expériences entreprises par Ordre de M. le Ministre des Travaux Publics, et sur la Proposition de la Commission Centrale des Machines à Vapeur. These researches remain a standard authority upon all questions relating to the theory and practice of the use of steam as a motive power.

M. Regnault was the father of the celebrated painter who fell, fighting for his country, at the siege of Paris.

M. Regnault published a Cours Élémentaire de Chimie, in four volumes, Première Notions de Chimie, and a Traité de Physique. The Cours Élémentaire has been translated into several European languages, and the other works of M. Regnault are highly appreciated in this country as in France.—*Ibid.*

## APPENDIX.

### ART. XXXIII.—*Notice of New Dinosaurian Reptiles;* by Professor O. C. MARSH.

IN addition to the Jurassic reptiles already described by the writer,\* several others of interest are now represented in the Yale Museum. Among these are a number of Dinosaurs of gigantic size, and others of diminutive proportions. Nearly all are from the Atlantosaurus beds of the Rocky Mountains. Most of the larger specimens belong to the *Atlantosauridæ*, a group marked by some interesting characters not before observed in Dinosaurs. The more important of these characters, so far as at present known, are, the pneumatic cavities in the vertebræ; the sacrum with only three or four vertebræ, and a corresponding short ilium; the large fore limbs; and the presence of five well developed digits in both the manus and pes. The latter was unguulate, and essentially plantigrade. The carpal and tarsal bones are not coössified with the long bones, and the third trochanter of the femur is rudimentary or wanting. The known genera are *Atlantosaurus* (*Titanosaurus*), *Apatosaurus*, and *Morosaurus* described below.

#### *Atlantosaurus immanis*, sp. nov.

The present species was vastly larger than any land animal either recent or fossil, hitherto described. It is indicated by various well preserved remains, of which the most characteristic is the femur. This bone has no true head, and no distinct third trochanter. The proximal end and upper half of the shaft are compressed transversely. The inner condyle of the distal end is proportionally large, and on the outer one, the fibular ridge is well marked. This femur is *over eight feet* (98 inches, or 2,500<sup>mm</sup>) in length. The transverse diameter of the proximal end is 25 inches (635<sup>mm</sup>), and the antero-posterior diameter of the inner condyle of the distal end is 18 inches (475<sup>mm</sup>). A comparison of this bone with the femur of a Crocodile (*C. Americanus*), would indicate for the fossil species, supposing the two reptiles to have the same proportions, a length of about one hundred and fifteen feet!

\* This Journal, xiv, pp. 87, 254, 513, 514.

The other bones found near the femur are proportionally gigantic, one caudal vertebra having a transverse diameter of over 16 inches (420<sup>mm</sup>). That this reptile when alive was near one hundred feet in length, is probable, although it may have been much less.

The only remains of this monster at present known are in the Yale College Museum. They are from the Upper Jurassic of Colorado.

*Morosaurus impar*, gen. et sp. nov.

This genus is allied to *Apatosaurus* and *Atlantosaurus*, but may be distinguished from them by the sacrum, as well as by other characters. The former has but three sacral vertebrae, while the present genus has four. The transverse processes are vertical plates, except at their expanded ends, which extend below the inferior surface of the centra. The latter are also more fully ossified than in *Atlantosaurus*. The first sacral vertebra has its articular face somewhat convex, while the articulation of the last sacral vertebra is concave.

The present species is represented by various remains, the sacrum being most characteristic. Its principal dimensions are as follows:

Length of sacrum .....	535 <sup>mm</sup>
Transverse diameter of anterior articular face .....	215 <sup>·</sup>
Transverse diameter of posterior articular face .....	190 <sup>·</sup>
Expanse of transverse processes of second vertebra .....	395 <sup>·</sup>

This sacrum indicates a reptile at least twenty-five feet in length. It was found with other remains in the *Atlantosaurus* beds by Mr. S. W. Williston, of Yale College Museum, to whom science is indebted for many important discoveries in the Rocky Mountain region.

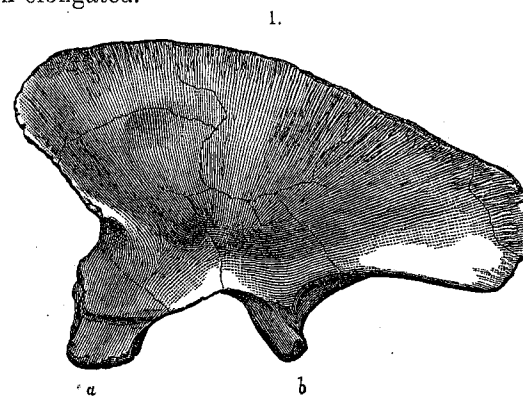
*Allosaurus lucaris*, sp. nov.

The peculiar genus named by the writer *Allosaurus* proves to be very different from the Dinosaurs found with it, and to represent a distinct family, *Allosauridae*. A second species, apparently of this genus, is indicated by some characteristic remains among which is an anterior dorsal vertebra. This has the anterior articulation of the centrum somewhat convex, and the posterior face concave. The sides of the centrum are so deeply excavated that only a narrow keel is left below, and there are large cavities in the interior. The length of this centrum is 69<sup>mm</sup>; the vertical diameter of the anterior face, 81<sup>mm</sup>; and the width of this face, 33<sup>mm</sup>. The articulation for the rib is at the anterior border, just below the suture of the neural arch.

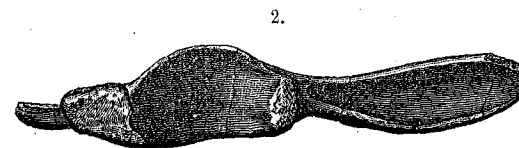
This specimen is from the Upper Jurassic of the Rocky Mountains, and belonged to a reptile eighteen or twenty feet in length.

*Creosaurus atrox*, gen. et sp. nov.

This genus is nearly allied to *Dryptosaurus* (*Laelaps*), and was the carnivorous enemy of the huge *Atlantosauridae*. It is indicated by various remains in excellent preservation, among them the ilium represented below. The teeth referred to the present species have the crowns more or less trihedral, and the cutting edges crenulated. The metapodial bones preserved are elongated, and the terminal phalanges supported sharp claws. The vertebrae known are biconcave, and the terminal caudals are much elongated.



Left ilium of *Creosaurus atrox* Marsh. Outside view.



Inferior view. Both one-tenth natural size.

The following measurements indicate the size of this reptile:

Antero-posterior diameter of left ilium .....	700 <sup>mm</sup>
Vertical diameter .....	425 <sup>·</sup>
Length of metatarsal .....	277 <sup>·</sup>
Transverse diameter of proximal end .....	72 <sup>·</sup>
Transverse diameter of distal end .....	79 <sup>·</sup>
Length of distal caudal vertebra .....	78 <sup>·</sup>
Transverse diameter of proximal end .....	33 <sup>·</sup>
Transverse diameter of distal end .....	31 <sup>·</sup>

This animal was about twenty feet in length. The remains at present known are from the same horizon as those above described, and were collected by Mr. S. W. Williston.

*Laosaurus celer*, gen. et sp. nov.

The present genus is indicated by various remains of small Dinosaurs, of two or more species. The long bones are not hollow like those of *Nanosaurus*, but their walls are thick, and the cavities small. The vertebræ preserved are biconcave, and the neural arches loosely united to the centra. The dorsal and anterior caudals are more elongated than in most Dinosaurs. The phalanges are so avian in character, that they would readily be taken for those of birds. The anterior limbs were much smaller than the posterior.

The following are some of the dimensions of the present species:

Length of median caudal vertebra .....	24 <sup>mm</sup>
Vertical diameter of anterior articulation .....	17
Transverse diameter .....	16
Greatest diameter of proximal end of ulna .....	19.5
Length of proximal phalanx of pes .....	29
Length of second phalanx of pes .....	21
Length of third phalanx .....	16

The remains at present known indicate an animal about as large as a fox. They are from the same horizon as the species described above.

*Laosaurus gracilis*, sp. nov.

A second species, much smaller than the above, is represented by well preserved remains of various parts of the skeleton. Its size is indicated by the following measurements:

Length of lumbar vertebra .....	16 <sup>mm</sup>
Transverse diameter of anterior face .....	18
Transverse diameter of posterior face .....	17
Length of median caudal vertebra .....	16
Transverse diameter anterior face .....	12
Greatest diameter of proximal end of ulna .....	17

The present species is from the same locality and horizon as the one above described.

This reptile is the smallest known Dinosaur, with the exception of the diminutive species of *Nanosaurus* (*N. agilis* and *N. victor*). The latter genus possesses some very peculiar characters, and represents a distinct family, *Nanosauridae*.

Yale College, New Haven, February, 1878.

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[THIRD SERIES.]

ART. XXXIV.—*On the Surface Geology of Southwest Pennsylvania, and adjoining portions of Maryland and West Virginia;* by JOHN J. STEVENSON, Professor of Geology in the University of New York.

THE following article contains a brief summary of the results obtained by me during three years' labor in connection with the Second Geological Survey of Pennsylvania. The detailed statement will appear elsewhere.

The area in which observations were made covers in all more than 10,000 square miles. It embraces that portion of Pennsylvania lying south from the Ohio and Conemaugh Rivers and west from the Alleghanies; includes a large part of West Virginia and Maryland lying on both sides of the Alleghanies of Virginia; and has the channel-ways of four great rivers, the Monongahela, Cheat, Youghiogheny and Potomac, lying partly within it.

Along all the streams there are fine terraces covered with detritus containing many polished fragments, which have been transported from a greater or less distance; these terraces fall down stream but not so rapidly as do the present stream-beds; and the terraces of tributaries are continuous with those of the main streams.

A second series of benches appears throughout this whole region and seems to be characteristic of a much wider area than that in which observations were made. The benches of this series evidently differ in origin from those of the lower series; their detrital coating contains little clay, no transported fragments and consists almost wholly of sand. They are almost absolutely *horizontal*; they do not merge into the lower series,

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