four sections. I, French Literature, History and allied subjects; II, English Literature, History and allied subjects; III, Mathematical, Physical and Chemical sciences; IV, Geological and Biological sciences. This first volume contains 16 papers in section I, 9 in section II, 24 in section III and 24 in section IV, showing great scientific activity in the academy during its first two years. Some of the papers have already been noticed in this Journal.

4. *Royal Society of New South Wales*, vol. xvi, 1882.—Mr. A. LIVERSIDGE describes in this volume the Deniliquin or Baratta meteorite. H. Tenison-Woods is disposed to refer the extensive sandstone formation of eastern Australia, named the Hawkesbury Sandstone, chiefly to wind transportation, an opinion the writer's observations (Wilkes Expl. Exped. Geol., 1849) do not appear to him to sustain. The same author describes Mesozoic fossils from Palmer River, Queensland. Mr. H. C. Russell has a paper on Tropical rains illustrated by maps.

Census Reports on Cotton, E. W. Hilgard, Special Agent in charge:
(1) General Discussion of the Cotton Production in the United States, by E. W. Hilgard.
(2) On the Cotton Production and Agricultural features of Mississippi and Louisiana, by E. W. Hilgard.
(3) Physical and Agricultural features of California, with a discussion of the present and future of Cotton production in the State; also Remarks on Cotton Culture in New Mexico, Utah, Arizona and Mexico, by Dr. E. W. Hilgard.
(4) On the Cotton Production and Agricultural features of Georgia, Texas, Arkansas and the Indian Territory, by Dr. R. H. Loughridge, Special Census Agent.
(5) On the Cotton Production and Agricultural features of Alabama and Florida, by Dr. Eugene A. Smith, Special Census Agent.

Geological and Mineral Studies in Nuevo Leon and Coahuila; by Dr. Persifor Frazer. 36 pp. 8vo, with maps. Philadelphia, 1884.

Types of Animal Life selected for Laboratory use in inland districts; by C. L. Herrick. Part I, Arthopoda. 34 pp. 8vo, Minneapolis, 1883.

German Upper Devonian Phyllopod Crustaceans. Professor J. M. Clarke (of Northampton, but for the year past in Germany) has described and figured, in the Jahrb. f. Min., i, 1884, three species of *Spathiocaris* and one of *Entomis*, from Bicken, and one of *Dithyrocaris* from Wildungen.

Der Tarsus der Vögel und Dinosaurier, eine morphologische Studie; von Dr. Georg Baur, aus München. 44 pp. 8vo, with two plates. An important paper.

Niagara fossils; by J. W. Spencer. 62 pp. 8vo, with several plates; including Graptolitidae and Stromatoporidæ of Upper Silurian, and fifteen new species of Niagara fossils. May, 1884. Printed for the Museum; also Proc. St. Louis Acad. Sci., vol. iv, no. 4. St. Louis, 1884.

The succession in the Archæan rocks of America compared with that in the Pre-Cambrian rocks of Europe, by Henry Hicks, F.G.S. Proc. Geologists' Assoc., vol. viii, no. 5.

Geology and Mineral Resources of the James River Valley, Va.; by J. L. Campbell, Professor Geol. and Min., Lexington, Va.; 120 pp. 8vo, with a map and Geological Sections. The work is a contribution to general as well as economic geology.

OBITUARY.

FERDINAND VON HOCHSTETTER, the able geologist of Vienna, who was connected with the Austrian expedition around the world of the Novara, from 1857 to 1860, died on the 18th of July, in his fifty-sixth year.

APPENDIX.

ART. XXI.—*On the United Metatarsal Bones of Ceratosaurus;* by Professor O. C. MARSH.

IN the April number of this Journal (vol. xxvii, p. 331), the writer described a remarkable new Dinosaur, the type of the genus *Ceratosaurus*, and of the family *Ceratosauridæ*. The skull, vertebræ, and pelvis were described and figured, but at that time little was known about the feet. More recently portions of these have been recovered from the same individual, and they prove to be as remarkable as the other parts of the skeleton already made known.

The most interesting feature in the extremities of this Dinosaur is seen in the metatarsal bones, which are completely ankylosed, as were the bones of the pelvis. There are only three metatarsal elements in each foot, the first and fifth having apparently disappeared entirely. The three metatarsals remaining, which are the second, third, and fourth, are proportionally shorter and more robust than in the other known members of the order *Theropoda*, and, being firmly united to each other, they furnish the basis for a very strong hind foot.

In figure 1, these coössified metatarsals of *Ceratosaurus* are represented, and for comparison the corresponding bone of a penguin is given in figure 2.

In comparing these two figures, it will be seen that the three metatarsal elements of the Dinosaur are quite as closely united as those of the bird. To the anatomist familiar with the tarso-metatarsal bones of existing birds, the specimen represented in figure 1 will appear even more like this part in the typical birds than the one shown in figure 2.

The position of the foramen, as seen in figure 1, *f*, is especially characteristic of recent birds, and, as a whole, the hind foot of this Jurassic Dinosaur was evidently similar to that of a typical bird.

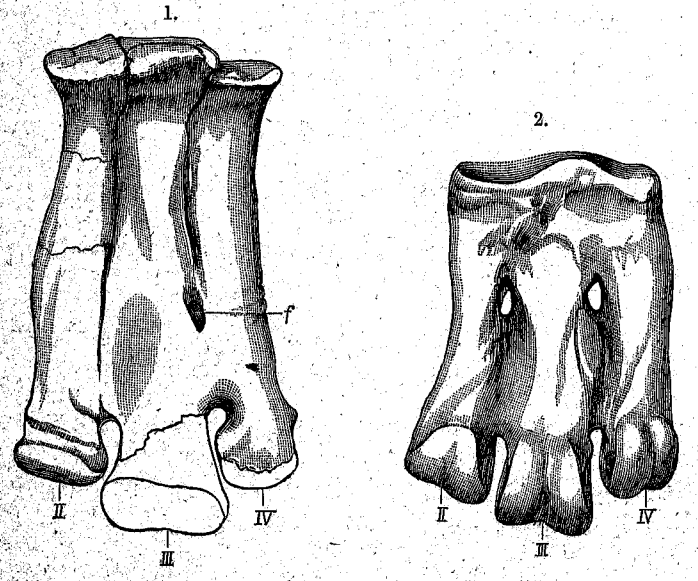

Figure 1.—United metatarsal bones of *Ceratosaurus nasicornis*, Marsh; left foot, front view. One-fourth natural size.
Figure 2.—United metatarsal bones of great Penguin (*Aptenodytes Pennantii*, G. R. Gr.); left foot, front view. Natural size.

All known adult birds, living and extinct, with possibly the single exception of *Archæopteryx*, have the tarsal bones firmly united, while all the *Dinosauria*, except *Ceratosaurus*, have these bones separate. The exception in each case brings the two classes near together at this point, and their close affinity has now been clearly demonstrated.

Yale College, New Haven, July 23d, 1884.

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[THIRD SERIES.]

ART. XXII.—*On the Amount of the Atmospheric Absorption*; by S. P. LANGLEY.

[From a communication made to the Nat. Academy of Sciences, in April, 1884.]

THE earth is surrounded by an absorbing atmosphere, and we never see the sun or the stars except through it.

When we wish to know what the absolute brightness of the sun or of a star is, we must then first ask what the degree and kind of this absorption has been, and must add to the directly observed quantities of light, the amount that the atmosphere has taken away. Accordingly, every one engaged in such researches must determine in explicit or implicit terms for himself, or take on trust through another, the amount of the absorption, which there is great unanimity in fixing at about 20 per cent of the whole (at the sea level.) Thus the earliest observations in the last century give the light absorption as 19 per cent. The very elaborate ones by Seidel of Munich give 21 per cent, those by Pritchard at Oxford, 21 per cent; the most recent by Mueller at Potsdam, 17 per cent; while the observations by Pouillet on the sun's heat give 18 to 24 per cent; and almost all of a great number which could be cited, whether on light or heat, give about 20 per cent. It has indeed been recognized of late years that the "light" rays are on the whole more absorbable than those of "heat," and that, in particular, blue light is much more so, but the difference between the mean coefficients of "light" and "heat" as found by the usual methods is so small that we may here continue to speak of this "light" absorption of 20 per cent as closely applicable (in common estimation) to heat also. Thus, the very careful series of Ericsson on the sun's