"it seems certain that the formation (Jamesburg) was produced during the submergence of the area which it covers;" secondly (p. 128), that "the period of submergence must have been short;" and thirdly (p. 129), that "the amount of erosion accomplished since the deposition of the Jamesburg is slight. This is shown * * * by the undissected flats of this material, even where in close association with considerable streams. * * * Either the formation is very recent, or conditions since its development have been most unfavorable for erosion * * *. The small amount of erosion which it has suffered seems hardly consistent with its correlation with the earliest glacial epoch."

In order to understand the distinct advance here made, one has but to refer to Prof. Chamberlin's article in the *American Journal of Science*, for March, 1893, pp. 191, 192, where he enumerates among the features which he thinks 'may be accepted as demonstrative,' first, that "an older fluviatile deposit (the Philadelphia Brick Clay) is to be associated in age with the old glacial drift," and "that after the formation of this older river deposit, which took place at a low altitude and a low gradient, there was an epoch of elevation and erosion, during which the Delaware cut its channel down to the depth of 200 or 300 feet below the upper old terrace." It would seem now that this interpretation must be abandoned for the Delaware, as a similar interpretation had to be abandoned for the gravel terraces near the junction of the Conewango and the Allegheny Rivers two years ago. Mr. Salisbury is undoubtedly correct in believing that these high level gravel and clay deposits in the Delaware Valley, in the vicinity of Trenton, are of comparatively recent deposition. They are not older, but younger, than the erosion of the rock channel of the Delaware.

I may say in conclusion, also, that the investigations of Prof. E. H. Williams, in the Lehigh Valley, which have been too little noticed, seem positively to show that the river channels of that whole region had been worn to nearly their present depth of rock bottom before the earliest period of glaciation. I trust that renewed attention will be attracted to this difficult problem concerning which so many facts have now been accumulated.

G. FREDERICK WRIGHT.

OBERLIN, O., January 29, 1896.

ANCIENT MEXICAN FEATHER WORK AT THE COLUMBIAN HISTORICAL EXPOSITION AT MADRID, 1892.

TO THE EDITOR OF SCIENCE: Under the above title a contribution of mine has appeared in the recently issued Report of the U. S. Commission on the Madrid Exposition, Government Printing Office, Washington, 1895. Owing to the fact that the proofs were not sent to me for revision, my paper contains several typographical errors, three of which particularly demand correction. It being too late to rectify these errors by any other means, I have adopted the present method of doing so, with the hope and earnest request that possessors of copies of the report will duly note them therein, in order to prevent future misunderstandings. On page 332 read that I identified the shield 'of Phillip II.' at the Royal Armory, Madrid, as being of Hispano-Mexican workmanship, in 'October, 1892,' instead of '1893,' as printed.

On page 335 read the 'tiny,' instead of the *wing* feathers * * * that grow on the heads and breasts of tropical humming birds.

On page 337 read Mr. Phillip Becker instead of 'Bectier(?)' I need scarcely state that, in my original text, the name of my late, highly esteemed friend, is correctly given and is not followed by an interrogation point.

Thanking you, in advance, for kindly affording me the opportunity to do myself justice.

Yours truly,

ZELIA NUTTALL.

JANUARY 14, 1896.

SCIENTIFIC LITERATURE.

NEW DATA ON SPIRULA.

Zoölogy of the Voyage of H. M. S. Challenger: Part I., XXXIII. Report on Spirula. By T. H. HUXLEY and P. PELSENEER. VIII., 32 and 12 pp. 4°, and six plates. 1895.

The eighty-third and last part of the zoölogical series of reports on the scientific results of the Challenger expedition could not be issued in one of the zoölogical volumes on account of delays in its preparation. These delays were

intimately associated with the failing health of Prof. Huxley, who after making a splendid series of anatomical drawings, illustrating nearly every detail of the gross anatomy, felt himself unable to supply the text. He therefore placed his notes and drawings at the disposition of Dr. Pelseneer who has furnished a description of them, together with some additional details drawn from his examination of two other specimens submitted to him by Prof. Giard.

It is probable that there were reasons why the work was not made more complete which do not appear in the preface, and in this way the absence of histological details may be accounted for. As regards the gross anatomy there is, doubtless, little left for future anatomists now that Huxley has cleared the path, and the present monograph will remain for the future the standard of reference for this genus. This being the case, the rarity of the animal being considered, it is perhaps worth while to point out wherein Dr. Pelseneer has come to too hasty and even erroneous conclusions from the data he possessed. The U. S. National Museum possesses a nearly perfect specimen of Spirula taken from the mouth of a deep-sea fish trawled in the Gulf of Mexico, and also a fragment found at Palm Beach, Florida. The possession of the former enables me to correct certain details of the monograph.

Spirula is a remarkable animal for a cuttlefish. It is short and stout, with the posterior (caudal) end blunt, truncate and furnished with what looks like a sucking disk nearly as large as the diameter of the animal's body. In the cavity of this organ is seen a central prominence of cartilaginous consistency, the homologue of the terminal cone of Belemnites or *Onychoteuthis robusta*. On each side the 'fins' or lateral expansions of the mantle occupy a dorso-ventral plane and lateral and terminal position instead of being, as in the quickly swimming forms, in the dorsal plane or parallel to it. In short, they look as if they were adapted to serve as buttresses if the animal should fasten itself to some hard object by its terminal disk, with its body in a vertical attitude, like a sea anemone.

Spirula is extremely rare in collections, though its siphunculated shell is abundant on the beaches or floating on the sea in certain regions. Nearly all the specimens which have been taken with soft parts more or less preserved are of two sorts; one has the cylindrical muscular cortical portion complete and uninjured, but the head and viscera are missing, leaving the rest buoyed up by the shell. The other sort has the viscera and terminal portions in a perfect state, but the outer layers of the cortex lacerated or removed. The National Museum specimen is of the latter kind; the epithelium, chromatophoric layer and part of the strong muscular layer below it, are scraped off and partly hang in strings scratched longitudinally from the tail end forward to the margin of the cylinder. The delicate outer layer over the posterior end is perfectly intact, as are the fins. There can be no reasonable doubt that this scraping is due to the teeth of the fish in whose mouth it was found. Both the Challenger and the Blake specimens were in this condition, and Prof. Giard's were also incomplete, though to what extent Pelseneer does not state. The aboral disk is strongly attached to the shell, and when the specimen is fresh and elastic, if the end of the finger is pressed upon the disk and withdrawn, a distinct sensation of suction is felt, though the hardening effect of the alcohol puts an end to this after a time.

Now, the only hypothesis which seems to reconcile all the facts in the case is that the aboral disk may serve as a means of attachment to hard bodies, so that the Spirula, while not unable to swim, is in general sedentary. This explains why living specimens are not taken free in the ocean. When alive, on this hypothesis, it usually adheres to hard bodies. If it relaxes its hold, through disease or weakness, it slowly rises by the gas contained in the chambers of the shell, and the viscera under this condition decay first. If forcibly pulled off from its perch by a fish, the epithelium is likely to be lacerated, something difficult to explain if the animal were taken free swimming, as the swimming cephalopods taken from fish stomachs are not lacerated in this manner when small enough to be swallowed whole. It is undoubtedly a deep-water animal.

The testimony of Rumphius is rightly rejected by Pelseneer, but we cannot agree with

him that it is necessary to abandon the hypothesis above mentioned, at least until some other function is proved for the terminal disk. Pelseneer seems to think that the rostral papilla may be covered with an external shell in the living animal, but for this there is no evidence as yet, and hardly any justification.

In most specimens the peripheral cortex has two lobes covering the lateral planes of the shell and leaving a certain portion of the outside of the whorl, dorsal and ventral, in front of the terminal disk, more or less exposed. Owen describes the epithelium as extending out over these areas of shell but not entirely enclosing them. Steenstrup describes a specimen in which the shell "was distinctly covered dorsally and ventrally, where the skin grew thin above it." Upon this Pelseneer observes, "As one might expect, this last assertion is absolutely incorrect," and "there is no portion of the integument, however thin this may be, which passes over the shell, contrary to the opinion of Owen and Steenstrup."

How difficult is the rôle of infallibility, may be judged by the fact that, in the National Museum specimen of Spirula, not only do the epithelial and chromatophoric layers extend, where untorn, completely over the dorsal exposure of the shell, but the underlying outer muscular coat,* as thick and tough as parchment, does the same; while, on the ventral side, the rags of this covering torn by the fish's teeth show that here also the shell was completely covered. The solid basal coriaceous part of the integument preserves its usual form. Huxley's figures of *Spirula Peronii* (Pl. I., figs. 1–3, 5–6) indicate the same state of affairs with great clearness, and the ragged edges of the torn integument are perfectly depicted. These are, however, interpreted by Pelseneer thus: "The margins of the openings appear to be fixed, and to have thus sent short irregularly cut prolongations over the shell." It would be rash, not having seen the specimen, to assert that these 'prolongations' are simply the rags of the former covering, but it is certain that in one species of Spirula (that referred to as *S. australis* by Pelseneer) in the adult animal the shell is completely covered by the integument, as was the opinion of Steenstrup.

Adams and Reeve have figured a very young Spirula, which Owen believed to be complete, in which the terminal disk was absent and the lateral lobes cover only a small part of the last whorl of the shell. Pelseneer has figured hypothetical stages of development for Spirula showing a gradual enlargement of the lateral lobes of integument. In most specimens so far observed, portions of the shell are certainly uncovered. It is not an extreme hypothesis to suppose that in the fully adult animal the integument in most cases will wholly enclose the shell.

The shell of Spirula is enrolled with the ventral side concave, and Pelseneer observes that the "other molluscs with rolled up univalve shells present, when they have not undergone torsion, a dorsal or exogastric rolling up, *e. g.*, *Nautilus*, embryonic *Patella* and *Fissurella*."

The learned doctor forgets that *Patella* and *Fissurella* are rolled up in opposite directions, and that *Fissurella*, if prolonged into a tube and coiled as it begins, would have an 'endogastric' whorl like Spirula. *Aliquando dormitat Homerus.*

In 1878 I saw in the Godefroi Museum, since acquired by the city of Hamburg, a large series of Spirula from the South Seas. They were partly fragmentary, but I believe comprised several perfect specimens which might throw light on doubtful points. The specimen in the National Museum came from a fish trawled in 324 fathoms in the northern part of the Gulf of Mexico, between the delta of the Mississippi and Cedar Keys, Florida. The color is yellowish white, with ferruginous and dark purple dotting profusely distributed. The specimen is a female. The temperature of the water at the bottom was 46°.5 F. It had evidently just been seized by the fish, for, except the lacerated epidermis, it is in most perfect preservation.

In conclusion we may note that perhaps the most important result of Dr. Pelseneer's analysis of the characters of Spirula is its final reference to the Oigopsid group. Owen had stated facts also confirmed by the data of paleontology which should have resulted in this classification more than fifteen years ago; but there has been a singular delay in accepting it. After the full

*Corresponding to Pelseneer's first and second layers.

details, now laid before the systematist, he should not longer delay his acceptance of the reform. WM. H. DALL.

Hunting in Many Lands—The Book of the Boone and Crocket Club. Edited by THEODORE ROOSEVELT and GEORGE BIRD GRINNELL. New York, Forest and Stream Publishing Co. 1895. 8°, pp. 447, illustrated.

The Boone and Crocket Club is an organization whose principal objects are: the preservation of the large game of America, the promotion of exploration in little known lands, the record of observations on the natural history of our wild animals, and the promotion of manly sport with the rifle. It is interested also in forest preservation. Membership is limited to one hundred, and no one is eligible who has not killed 'in fair chase' at least one kind of American big game.

The Club has done much good in diffusing a healthy sentiment against illegitimate hunting and unnecessary destruction of game, and in aiding the enforcement of game laws in the various states. It has been largely instrumental also in accomplishing the passage by Congress of an act for the protection of the Yellowstone National Park; and still more recently has secured the passage by the State Legislature of an act incorporating the New York Zoölogical Society, which Society will soon establish, in the neighborhood of New York, a great Zoölogical park.

Several years ago the Boone and Crockett Club published a volume entitled 'American Big Game Hunting,' which was made up of articles by well known writers on the game of our own country. This, and Mr. Roosevelt's personal writings, particularly his 'Wilderness Hunter,' which is incomparably the best book ever written on the large mammals of America, made it desirable to select a wider field. The present volume, 'Hunting in Many Lands,' contains chapters on Hunting in East Africa, by W. A. Chanler; To the Gulf of Cortez, by George H. Gould; A Canadian Moose Hunt, by Madison Grant; A Hunting Trip in India, by the late Elliott Roosevelt; Dog Sledging in the North, by D. M. Barringer; Wolf-Hunting in Russia, by Henry T. Allen; A Bear Hunt in the Sierras, by Alden Sampson; The Ascent of Chief Mountain, by Henry L. Stimson; The Cougar, by Casper W. Whitney; Big Game of Mongolia and Tibet, by W. W. Rockhill; Hunting in the Cattle Country, by Theodore Roosevelt; Wolf Coursing, by Roger D. Williams; Game Laws, by Charles E. Whitehead; Protection of the Yellowstone Park, by George S. Anderson. It contains also an interesting account of the Yellowstone National Park Protection Act, some Head Measurements of Trophies, and the By-Laws and List of Members of the Club.

The book is well gotten up, entertainingly written, and abounds in facts of interest to the naturalist. The editors are to be congratulated in securing such a choice selection of articles, and on bringing out the book in such attractive form. C. H. M.

Guide d'océanographie pratique. J. THOULET. Paris, G. Masson & Gauthier-Villars et fils. 1895. Pp. 224.

This is a simple, brief, and satisfactory account of the kinds of observations that are required in oceanographic investigations of the lesser depths, of the methods of making the observations, and of the instruments and implements used. There are kept constantly in view, especially with reference to the subject of maritime fisheries, the practical results that flow from the development and study of the topographic forms of the bottom of the ocean, and of the various deposits of soil that are found there; of the study of currents and winds, of transparency and coloration, of the temperature, salinity, and chemical composition of the waters of the ocean; and of the relation between meteorology and oceanography.

The book is provided with reliable and useful tables for the conversion of fathoms into metres, for the comparison of the Fahrenheit, Reaumur and centigrade thermometric scales, for the determination of the humidity of the air and the tension of vapor of water, and for finding the density and salinity of sea water.

The scope of the work, which relates principally to the continental plateau or region which lies along the borders of the oceans between the coasts and the line marking the

depth of 100 fathoms, is mainly to inform the general reader what oceanographic research consists of, how it is carried on, and, in general, what has been accomplished; but it will also be found useful in the hands of the observer of oceanographic data and of the student of oceanographic problems.

An important feature of the book is the biblographic list at the end.

As the operations referred to are in the main those which are carried on in the waters of lesser depth bordering the oceans, a less general title would have been more appropriate.

No inadvertence in the revision of the proofs has been detected except the manifest confusion between t and t′ and f and f′ in the explanation of the hygrometric formulæ on page 110.

G. W. LITTLEHALES.

SCIENTIFIC JOURNALS.

JOURNAL OF GEOLOGY, DECEMBER–JANUARY.

Review of the Geological Literature of the South African Republic: By S. F. EMMONS. The great and rapid development of gold mining in the Transvaal has attracted the attention of the world to this region, not otherwise of immediate interest. This article sums up the literature concerning the gold fields. The most important of these is the Witwatersrand, usually called 'the Rand,' in which Johannesburg is situated. This is in the southern part of the Republic. It is about 2,000 square miles in extent. The rocks are auriferous conglomerates of which there are several beds. On the whole the gold is distributed rather uniformly in these beds. They are crossed by basic dikes as well as quartz veins, and at the intersection of the latter the quartz is said to be peculiarly rich. As to the origin, the author quotes Smeisser as saying that the evidence points to the fact of deposit with the conglomerate 'fossil placer deposits' and also to deposit from solution subsequently. Working has progressed to a depth of nine hundred feet, but drill holes show that workable beds extend much deeper. The average gold content of this region is ten to fifteen dollars per ton. The output for 1894 was £7,800,000; that of 1895 is estimated at £8,750,000. Hatch estimates the whole product of the Transvaal at £700,000,000, a sum greater than the whole product of the United States up to date.

Igneous Intrusions in the neighborhood of the Black Hills of Dakota: By I. C. RUSSELL. This is a description of a series of hills on the northern border of the Black Hills which appear to be of a type not clearly recognized heretofore. All are due to the intrusion of igneous rock into stratified beds, but they differ from the laccolites of Gilbert in that the molten material did not spread out into a broad dome. They differ equally from the volcanic necks of Dutton, since they did not reach the surface. The name Plutonic Plug is proposed for the intruded mass. Perhaps the most impressive of these plugs is that of Mato Teepee, which has been completely uncovered and rises almost perpendicularly from its platform to a height of 625 feet. Basaltic structure is beautifully developed, the columns reaching a diameter of ten feet. How the sedimentary beds were lifted or displaced to admit of the intrusion of such a mass is not clear to the author.

The Geology of New Hampshire: By C. H. HITCHCOCK. Historical accounts of the surveys of several States have already been given in the Journal. The present article continues the series. The first survey of new Hampshire was begun in 1839 by Dr. C. T. Jackson, of Boston. This lasted three years. The second survey, under the direction of the author, was begun in 1868 and continued ten years. Great difficulties were encountered in the wildness of the region, and the fact that the study of crystalline rocks had not at that time progressed very far, and the crystalline area in the State was considerable. Much attention was paid to surface geology. Such questions as the direction of movement of the ice sheet, the diversity of the 'ice age,' terminal moraines, river terraces, etc., were carefully studied and much light was thrown upon them during the course of this survey.

North American Graptolites: By R. R. GURLEY. No general revision of the American graptolites has been attempted since Hall's work was completed, thirty years ago. This paper is an attempt at such a zoölogic and geologic revision, though its aim is mainly geologic. All the species known in American strata are discussed with reference to generic disposal and