tise lacks that charm. Many a student who uses it will be likely to lose his interest in experimenting, when he finds that some trifling direction has been omitted by which success could have been secured. No handbook dealing with manipulation should fail to give even fussy details, rather than leave the student to find out all such minor points of practice for himself.

Although we miss a good many excellent methods which should find place in a work of this sort, it is nevertheless a valuable aid in the laboratory. The illustrations are numerous and excellent. It is to be regretted that the work has no index. G. L. G.

III. Miscellaneous Scientific Intelligence.

1. *Proceedings of the Colorado Scientific Society*, vol. ii, part 2, 1886, 153 pp. 8vo. Denver, Col. (published by the Society).—The Colorado Society, though somewhat removed from the chief scientific centers has shown an admirable spirit in the amount and excellence of the scientific work it has called out. This closing part of volume ii contains a series of papers chiefly geological and mineralogical. Mr. P. H. Van Diest describes the telluride veins of Bowlder county, with an excellent map. A paper by Charles G. Slack follows on the artesian wells of Denver; these wells number about 200, furnishing about 3,000,000 gallons daily, they draw their water from sandstone or shale layers, from a few inches to 80 feet in thickness, at varying depths down to 900 feet. Mr. S. F. Emmons furnishes notes on some Colorado ore deposits. Mr. W. Cross on the Cimarron land-slide of July, 1886; Mr. R. C. Hills on the circulation of water through the strata of the Upper Cretaceous Coal-measures of Gunnison county. There are also a number of mineralogical articles, several of which have been printed in this Journal.

2. *Relative Proportions of the Steam Engine*, being a rational and practical discussion of the dimensions of every detail of the steam engine, by W. D. Marks, 3d edition, revised and enlarged. 295 pp. 8vo. Philadelphia, 1887 (J. B. Lippincott Company).—A new and considerably enlarged edition of this excellent manual will be acceptable to all interested in the steam engine. The chief additions are in an important line, being an attempt on the part of the author, approaching the subject both from the mathematical and practical side, to develop the laws of the condensation of steam within the steam cylinder.

3. *Modern American Methods of Copper Smelting;* by Edw. D. Peters. 342 pp., large 8vo. New York, 1887. (Scientific Publishing Company.)—The author gives here a practical and detailed description of the methods employed in this country for smelting copper, adding more than usual of minute directions and with many useful data as to the actual cost. The volume will be valuable to the student and still more to the practical worker.

Obituary.

Ferdinand Vandeveer Hayden.—Dr. Hayden, for many years at the head of Government Exploring Expeditions in the Rocky Mountain region, and the author of various geological papers, died on the 22d of December, in his 59th year. A notice of his special scientific work is necessarily deferred.

APPENDIX.

Art. VI.—*Notice of a New Genus of Sauropoda and other new Dinosaurs from the Potomac Formation*; by O. C. Marsh.

The variegated red and gray clays which form so conspicuous a feature in their outcroppings between Baltimore and Washington have long been a puzzle to geologists. They have been supposed to be Mesozoic, but as no characteristic fossils had been found at the typical localities, or in the known extensions of the deposits, their true age was uncertain. They are evidently above the red Triassic sandstones, and are supposed to pass into clays which extend beneath the Cretaceous marls of New Jersey.

The United States Geological Survey has named these problematic deposits the Potomac formation, and the Director recently requested the writer to institute a special search for vertebrate fossils, to solve, if possible, the question of its age. The field work was intrusted by the writer to Mr. J. B. Hatcher, whose experience in the West has especially fitted him for it. The results of two months' investigation prove that these deposits, so long supposed to be nearly or quite destitute of fossils, contain a rich vertebrate fauna, apparently of Upper Jurassic age, but quite distinct from any hitherto discovered in this country.

The most abundant fossils obtained are remains of Dinosaurian reptiles, three orders of which are represented, and in the present article, some of the new forms are described. Associated with these are remains of crocodiles and tortoises, also of Jurassic types, some fishes, and a few mollusks. A number of plants have been found, mainly conifers and cycads. The strata containing these fossils are evidently of lacustrine origin.

Pleurocœlus nanus, gen. et sp. nov.

The most common fossils secured thus far from the Potomac formation are the remains of a small Dinosaur which clearly belongs to the *Sauropoda*, but is by far the most diminutive member of this group yet discovered. Portions of the skull, vertebræ, and limb bones of several individuals have been obtained, and these agree so nearly that they may be referred to one species. They differ somewhat in size, owing apparently to a difference in age.

In comparing these remains with the *Sauropoda* now known, they appear to resemble most nearly those of the genus *Morosaurus*, so well represented in the upper Jurassic of the Rocky Mountain region. A careful comparison, however, shows that they belong to a distinct genus. The teeth are of the same general type as those of *Morosaurus*, but their crowns are mainly compressed cones, and not spoon-shaped. The dentary bone is slender, and rounded at the symphysis, instead of having the massive, deep extremity seen in *Morosaurus*. The maxillary is also lighter, and less robust. The supra-occipital agrees closely in shape with that of *Morosaurus*, and forms the upper border of the foramen magnum, as in that genus.

FIG. 1. FIG. 2.

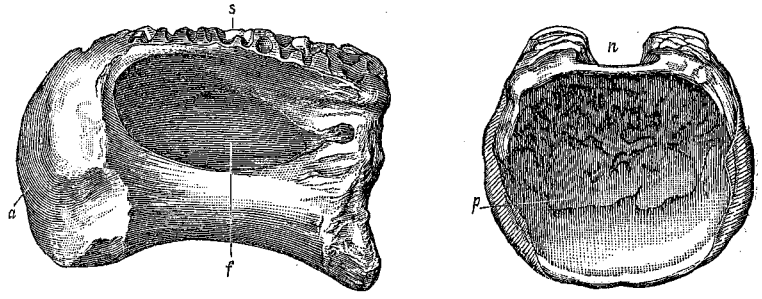

FIGURE 1. Dorsal vertebra of *Pleurocœlus nanus*, Marsh; side view.
FIGURE 2. The same vertebra; posterior view.
Both figures are one-half natural size.

The cervical and dorsal vertebræ are elongate, and strongly opisthocœlous. The latter are much longer than the corresponding vertebræ of *Morosaurus*, and have a very long, deep cavity in each side of the centrum, to which the proposed generic name refers. All the trunk vertebræ hitherto found are proportionately nearly double the length of the corresponding centra of *Morosaurus*, and the lateral cavity is still more elongate. These points are shown in the posterior dorsal vertebra represented in figures 1 and 2. The neural arch in this region is lightened by cavities, and is connected with that of the adjoining vertebræ by the diplosphenal articulation.

The sacral vertebræ in *Pleurocœlus* are solid, as in *Morosaurus*, but much more elongate. The surface for the rib, or process which abuts against the ilium, is well in front, more so than in any of the known *Sauropoda*. Behind this articular surface, is a deep pit, which somewhat lightens the centrum. These characters are seen in the sacral vertebra represented in figures 3 and 4.

FIG. 3. FIG. 4.

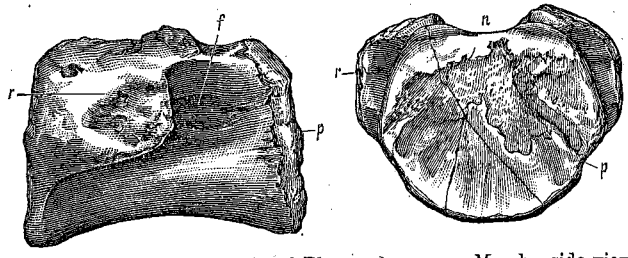

FIGURE 3. Sacral vertebra of *Pleurocœlus nanus*, Marsh; side view.
FIGURE 4. The same vertebra; posterior view.
Both figures are one-half natural size.

The first caudal vertebra has the centrum very short, and its two articular faces nearly flat, instead of having the anterior surface deeply concave, as in the other known *Sauropoda*. The neural spines in this region are compressed transversely. The middle and distal caudals are comparatively short, and the former have the neural arch on the front half of the centrum, as shown in figures 5 and 6.

FIG. 5. FIG. 6.

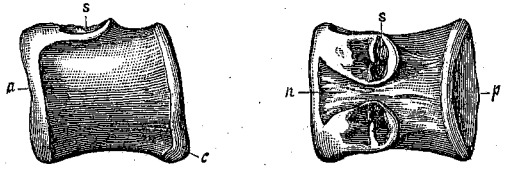

FIGURE 5. Caudal vertebra of *Pleurocœlus nanus*, Marsh; side view.
FIGURE 6. The same vertebra; superior view.
Both figures are one-half natural size.

The bones of the limbs and feet preserved, agree in general with those of the smaller species of *Morosaurus*, but indicate an animal of slighter and more graceful build. The metapodials are much more slender, and the phalanges are less robust than in the other members of the order.

The known remains of the present species, representing several individuals, indicate an animal not more than twelve or fifteen feet in length, and, hence, the smallest of the *Sauropoda*. They were found at several localities of the Potomac formation in Prince George Co., Maryland.

Regarding the present species as typical, some of the more special characters distinguishing these remains from the known *Sauropoda* are as follows:

(1) Teeth with compressed, or flattened crowns.

(2) Dorsal vertebræ with low neural sutures, and elongate excavation in each side of centrum.

(3) Sacral vertebræ solid, with cavity in each side, and with face for rib in front.

(4) Anterior caudals with flat articular faces, and transversely compressed neural spines.

(5) Middle caudal vertebræ with neural arch on front half of centrum.

These characters appear to indicate a distinct family, that may be called the *Pleurocœlidæ*.

Pleurocœlus altus, sp. nov.

A larger species apparently of the above genus is represented by various remains from the same localities as the specimens just described. A tibia and other limb bones show the animal to have had elongated posterior extremities, at least a third longer, proportionately, than in *Morosaurus*, which these remains, in some respects, clearly resemble.

The tibia has the proximal end compressed transversely, with its outline sub-rhomboidal. The cnemial crest is well developed. The shaft is solid throughout, with the exception of a very small cavity near the middle, and here it is sub-ovate in transverse section. The distal end is much flattened antero-posteriorly, and the notch in the articular face, characteristic of the *Sauropoda*, is well marked. This tibia is twenty-five inches (M. ·635) in length, with its proximal end seven inches (M. ·177) in fore and aft diameter, and the distal end six inches (M. ·152) in transverse diameter. Both extremities are rugose, indicating a heavy covering of cartilage. The fibula is massive, and its distal end somewhat expanded. The astragalus was free, and is wanting in the present specimen.

Priconodon crassus, gen. et sp. nov.

The existence of another herbivorous Dinosaur in the same horizon of the Potomac formation is indicated by a number of fragmentary remains, the most characteristic of which is the tooth figured below. This may be regarded as the type specimen. Although resembling somewhat the teeth of *Diracondon* from the Jurassic of the West, it is quite distinct. It has the narrow neck, swollen base, and flattened crown of that genus, but the serrated edges meet above at a sharp angle, instead of forming a wide curve at the apex.

FIG. 7. FIG. 8. FIG. 9.

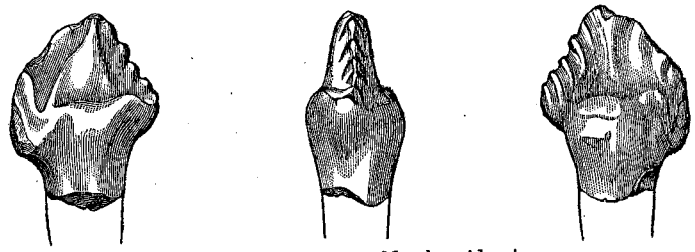

FIGURE 7. Tooth of *Priconodon crassus*, Marsh; side view.
FIGURE 8. The same tooth; end view.
FIGURE 9. The same; inside view.
All the figures are twice natural size.

The surface shown in figure 7 is much worn by the opposing tooth. In figure 9, the pit formed by the succeeding tooth is seen near the top of the fang.

The other remains at present referred to this species were not found with this tooth, and hence, their relations to it are uncertain. They will be described more fully elsewhere.

All the remains supposed to pertain to this animal are from the Potomac formation, Prince George Co., Maryland.

Allosaurus medius, sp. nov.

Besides the herbivorous Dinosaurs described above, remains of two carnivorous forms were secured from the same horizon. The larger of these, which may be provisionally referred to the genus *Allosaurus*, is represented by various specimens, the most characteristic of which are teeth, and bones of the limbs and feet. The teeth are remarkably flat and trenchant, with the edges finely serrated, and the surfaces very smooth. The limb bones, and even the phalanges, are unusually hollow, and the latter have the articulations finely finished. The principal dimensions of some of the parts preserved are as follows:

One tooth has the crown 30^{mm} in height; its antero-posterior diameter at base 15^{mm}; and its transverse diameter 7^{mm}.

The astragalus is 55mm in width; and 50mm in fore and aft diameter.

A first phalanx of the hind foot is 90mm in length.

These specimens would indicate an animal ten or twelve feet in length.

These remains are from the same horizon and localities as those above described.

Cœlurus gracilis, sp. nov.

The smallest Dinosaur found in these deposits is a very diminitive carnivore, apparently belonging to the genus *Cœlurus*. It was not more than one-half the size of the western species, and its proportions were extremely slender. The bones are very light and hollow, the metapodials being much elongated, and their walls extremely thin. An ungual phalanx of the manus measures about 25mm in length; and 14mm in vertical diameter at the base.

This animal could not have been more than five or six feet in length. The known remains are from the same horizon as those above described.

All the specimens described in the present article were found by Mr. J. B. Hatcher, of the U. S. Geological Survey, and the writer's able field assistant in paleontology.

The fossils here described, and others from the same horizon, seem to prove conclusively that the Potomac formation in its typical localities in Maryland is of Jurassic age, and lacustrine origin. There is evidence that some of the supposed northern extensions of this formation, even if of the same age, are of marine, or estuary origin.

Yale College, New Haven, Conn., Dec. 23, 1887.

Art. VII.—*Notice of a New Fossil Sirenian, from California;* by O. C. Marsh.

In exploring a Tertiary deposit in California a few years since, the writer obtained several teeth of a large mammal, very distinct from anything hitherto discovered in this country. Other specimens were subsequently secured, and with them, a number of vertebræ, apparently pertaining to the same animal which is described below. The associated vertebrate fossils were a large edentate (*Morotherium*), a mastodon, a camel, and one or more extinct species of the horse, all indicating the Pliocene age of the strata in which they were entombed.

Desmostylus hesperus, gen. et sp. nov.

The remains known of the present species indicate an animal about fifteen feet (M. 4·5) in length, and of robust proportions. The most characteristic parts preserved are the molar teeth, which are composed of a number of vertical columns, closely pressed together, and in adult animals, firmly united at their bases. These columns are thickly invested with enamel, which is rugose externally. Inside the enamel, is a body of dentine, in which there is a central cavity.

In immature teeth, the columns are nearly round, and loosely united, but as they increase in size, they press together, and become more or less polygonal in cross section. Before being worn, they have their summits smooth and convex, but after some use, the center of each column presents a rounded elevation, well shown in the figures below. This is due to the harder material forming the walls of the central cavity. As this apex is removed by further wear, the cavity is reached, and this central opening increases in size as the tooth is shortened by attrition.

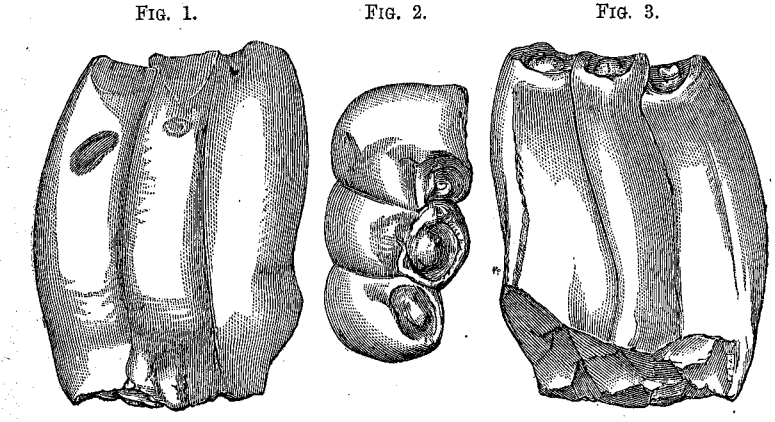

Figure 1. Part of tooth of *Desmostylus hesperus*, Marsh; end view.
Figure 2. The same specimen; seen from above.
Figure 3. The same specimen; inner surface.
All the figures are natural size.

The specimen figured is apparently the posterior portion of a molar tooth. The three columns shown are much smaller than the average, not half as large as some others found with them, and probably belonging to the same individual. The number of columns in a single tooth is uncertain, but there are