cut out the various items for pasting upon cards of his catalogue.

Appended are some of the more important papers which, though having appeared during the interim of 1888–1892, have not been listed by Mr. Keyes.

Ami, Henry M. Notes and Descriptions of some New and hitherto Unrecorded Species of Fossils from the Cambro-Silurian (Ordovician) Rocks of the Province of Ontario. Can. Rec. Sci. v, 96–103. April, 1892.

Ami, Henry M. Palæontological Notes I. On a Collection of Fossils from the Ordovician of Joliette in the Province of Ontario. Can. Rec. Sci. v, 104–107. April, 1892.

Ami, Henry M. Palæontological Notes II. On the Occurrence of Fossil Remains on the Manitou Islands, Lake Nipissing, Ontario. Can. Rec. Sci. v, 107–108. April, 1892.

Ami, Henry M. The Utica Terrane in Canada. Can. Rec. Sci. v, 166–183; 234–246. July and October, 1892.

Beecher, Charles E. On the Development of the Shell in the genus Tornoceras, Hyatt. Am. Jour. Sci. xl, 71–75, i. July, 1890.

Calvin, S. Some New Species of Paleozoic Fossils. Bull. Lab. Nat. Hist. State Univ. Iowa, i, 173–181, i–iii. June, 1890.

Dawson, J. Wm. On Sporocarps discovered by Prof. E. Orton in the Erian Shale of Columbus, Ohio. Can. Rec. Sci. iii, 137–140. July, 1888.

Hollick, Arthur. Additions to the Paleobotany of the Cretaceous Formation on Staten Island. Trans. N. Y. Ac. Sci. xii, 28–39, i–iv. Nov., 1892.

Hollick, Arthur. Paleobotany of the Yellow Gravel at Bridgeton, N. J. Bull. Torr. Bot. Club, xix, 330–333. Nov., 1892.

Hyatt, Alpheus. Jura and Trias at Taylorville, Cal. Bull. Geol. Soc. Amer. iii, 395–412.

Koken, E. Ueber die Entwickelungsgeschichte der Gastropoden vom Cambrium bis zur Trias. Neues Jahrb. Min., etc., B. B. vi, 305–484, x–xiv. 1889.

Lapworth, Chas. On Graptolites from Dease River, B. C. Can. Rec. Sci. iii, 141–142. 1888.

Matthew, G. F. Illustrations of the Fauna of the St. John Group. No. vii. Trans. Roy. Soc. Can. x, Sect. iv, 95–109, pl. i. 1892.

Matthew, G. F. On the Diffusion and Sequence of the Cambrian Faunas. Trans. Roy. Soc. Can. x, Sect. iv, 3–16.

Scudder, Samuel H. Illustrations of the Carboniferous Arachnida of North America, of the orders Anthracomarti and Pedipalpi. Mem. Bos. Soc. Nat. Hist. iv, 443–456, xxxix–xl. 1890.

Scudder, Samuel H. The Insects of the Triassic Beds at Fairplay, Colo. Mem. Bos. Soc. Nat. Hist. iv, 457–472, xli–xlii. 1890.

Ulrich, E. O. Notes on Lower Silurian Bryozoa. Jour. Cin. Soc. Nat. Hist. Jan., 1890. Pp. 173–198.

Whitfield, R. P. Contributions to Invertebrate Paleontology. I. Descriptions of Fossils from the Palæozoic Rocks of Ohio. Ann. N. Y. Ac. Sci. v, 505–622, v–xvi. 1891.

Williams, Henry S. An account of the Progress in North American Paleontology for the years 1887, 1888. Smithsonian Report for 1888. Pp. 261–326. 1890.

Gilbert van Ingen.

SOCIETIES AND ACADEMIES.

BIOLOGICAL SOCIETY OF WASHINGTON, 248TH MEETING, SATURDAY, NOV. 2.

Mr. F. V. Coville spoke of the botanical explorations of Thomas Coulter in Mexico and California.

Thomas Coulter, the Irish botanist, he said was born in the year 1793, near Dundalk, Ireland. He received his A. B. degree at Dublin University in 1817, and his A. M. in 1820. He then went to Geneva, where he studied for about three years under DeCandolle, and published a monograph of the Dipsaceæ in 1823. In 1824 he sailed for Mexico, where for six years he made collections of plants at Real del Monte, Zimapan, Zacatecas, Hermosillo and presumably at intermediate points. In 1831 he reached Monterey, California, where he spent the winter with David Douglas, the Scotch botanist, and in the following Spring he made a journey from Monterey by way of San Luis Obispo, Santa Ynez, Santa Barbara, San Buenaventura, San Fernando, San Gabriel, Pala and San Felipe to a point on the Colorado River eight miles below its junction with the Gila, returning by

the same route. After making collections in other directions from Monterey, he returned to Europe by way of Mexico, reaching London in November, 1834, and bringing with him a collection of about fifty thousand herbarium specimens, besides a thousand woods and a complete journal of his travels and experiences. He presented his collections to Trinity College, Dublin, and thus became the founder and keeper of that well known herbarium. His journal was lost in transport between London and Dublin, and this together with his continued ill health kept him from publishing an account of his travels and work, which was thus left incomplete at the time of his death, in 1843. The duplicates of his collections were subsequently distributed in part by his successor, W. H. Harvey, at least two of the sets reaching America, one presented to Dr. Gray, the other to Dr. Torrey. Though no general report on his collections was ever published, a large number of species have been described from them, more than forty receiving the specific name *coulteri*. The information on which this outline was based was drawn principally from scanty published records together with a series of letters from Coulter to A. P. and Alphonse DeCandolle, which were exhibited at the meeting by Mr. Coville through the courtesy of Dr. Casimir DeCandolle, of Geneva.

Mr. William Palmer exhibited some specimens of birds having albinistic feet, saying that albinism of the beak and feet was rare, and that he had never seen an example of the former except in complete albinos. Partial albinism he thought to be due to temporary causes, such as defective nutrition, and he instanced cases in which white feathers had, upon moulting, been replaced by those normally colored.

Mr. F. A. Lucas spoke on the gigantic extinct birds of Patagonia, briefly reviewing Señor Ameghino's recent memoir on the subject. He considered that these birds belonged to an extinct avifauna, represented by a few forms like Palamedea and Psophia, and that many forms were needed to fill in the gap between them and existing birds. It was useless, he thought, to make any comparisons with struthious birds and he deprecated the use of the divisions *Ratitæ* and *Carinatæ* as being unnatural.

Dr. Theo. Gill spoke *On the Belone and Sarginos of Aristotle*, and the misuse of zoölogical names of the ancients by writers like Linnæus, dwelling at length on the Belone and Sarginos. The Belone, as is quite evident from the several passages wherein the name occurs, was the small pipe-fish, or Syngnathid, and its misapplication to the gar-fish was entirely unjustifiable. The gar-fish, however, was undoubtedly familiar to the ancients and the old Greek name can be discovered by a comparison of the name of unidentified species enumerated by Aristotle and those now current in Greece and the Archipelago. One of the hitherto unidentified Aristotelian names is *Sarginos*, and at the present time that name under a slightly different form still prevails and is applied to the gar-fish. The modern variants are *Zargana* and *Sargannos*. The application of Belone to the gar-fishes was unfortunate, but happily the name must be given up and Esox used in its place. Esox itself, however, is another example of misuse of ancient names, for the *Esox* mentioned by Pliny was apparently a sturgeon. The misuse of *Trochilus* and *Amia* was also dwelt upon.

Dr. Erwin F. Smith exhibited some plants showing the effect of inoculation with the organism of cucumber blight.

F. A. LUCAS, *Secretary*.

ENTOMOLOGICAL SOCIETY OF WASHINGTON.

THE 111th regular meeting was held November 7, 1895.

Mr. Hubbard read a paper entitled 'Some Insects which brave the dangers of the Pitcher Plant,' giving observations supplementary to those recorded 20 years ago by Riley, on the insects found in connection with *Sarracenia variolaris*. Mr. Hubbard's observations were made upon *S. flava*, a species common in Georgia and Florida. Mr. Hubbard found the larvæ of the two species of Xanthoptera described by Riley living unharmed in these pitchers. He found that an enormous number of insects were captured by the pitchers, among others the honey bee, species of Bombus and Megachile, sand wasps and many other insects. He found that a Sphegid makes its nesting place within the pitchers and that a species of Lycosa habitually spreads its web within them.

Sarcophaga sarraceniæ is so uniformly present and so abundant in every species of pitcher plant known to the speaker that he is constrained to think that the species has a more intimate connection with the economy of the plant than has been assigned to it.

Mr. Howard read a lengthy paper entitled 'Notes on the Life-history of *Culex pungens*, with remarks about other Mosquitoes.' He gave results of actual rearing of *C. pungens* in Washington, showing that a generation may develop in ten days. Other mosquitoes occurring at Washington are *Psorophora ciliata* and *Anopheles quadrimaculatus*. The subject of mosquito remedies was treated in extenso. The paper was discussed by Messrs. Gill, Marlatt, Ashmead, Hubbard, Mann and Benton.

Mr. Heidemann exhibited specimens of the winged form of *Rheumatobates rileyi* and *R. tenuipes*. These specimens were of especial interest since Meinert doubts the existence of winged individuals.

Mr. Ashmead exhibited certain Mutillidæ and called particular attention to the differences between Sphærophthalma and Photopsis, expressing himself as of the opinion that one section of the genus Photopsis is based entirely on males of Cyphotes.

Mr. Hubbard exhibited a brood cell of what is probably *Xyleborus pini*, announcing the discovery that this insect in its brood cell constructs a cemetery for dead larvæ and adults, removing them entirely from the main portion of the cell in which grows the ambrosia upon which the larvæ feed. He compared the intelligence exhibited in this way with that shown by ants, since certain of the latter insects cultivate fungi and similarly set aside spots to be used for cemeteries.

L. O. Howard, *Recording Secretary.*

New York Academy of Sciences.

The Academy met on October 28, with Vice-President Stevenson in the chair. After the usual routine business the Geological Section organized and listened to the following paper:

Geological notes from Long Island and Nantucket by Arthur Hollick. The author described the further discovery of fossil Cretaceous plants at Center Island in Oyster Bay, along the north shore, and on Montauk Point, the northeastern extremity. He also mentioned the finding of several boulders containing marine Cretaceous molluscs, and set forth the reasons for thinking that the New Jersey greensands had formerly existed in the basin of Long Island Sound. Recent observations and lists of fossils from Sankaty Head, Nantucket, concluded the paper. Among these was a fragment of silicified Palm-wood, the first specimen of the kind recorded from eastern North America. Discussion followed by W. M. Davis.

The second paper was by Gilbert Van Ingen and T. G. White: "An account of geological work the past summer on Lake Champlain." The paper described the results of recent stratigraphical studies on the Trenton limestones and briefly outlined the character and relations of the faunas. An abstract will appear in the Transactions of the Academy of even date.

After routine business on November 4 the Section of Astronomy and Physics organized, and listened to a paper, by Prof. R. S. Woodward, upon 'Systems of Mechanical Units.' Mr. Woodward referred to the importance of the dimensional formulæ in discussing systems of units, and called attention to their introduction in 1821 by Fourier, and their subsequent revival by Maxwell. He pointed out some of the difficulties arising from the adoption of the present fundamental units of length, mass and time, and showed how, by the elimination of either length or time and the substitution of energy, new systems could be obtained. He dwelt upon the desirability of the system in which energy replaces time for those people who may have no conception of time, and pointed out that the conceptions of energy are certainly as distinct as those of mass and possibly even as distinct as those of length and time. This paper was discussed by Profs. Pupin, Hallock and Pfister.

Prof. Harold Jacoby then read a paper received too late for announcement in the Bulletin, on 'Suggestions as to the determination of the relative mass of the two components of the double Star Eta Cassiopeiæ,' from Rutherfurd photographic measures. Prof. Jacoby outlined the method to be pursued in this investigation, and deduced the formulæ to be used. The

calculations will be made by Mr. Davis. The paper was discussed by Prof. Rees.

Prof. Pupin then explained a method of measuring alternating currents with a galvanometer. It consists in placing in the circuit a primary cell and an electrolite cell whose counter electro-motor is slightly greater than that of the primary cell. Under these conditions only one-half of the alternations passed through the circuit, the other half being stopped by the two cells. Experiments have shown the availability of this method up to 600 alternations per minute.

J. F. KEMP, *Secretary.*

GEOLOGICAL CONFERENCE OF HARVARD UNIVERSITY, OCTOBER 22, 1895.

The Development of Oligoporus. By ROBERT T. JACKSON.

The following is an abstract of the results of recent studies of the Palæoechinoidea. In Oligoporus the interambulacra terminate ventrally in two plates, which present on their oral faces a reëntrant angle for the reception of a single initial plate of the area. Proceeding dorsally, new plates and new columns of plates are added, accenting by their appearance stages in growth, as he had previously shown in Melonites, until the full complement of the species is attained. The single initial interambulacral plate of Oligoporus was compared with a similar plate in Melonites, Lepidechinus, young modern Cidaris, etc. At the ventral or younger portion of the corona of Oligoporus there are only two columns of ambulacral plates. The four columns characteristic of the adult are derived from these two by a drawing-out process. The four columns of ambulacral plates of adult Oligoporus are the equivalent of the two outer and two median columns of Melonites. These four columns in both genera are the morphological equivalent of the two columns seen in the ambulacra of Bothriocidaris, Cidaris, etc.

Oligoporus, as shown by the development of both ambulacral and interambulacral areas, is a genus intermediate between Palæechinus and Melonites. During the development of Oligoporus it passes through a Rhœchinus stage, and later a Palæechinus stage. Melonites in its development passes through an Oligoporus stage.

An early stage in developing Echinoderms was named the 'protechinus' stage. At this stage are first acquired those features which characterize the developing animal as a member of the Echinoidea. The protechinus stage in Echinoderms is directly comparable to the protoconch of Cephalous Mollusca, the protegulum of Brachiopods, the protaspis of Trilobites, etc. The Echinoderm at this period in its growth has a single interambulacral plate (representing a single column of such plates), and two columns of ambulacral plates in each of the five areas. This stage is seen in Oligoporus, Lepidechinus, Goniocidaris and other genera; it finds its representative in an adult ancestral form, in the primitive, oldest known genus of the class, Bothriocidaris, of the Lower Silurian, which has but one column of interambulacral and two columns of ambulacral plates in each area.

Species of Oligoporus and Melonites with few interambulacral columns are considered the more primitive types, as they are represented by stages in the development of those species which acquire a higher number of columns in the adult.

The structure of the ventral border of the corona of Archæocidaris was described. It presents a row of plates partially resorbed by the encroachment of the peristome, as in modern Cidaris, etc. Ambulacral and interambulacral plates on the peristome were described in Archæocidaris, also teeth and secondary spines on the interambulacral plates of the corona.

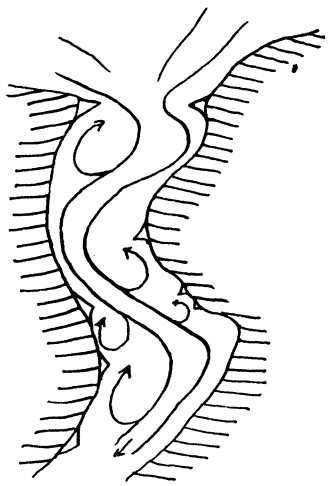
This paper contains a classification of Palæozoic Echini based on the structure and development of the ambulacral and interambulacral areas and the peristome. It will be published in the Bulletin of the Geological Society of America.

Tidal Sand-cusps. F. P. GULLIVER.

In the rias, or drowned valleys, of the Puget sound region, Washington, occur many cuspate deposits of sand projecting from the valley sides into the tidal inlets. West point, north of Seattle, is the typical example (Coast Survey, 653; Geological Survey, Seattle sheet). These points always project at right angles both to the shoreline and to the general direction of in and out flowing tidal currents. They vary in stage

of development from an early condition of a V-shaped bar inclosing a lagoon, similar to the bars described by Mr. Gilbert on the Bonneville shoreline (Mon. I., U. S. G. S. 1890, 58), to the stage where the lagoon has been filled and the marsh covered with sand dunes. These sand cusps were not produced by ocean eddy currents as in the case of Hatteras, Lookout, etc. (C. Abbe Jr., B. Soc. Nat. Hist., XXVI., 1895, 489–497). Along the outer shoreline the ocean currents with large radii of curvature are effective, but upon the inner shore line the tidal currents are the more important agents. The terms inner and outer are adapted from those used by Prof. Penck in Morphologie der Erdoberflache, 1894, II., 551.

An ideal scheme of inflowing tide with its eddies is given in the figure. The outflowing tide



would reverse the direction of flow and transportation of shore drift.

Other examples of similar cusps whose formation has been referred to tidal action are those on Coatue beach, Nantucket (N. S. Shaler, Bull. U. S. G. S., No. 53, 1889, 13), and Romney marsh in southeast England (W. Topley, Geol. of the Weald, 1875, 211, 303). This material was presented as a portion of a thesis to be published at a later time.

MEETING OF OCTOBER 29, 1895.

Some Features of the Arizona Plateau. L. S. Griswold. Illustrated by stereopticon.

The district here considered includes parts of northeastern Arizona; the middle portion of the valley of the Little Colorado, the region about the San Francisco Mountains, and a portion of the Grand Cañon of the Colorado, being the localities best observed.

In general the plateau surface is between 5,000 and 7,000 feet in elevation above sea level and strikes one as being remarkably smooth for so high elevation; there are large stretches of nearly level or gently rolling country, diversified, however, by mesas and outliers with escarpments rising between 50 and 200 feet, shallow but broad old stream channels now little used and leading to cañons with precipitous walls. On the plateau top are numerous volcanic elevations, varying in age from the young cinder cone to the denuded stock. Over the district silicified wood is well known, occurring at the base of a gravel and sand horizon, little consolidated, belonging to late Tertiary or Pleistocene times, and lying with slight unconformity in part upon probable Triassic strata and in part upon Carboniferous, the older formations being little disturbed.

The trees now petrified, originally grew to large size, eight or nine feet in diameter for the largest, probably conifers, and perhaps not very different from the forest growth of part of the present plateau. This ancient forest was apparently thrown down by the wind, for tree butts are common in horizontal position, while only one was found erect. The gravel and sand covering would seem to have come soon, for only a few have fillings of sediment in hollows or give other indication of decay; the logs were buried at least fifty or sixty feet deep. The weight of the overlying sediments crushed the trees so that the horizontal diameters are commonly greater than the vertical as they are seen in place. Silicification was probably accomplished by percolating surface waters, as the logs are distant from volcanic vents, as far as known to the writer; then no hot water deposits were seen accompanying the logs, and the distribution as seen over many miles and reported much more widely would also militate against the theory of change by hot waters.

The stages noted in the development of the plateau would begin with a baseleveling of the

older formations, Carboniferous-Triassic; in late Tertiary or early Pleistocene times a forest growth was apparently thrown down and soon covered by coarse sediments, after which percolating waters replaced the vegetable matter with silica. The existence of the widespread gravels necessitates belief in an equally widespread plain in late Tertiary or Pleistocene times. An uprising of perhaps a few hundred feet gave opportunity for wearing away the gravels and the upper part of the older formations, and the valley systems broadened and interlocked to produce mesas and outliers, while streams gained a meandering habit to some extent. A second and great uplifting to the present plateau altitude gave opportunity for the greater drainage lines to cut deep trenches with precipitous sides. The subordinate drainage in the Carboniferous limestone region seems to reach the cañon bottoms chiefly by underground channels, the old surface valleys showing small traces of recent work, while on the other hand the development of sink holes has begun. In the sandstone and shale regions the water in part goes underground to the main channels; in part it is carving the plateau surface by a system of 'box cañons.'

The volcanic work would appear to have begun after denudation of the Tertiary or Pleistocene plain had progressed far, but before the second or cañon elevation; the large number of volcanic masses in all stages of destruction evinces a pretty continuous activity until perhaps the last few centuries.

THE ACADEMY OF SCIENCE OF ST. LOUIS, MO., NOVEMBER 4, 1895.

THE Academy held its regular meeting with President Green in the chair and thirty-three members and visitors present.

Prof. Francis E. Nipher, as a committee appointed by President Green, read a memorial of the late Prof. C. V. Riley, dwelling briefly upon Prof. Riley's life and work, and especially his great achievements in the field of economic Entomology.

Prof. H. S. Pritchett presented a communication on 'The Resumé of Certain Studies of the Satellite System of Saturn,' calling attention to the remarkable similarity between this system and the solar system, and also the frequent eclipses to which the satellites of Saturn are subjected.

A very interesting exposition was given of the effect of the attraction of the large satellite Titan upon the smaller Hyperion, resulting in great eccentricity of the orbit of Hyperion and a rapid revolution of its pericentric. Mention was also made of the curious phenomena of the satellite Iapetus being much brighter on one side than on the other, and of its revolution on its axis coinciding with its revolution around the planet.

The paper was followed by a discussion as to the nature of the Saturnian system of rings and satellites.

Prof. Nipher presented a paper on 'The Law of Minimum Deviation of Light by a Prism.'

Adjourned.

A. W. DOUGLAS,
Recording Secretary.

SCIENTIFIC JOURNALS.

JOURNAL OF GEOLOGY, OCTOBER–NOVEMBER.

On the Cliffs and Exotic Blocks of North Switzerland: By E. C. QUEREAU. Certain exotic rock masses occurring along the north border of the Alps and Carpathian mountains have long been more or less a puzzle to geologists. They occur on the Flysch, which is Eocene, while the fossils found in the cliffs have been pronounced by Professors Kaufmann, Steinmann and the author to be Jurassic. Two explanations have been offered for the phenomenon: First, that the cliffs were forced up through the newer rocks. Second, that they were thrust over them. Of these hypotheses the author maintains the latter. He finds the source to the north in a mountain system 'das Vindelisische Gebirge," now buried under the Miocene of the Swiss plain, the existence of which was predicated on entirely different grounds by Professor Studer and other Swiss geologists.

The Preglacial Valleys of the Mississippi and its Tributaries: By FRANK LEVERETT. That drainage systems were greatly changed by the advance of the ice is no longer doubted. The author has in this paper gathered a large amount of data with reference to preglacial