PROCEEDINGS

OF THE

ACADEMY OF NATURAL SCIENCES

OF

PHILADELPHIA.

1870.

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PROCEEDINGS

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PHILADELPHIA.

1870.

Jan. 4th, 1870.

The President, Dr. Ruschenberger, in the Chair.

Thirty members present.

Prof. Leidy called the attention of the members to a curious fossil, which had been sent to him for examination last fall by Prof. Hayden. It was found in Colorado, and loaned to the latter by Dr. Gehrung, of Colorado City. Prof. L. remarked that when first received, the specimen strongly recalled to his mind the upper part of the face of the wonderful *Sivatherium* of the Sivalik Hills of India. It, however, presents so many peculiarities, that among other conjectures he thought it might have pertained to the pelvis of a chelonian, but had finally concluded that his first suspicion was the correct one. The specimen corresponds with that portion of the face of *Sivatherium* comprising the upper part of the nose together with the forehead and anterior horn cores. As is described to be the case in the corresponding portion of the skull of *Sivatherium*, all the bones comprising the fossil are completely coössified so as to leave no trace of the original position of the sutures. The nasal and contiguous bones are of great thickness, and as solid as those generally of the Sirenians. The animal to which the fossil belonged was nearly as large as the *Sivatherium*.

The horn cores are nearly like those of the latter in form, size, and relative position to each other. They are conical knobs, slightly trilateral, and with an obtusely rounded summit, which is more porous than the bone is elsewhere. They are moderately divergent, and their summits project more over their base externally than in *Sivatherium*. The space between the cores extending across the forehead forms a continuous concavity; and the surface from the end of the nose to the broken border of the fossil posterior to the cores forms a moderate convexity. In *Sivatherium* the corresponding surface from the slope of the forehead to the convex rise of the nasals forms a deep concavity.

The face, as formed by the nasals and their apparent conjunction with the maxillæ in advance of the horn cores, is very short in comparison with that of *Sivatherium*. The coössified nasals are proportionately shorter, broader, and stouter than in the latter animal. Their lateral borders are much more obtuse, and they terminate in a broad, thick, notched point. The ends bordering the notch are most thickened and porous, apparently indicating the attachment of a long moveable snout. The nasals do not rise from the forehead in the vaulted manner so conspicuous in *Sivatherium* and *Rhinoceros*, but, as previously indicated, simply continue the curvature of the forehead.

One of the most remarkable characters of the fossil is the greater extent backward of the lateral nasal notch than in *Sivatherium*. In this it ceases far forward of the position of the horn cores, situated above the orbits. In the Colorado fossil the notch continues back and beneath the position of the horn cores, where the nasals apparently become continuous with the maxillaries. The relative position of the orbits cannot be ascertained, as all the contiguous parts are broken away. They appear to have been situated behind the position of the horn cores.

Several measurements of the fossil are as follows:

Distance from the centre of the summit of one horn core to the other...	10½	in.
Length of horn cores above level of the intervening space..................	5	"
Length of lateral nasal notch..	4½	"
Distance from end of nose to centre of space between the horn cores....	6	"
Breadth of nose midway between end and position of horn cores.........	4	"
Breadth of face, where narrowed, below horn cores.............................	7¼	"

It is probable that the fossil may pertain to the same animal as the remains from the Mauvaises Terres of Nebraska, described under the name of *Titanotherium*, but in the state of extreme uncertainty as to its collocation, it may with equal probability be referred to other genera, perhaps to *Megalomeryx*, or it may have been an American species of the *Sivatherium*. Under the circumstances it may be referred to a new genus, with the name of MEGACEROPS COLORADENSIS.

PROF. O. C. MARSH, of Yale College, exhibited a number of vertebræ of a new Dinosaurian from the cretaceous green sand near Barnsboro', N. J. He observed that they indicated a reptile allied to *Hadrosaurus Foulkii* Leidy, but only about one half the size of that species. The specimens, although all found in the same immediate neighborhood, were apparently portions of three different individuals, only one of which was fully adult. They consisted of several dorsal and lumbar vertebræ belonging to the Museum of Yale College, and an anterior caudal vertebra recently presented to the collection of the Academy by Dr. Leidy. These remains appear to be quite distinct from those already described, and apparently belong to the same species, for which Prof. Marsh proposed the name *Hadrosaurus minor*. Prof. Marsh also showed the tooth of a new and very large Mosasaurus from the cretaceous of North Carolina. It belonged to a very perfect right upper jaw, formerly in the collection of the late Dr. Emmons, and now in the cabinet of Williams College. The teeth of the specimen are remarkably short and thick, nearly round at the base and their surface entirely without facets. The remains preserved indicate a species of great size, probably sixty feet in length, but with a head and muzzle comparatively short. It was named *Mosasaurus crassidens*.

A peculiar caudal vertebra of a somewhat similar reptile from the lower cretaceous marl bed, near Hornerstown, N. J., was likewise exhibited. It is one of a series in the museum of Yale College, and indicated a new *Mosasaurus* of medium size, apparently belonging to the genus *Leiodon*. The articular surfaces for the attachment of the chevron bones were in nearly the same plane as the lower surface of the vertebræ, and not impressed as in *Macrosaurus proriger* and other allied species. The presence of well developed diapophyses in this part of the caudal series was another peculiarity of these vertebræ, and indicated that the animal had a broad, muscular tail. The species was therefore named *Leiodon laticaudus*.

Prof. Marsh stated in this connection that in the November number of Silliman's Journal he had proposed the name *Halisaurus* for a new genus of Mosasauroid Reptiles, but as *Halosaurus*, essentially the same word, had previously been given to a genus of fishes, he wished to substitute for the former the name of *Baptosaurus*.

Prof. Marsh also showed a tooth of a rhinoceros from the miocene of Squankum, N. J., which was the first authentic evidence of this animal east of the Mississippi River. It was found in the pits of the Squankum Marl Company, in the same layer with the remains of the *Elotherium Leidyanum* Marsh, and was presented to the Yale Museum by Mr. O. B. Kinne. The tooth was the last molar of the left under jaw, and indicated an animal about two-thirds the size of the living Indian species. He proposed for it the name *Rhinoceros matutinus*.

Jan. 11*th.*

The President, DR. RUSCHENBERGER, in the Chair.

Twenty-five members present.

PROF. LEIDY directed attention to some fossils, on which he made the following remarks:

1. A specimen consisting of less than the half of a vertebral body, was submitted to my examination by Prof. Hayden, who obtained it last summer during his geological survey. It is from Middle Park, Colorado, and Prof. Hayden thinks was derived from a cretaceous formation. Similar specimens were reported to be not unfrequent, and were known under the appellative of "petrified horse hoofs." The fossil indicates an elongated form of caudal vertebra of some large saurian. Much constricted towards the middle, such specimens would be most liable to break in this position, and the halves from their form might readily be taken, by the inexperienced in such matters, for what they are called.

The vertebral body in its entire condition would resemble in form those of *Megalosaurus*, but in form and other characters bears a near resemblance to those of *Poicilopleuron Bucklandi*. This is an extinct reptile from the oolitic formation of Caen, in Normandy, described by Deslonchamps; and remains apparently of the same animal from the Wealden of Tilgate, England, have also been described by Prof. Owen.

Poicilopleuron has generally been viewed as a crocodilian reptile with biconcave vertebræ, but probably pertains to the dinosaurs. The *P. Bucklandi* is estimated by Deslonchamps to have been about 25 feet long. The Colorado fossil indicates a much larger animal, having been more than one-third greater.

One of the most remarkable characters of the *Poicilopleuron* is the presence of a large medullary cavity within the bodies of the vertebræ, paralleled among living animals, so far as I know, only in the caudal vertebræ of the ox. The same character is presented by the Colorado fossil. In the former animal the cavity appears simple or unobstructed by osseous trabeculæ. In the Colorado fossil, as seen in the broken surface of the specimen, the medullary cavity occupies the lower two thirds of the interior of the body and is crossed by a few trabeculæ. The sides of the cavity, converging below, are constituted by a layer two lines thick and as compact as the walls of the medullary cavity in the limb bones of most ordinary mammals. The upper third of the interior of the body is occupied by the ordinary spongy substance which becomes more compacted ascending into the interior of the neural arch. The cavernous structure of the Colorado fossil is occupied with crystalline calcite.

The estimated length of the vertebral body is six inches or more. The sides are much narrowed towards the middle, and they are concavely depressed just below the sutural conjunction of the neural arch. A narrow groove occupies the lower border of the body, as is indicated to be the case in the Tilgate specimens. The posterior articular surface of the body is moderately depressed, but its lower fourth curves forward, producing a thick, convex ledge for the accommodation of a chevron. The breadth of the articular surface is scarcely four inches, and its depth is about the same measurement.

The species represented by the fossil may be named POICILOPLEURON VALENS. Should the division of the medullary cavity of the vertebral body into smaller recesses by trabeculæ be significant of other characters indicating the Colorado saurian to be distinct from *Poicilopleuron*, it might be named ANTRODEMUS.

2. A collection of fossils from the cretaceous formation of Pickens Co., Alabama, received from Dr. J. C. Nott, formerly of Mobile, indicates a mosasauroid reptile apparently of the genus *Clidastes*, of Prof. Cope. The specimens consist of an anterior portion of one ramus of the lower jaw, a portion of the upper jaw, an axis and several dorsal vertebræ. The species was of intermediate size to *C. iguanavus* of the cretaceous of New Jersey and *C. propython* of Uniontown, Alabama. It may be named *Clidastes intermedius*. The jaw fragments indicate more robust proportions than in *C. propython*. The fragment of the lower jaw is 5½ inches long and contains a series of nine teeth; the depth of the symphysis is one inch; the depth below the seventh tooth almost an inch and a quarter.

The body of a dorsal vertebræ is almost an inch and a half long; its articular cup is a little over an inch wide and about three-fourths of an inch vertically. The neural arch retains the zygosphene and zygantrum, indicating the iguanian character of the extinct reptile.

Since communicating the above I have received for examination some remains apparently of the same species, from the cretaceous formation of Kansas. Among them are two nearly entire dentary bones, the length of which is about eleven inches. They contain the bases of the teeth, indicating the full series to be twelve. The more slender jaws of *C. propython*, with the dentary bones about the same length, contain a series of about eighteen teeth.

3. The caudal vertebra represented in figures 15, 16, plate II, of the "Cretaceous Reptiles of the United States," indicates a reptile apparently of the genus *Leiodon* or *Macrosaurus*. The constitution of the vertebra is the same as in the caudals of the known species of this genus. It probably belongs to the species described by Prof. Cope under the name of *M. proriger*.

4. The fine specimen of a fossil turtle exhibited to the Academy was loaned by Mr. O. C. Smith, of Amherst, Mass., through Prof. Hayden, for my examination. It was obtained, as the latter informs us, from the Bridger Group of tertiary rocks, probably of miocene age, in the vicinity of Fort Bridger, Wyoming. It appears to represent an extinct genus, approaching in character the existing *Dermatemys* of Central America, and was nearly of the size and shape of *Dermatemys Mawii*, Gray, of Vera Cruz and Tabasco, C. A.

The carapace in its general form and construction especially resembles that of the latter. It has the same elongated vertebral plates and scutes. The sternum is intermediate in its proportions and shape with those of *Dermatemys* and *Staurotypus*. The interspaces of the carapace and sternum are very much larger than in the former, but proportionately less than in the latter. The pedicles of the sternum are not so deep as in *Dermatemys*, but are much wider. The back part of the sternum, intermediate in its proportions with what it is in *Dermatemys* and *Staurotypus*, ends in a posterior narrowly rounded extremity, not acute as in the latter, nor emarginate as in the former. *Dermatemys* has two large scutes intervening between the unusually large inguinal and axillary scutes. In *Staurotypus* the axillary and inguinal scutes meet across the sternal pedicles. In our fossil a single large hexagonal scute intervenes to the axillary and inguinal scutes. The latter are much larger than in *Dermatemys*, and extend in advance of the suture between the hyo- and hypo-sternal plates.

The name of BAPTEMYS WYOMINGENSIS is proposed for the turtle. When complete the carapace has measured about one foot and a half in length by one foot in breadth. The sternum has measured about one foot in length; the depth of its pedicles 4 inches, their breadth 3 inches; the length of the posterior extremity 4 inches, its breadth at base 4½ inches.

It is probable that the specimen, from the same locality. upon which was characterized the *Emys Wyomingensis* (Pr. A. N. S., 1869, 66,) belongs to the same animal.

5. Among a multitude of fragments of turtle shells obtained by Mr. J. Van A. Carter from the same formation and locality in which the preceding specimen was found, there are many apparently of the *Trionyx guttatus* (Pr. A. N. S., 1869, 66.) Some of the fragments pertain to an emydoid differing from the preceding, but they are too imperfect to ascertain the exact generic characters. In this species both the vertebral plates and scutes are proportionately much wider in relation with their breadth than in *Baptemys*. The scutes mentioned are deeply impressed, whereas in the latter their boundaries are scarcely traceable. The series of vertebral plates from the first to the eighth, inclusive, measure eight and a half inches. The fore part of the sternum is truncate as in *Dermatemys*, but not so much produced. For the species the name of EMYS STEVENSONIANUS is proposed, in honor of James Stevenson, the companion and able assistant of Prof. Hayden in his geological explorations of the west.

PROF. O. C. MARSH, of Yale College, exhibited a series of specimens of the remains of birds from the cretaceous and tertiary of the United States, which showed that this class was well represented during these periods, although no species have yet been described from these formations in this country, and none indeed from older rocks, since it now appears to be well established that the bird-like foot-prints in the Connecticut Valley were made by Dinosaurian reptiles. Among the species shown were the remains of at least five species of cretaceous birds, although but one, or possibly two, species have hitherto been described from strata of this age in Europe. The present cretaceous specimens were all found in the green sand of New Jersey, and with one exception in the middle marl bed. They are all mineralized, and in the same state of preservation as the bones of extinct reptiles found with them in these deposits, and hence are readily distinguished from the remains of recent birds which have occasionally been found near the surface in the marl excavations of New Jersey.

The most interesting of the specimens exhibited was the distal portion of a large and robust tibia, apparently of a swimming bird, about the size of a goose; it was found in the green sand at Birmingham, New Jersey, in the pits of the Pemberton Marl Company. For this new genus and species Prof. Marsh proposed the name *Laornis Edvardsianus*. Two species of small wading birds, which appear to have been allied to the Curlews, were also represented, each by the distal end of a tibia, and probably by some other less characteristic portions. The larger of these species, which was found in the green sand of the middle marl bed at Hornerstown, New Jersey, was named *Palæotringa littoralis*, the smaller species, which was called *Palæotringa vetus*, was founded on the specimen mentioned by Dr. Morton in his Synopsis of cretaceous fossils (p. 32), which has since, however, been generally regarded as a recent species. The specimen was found in the lowest marl bed at Arneytown, N. J., and is now in the collection of the Academy. Portions of the humeri of two small and closely allied species, apparently related to the Rail family, were part of the series shown. They were found deep in the green sand of the middle marl bed, near Hornerstown, N. J., in the pits of the Cream Ridge Marl Company. For the species thus represented the names *Telmatornis priscus* and *Telmatornis affinis* were proposed.

The remains of several species of tertiary birds were also exhibited by Prof. Marsh. Among these was the lower extremity of a tibia, closely resembling that of some of the cranes. It was found in the miocene of the Niobrara River, by Dr. F. V. Hayden, and is interesting as the only representative of a fossil bird yet detected in the tertiary deposits west of the Mississippi. This specimen, which belongs to the Academy, indicated a new species, which was named *Grus Haydeni.* Another species of extinct birds was represented by portions of a humerus and ulna, also in the collection of the Academy. They were found many years since in the miocene of Maryland by Mr. T. A. Conrad. This species, which appears to be closely related to the Petrels, was named *Puffinus Conradii.* Several other interesting specimens of bird remains were shown, but most of them were not sufficiently characteristic to admit of determination. With the exceptions already mentioned, the fossils exhibited belonged to the museum of Yale College.

Jan. 18*th.*

The President, Dr. Ruschenberger, in the Chair.

Nineteen members present.

Jan. 25*th.*

The President, Dr. Ruschenberger, in the Chair.

Thirty members present.

Mr. Wharton said that the ore of the nickel mine at Gap, Lancaster Co., Pa., consists substantially of a sulphide of iron, in which a small part of the iron is replaced by nickel, copper and cobalt. This ore after washing is smelted in a high furnace, and yields a matter about seven times as rich as the ore in the valuable metals, that is, containing 10 to 15 per cent. of nickel and cobalt and about one-third that quantity of copper. In this matter there are found at rare intervals small lamellar crystalline bodies, having high metallic lustre and pliability. In order to give a clearer idea of the nature of this substance, or to discover perhaps something still more interesting, search was made during several years of the mass remaining in each furnace bottom after its extinguishment, in those instances where the matter had shown the plates above named. Finally in such a bottom, definite crystals were found in the cavities of the matter, which crystals, being subjected to analysis, showed,

Copper,	1·85	per cent.
Nickel and Cobalt,	25·22	"
Iron,	64·10	"
Sulphur,	8·90	"
	———	100·07.

Supposing the copper to exist as Cu_2S there would remain of nickel, cobalt and iron (whose atomic weight are nearly similar) 89·32, and of sulphur 8·43, thus indicating the formula R_6S. As a crystallized compound of this composition has perhaps not yet been described there is a certain scientific interest in the observation made.

The crystals are very highly magnetic, very readily taking and holding polarity enough to cause a spicula to place itself in the line of the magnetic meridian when floated upon a surface of water. Their color is about that of zinc.

The following Standing Committees were elected for 1870:

ANTHROPOLOGY.

J. Aitken Meigs,
F. V. Hayden,
Henry S. Schell.

COMPARATIVE ANATOMY.

Harrison Allen,
J. H. McQuillan,
Jos. Leidy.

MAMMALOGY.

Harrison Allen,
E. D. Cope,
H. M. Bellows.

ORNITHOLOGY.

B. Hoopes,
W. P. Turnbull,
E. Sheppard.

HERPETOLOGY.

E. D. Cope,
Harrison Allen,
S. B. Howell.

ICHTHYOLOGY.

E. D. Cope,
Thaddeus Norris,
J. H. Redfield.

ARTICULATA.

G. H. Horn,
R. S. Kenderdine,
H. M. Bellows.

RADIATA.

G. H. Horn,
J. G. Hunt,
R. S. Kenderdine.

BOTANY.

E. Durand,
Thos. Meehan,
Isaac Burk.

VERTEBRATE PALÆONTOLOGY.

Jos. Leidy,
E. D. Cope,
Harrison Allen.

INVERTEBRATE PALÆONTOL'Y.

T. A. Conrad,
W. M. Gabb,
H. C. Wood, Jr.

MINERALOGY.

Wm. S. Vaux,
E. Goldschmidt,
Jos. Willcox.

STRATIGRAPHIC GEOLOGY.

J. P. Lesley,
B. S. Lyman,
F. V. Hayden.

PHYSICS.

R. E. Rogers,
J. F. Frazer,
J. Warner.

CHEMISTRY.

F. A. Genth,
R. Bridges,
E. Goldschmidt.

INSTRUCTION AND LECTURES.

R. S. Kenderdine,
Wm. Mayburry,
H. M. Bellows.

LIBRARY.

Jos. Leidy,
W. P. Turnbull,
Robt. Bridges.

Dr. Chas. T. Hunter was elected a member.

Feb. 1*st.*

The President, Dr. Ruschenberger, in the Chair.

Twenty-five members present.

The following paper was presented for publication :

"Note on the relations of Synocladia, King (1849) to the proposed genus of Septopora, Prout (1858)." By F. B. Meek and A. H. Worthen.

The death of Mrs. E. H. Vaux was announced.

Feb. 8th.

The President, Dr. Ruschenberger, in the Chair.

The death of Caleb S. Hallowell was announced.

Notice was given of the publication of the third number of the Proceedings for 1869.

Feb. 15th.

Dr. Bridges in the Chair.

Eight members present.

Feb. 22d.

The President, Dr. Ruschenberger, in the Chair.

Eighteen members present.

The following gentlemen were elected Members:

Chas. D. Reed, Jas. S. Martin and Theo. Harrison.

March 1st.

The President, Dr. Ruschenberger, in the Chair.

The following paper was presented for publication:

"Descriptions of new species and genera of Fossils from the Palæozoic Rocks of the Western States." By F. B. Meek and A. H. Worthen.

Prof. Leidy directed attention to a specimen received from the Smithsonian Institution for examination, which he said was the upper two-thirds of the right humerus of one of the extinct giant sloths, and was obtained in Central America by Capt. J. M. Dow. It agrees so nearly in form, proportions and size with the corresponding portion of the arm-bone of the *Mylodon robustus* of Buenos Ayres, as described and figured by Prof. Owen, as to render it probable it may belong to the same species.

The specimen is unworn, black, not petrified, has no adherent rock matrix, and looks as if it had been obtained from alluvial mud. The interior of the shaft presents a long wide cavity, which might be viewed as the medullary cavity were it not that all the known extinct giant sloths have the limb bones solid. There would perhaps have been less hesitation in deciding as to the character of the cavity, were it not that comparatively recently a reverse condition was observed in a bone where it would not have been anticipated. A short time ago Mr. James Orton, of Rochester, N. Y., submitted for examination a collection of bones from the valley of Quito, Ecuador, S. A. The specimens were obtained at an altitude of 10,000 feet, and from Mr. Orton's account, were imbedded in a cliff of unstratified silt 400 feet in height. Among the bones, besides those of Horses, Lamas, etc., there was the femur apparently of a Mastodon, but solid or devoid of a medullary cavity, If the hollow interior be the natural condition of the *Mylodon*-like humerus under inspection, it would not belong to *Mylodon robustus*. Independently of the cavity indicated, the bone is sufficiently different in size and form to indicate a different species from the *Mylodon Harlani* of North America. The humerus from Oregon, described by Perkins (Am. Jour. Sci. 1841, xlii, 136), and referred to the latter by Prof. Owen, is not only much larger, but it is of greater breadth in relation with its antero-posterior diameter. The fragment of a humerus from Big-Bone-Lick, Ky., represented in fig. 3, plate xiv of my "Memoir on the Extinct Sloth Tribe," is somewhat smaller than the corresponding part of the Oregon specimen, and is more compressed or wider in comparison with the antero-posterior diameter.

Prof. Leidy further observed that there appeared to be a point of some significance in the anatomy of the mandible of *Dromatherium silvestre* worthy of attention, though the appearance may turn out to be a deceptive one. Prof. Emmons had discovered three isolated rami of mandibles of this most ancient of American mammals in the triassic coal of North Carolina. Of the specimens, one is represented in fig. 66 of Emmons' American Geology, repeated in outline in fig. 650 of Dana's Geology. Another specimen Prof. Emmons presented to the Academy, and is contained in our museum. The point of interest to which reference is made is the apparent absence of a condyle. This process may have been lost, but in the two specimens seen by Prof. L.—that figured by Prof. Emmons, and that preserved in our museum—a separation of the process is not obvious.

March 8th.

Dr. Carson, Vice-President, in the Chair.

Twenty-five members present.

Prof. Leidy made the following remarks :—The reptilian remains from the cretaceous formation near Fort Wallace, Kansas, presented to the Academy by Dr. T. H. Turner, and described by Prof. Cope under the name of *Elasmosaurus platyurus*, belong to an Enaliosaurian, as originally suggested by Prof. Cope. The anatomical characters of the different regions of the vertebral column, those of the shoulder and pelvic girdles, and of the preserved portions of the skull and teeth, are decidedly Plesiosaurian.

Prof. Cope has described the skeleton in a reversed position to the true one, and in that view has represented it in a restored condition in fig. 1, pl. ii. of his "Synopsis of the Extinct Batrachia and Reptilia," Pt. I, August, 1869, published in advance for the fourteenth volume of the Transactions of the American Philosophical Society. To explain the apparently anomalous and reversed arrangement of the articular processes (zygapophyses) of the vertebræ, he has supposed that those as ordinarily existing are substituted by the second set of articular processes (zygophene and zygantrum), as found in serpents and iguanians (Proc. Bost. Nat. Hist. Soc. xii, 265 ; Syn. Ext. Bat. and Rept. 42).

The finding of a portion of the jaws, as reported by Dr. Turner, in the vicinity of what Prof. Cope has supposed to be the cervical portion of the skeleton, and which he considers as confirmatory of the view he has taken of its position, without further consideration, is more than compensated in the opposite end of the column terminating in a coössified axis and atlas, as is the case also in the mature *Plesiosaurus*. The cup of the atlas still retains the hemispherical occipital condyle.

The Kansas saurian was wonderful for the length of its neck, far exceeding in this respect the *Plesiosaurus*. The vertebræ in the specimen form a nearly unbroken series to the seventy sixth inclusive. If we regard all as cervical until the transverse processes begin to spring in part from the spinal arch, it will comprise the extraordinary number of seventy-two. In the different species of *Plesiosaurus*, so far as known, the number ranges from twenty-four to forty-one. The length of the neck, independent of the head, was about twenty-two feet.

The cervical vertebræ successively increase in length to about the forty-fourth, then remain nearly the same to the sixtieth, and afterwards gradually decrease. The atlo-axis is about 2¼ inches long; the third cervical is 1½ inches; the tenth nearly 2 inches; the twentieth 2¾ inches; the thirtieth 3½ inches; the fortieth 4 inches; the forty-fourth 4½ inches, and so to the sixtieth; and the sixty-eighth to the last one about 3¾ inches, which is also about the length of the succeeding four dorsals.

The imperfections in the remainder of the vertebral column of the Kansas saurian do not permit a positive estimate to be made of the comparative extent of the trunk and tail.

A comparison of the caudal vertebræ with isolated specimens from the cretaceous formations of Alabama, Mississippi and New Jersey, leaves but little doubt that *Elasmosaurus* is identical with *Discosaurus*. Such also appears originally to have been the opinion held by Prof. Cope in regard to a portion of the same skeleton, which he referred to a species with the name of *Discosaurus carinatus* (LeConte's Notes on the Geology of the Survey of the Union Pacific Railroad, 1868, p. 68).

Specimens of vertebral bodies from the New Jersey green sand, referred to *Cimoliasaurus* (Cret. Rept. of the United States, pls. v, vi), and supposed by me to belong to the posterior part of the column, are seen by comparison with the Kansas skeleton to be cervical and perhaps anterior dorsals. The difference in the proportions of the corresponding vertebræ appear to indicate the genus to be distinct from *Discosaurus*.

The imperfect vertebral specimens from Arkansas, originally referred to *Brimosaurus* (Pr. Acad. Nat. Sci. 1854, 72, pl. ii, figs. 1—3), are probably posterior cervicals of *Discosaurus*.

In the true view of *Discosaurus* and its allies, the so-called order of *Streptosauria* (Proc. Bost. Nat. Hist. Soc. 1869, 265; Synopsis Ext. Batr. and Rept., 40) fails to maintain its position.

The extensive shoulder and pelvic girdles of the Kansas saurian, so much like those of *Plesiosaurus*, were most probably provided with limbs constructed like those of the latter animal.

In its restored condition *Discosaurus* would appear to have resembled *Plesiosaurus* in its form as ordinarily represented, excepting that it possessed a much longer neck,—one indeed that exceeded that of all known animals. We may imagine this extraordinary creature, with its turtle-like body, paddling about, at one moment darting its head a distance of upwards of twenty feet into the depths of the sea after its fish prey, at another into the air after some feathered or other winged reptile, or perhaps, when near shore, even reaching so far as to seize by the throat some biped dinosaur.

Prof. Leidy subsequently exhibited fragments of a fossil mandible, upon which he made the following remarks: The specimens were obtained by Prof. F. V. Hayden from the tertiary rocks of the Bridger Group, near Fort Bridger, Wyoming. They indicate a carnivorous animal, apparently of an extinct and heretofore unknown genus. Unfortunately the teeth are lost, except portions of some of the molars. The animal was larger than our Panther, and probably was a member of the same family, but with a relationship to the Hyænas. The portion of the jaw preserved nearly agrees in form with the corresponding portion in the Cats, but its depth below the position of the teeth is proportionately greater, resembling in this respect more the condition in the Striped Hyæna.

Remains of the canine alveolus indicate a tooth of more robust proportions than in the latter animal. The symphysis pursues the course of the alveolus.

Of several mental foramina, the largest one is situated below the position of the first premolar.

The condyle holds the same relative height as in Cats. The back portion of the jaw, including the coronoid process, is proportionately not so broad as in the latter. The masseteric fossa is shallower at its lower part, and is not bounded by the everted base, but is defined a little above the latter in a curvature sweeping from the condyle downward and forward to an angle about halfway below the position of the last molar tooth.

The molar teeth, of which there were five, completely occupied the space back of the canine, as in some of the viverrine and musteline animals, there being no hiatus in the series. All the molars were double-fanged, and none appear to have been of the tubercular kind.

The first premolar was the smallest, and the third premolar appears to have been the largest tooth of the molar series. The fourth premolar was intermediate in size to the third and the last molar, which appears to have but little exceeded this and the second premolar.

The remains of the crown of the last molar indicate a bilobed tooth, apparently like the sectorial molar of Felis, and without a heel. The crown of the tooth in advance was provided with a well-developed heel, but the fore part is too much broken to ascertain its form. The larger tooth in advance, the third premolar, retains its heel, which has a subtrenchant fore and aft border, and is bounded internally and externally by an oblique basal ridge.

For the animal indicated by the fossil jaw, the name of *Patriofelis ulta* is proposed. The measurements of the specimen are as follow:

Estimated length of lower jaw when complete	6	inches.
Breadth of coronoid process at base	$1\frac{3}{4}$	"
Height at condyle, and below last molar tooth	$1\frac{3}{8}$	"
Height below first premolar	$1\frac{1}{2}$	"
Length of molar series	3	"

Breadth of crown of first molar tooth, $4\frac{1}{2}$ lines; second do., 8 lines; third do., 9 lines; fourth do., $7\frac{3}{4}$ lines; fifth do., 8 lines.

Prof. Marsh exhibited specimens of the remains of a bird allied to the Turkey, which he considered as belonging to an extinct species. These remains were said to have been found in the green sand of Monmouth Co., N. J., but doubtless were from the post-tertiary above it. He proposed to name the species *Meleagris altus.*

Prof. Marsh also called attention to the tooth of a Peccary from the miocene of Shark River, New Jersey. It is a second molar from the left side of the lower jaw. He proposes to call the species to which it belonged *Dicotyles antiquus.*

March 15*th.*

The President, **Dr. Ruschenberger**, in the Chair.

Twenty members present.

The following paper was presented for publication:

"Cross Fertilization and Law of Sex in Euphorbia." By Thomas Meehan.

March 22*d.*

Dr Carson, Vice-President, in the Chair.

Thirty-six members present.

The following paper was presented for publication:

"Descriptions of Fossils collected during the U. S. Geol. Survey under the charge of Clarence King." By F. B. Meek.

Prof. Leidy exhibited specimens of ichthyodorulites, upon which he made the following remarks:

Xiphactinus audax. The genus and species are founded on an interesting specimen belonging to the collection of the Smithsonian Institution, and obtained from the cretaceous formation of Kansas by Dr. Sternberg. From the want of symmetry in the base of the specimen, I suppose it to have been the pectoral spine of some huge siluroid fish.

It is a broad sabre-shaped weapon, in its present condition sixteen inches long, which is near its original length, if one may judge from the thinness and rounding of the border at the broken end. At its middle it is nearly two inches broad and almost seven and a half lines thick. It slightly narrows and becomes thinner towards the outer end, and becomes thicker and more narrow approaching the base. An inch and a half from the latter it is thirteen and a half lines thick and seventeen lines wide; and the same distance from the outer end it is the fourth of an inch thick and twenty lines wide. The anterior convex border is rounded at first, but becomes subacute at its outer part. The posterior concave border is rather more obtuse.

A large groove commences back of the root, extending outwardly, becoming contracted and deeper, and opening to its bottom along the under part of the spine to its outer extremity. The bottom of the groove is irregularly pitted, and its upper surface formed by the overhanging posterior portion of the spine is transversely corrugated or striated. A similar but shallower groove commences in front of the root, and extending outwardly opens beneath the spine at the anterior half of its surface.

The upper surface of the spine is nearly flat and longitudinally striated, except at the outer part of the anterior border, where the striation is finer and curves forward.

The root of the spine turns up into a sort of hook-like process, broken at the end. It has been about two and a half inches in height from a level with the inferior surface of the spine. The inner part of the root forms a vertical oblong convexity, the lower half of which is occupied by a raised facet, apparently an articular surface, upon which the spine moved.

Prof. Agassiz, in his Poissons Fossiles, has described specimens of ichthyodorulites from the chalk of Lewes, England, which he referred to placoid fishes of the genus *Ptychodus*, "from the circumstance of their constant occurrence in the same localities" as teeth upon which the genus was first established. These rays are especially remarkable for their segmented character. "Instead of being composed of a single piece, as in other genera, they consist of flat rods, or rather broad, thick plates intimately united, but rendered distinct on the surface of the ray by longitudinal grooves." Without question as to the reference of these rays, I exhibit several similar specimens from the cretaceous formation of Kansas, submitted to my examination by the Smithsonian Institution. The same collection of fossils, of which the rays were part, also contained many teeth of *Ptychodus Mortoni*, but I am uninformed whether they were found in association.

The specimens are probably two fragments of the same ray, but an intermediate piece is wanting, and they are imperfect at the opposite ends. They also appear to be somewhat compressed from pressure. As a whole the ray is flat at the sides, with a thickened, convex, posterior border, and an acute dentated or festooned anterior border. The dentate processes are composed of a denser tissue than the rest of the ray, and are thickened in a line from the point to the base. The body of the ray is composed of longitudinally oblique bars ascending from the posterior border to the bases of the dentate processes in which they are merged. The longer and broader fragment is four and three-quarter inches long and three-quarters of an inch wide, gradually tapering to seven lines, and is provided with about seven and a half dentate processes. The other fragment is three and three-quarter inches long, seven lines wide below, and four lines at the broken apex, and is provided with nine dentate processes.

The segmented condition of the ray recalls to mind a singular fossil specimen formerly described by me as the portion of a jaw of a fish to which the name of *Edestus vorax* (Jour. Acad. Nat. Sci. iii, 159, pl. 15) was given, and which also exhibits a segmented condition. This fossil, notwithstanding its jaw-like appearance furnished with shark-like teeth, I have always suspected was an ichthyodorulite (Proc. 1856, 301), and this suspicion is increased by an examination of the rays supposed to pertain to *Ptychodus*.

Asteracanthus siderius. The species is founded on a fragment of an ichthyodorulite, found on a stream near Glasgow, Tennessee. The specimen was submitted to my examination by Prof. J. M. Safford, through Prof. Hayden. It purports to be of subcarboniferous age, but perhaps this is an error, for all the previous known fossils attributed to the genus are of much later age. It looks as if in its complete condition it had approximated in size the dorsal spine of *Asteracanthus ornatissimus*, which is a foot and a half long. The fragment is from an intermediate position at the junction of the root and shaft, and is a little over three inches in length. Broken at the extremities, and posteriorly, so as to leave no remains of a groove, it is composed of solid porous bone, and is triangular in transverse section. The triangle of the shaft has a base seven lines thick; the sides are about three-fourths of an inch wide, and the apex is rounded. The root is compressed laterally to a greater degree than the bottom of the shaft, and in the fragment is an inch and a half wide.

The lateral surfaces of the shaft are closely covered with large mammillary tubercles, which have been worn off at the summits. These tubercles are of enamel-like hardness, brown and lustrous. Their sides are closely and longitudinally wrinkled; the fewer wrinkles near the apex becoming branched and more numerous approaching the base. The tubercles are situated in parallel longitudinal rows, having a slight obliquity. The intervals formed by the divergence of the longer rows near the root are occupied by shorter rows. About thirteen rows, including the short ones, may be counted on one side of the specimen at the verge of the root.

Prof. Leidy further observed that the two fossils presented this evening by Henry Green, of Elizabeth, Jo Daviess Co., Illinois, through Dr. Edward D. Kittoe, of Galena, were of considerable interest. They consist of a metacarpal bone of the Giant Sloth of Jefferson (*Megalonyx Jeffersoni*), and a last lower grinder of the extinct Ox, *Bison antiquus*. They were discovered, in the search for lead, in a narrow crevice of the lead-bearing rocks, at the depth of 130 feet, in the vicinity of Galena. A number of other bones were found at the same time, but, unfortunately for the interests of science, these are scattered or lost.

The museum of the Academy contains fossils which were found in a similar position in the same locality some years back. Of these, some were presented by Dr. LeConte, who obtained them from Mr. Snyder of Galena; others were presented by my friend Dr. Kittoe. They consist of remains of an extinct Peccary, *Platygonus compressus*, larger than the existing species; an extinct Raccoon, *Procyon priscus*, and a large insectivore, named in honor of Mr. Snyder, *Anomodon Snyderi*. These animals were probably cotemporaries of the former.

Mr. Thomas Meehan said that no one who examined the prevailing theories concerning the formation of bark and wood with numerous living specimens before him, could be satisfied that these theories were in all respects correct. He had made numerous observations during the past year, which satisfied him that at any rate we had much to learn. He hoped to present these observations to the members at some future time, but at present wished only to direct their attention to a portion of a trunk of *Yucca alœfolia*, which he exhibited, the structure of which he suggested could not be accounted for on any theory generally known. The general idea was that the sap of plants ascended through the system, and was *elaborated* in the leaves, where the woody matter was formed, and afterwards *descended*,—in exogenous plants forming a regular concentric layer over the last year's wood, and in endogenous structures returning by the interior, pushing these descending columns of wood through the mass of cellular matter without order or system.

It would be seen that in this endogenous *Yucca* the woody matter, if it ever *descended* at all, as our present belief demanded it should do, had descended in a very regular and beautiful manner, quite as systematic, in fact, as most exogens would do. The wood was arranged in annual rings, not entirely concentric; but some tropical exogens did not have the woody annual layers always forming an entire circle any more than in this. In this case the annual layers of wood extended about two-thirds of the distance round the axis, and such layer was about the eighth of an inch thick. These annual layers were made visible by the bundles of fibres being packed more closely together towards the end of the season's growth, just as they are in exogens, from which, indeed, there was very little to distinguish this structure on a cursory examination but the absence of the so-called medullary rays.

March 29*th.*

The President, Dr. Ruschenberger, in the Chair.

Thirty members present.

A resolution to amend Art. XI, Chapter 10 of the By-Laws by the omission of the word "gratuitous," was adopted after a third reading.

The following gentlemen were elected members:

Geo. Hewston, W. H. Eisenbrey and Alfred Tucker.

On favorable report of the committees the following papers were ordered to be published:

Cross fertilization and the law of sex in EUPHORBIA.

BY THOMAS MEEHAN.

Mr. Charles Darwin's interesting observations on cross fertilization have opened a new world for original discovery. The list of plants which seem to avoid self fertilization is already very large. I think *Euphorbia* may be added to the number. Certainly this is the case with *Euphorbia fulgens*, Karw. (*E. jacquinaflora*, Hook.) which I have watched very closely in my greenhouse this winter. Several days before the stamens burst through the involucre, which closely invests them, the pistil with its ovarium on the long pedicel has protruded itself beyond, exposed its stigmatic surfaces, and received the pollen from the neighboring flowers. The way in which the pollen scatters itself is curious. In most flowers a slight jar or a breath of wind will waft the pollen to the stigmas, but I have not been able to notice any to leave the flowers in this way; for as soon as the anther cells burst the whole stamen falls from its filament like pedicel and either drops at once on the pistils of other flowers or scatters its pollen grains by the force of the fall.

This *Euphorbia* also furnishes another contribution to the theory of sex which I have advanced. The plan on which the male and female organs are formed is evidently a common one; and the only reason why some flower heads have a pistil in the center, and others are wholly staminate, is, that there is *greater axial vigor when the female flower is formed.* Whenever the common peduncle (below the scarlet involucre) is weak, a pistil never appears in that head of flowers. A few which seem strong neither have them, but the great majority of the strong peduncles are those which bear the female blossoms. Another interesting fact is that the number of male flowers is less in those heads which also bear a female, than in those which are wholly staminate. This seems to add to the point I made in my paper on *Ambrosia*, that after the flowers have been partially formed in embryo, and before the sex has been finally determined, the female flower, being primordially the stronger, has the power of absorbing the males or their partially formed elements into its system. It is certainly remarkable that in both these instances the number of male flowers should decrease in proportion to the existence or vigor of the central female one.

The male and female flowers of *Euphorbia fulgens* are formed much alike. The female occupies the center, and seems really but a prolongation of the main stem, on the top of which is an articulation from which the ovarium springs. The capsula readily falls from this articulation when mature. From the base of the female central peduncle spring weaker peduncles, colorless, appearing indeed almost like filaments, articulated at about the same height as the female, only above the point bearing a short filament and anther—the caduceous part before referred to. No one can fail to see the correspondence of plan in these different parts, and I think that nothing but the favorable position in the direct line of axial vigor made the central flower a female one.

Cases occasionally occur in which a tolerably strong head of wholly male flowers will develop the central axis into a pedicel *almost as long and vigorous as those which bear female flowers.* But the flow of vital force—if I am correct in using this term—not being quite sufficient, the final goal of natural perfection in the female form was not reached. These cases do not occur often, but are well worth looking for, as they show so clearly the dividing line between the forces which govern the male or female sex.

Note on the Relations of SYNOCLADIA, King, 1849, to the Proposed Genus SEPTOPORA, Prout, 1858.[*]

BY F. B. MEEK AND A. H. WORTHEN,

Of the Illinois State Geological Survey.

Not having studied the *Polyzoa* of our rocks, it was only recently that we noticed the remarkable agreement between the fossil from the Chester division of the Lower Carboniferous, on which Dr. Prout proposed to found a genus *Septopora*, and the common Western Coal-measure species, that has been by some referred to the European Permian species, *Synocladia virgulacea*, the type of Prof. King's genus *Synocladia*. In identifying this fossil, from beds in Kansas referred by him to the lower Permian, with *S. virgulacea*, Prof. Swallow noticed that it differs from the foreign species in having only two, or, on some parts, apparently three,[†] rows of cellules to each of the longitudinal branches, instead of from three to five rows, as in the latter; and although he referred the Western species doubtfully to *S. virgulacea*, he proposed for it the provisional name, *S. biserialis*, in case the differences noted should be considered of specific importance.[‡] Prof. Geinitz, however, did not consider these differences of full specific value, and referred the species to *S. virgulacea.*[§]

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[*] Transac. Acad. Sci. St. Louis, Vol. I, p. 448, pl. 18, fig. 2, 2 a, b, c, 1858.

[†] It is only *immediately* below the bifurcations of the larger stems that the pores are so arranged that they might be counted so as to appear to make three rows, the proper number of rows being only two.

[‡] Trans. Acad. St. Louis, Vol. I, p. 179, 1858.

[§] Carbonf. und Dyas, in Nebraska, p. 70, 1866.

After a careful comparison of a series of good specimens, showing clearly both sides, of the fossil on which Dr. Prout proposed to found his genus *Septopora* (*S. Cestriensis*, Prout), from the original locality in the Chester limestone of the Lower Carboniferous, with an equally well preserved series of the Coal-measure fossil mentioned above, that has been referred to *S. virgulacea*, we find that they not only agree exactly in all *generic* characters, but that we have, up to this time, been entirely unable to discover any *specific* differences. We observe, it is true, among the Coal-measure specimens, some differences in the greater or less size, and irregularity of divergence of the branches, and consequent differences in the sizes and forms of the fenestrules; but the same differences are also observable among the specimens from the Chester beds, so that if we were to regard these as specific differences, we would have to admit several species to be common to the two horizons, instead of only one.

We have for a long time been aware of the fact that the form that has been referred to *S. virgulacea*, from the Kansas and Nebraska rocks, not only ranges through the beds included by some as lower Permian in Kansas, but that it has an extensive vertical and geographical range in the admitted Coal-measures of these States and Iowa. We are also now prepared to show that it not only ranges through the whole of the Coal-measures of Illinois, but that, as above stated, specimens beyond all doubt belonging to the same *genus*, and, as we believe, to the very same *species*, occur both in the St. Louis and Chester beds of the Lower Carboniferous limestone series. We were slow to adopt the conclusion that the specimens from these different horizons are really specifically identical, because we have so often, in such cases, on examining better collections than those first obtained, succeeded in finding differences not previously supposed to exist. In this instance, however, as well as occasionally in others, we have, as already mentioned, found the specimens to agree *exactly* in apparently all of their specific characters.

In regard to the generic relations of this fossil to the genus *Synocladia*, as typified by the common European Permian true *S. virgulacea*, there may be differences of opinion between some of those who draw very exact distinctions between genera, and others who give them greater latitude. That they really belong to the same genus, however, we can scarcely entertain any doubts, though it must be admitted that they are certainly distinguished on very nearly the same kind and degree of differences that distinguish *Fenestella* from *Polypora*.

It is a little remarkable that Dr. Prout, who made an especial study of the palæozoic *Polyzoa*, should have failed to notice the very close relations between his *Septopora* and *Synocladia*, at the same time that he assigned to the former almost exactly the same characters mentioned by Prof. King in describing his genus *Synocladia*. This identity of generic characters in these two species will be better understood by comparing the original generic descriptions of these forms as given by Prof. King and Dr. Prout, making, of course, some allowance for differences of terminology. Prof. King's description of *Synocladia* (see Brit. Permian Foss. p. 38) reads as follows:—

"A foliaceous or frondiferous infundibuliform *Fenestellidia*. Fronds consisting of numerous connecting stems or ribs. Stems bifurcating; radiating from a small root; running parallel to, and at short distances from each other, on one plane; and giving off bilaterally numerous short, simple branches [dissepiment], of which opposite pairs conjoin midway between its stems, arcuately or at an ascending angle. Branches occasionally modified into stems. Cellules on the inner or upper surface of the fronds; on both stems and branches; imbricated, and distributed in longitudinal series. Series of cellules separated from each other by a dividing ridge. (?)Gemmuliferous vesicles on the dividing ridge."

He farther adds that this genus differs from the allied genera, *in the arching and celluliferous character of its connecting branches, or dissepiments, and the fact that they are sometimes developed into intermediate radiating branches or stems.* It will also be observed that he does not mention the *number* of rows of cellules or pores in each radial branch or stem, in his *generic* description, though he does so in describing the *species;* from which it is evident that he did not regard that as a generic character, and that he would have considered the American type as belonging to another species of the same genus.

For comparison with the above, we give below Dr. Prout's description of his proposed genus *Septopora*, from the Transactions of the Acad. Sci. of St. Louis, vol. I. p. 448:—

"Bryozoum a fan-like expansion, with longitudinal ribs [stems of Prof. King], irregular in size, radiating from a centre, branching and occasionally anastomosing, having two lines of pores, one on each side of a tuberculated midrib.* Dissepiments forming arches. or more or less angular, dividing the Bryozoum into quadrangular, round, semi-lunar, or rhombic fenestrules; each dissepiment supporting from one to four irregular lines of cell-pores; reverse smooth when worn, but more or less tubercled when perfect."†

He adds that, "though in its general features it resembles *Fenestella*, it differs in a marked degree by its celluliferous dissepiments." This, it will be observed, together with the *arched, or angulated character of its dissepiments, and the fact that they sometimes give origin to intermediate branches, or sterms*, as Prof. King terms them, were exactly the characters mentioned by the latter author as distinguishing *Synocladia* from other allied *Fenestellidæ*. Although Dr. Prout does not mention the character of the angulated dissepiments giving off intermediate branches, his figure 2 a, pl. 18, of the St. Louis transactions cited, distinctly shows it, and it is even more strongly defined in specimens now before us, from the original locality, and identified by Dr. Prout himself. It is also worthy of note, that Dr. Prout's enlarged figures, 2 *b* and 2 *c*, of the plate above cited, do not give a correct idea of this fossil, as may be seen by comparison with his own description. Figure 2 *c*, for instance, represents the fenestrules proportionally much too small, and the dissepiments too thick and not in the slightest degree "forming arches, or more or less angular." Figure 2 *b* also fails to show this arching or bending upward of the dissepiments, and the "tubercles" or vesicles on the midrib, which characters are as strongly defined in the Chester and Coal-measure specimens as in Prof. King's figures of the typical *S. virgulacea.* Some portions of the celluliferous surface near the base of the frond might be selected from some specimens that would nearly agree with these figures given by Dr. Prout, but this is far from the general character of the fossil farther up, where the branches are more diverging, so as to form larger fenestrules.

The question respecting the relations of these Western specimens, from the several horizons mentioned, to each other, and to the European Permian *Synocladia virgulacea*, is, for other reasons, one of more interest and importance than the mere difference or identity of particular fossils, since it involves the question of the duration in time, and the consequent geological range, of one of the most important of the types that have been appealed to as evidence that the Permian should be carried down in Kansas and Nebraska, so as to include several hundred feet of rocks regarded by us and others as belonging to the true Coal-measures. Whether we regard this fossil as being specifically identical with *Synocladia virgulacea* (which we do not admit), or view it as a distinct species of the same genus, it is now evident that it can no longer be regarded as properly a *Permian* type; for, even if it could be shown to be only a *variety* of *S. virgulacea*, it would still be a *form* unknown in the Permian of Europe; while here it is, as above shown, not only one of our most abundant Coal-measure types, but one that began its existence during the deposition of lower Carboniferous or Mountain limestone series.

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* The midrib mentioned here is the "dividing ridge" of Prof. King, and the "tubercles" on it are the "(?)gemmuliferous vesicles" of Prof. King.

† It is minutely striated in perfect specimens, as we know from examination of typical examples from the original locality.

It is worthy of note in this connection, that there are various other fossils in the upper members of our lower Carboniferous series that might with quite as much propriety be referred to European Permian species as many of the Western Coal-measure types that have been so referred. For instance, Dr. Prout long since (Trans. St. Louis Acad. Sciences, vol. I. p. 450) identified a *Polypora*, from the Chester beds, with the Russian Permian ***P. biarmica;*** while several other species of *Polyzoa* found in the Chester group are scarcely distinguishable from forms found in western beds that have been by some included in the Permian. We also now know that there are species of *Schizodus*, *Pleurophorus*, etc., in the Chester beds *very* like Permian forms; while a Crinoid, found by Prof. Marcou in beds in Nebraska (referred by him to the Permian), and thought by him to be "extremely near *Encrinus moniliformis*, Miller, of the Muschelkalk of Europe," is now known to range through the whole of the Western Coal-measures, and to be represented in the Chester limestone beneath the Millstone-grit by closely allied species. Indeed, a number of Crinoids that have been recently discovered in the Chester beds and the Coal-measures of Illinois are remarkably similar representative forms. Even the curious *Zeacrinus mucrospinus* of McChesney, from the Upper Coal-measures of Illinois, has its nearly allied representative in the Chester limestone below the Millstone-grit.

Numerous facts like the foregoing (such, for instance, as the occurrence of Tertiary types of plants in the Nebraska Cretaceous), might be cited to show that in many instances particular forms of life, both animal and vegetable, appeared here at earlier periods than in the old world. Hence, great caution, and some general knowledge of the entire fauna and flora of our rocks, are often required in order to arrive at sound conclusion with regard to their relations to particular horizons of the series, as made out in Europe.

April 5th.

DR. CARSON, Vice-President, in the Chair.

Twenty-three members present.

PROFESSOR LEIDY made the following remarks ON DISCOSAURUS AND ITS ALLIES.

The body of the last vertebra in the series of caudals belonging to the Kansas saurian, described by Prof. Cope under the name of *Elasmosaurus*, has the length less than the depth or breadth, which latter is the greatest diameter. It is moderately contracted towards the middle, the sides below the neural arch and the surface below the costal articulations being fore and aft concave, and bounded in front and behind by an acute margin from the articular ends. A ridge extends fore and aft between the chevron articulations and the included surface is concave, and exhibits a single lateral venous foramen. The costal articular processes project from the middle of the side of the body, reaching nearer the fore than the back end of the latter. They are transversely oval, about three-fourths the length of the body, and the height about half. They form a deep concavity, with acute margins expanding peripherally. The articular ends of the body are transversely oval and defined from the intermediate portion of the latter by an acute everted margin. A short distance within the position of the latter the surface is marked by a narrow groove, and within the circle of this groove the surface projects in such a manner as to appear like a distinct disk or epiphysial plate applied to and coössified with the body. The surface of the disk is convex at the periphery and moderately concave towards the centre. The articular surface beyond the groove defining the disk appears as an everted ledge, and the triangular articular facets for the chevrons appear as deflections of the ledge. The extension of the latter inferiorly is greater at the posterior extremity of the body than at the anterior extremity, thus producing a larger provision of surface in that position for the articulation of the chevron. The neural arch in the specimen has apparently been so much laterally compressed, that its original condition cannot be ascertained.

It was upon several similar isolated vertebræ to the one just described that the genus *Discosaurus* was established, and I shall now proceed to examine them comparatively with the object of determining their relationship with the Kansas saurian.

The genus *Discosaurus* was originally indicated from a mutilated body of a caudal vertebra from the cretaceous formation of Alabama (Proc. Acad. Nat. Sci. 1851, 326). In its imperfect condition, its peculiar character, and resemblance to a vertebra represented, by Prof. Owen, as a cervical of *Plesiosaurus pachyomus* (British Fossil Reptiles, pl. 28,) it was mistaken for a cervical. The specimen, together with another from the same individual, were described in their true position, as relates to the regions of the vertebral column, in the "Cretaceous Reptiles of the United States." They are represented in figs. 4, 5, 6, pl. v, of that work. The two vertebral bodies bear a near resemblance with that of the Kansas saurian above described. They have nearly the same proportions, and are slightly smaller and rather less contracted intermediately. The interchevron ridges are comparatively less well developed. The discoid arrangement of the articular ends is even more conspicuous. The disks are more prominent, more decidedly defined from the ledge beyond by a deeper constriction or groove. The periphery of the disks is rather more convex, and the surface towards the centre slightly less concave. The outside ledge is comparatively narrow and is not everted. The chevron articular surfaces appear rather to be produced through deflections of the groove defining the disk, than by an extension of the ledge, so that the chevrons would appear to have articulated with the depressed margin of the disk itself instead of with the ledge. The neural arch is broken away in both specimens, except part of an abutment in one of them.

The slight difference in size of these vertebræ from that of the Kansas saurian, as well as the feebler production of the interchevron ridges, might readily be due to their more posterior position in the column. The more decided constriction of the disks at the articular extremeties from the rest of the body, which led to the application of the name of *Discosaurus*, might be regarded as an individual peculiarity, or a variation in specific character; which is often greater than real specific or even generic characters.

A similar vertebra, from the lower cretaceous of Mississippi, represented in figs. 10—12, pl. v of the "Cretaceous Reptiles of the United states," likewise referred to *Discosaurus*, has the same size and proportions as that above described of the Kansas saurian. In its anatomical characters it is intermediate to the latter, and those of the Alabama saurian. The interchevron ridges are intermediate in degree of development. The most marked difference exists at the articular ends of the body. The articular surface is comparatively flat, being but feebly depressed towards the centre and as feebly rounded towards the periphery, which extends to the acute margin defining it from the sides of the body, almost without the intervention of a groove such as is described in the preceding specimens. A slight deflection in the course of the acute border defines the anterior chevron articulation. The posterior chevron articulation is comparatively large and more distinctly defined than the corresponding one in the Kansas and Alabama specimens. The sides of the neural arch ascend in a steep slope from the more concave sides of the body, sweeping outwardly to the upper border of the costal pit. The diameter of the spinal canal is about seven lines.

Another vertebral body, from the cretaceous formation of New Jersey, referred to *Discosaurus*, is represented in figs. 7—9 of the work above indicated. It presents characters in common with the preceding specimens, but likewise has peculiarities of a decided kind. It approaches most the Alabama specimens, and has nearly the same size. Interchevron ridges are entirely obsolete. The articular extremities of the body are very like those of the Alabama specimens, but the groove defining them from the acute margin is very inconspicuous or nearly obsolete. The deflections of the acute margin for the accommodation of chevrons are comparatively and remarkably deep, especially those anteriorly. The spinal canal at the orifices is about seven lines wide; at the middle scarcely five lines.

In all the specimens above indicated, a single venous foramen is situated on the under side of the body, to the right of the median line.

Comparative measurements of the specimens are as follow:

Caudal from	Kansas,	Mississippi,	Alabama,	New Jersey.
Length of body inferiorly.........	24½ *l.*	24½ *l.*	23½ *l.*	23½ *l.*
Breadth ant. artic surface........	36	36	33½	34
Depth " " "	30	30	26½	27½
Breadth post. " "	34	34	31	31½
Depth " " "	29	29	—	26
Breadth costal artic. cavity......	18	17	15	15
Depth " " "	12	11	11	11
Width between inf. margins of costal cavities..........................	39	39	38	38
Distance fore and aft of chevron surfaces..........................	16	16	16	12½

We thus have the nearly corresponding caudal vertebræ of four individuals, from the cretaceous formation of as many different localities, agreeing nearly in size, proportions, form, and construction, but exhibiting decided peculiarities in every case. Are these peculiarities to be considered of generic and specific value; of specific value alone; or are they to be regarded as variations in the characters of a single species? From the specimens alone I would incline to view them in the latter light, though I admit that each variation may represent a different genus, or a different species of the same genus. The reason for referring any one to a genus is equally good for all. If the Alabama specimens be regarded as characteristic of *Discosaurus*, and the Kansas one of *Elasmosaurus*, the caudal from Mississippi, with its nearly flat ends, is quite as characteristic of a third genus, and the New Jersey caudal, with its peculiarities, would form a fourth. The close correspondence in size of the specimens rather favors the view that they all pertain to the same species, though this may be as coincidental as the discovery of the nearly corresponding vertebra in the four cases. The one which, in my view, is most distinctive from the others, is the specimen from Mississippi, with the nearly flat articular extremities of its body. It may be well to consider it as representing a species, and for this one I propose the name of *Discosaurus planior*.

A vertebra, which accompanied the Discosauroid caudal from New Jersey, from its appearance was supposed to belong to the same individual. It was regarded as a posterior cervical, and is represented in figs. 1–3, pl. v, and described on page 24 of the "Cretaceous Reptiles." It would appear by comparison rather to be an anterior caudal, and so far as I can judge in the imperfect condition of the specimens, resembles most nearly the fifth of the last continuous series of twenty-two vertebræ of the Kansas skeleton. It appears to agree nearly in form, constitution, and proportions with the corresponding bone of the latter, but is rather smaller.

Some years since I had the opportunity of inspecting some vertebral specimens of a huge saurian in the possession of Mr. W. F. Roberts, who obtained them from near Greenville, Clark Co., Arkansas. They are supposed to be of cretaceous age, as the formation of that period is the prevailing one in the locality in which they were found. Two of the best preserved of the specimens, generally very imperfect, were briefly noticed in the Proceedings for 1854, page 72, and represented in figs. 1–3, pl. ii. The remains were observed to bear a resemblance to those of *Cimoliasaurus*, and were referred to an animal with the name of *Brimosaurus grandis*. Through comparison with the skeleton of the Kansas saurian, they appear to be posterior cervicals, and further appear sufficiently near in character to belong to the same, though their larger size renders it probable that they pertained to a larger species.

A question arises as to the relationship of those remains originally referred to *Cimoliasaurus* with *Discosaurus* in the present state of our knowledge of the latter. In the first place, by comparison with the skeleton of the Kansas saurian, we observe that the position in the column, assigned to the vertebral bodies of *Cimoliasaurus*, was incorrect, and this probably contributed to mislead Prof. Cope in his examination of the skeleton of the Kansas saurian.

The vertebral specimens referred to *Cimoliasaurus* consisted of two sets of specimens, from two different individuals, both from the green sand of Burlington Co., N. J. They are described in "Cretaceous Reptiles," page 25, and characteristic ones represented in plates v. and vi.

The eleven vertebræ considered as lumbar, and represented by figs. 17–19, pl. v, and 16–18, pl. vi, are evidently cervicals. Those considered as dorsals on page 26, and represented in figs. 13–16, pl. v, are at least in part posterior cervicals. Of the fourteen vertebræ referred to on page 27 as dorsals and lumbars, those described and represented in figs. 1–5, pl. vi, are alone dorsals, while the others described and represented in figs. 6–9 are posterior, and those of figs. 10–18 more anterior cervicals.

The cervicals of *Cimoliasaurus* are so different in their proportions from those of the Kansas saurian that there can be no question as to the distinction of the two animals, at least as species.

Do all the remains originally referred to *Discosaurus* belong to this genus as distinct from *Cimoliasaurus?* I suspect that those from New Jersey belong to the latter. The animals indicated by all the fossils which have been under consideration are Plesiosauroid, and as in recognized species of *Plesiosaurus* there is much variability in the number, proportions, and other characters of the cervicals without a corresponding extent of variation in other parts of the vertebral column, we would be prepared to find in *Cimoliasaurus* nearly the same kind of caudals as in *Discosaurus*.

Prof. Cope, in his "Synopsis of the Ext. Batrachia and Reptilia," pt. i, 1869, p. 56, describes two vertebral specimens from the lower bed of the cretaceous green sand of Gloucester and Monmouth counties, which he attributes to a species with the name of *Elasmosaurus orientalis*. The specimens described as caudals are seen, by comparison with the Kansas skeleton, to be cervicals.

The smaller of the two specimens is intermediate in its form, proportions, and size with what appear to be the nearly corresponding vertebræ of the Kansas saurian, and the vertebræ referred to *Cimoliasaurus*. The larger specimen I have not seen, but from the description and measurements given it would appear to have belonged to a species quite as large as the Kansas saurian. The comparative measurements of the two specimens with that of the Kansas saurian, which appears to be most like them, and with the largest of the specimens which had been referred to *Cimoliasaurus*, are as follow:

	New Jersey specimens.		Kansas sp.	Cimoliasaurus.
Length of body............	3¾ in.	4½ in.	4¼ in.	3 in. 11 *l.*
Breadth "	4¼ in.	5¾ in.	4½ in.	4 in. 2 *l.*
Depth "	3 in.	4¼ in.	3½ in.	3¼ in.

The various remains to which I have referred in this communication probably indicate a number of different species of a genus, presenting a like variability in the number and proportions of the cervicals as has been observed in the closely related genus *Plesiosaurus*. In the present condition of knowledge of the remains, they appear to me to be referable to a series of species as follow:

1. Discosaurus vetustus.

Leidy: Pr. Ac. Nat. Sc. 1851, 326; Cret. Rept. United States, 1865, 22,

Cimoliasaurus magnus. Cope: Pr. Bost. Soc. Nat. Hist. 1869, 266.
Cimoliasaurus vetustus. Cope: Synopsis Ext. Bat. Rept., &c., 1869, 57.
Cretaceous of Alabama.

2. Discosaurus grandis.
Brimosaurus grandis. Leidy: Pr. Ac. Nat. Sc. 1854, 72, pl. i, figs. 1–3.
Cimoliasaurus grandis. Cope: Pr. Bost. Soc. Nat. Hist. 1869, 266; Synopsis Ext. Batrachia, Reptilia, &c. 1869, 57.
Cretaceous of Arkansas.

3. Discosaurus carinatus.
Elasmosaurus platyurus and *Discosaurus carinatus.* Cope: LeConte's Notes on the Geology &c. Union Pacific Railway, 1868, 68.
Elasmosaurus platyurus. Cope: Pr. Ac. Nat. Sc. 1868, 92; Pr. Bost. Soc. Nat. Hist. 1869, 266; Synopsis Ext. Batr. Rept. 1869, 46.
Cretaceous of Kansas.

4. Discosaurus magnus.
Cimoliasaurus magnus. Leidy: Pr. Ac. Nat. Sc. 1851, 325; 1854, 72, pl. ii, figs. 4–6; Cret. Rept. U. S. 1865, 25, pl. v, figs. 13–19, pl. vi. Cope: Pr. Bost. Soc. Nat. Hist. 1869, 266; Synopsis Ext. Batr. Rept. 1869, 57.
Discosaurus vetustus in part? Leidy: Cret. Rept. U. S. 1865, 24, pl. v, figs. 1–3, 7–9.
Cretaceous of New Jersey.

5. Discosaurus planior.
Discosaurus vetustus in part. Leidy: Cret. Rept. U. S. 1865, 23, pl. v, figs. 10–12.
Lower cretaceous of Mississippi.

6. Discosaurus orientalis.
Elasmosaurus orientalis. Cope: Pr. Bost. Soc. Nat. Hist. 1869, 266; Synopsis Ext. Batr. Rept. 1869, 54.
Lower cretaceous of New Jersey.

In the cervicals of *Discosaurus*, so far as can be ascertained by the material at command, there appears to be no subdivision of the articular process for the riblets, as in *Plesiosaurus*. In the latter the chevron bones consist of lateral halves, ununited by osseous tissue. In the skeleton of the Kansas saurian, intervening between two of the caudals, there is a bone which looks as if it might be an inverted Y-shaped chevron, with one arm broken off. The spine broken at the end is about four inches long. The remaining arm, broken away at the articular end, is about three inches long.

On favorable report of the Committees, the following papers were ordered to be printed:

Descriptions of new Species and Genera of Fossils from the Palæozoic rocks of the Western States.

BY F. B. MEEK AND A. H. WORTHEN,
Of the Illinois State Geological Survey.

FORAMINIFERA?

Receptaculites formosus, M. and W.

Body obovate, the breadth being about three-fourths the height, and the widest point a little above the middle; upper end rounded, and without any umbilicoid concavity or opening, unless it may be a very small one; sides gradually tapering with a slight convexity from a little above the middle, to an apparently moderate sized base of attachment. Cell openings or depressions shallow, quadrangular, or transversely rhombic (those on the upper part being quadrangular, and those farther down becoming more rhombic, and wider than high), arranged in spirally ascending rows, which make nearly one turn in passing from the base to the centre of the top; each with a transverse linear central furrow, from which a similar furrow passes to the lower angle; central perforations of the cell depressions minute, and generally closed in the typical specimen.

Height, 1·75 inches; breadth, 1·22 inches.

This species differs from all others known to us, especially from any Upper Silurian horizon, in its elongated, obovate form, its outline being almost exactly obovate, excepting the truncation of the lower (smaller) end. In general appearance it perhaps most nearly agrees with a form found in the Galena Limestone, and referred by us, doubtfully, to *R. globularis*, Hall, in the third vol. Illinois Geol. Reports, pl. 2, fig. 2 a,b. It differs, however, from that species in having the upper end more round, or less depressed, and without any umbilicoid impression. Its cell impressions are also very different, not being near so crowded, and instead of becoming more crowded and narrower on the lower half, they are less so there than above; while the central perforation of each is much smaller.

Locality and position. Bridge Port, near Chicago, Illinois. Niagara Group of Upper Silurian.

We are under obligations to the Rev. E. C. Bolls, of Portland, Me., for the use of the only specimen of this species we have seen.

ECHINODERMATA.

BARYCRINUS SPECTABILIS, M. and W.

Body attaining a large size, rather deeply cup-shaped, though wider than high; truncated below, with sides moderately expanding upward. Base basin-shaped. Basal pieces rather large, nearly twice as wide as high, pentagonal in form, with the mesial angle above deeply impressed, the impression being also continued down the middle to the lower edge, with a broad prominence or ridge on each side of it also extending to the lower edge, where each of these prominences terminates in a little angular projection, while the lateral margins are strongly and abruptly beveled, so as to form deep, wide notches at the sutures. Subradial pieces large, hexagonal, excepting one on the anal side, which is heptagonal; all very profoundly impressed at the corners, so as to form strong, radiating ridges, extending one to each of the sides, to connect with those on the other contiguous plates; sometimes these ridges terminate in pinched-up nodes on the central region. First radial pieces about twice as wide as high, being generally a little wider than the subradials, pentagonal in form, with superior lateral angles more or less truncated, and slightly projecting at the edge, each with its broad, very shallow sinus above, for the reception of the second radials, more than three-fourths as wide as its upper margin, while the deep impression at the lower angles form two broad, very strong ridges, extending downward to connect with those on the subradials; sometimes these terminate near the middle above, in sharp pinched-up, diverging nodes, or short carinæ, while between these and the superior lateral, truncated angles, one or two other sharp prominences are sometimes seen. Second radial pieces extremely short, or almost transversely linear, and not always entirely filling the broad shallow sinuses in which they rest. Third radials triangular, a little higher in the middle than the first, but wedging to a very thin edge on each side, or even sometimes thinning out so as to let the first brachial pieces rest, at the lateral ends partly upon the first and partly on the second radials. Anal pieces of moderate size, quadrangular in form, a little wider than high, and resting on the upper truncated edge of the heptagonal subradial, while its own upper edge is truncated entirely across, nearly on a level with the superior lateral angles of the first radial on each side of it.

Arms two from each ray, rather long, rounded, and tapering; very stout below, where they are composed of thin (short) wide pieces, the first two of which, in each pair of arms, are joined together at their inner ends; above these the arms of each ray diverge more or less from each other, and throw off alternately on each side stout armlets from every second piece. Arm pieces above the wide ones at the base, somewhat longer in proportion to breadth than the latter, and more or less wedge formed, with each a little pinched or angular ridge or projection on each side, ranging transversely to the arms. Armlets stout, about eight to nine on each side of each arm, near half as thick as the arms just above the points where the two connect; composed of pieces of nearly the same form as the arm pieces, but generally showing a slight disposition to become a little zigzag, and, at least some of them, throwing off alternately on each side a series of smaller secondary armlets, exactly as they are themselves given off from the main arms. Secondary armlets showing a slight zigzag appearance, from the greater thickness and prominence of every second piece on opposite sides, so as to appear as if they may give off a tertiary series of armlets, or pinnulæ, though the specimen does not show these if they exist.

Column very stout, nearly round, and composed, at least for about three inches or more below the base, of alternately thin and somewhat thicker pieces, the latter of which project outward a little beyond the others, and show a slight disposition to become nodular, or irregularly thickened on the edge. Internal cavity large, with an obtusely pentagonal section. Longitudinal sutures, dividing the column into five sections, partly anchylosed, but still visible.

Height of body, about 1 inch; breadth, about 1·70 inches; length of arms, 3·80 inches; thickness of do. at the base, 0·40 inch; thickness of column near base, 0·60 inch.

This fine large species seems to be most nearly allied to *B. Thomæ*, (= *Cyathocrinus Thomæ*, Hall), from the Warsaw Limestone, but differs in having the impressions at the corners of its body plates, and the ridges between the same, greatly more strongly defined, and its arms much stouter, and more rounded below. Its column is also proportionally thicker, with a more obtusely pentagonal internal cavity. The typical specimens of the *B. Thomæ*, which are now before us, are not in a condition to show much of the arms, but as far as they can be seen, they seem to be proportionally more slender, and we can scarcely doubt that they will show other corresponding differences in the details of their structure, when better specimens can be compared. We have ascertained, however, that the arm-pieces of the typical specimens of *B. Thomæ* have on their sides little pinched-up prominences, as in the species here described, which character was not mentioned in the description of that species.

The peculiarity of having the corners of the body plates impressed so as to form large ridges on the plates is very common in this group, but it differs in degree, or otherwise, in the various species, presenting corresponding differences in other parts. It is more strongly defined in the species here described, and the ridges more angular than in any other known to us. This species is also the first of the group in which we have clearly seen secondary armlets springing from the sides of the larger ones given off from each side of the arms; but since seeing this character in this species, we think we have been able to detect indications of it in others.

We hope those who may not be disposed to admit the genus *Barycrinus* as distinct from *Cyathocrinus*, will at least write the name of this species *Cyathocrinus* (*Barycrinus*) *spectabilis*.

Locality and position. Otter Creek, Jersey County, Illinois; from the St. Louis Group of the Lower Carboniferous.

CYATHOCRINITES? POTERIUM, M. and W.

Body small, depressed-subglobose, somewhat flattened below and contracted above. Basal plates of moderate size, pentagonal in form, and spread out horizontally so as to form a nearly flat pentagonal disc, excepting that the salient angles are curved upward a little; facet for the attachment of the column small, compared with the size of the base, round and not impressed. Subradial plates large, forming the widest part of the body, convex on the outside, but not from thickening; about as wide as long, hexagonal, with perhaps the exception of one on the anal side of heptagonal form; all curving under below to connect with the base. First radials somewhat smaller than the subradials, wider than long, pentagonal in form, and provided above with very small, shallow sinuses for the reception of the second, which are small, but more than filling the shallow little sinuses. Third radials, in two of the arms seen, small, and bearing on each of their superior sloping sides, a long, very slender, subcarinated arm, which bifurcates on the second piece above; while the divergent divisions subdivide two or three times again above, at intervals of three or four pieces; the divisions and subdivisions all being very slender, and composed of joints about twice as long as wide. In two of the rays seen, however, the free arms are simple from their origin on the first radials, at least as far up as to the sixth piece, inclusive, (which is as far as they can be traced in the specimen), and present the remarkable character of having the second, third and fourth pieces greatly dilated, or alate on each side, so as to be nearly two-thirds as broad as the whole body below; though the first piece next the body (second radial), is narrow, and nearly twice as long as wide, as are the fifth and sixth pieces. Surface smooth, or only finely granular; sutures close fitting, or not channeled. Anal plate and column unknown.

Height of body, 0·20 inch; breadth of do., 0·34 inch; breadth of the dilated part of one of the simple arms, about 0·22 inch.

It is possible that the dilated arms may bifurcate above the sixth piece, though the specimen from which the description is made out is not in a condition to enable us to settle this point. The fact that they become suddenly narrow above the fourth piece, would seem to indicate that they may possibly assume the character of the other arms farther up. As seen lying partly imbedded in the matrix, with the long-jointed, slender arms and their branches incurved, above the little globular body, the whole reminds one very much of the Jurassic genus *Saccosoma*, Agassiz.

The very remarkable characters of the arms in this little crinoid, if not due to abnormal development, would certainly seem to warrant its separation, at least subgenerically, from the typical forms of *Cyathocrinites*. It also seems very improbable that its ventral disc is constructed as in the typical forms of that genus. Should other specimens show the peculiarities we have mentioned to be normal, we would propose for this type the generic or subgeneric name *Saccosomopsis*.

Specifically this form, at least so far as regards its body, seems to be exactly like a species described by Prof. Hall, under the name *Cyathocrinus parvibrachiatus* (Jour. Bost. Soc. Nat. Hist.., Vol. vii, p. 395, 1861); and it is worthy of note, that he describes its "subrachial" or free radial pieces as being "two to each ray, broad and strong, but varying in the different rays." As these pieces "*vary in the different rays*," may not those he saw, that were broad and strong, have belonged to dilated simple rays, as in our species, and these rays been broken off above the second pieces, in the specimen described? If so, his species would almost certainly belong to the same group as ours, but differs specifically in having its bifurcating arms shorter, more rapidly diminishing in size, with shorter pieces between the bifurcations, so as to bring the subdivisions closer together; also in having larger and deeper sinuses in its first radials for the reception of the second.

We are much inclined to believe there is a little group of species having essentially the form of body, and the peculiarities of the arms we have described, and that it will probably include *Cyathocrinites Saffordi*, the arms of which are unknown.

Locality and position. Crawfordsville, Indiana. Keokuk division of the Lower Carboniferous series. The specimen from which our description was made out belongs to the collection of Mr. Corey.

POTERIOCRINITES (ZEACRINUS?) CONCINNUS, M. and W.

Body wider than high, rather rapidly expanding upward from the column. Base small, basin-shaped, about three times as wide as high, and truncated about three-fourths its breadth below by the facet for the attachment of the column. Basal pieces wider than high, pentagonal in form, and expanding upward from the column, which is rather stout, round, and composed near the base of thin pieces. Subradials of moderate size, not thickened or tumid, four hexagonal, and one on the anal side heptagonal. First radials as wide as the subradials, but shorter, pentagonal, and truncated their entire breadth above. Second radials as wide as the first, but scarcely more than half as long, all transversely oblong in form. Third radials in the posterior and anterior lateral rays, of nearly the same size and form as the first, but of course with the sloping sides above. On these sloping sides they each support two unequal arms, the posterior one of which in one of the posterior lateral rays is smaller than the other, and can be seen to bifurcate on the fourth piece, while the other bifurcates on the second piece, and its subdivisions divide again at various distances above, several times, so as to make altogether about thirteen or more subdivisions in this ray. The anterior main division of one of the anterior lateral rays can also be seen to bifurcate on the fifth piece above the third radial, and one of its branches subdivides at different distances above into three subdivisions, and the other into four. Anterior ray simple to the eighth piece, the pieces between the first and last being short and somewhat wedge-form, while the last is pentagonal and supports two arms, each of which can be seen to bifurcate at least once some distance above. Anal pieces with the usual double alternating arrangement, the lowest piece being obliquely inserted between the upper sloping sides of two of the subradials, and partly under one side of one of the first radials, while a contiguous piece on the left above is supported on an upper truncated side of one of the subradials, and the latter are succeeded by others that connect with the base of the proboscis.

Arms long, slender, very straight, and gradually tapering; slightly convex on the dorsal surface, and flattened so as to fit closely together on each side, with all their divisions running up parallel, or showing scarcely any divergence at the bifurcations, and all composed of short wedge-formed pieces; axillary pieces not more protuberant than the others. Pinnulæ small, and arising one from the upper part of the longer side of each arm piece, alternately on each side, and rather closely approximated to each other.

Surface, in well preserved specimens, finely and obscurely granular, the granules showing on the arms (as seen under a magnifier) a tendency to arrange themselves in longitudinal rows, or to assume vermicular forms. Sutures between all the pieces merely linear.

Entire length of arms and body, 2·80 inches; height of body to the top of first radials, 0·27 inch; breadth about 0·43 inch. Thickness of column, at its connection with the base, 0·17 inch.

This species seems to combine, to some extent, the characters of *Poteriocrinites* and *Zeacrinus.* In general habit, especially in the somewhat flattened and closely contiguous characters of all the divisions of its arms, all around, when folded together, as well as, to some extent, in their mode of division, it reminds one of many species of *Zeacrinus.* In the form of its body, however, and particularly in having three primary radials, instead of only two, in each of the anterior lateral and posterior lateral rays, and about eight below the first bifurcation in the anterior ray, as well as in the general form of its body, it agrees more nearly with the typical forms of *Poteriocrinites.* We know of no species liable to be confounded with this when specimens can be seen with its arms well preserved.

Locality and position. Keokuk division of the Lower Carboniferous series, at Crawfordsville, Indiana. The typical specimen belongs to Mr. Corey, of Crawfordsville, to whom we are indebted for the loan of it.

SCAPHIOCRINUS DEPRESSUS, M. and W.

Body small, somewhat basin-shaped, about twice as wide as high to the top of the first radials, broadly truncated and concave below, with but slightly expanded or nearly vertical sides. Base occupying the concavity of the under side, and apparently flat or concave. First radial pieces about as high as wide, a little convex, rising vertically, except below, where they curve abruptly inwards to connect with the base; all seen, presenting pentagonal general outlines on their outer faces. First radial pieces nearly twice as wide as high, pentagonal in form, and truncated their entire breadth above for the reception of the second radials. Anal pieces unknown. Second radials longer than wide, strongly constricted in the middle with steeply sloping sides for the support of the arms above. Arms simple from their origin on the second radials, slender, and composed of long, rounded, somewhat constricted joints, which are obliquely truncated at the ends, with the upper end of all projecting, alternately on opposite sides for the support of long, very slender tentacles, composed of long joints.

Breadth of body, near 0·30 inch; height, 0·15 inch. Arms apparently about 1·12 inches in length, and only 0·05 inch in thickness at the constricted part of one of the lower joints; first four joints 0·32 in length.

In its depressed body, with nearly vertical sides, and broadly truncated, concave lower part, this species seems to resemble *S. unicus*, of Hall, as near as can be determined from a description alone. It differs, however, in having the arms simple from their origin on the second radials, with long instead of very short joints. It is peculiar in the broadly truncated and concave character of its under side, as well as in the slenderness of its arms and pinnulæ. The latter are also remarkably distant from each other, owing to the length of the arm joints.

Locality and position. Crawfordsville, Indiana. From the Keokuk division of the Lower Carboniferous series.

ZEACRINUS? ARMIGER.

Body small and depressed, or nearly basin-shaped, but with the under side rounded, and concave in the middle. Base very small and nearly or quite hidden in the concavity of the under side. Subradial pieces comparatively large and curving under below, but not tumid or convex; three with a general pentagonal outline, but probably having a sixth obtuse angle at the middle of each below; the other two, on the anal side, presenting a general hexagonal form, but truncated by the anal pieces in such a manner as to present a heptagonal form, exclusive of the very obtuse angle probably existing at the middle of the under side of each. First radial pieces twice as wide as high, pentagonal in form, and truncated across their entire breadth. Second radials as high as wide, each bearing two arms on their superior sloping sides, and developed into a long, slender, rounded, mucronate spine, which is directed nearly horizontally outward. Anal pieces small, and arranged in a double alternating series, the first on lowest piece being somewhat cuneiform and wedged obliquely down between one of the subradials and the under side of the first radial on the left, so as to touch, by a very short side, the next subradial on the left; second anal piece resting on the short truncated summit of one of the heptagonal subradials, and connecting on the right with one of the first radial pieces, and on the left with one of the upper sides of the first anal piece, and another piece resting on the latter. Above these, others continue on up to connect with the base of the ventral extension of the body. Arms unknown; surface smooth; sutures not impressed.

Breadth of body, 0·39 inch; height of same to top of first radials, 0.17 inch; length of spines formed by the extension of the second radials, 0·40 inch.

In the peculiarity of having its second radial pieces developed into long slender spines, this species agrees with *Zeacrinus(?) mucrospinus* of McChesney, from the upper Coal-measures, and may be regarded as a representative form of that curious Coal-measure species, in the upper part of the Lower Carboniferous. It differs, however, specifically, from Prof. McChesney's species, not only in being much smaller and more delicate, but in having its subradial pieces much shorter in proportion to breadth and distinctly less produced and pointed at the ends. Its anal pieces are also very differently arranged, the first or lower one being wedged down obliquely under the first radial on the *left*, instead of under that on the *right* of the anal series, as in *Z. mucrospinus.* It is the first American species of the *Cyathocrinidæ* we have ever seen with this reversed arrangement of the anal series, though Prof. McCoy has represented a similar arrangement of these parts in an analogous form from the Carboniferous rocks of Scotland. Until the arms of this crinoid can be seen, it is not possible to determine whether or not it belongs properly to the genus *Zeacrinus.*

Locality and position. Pope County, Illinois. Chester division of the Lower Carboniferous.

ZEACRINUS (HYDREIONOCRINUS?) ACANTHOPHORUS, M. and W.

Body below the top of the first radial pieces much depressed, or nearly saucer-shaped, but concave below. Base very small and almost entirely hidden in the concavity of the under-side when the column is attached. Subradial pieces small, four of them included in the concavity of the under side and projecting horizontally outward into rather acute angles between the first radials, so as to present a subtrigonal general outline, though they are really hexagonal, their lateral and inner edges being connected with each other and to the base, so as to form four very short sides with five obscure angles; fifth one larger than the others, proportionally longer, and curving upward at the outer end, which is truncated so as to form a short side for the support of one of the anal pieces. First radial pieces comparatively large, widening rapidly from below to the top, which is truncated evenly the entire breadth, and about twice as wide as the greatest height, all curving under to connect with the subradials below in such a manner that the body rests upon them when placed on a plane surface with the column removed. Second radials a little smaller than the first, nearly twice as wide as long, pentagonal in form, with lateral margins short and not constricted; each supporting two arms on its superior sloping sides. Arms rather slender for a species of this genus, not being wide enough to be in contact laterally all around when raised vertically; rounded on the dorsal side, rather rapidly tapering, and, so far as can be seen in the typical specimen, all bifurcating on the second piece; below the bifurcation the two pieces are each about as long as wide, the upper one being sometimes slightly constricted around the middle; arm piece above the bifurcation rather slender, longer than wide, rounded, and distinctly constricted around the middle.

First anal piece about twice as long as wide, and wedged so far down under one side of one of the first radials, by the side of the largest subradial, as to come nearly or quite in contact with the very small base. Second anal small and resting upon the short upper end of the larger subradial, between the upper part of the first anal on the right and the first radial on the left; above these the alternating series continues up to connect with the ventral extension.

Ventral prolongation, or so-called proboscis, about equaling the apparent length of the arms, comparatively rather narrow and sub-cylindrical below, but widening rather gradually upward above to the summit, where it flares suddenly out all around to about the breadth of the body below, its top being nearly flat, or much depressed, and composed of small, unequal, convex pieces; while each one of the marginal row of these top pieces, all around, extends horizontally outward in the form of a sharp spine about two-thirds as long as the entire transverse diameter of the flattened top itself.* Plates forming the sides of the ventral portion, below its flattened spiniferous crown, probably more or less costated, or sculptured, in perfect examples, but the specimen seen is not in a condition to show this, though the usual pores can be seen passing through the sutures between the plates. Surface of body and arms apparently smooth.

Height of body to top of first radials, about 0·18 inch; breadth of do. 0·65 inch; height to top of ventral portion, including the body, 1·20 inches; breadth of the flattened top of the ventral portion, exclusive of the free marginal spines, about 0·50 inch; whole breadth across same to the extremities of the spines.

The form of the body and the arrangement of the anal pieces of this species are very similar to those of our *Z. discus*, from the Upper Coal-measures, but its under side is more decidedly concave, its first radial pieces proportionally higher, and separated by decidedly deeper sutures. Its subradials are also proportionally smaller. From *Z ? mucrospinus*, of McChesney, it is at once distinguished by not having its second radial pieces developed into spines, and by the different structure of its arms.

Locality and position. Fulton County. Associated with the lowest coal bed of the Illinois Coal-measures.

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* On comparing this Crinoid with Prof. de Koninck's figure of the type of his genus *Hydreionocrinus* (*H. Woodianus;* Bull. de l'Academy Royale de Belgique, 2me serie, tome III, pl. ii), we have been much impressed by the remarkable resemblance of the large ventral extension of its body with its depressed or flattened crown, surrounded by a series of marginal spines directed horizontally outward, to the part in Prof. de Koninck's type supposed by him to be formed by the lateral coalescence of the arms, in such a manner as to form a kind of cylindrical extension of the body upward. In our species, however, there are unquestionably well developed, free arms, independent of this part. It would be such an anomalous structure for a Crinoid belonging to the *Cyathocrinidæ*, and otherwise so similar to *Zeacrinus* and *Poteriocrinites* as *Hydreionocrinus* is, to have no traces of free arms, that we are tempted to make the inquiry, whether Prof. de Koninck's specimen may not have had its arms broken away and the lower parts of the rays on which they rested accidentally pressed in so as to appear to support the ventral extension; or, in other words, so as to give this part the appearance of being actually composed of the arms themselves united laterally and crowned by a vault? If this upward prolongation of the body was really composed of the arms united laterally, and there were no free arms, with the usual ambulacral openings at their bases, the whole visceral cavity would seem to have been hermetically sealed, excepting perhaps the minute lateral pores we have found to exist in the ventral extension of many analogous forms. Prof. de Koninck distinctly states that he was unable to find any traces of an anal or buccal opening in his type, and we have been equally unable to find any traces of such openings in any of the numerous specimens of *Poteriocrinus*, *Scaphiocrinus*, *Zeacrinus*, *Cœlocrinus*, and other analogous forms we have seen, that are provided with a similar large ventral extension of the body. *But in all these types there are well developed free arms, with ambulacral openings at their bases.* It will be remembered that the genus *Haplocrinus* was supposed to have its arms united to form a kind of conical vault, until Müller discovered a species with true free arms independent of this part.

If *Hydreionocrinus* really possessed free arms, it would otherwise agree so exactly with *Zeacrinus* that it would seem to be impossible to separate them even subgenerically: in which case Troost's name would probably become a synonym under *Hydreionocrinus*, as Prof. de Koninck's name was, we believe, published a few months earlier than Dr. Troost's. It is to be hoped that those who may have an opportunity to examine other specimens than those studied by Prof. de Koninck, of the typical species of *Hydreionocrinus*,* will examine them very carefully to see if some remains of free arms cannot be found.

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* *Hydreionocrinus? globularis*, de Kon., seems to us to belong to a distinct genus nearly allied to *Agassizocrinus*, which in some species has its base distinctly divided into five parts.

EUPACHYCRINUS BOYDII, M. and W.

Body much depressed, or twice and a half as wide as high to the top of the first radials, rounding inward above the second radials, and under to the very profound central concavity below; composed of thick, strong, slightly convex plates. Base very small, and deeply sunken in the concavity of the under side. Subradials comparatively large, convex and curving upward above, and under below, and then again upward into the concavity of the under side, where each of them has a mesial indentation or notch; each presenting a general pentagonal outline, excepting two on the anal side, which are modified for the reception of the anal pieces. First radial pieces about twice as high, convex, and equaling the subradials in breadth; all pentagonal in form. Second radial pieces convex, about half as large as the first, which they do not quite equal in breadth, although they are in contact with each other laterally all around, thus giving a contracted appearance to the body just above the first radials; each about twice as wide as high, pentagonal in form, and bearing on one superior sloping side an arm, while on the other there rests a smaller secondary radial bearing two arms; thus making, as far as can be seen, three arms to a ray, or if the same structure exists in all the rays, fifteen to the entire series. First, or subanal, rather large, nearly quadrangular in form, and resting between the sloping upper sides of two of the subradials, under one side of the first radial on the right, and connecting with the second radial on the left; but apparently not always extending up far enough to have its upper angle truncated by one of the succeeding anals above. Second anal piece considerably smaller than the first, and resting upon the upper truncated side of one of the subradials; above these two or three smaller pieces appear between the arms. Surface smooth. Sutures between the body-plates rather deep.

Arms slightly convex on the outer side, with lateral margins flattened and straight, so as to fit closely together when raised up vertically; each composed below of a single range of wedge-formed pieces, but soon passing into a double alternating series above.

Breadth of body across the middle, 0·90 inch; do. across the second radials, 0·64 inch; height to top of first radial pieces, 0·40 inch.

This is a very neat, symmetrical crinoid, unlike any other known to us, and remarkable for having its much depressed body rounding in above, at the top of its first radial pieces, so as to be very distinctly narrower across above the top of the first radials than below. Its sides also round very neatly under below, and so far into the deep concavity of the under side that the lower (inner) ends of the subradial pieces curve upward into the mesial concavity nearly as far up as their outer or uppper ends. It seems to be the same form figured by Prof. Yandell and Dr. Shumard, in their "Contributions to the Geology of Kentucky," (see fig. 4 a, b), without a description or name, from near Grayson Springs, Kentucky. The specific name is given in honor of Dr. Boyd, of Chicago, to whom we are indebted for the use of the last specimen seen.

Locality and position. Chester, Illinois. Chester division of the Lower Carboniferous limestone series.

HOMOCRINUS ANGUSTATUS, M. and W.

Body below the first radial pieces more or less obconic, or somewhat constricted below the middle. Base forming a narrow cup, sometimes nearly as high as wide, with vertical sides; composed of convex pieces, once and a half to nearly twice as wide as high. Subradial pieces as long as the basals, or sometimes a little longer, and always wider; more or less convex, all hexagonal excepting one on the anal side, which is heptagonal. First radial pieces nearly one-third wider than high, being as wide as the subradials, but shorter, and not so tumid; all pentagonal, with the upper side truncated their entire breadth. Succeeding radials, of which there are three in each of the rays seen,* as wide as the first, but much shorter, or only one-third to one-fourth as long as wide, thus forming free arms so wide as to be nearly in contact all around, excepting on the anal side; last or fourth radial supporting upon its superior slightly sloping sides, the first divisions of the arms, which, at least in one of the posterior, and one of the lateral rays, bifurcate on the third piece, while some of the divisions appear to divide again on the fourth piece. which is as far as they can be traced in the specimens examined. Column large, or nearly two-thirds as wide as the base, at its connection with the latter; but suddenly tapering downward, and, at least in one of the examples, ending with the sixth piece in a rounded point, evidently showing this individual to have been free at maturity. Connecting, or upper joint, of the column in the only two examples seen, very thick, and in one quite tumid.

Height to summit of first radial pieces, 0·48 inch; breadth of do., 0·50 inch; height of base, 0·20 inch; breadth of do., 0·24 inch; breadth of rays below the first division, 0·17 inch.

This species seems to be most nearly related to *H. polydactylus* of Shumard, from which it differs in the remarkable narrowness of its base, and the proportional greater thickness of its column. It also differs in having only three to four primary radials to each ray, instead of five to six.

Locality and position. Mount Carroll, Illinois. Cincinnati Group of Lower Silurian.

Genus CODONITES, M. and W.

In the Proceedings for April of last year, page 84, we proposed, in a note, to found a new genus under the above name, for the reception of *Pentremites stelliformis*, of Owen and Shumard. This genus agrees with *Pentremites* in structure, excepting that its openings corresponding to those usually called the ovarian apertures (*Hydrospires*, of Mr. Billings), instead of forming with the larger opening, usually called the anus, five round apertures, appear at the surface as ten elongated slits, widest at the upper and inner ends, and situated one on each side of each of the so-called pseudo-ambulacra.† Again its aperture, corresponding to that usually considered the anus in *Pentremites*, is proportionally larger, more remote from the center of radiation, and completely disconnected from the so-called ovarian opening on each side of it. As in *Pentremites*, the central hiatus is covered by small plates in perfect specimens, and from this little disc of plates two rows of minute alternating pieces are seen to extend out, so as to cover each of the little ambulacral furrows, passing along the middle of each pseudo-ambulacral area and under the central disc, into the covered central aperture. These little covering plates of the furrows probably extended the whole length of the pseudo-ambulacra, but were doubtless movable, or capable of opening along the middle, being in fact marginal ambulacral pieces.

As in the genus *Pentremites*, we also observe in this type three pieces anchylosed to the bottom of the busasal pieces, with the sutures between them exactly coinciding with those separating the three busas pieces; these we propose to call supplementary basal pieces.‡ The internal folds, or compressed

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* The right posterior ray seems to be an exception to this statement, as it *appears* to have only three radials including the first, with the second one nearly as large as the first. Its parts, however, are not well preserved.

† We regard these, as elsewhere stated, as really recumbent arms, similar to those of some Cystoids.

‡ Mr. S. S. Lyon was the first author, so far as we are informed, who called attention to these lower pieces in *Pentremites*; and he showed that they are really separable from the basal pieces, in some cases (See Owen's Geol. Report of the Kentucky Survey, vol. 3, p. 468). He, however, regarded these pieces as the true base, and those usually so considered, as subradials. At one time we were inclined to adopt this view, as has been recently done by Mr. Billings, in an interesting paper on the structure of the Blastoids and other types, published in the American Journal of Sciences and Arts, for July, 1869. The fact, however, that these lower pieces do *not alternate with the range above*, that *Mr. Lyon's* view

tubes of thin calcareous matter under the pseudo-ambulacra, and connecting with the inner ends of the slits representing the so-called ovarian pores, are also constructed as in *Pentremites*, excepting that here there are twelve of these tubes under each pseudo-ambulacral area, while we have not seen more than eight in any of the true *Pentremites*, nor more than four in *Granatocrinus*, though we are not positively sure that these numbers will always be found to hold good as generic distinctions.

Compared with *Codaster*, the type under consideration is found to differ in having only two of the slits mentioned in each of the anal and interradial areas, instead of about eight to sixteen ; while it has these slits equally in the anal and interradial areas, instead of only in the latter, as in *Codaster*. It also differs from that genus in having the internal folds or compressed tubers, under the so-called pseudo-ambulacra, instead of extending under the whole interradial areas.

Since proposing this new genus, we have received from Mr. Wachsmuth a fine specimen of another species of this type, which, although widely different specifically, from the typical species, still exhibits very clearly the same generic characters, as will be seen from the following specific description :

CODONITES GRACILIS, D. and W.

Body comparatively small, pentagonal-suboval, longer than wide, the widest part being at the lower extremities of the so-called pseudo-ambulacral fields, which terminate a little below the middle. Supplementary base small, very short, or only appearing to be composed of a single tripartite joint of the column. Base low, or near three times as wide as high, expanding rapidly upward, and pentagonal in outline, as seen from below ; basal pieces of moderate size, two pentagonal and one hexagonal. Radial pieces nearly twice as long as wide, with a general oblong outline, though they are a little wider in the middle than above or below ; while the superior lateral angles are a little truncated by the anal and interradial pieces, and the lower end is rounded, or somewhat obtusely augular in outline at the middle ; all rather distinctly convex below the middle ; so called pseudo-ambulacral sinuses narrow, and very slightly tapering,—extending down a little below the middle, where they each terminate at a little pointed projection, which is directed horizontally outward, so as to add to the pentagonal form of the body, as seen from above or below. Anal piece of moderate size, wider and more obtuse below than the interradials, and narrowed above, with a comparatively large anal opening, nearly dividing it a little below the middle, where it is very contracted.* In-

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would require should be considered subradials, would alone be an objection to this conclusion. It is also worthy of note, that when these lower pieces are removed, we find the next range of pieces above closed together, so as to form the bottom of the visceral cavity, as true basals. Again in those species of *Granatocrinus*, like *G. Norwoodii*, with a deep concavity in the under side, we find the pieces corresponding to those Mr. Lyon thinks are the subradials, as it were, pushed inward, and forming a little pyramid in the bottom of the visceral cavity, precisely as we see the true basals in various types of Crinoids with a sunken base. In addition to this, although adult specimens of the type here under consideration have this lower part, supposed by Mr. L. to be the true base, as solid as in the true *Pentremites*, young individuals show that it is *actually composed of five or six of the upper joints of the column enlarged and anchylosed together*. Similar enlargements of the upper joints of the columns of various types of Crinoids are known to occur, as, for instance, in *Forbesiocrinus* and its allies, in *Poteriocrinites*, *Apiocrinites*, etc. It is true, that in these the enlarged part is not divided longitudinally by sutures, as in *Pentremites*, *Codonites*, etc. This fact, however, will be seen to be of less importance when it is remembered that there are examples of true Crinoids with the column longitudinally divided; such, for instance, as in *Barycrinus*, where we see the whole column divided into five sections longitudinally, through its whole length. And here the five sutures of the column coincide with those between the five true basal pieces, exactly as the *three* sutures between the supplementary basal pieces in *Codonites* and *Pentremites* coincide with those between their *three* basal pieces.

* We have several times thought we could see indications of sutures dividing the anal piece of *Codonites stelliformis* and *Granatocrinus Norwoodii* into three pieces. That is, a transverse suture at the anal opening, and a longitudinal one dividing the upper or inner half into two pieces. Some casts of the interior of *G. Norwoodii* seem to show this distinctly.

terradials more than twice as long as wide, the widest part being below, while the central region is much contracted, and the upper part, like that of the anal piece, somewhat dart-shaped, and a little concave, with a smaller tubercle occupying the middle of the little concavity.

So-called pseudo-ambulacral fields rather narrow, somewhat convex, with mesial or ambulacral furrows rather wide and deep, particularly above the middle; pore or arm-pieces, about twenty-two on each side of each area; lancet pieces very narrow, but thick, and rather deeply furrowed along the middle above, where they form the bottom of the ambulacral furrows; farther down, the pore pieces close in so as nearly or quite to cover the lancet pieces at the lower end. Elongated slits corresponding to the openings usually called ovarian apertures in *Pentremites*, widest at the upper end, and extending down apparently three-fourths of the length of the pseudo-ambulacral areas, so very close to the margins of the latter as scarcely to leave more than a thin intervening space above, and apparently none below. Central hiatus very small, and doubtless covered by minute plates in perfect specimens.

Surface distinctly ornamented with very regular, well-defined striæ, running parallel to the upper margins of the basal pieces, and to the inferior and lateral margins of the radials. Along the margins of the pseudo-ambulacral areas, narrow flattened, or very slightly concave spaces are seen extending along the surface of the radial pieces, and corresponding to the rather broad, deep furrows seen occupying the same position in the typical species, *C. stelliformis*. (Column and pinnulæ unknown.)

Height, 0·60 inch; breadth, about 0·50 inch.

This species, although agreeing with *C. stelliformis* in the important characters distinguishing this genus from *Pentremites* and *Codaster*, differs so materially in form and other specific characters, as to render a comparison unnecessary. In general form it much more nearly resembles the true *Pentremites* than the typical form of *Codonites* does. It must be very rare, as we are not aware that more than the one specimen has ever been found.

Locality and position. Lower division of the Burlington group of the Lower Carboniferous, at Burlington, Iowa. Mr. Wachsmuth's collection.

PENTREMITES BURLINGTONENSIS, M. and W.

Body attaining a medium size, ovoid, or ovoid-subglobose, depressed and short below, and rounded and more produced above. Supplementary base very small, or only one-fourth as wide as the base, rounded and firmly anchylosed to the true base; short, or apparently composed of not more than three anchylosed segments from the upper end of the column. Base of moderate size, much depressed, or having the form of a pentagonal dish. Radial pieces once and a half as long as wide, rather narrow below, and widening upward to near the middle, above which they are very slightly contracted to the top; each divided three-fourths of its length by its rather wide pseudo-ambulacral sinus. Anal and interradial pieces very small, exposed part presenting an elongate rhombic outline, the upper part being more elongate and acute than the lower. So-called pseudo-ambulacral areas* wide, moderately convex, tapering rather gradually below the middle, and more abruptly above; so-called pore pieces about 35 on each side of each area, less than half as long, transversely, as the breadth of the exposed part of the lancet pieces at their widest part, nearly transverse above, but becoming somewhat oblique toward the lower part of the area; supplementary pore pieces small. Lancet pieces exposing a wide, lanceolate form, being widest above the middle, gradually tapering below, and contracting abruptly above; each with its mesial or ambulacral furrow rather wide and deep, and minutely crenate within; transverse

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* Although we use here the usual term for these parts, we really regard them as recumbent arms, similar to those seen in some *Cystoidea*.

furrows well defined, and also minutely crenate. Central hiatus small. So-called ovarian openings small, and those distinct from the anal opening appearing at the surface as four pairs of closely approximated elongate-oval pores. Anal opening comparatively large, and, as usual in the genus, including one of the pores on each side. Surface ornamented with five parallel striæ, running as usual in allied species.

Height of one of the smaller, less globose specimens, exclusive of the little supplementary base, 0·50 inch; breadth, 0·49 inch. Height of a large, more ventricose specimen, 0·87 inch; breadth of do., 0·84 inch.

This species has much the form and general appearance of the common *P. Godoni*,—so much so, indeed, that those who give wide limits to species would probably fail to observe any well defined differences. On comparison, it will be found to differ, however, in the following characters, viz.: In the first place, its pseudo-ambulacral areas are more convex, and not bounded by near such sharply elevated margins of the radial pieces. Its pore pieces are also larger, and scarcely more than half as numerous as in *P. Godoni.* Its anal and interradial pieces are likewise decidedly smaller than in that species, while it also presents the well-marked difference of having its so-called ovarian openings with each pair appearing at the surface, as two closely approximated, but distinct elongate-oval pores, instead of as a single round, larger opening. It moreover holds a much lower geological position than *P. Godoni.*

It is the first true, typical *Pentremite* we have seen with each pair of ovarian pores (so-called) appearing as two distinct pores at the surface. It must be quite rare, as only three specimens have come under our observation.

Locality and position. Upper division of the Burlington group of the Lower Carboniferous, at Burlington, Iowa. No. 387 of Mr. Wachsmuth's collection.

OLIGOPORUS COREYI, M. and W.

Body small, subglobose, or apparently depressed-globose, and deeply sulcate; composed of moderately thick plates; apical region sunken. Interambulacral areas twice as wide as the ambulacral, very convex, and rounded over from side to side; composed at the middle by six ranges of plates, which decrease in numbers to apparently about three ranges, at the upper and lower extremities of the areas. Ambulacral areas deeply furrowed along each side, and rising into a rather prominent ridge along the middle; composed of somewhat irregular plates, as to size and form, but clearly showing but two rows on each side of the mesial zig-zag suture, the outer range being generally a little shorter in the transverse diameter than the inner; the two pores of each piece situated near its outer end. Apical disc unknown. Oral aperture, as seen in the test, comparatively large. Surface unknown.

Height, as near as can be determined from a somewhat distorted specimen, about 1·65 inches; breadth near 2 inches.

This species is most nearly allied to *O. Danæ*, but differs not only in being much smaller, and apparently more depressed in form, but in having much more deeply furrowed ambulacral areas, and only six rows of interambulacral pieces at the widest part of the areas, instead of eight, the plates being also larger in proportion to the size of the body.

From our *O. nobilis* it will also be readily distinguished by its much smaller size, and more deeply sulcate ambulacral areas, which are also proportionally much wider. It also differs in having six rows of interambulacral pieces at the widest part of each area, instead of only five.

Locality and position. Crawfordsville, Indiana; from the Keokuk division of the Lower Carboniferous series. The specimen from which the description was made out belongs to Mr. Corey, of Crawfordsville, Ind., to whom we have dedicated the species.

BRACHIOPODA.

CHONETES ? ? MILLEPUNCTATA, M. and W.

Shell attaining a large size, very thin, transversely subsemicircular, or more than twice as wide as long, with lateral extremities rounded. Dorsal valve nearly flat, or but slightly and evenly concave; hinge line a little less than the greatest transverse diameter; cardinal process rather stout, with an obscure linear ridge (or sulcus) extending forward from its base nearly to the front; cardinal edge slightly thickened within, so as to form a faintly defined ridge extending about half-way from the cardinal process toward each lateral margin, but apparently without any trace of sockets for the reception of teeth in the other valve; muscular and other internal markings unknown; surface ornamented by numerous slender, exceedingly regular, closely arranged concentric lines, exactly parallel with each other and the front and lateral margins. (Ventral valve unknown.)

Length of a medium sized specimen, 1·30 inch; breadth, 2·95 inches. Largest examples seen, 2·10 inches in length, and of nearly the same proportional breadth as the others.

Of this very remarkable shell we have seen six or eight specimens, and some fragments of others. All of the specimens yet found, however, are dorsal valves only, the ventral valve being entirely unknown to us. The slightly worn, or more or less weathered condition of the specimens has obliterated whatever muscular or other internal markings there may have been. In most cases only patches of the shell itself remain, though, even in these cases, the general outline and external surface markings are very distinctly defined in the matrix. All of the specimens show a rather obscure, linear, internal sulcus extending from the base of the cardinal process nearly to the anterior margin. This, however, is probably caused by the accidental removal of a linear mesial ridge, because we also see it equally defined in impressions of the external surface of the valve left in the matrix, just as would be the case if a firm internal ridge had been, owing to the thinness of the shell, as it were, pressed through. The concentric lines of the surface present an extraordinary degree of regularity, both in size and arrangement. On a medium sized dorsal valve about sixty of these lines may be counted, while some of the largest show twice as many. They are of exactly the same size and distance apart on all the specimens, and of so nearly the same size on all parts of the same individual as to appear to the eye to be exactly uniform throughout. By measurement, however, we count fifteen of them in the space of 0·25 inch near the margins of a medium sized specimen, and twenty in the same space near the beak. In a few instances we have observed what seemed to be the faintest possible traces of a few larger radiating lines or costæ, near the middle of the anterior margin of the dorsal valve. None of the specimens show the cardinal process entire, but as far as its characters can be made out it seems to have been much as in *Chonetes.*

The most remarkable character of this shell, however, remains to be mentioned. That is, its extremely coarse punctate structure, and the unusually close arrangement of the punctures, which are so large as to be nearly visible to the unassisted eye. As seen by the aid of a common single pocket lens, they present, on the inner surface of the dorsol valve, much the appearance and arrangement of the cells of a delicate *Chætetes*, the spaces between them being much less than the diameter of the pores themselves. They appear to diminish rapidly in size, however, as they approach the external surface, near which they seem to be a little less than the diameter of the spaces by which they are separated. As we have never seen such a shell structure as this in any species known to possess the characters of the genus *Chonetes*, nor indeed in any other known Brachiopod, we are very strongly inclined to believe our shell really belongs to an undescribed genus. The fact that there appear to be no sockets in the cardinal margins of its dorsal valve, for the reception of teeth in the other valve, would also favor the conclusion that it is not a true *Chonetes*. Nevertheless, we prefer to place it provisionally in that genus, until specimens can be obtained showing the dorsal valve, with the muscular impressions and other generic characters. Should it be found, as we believe it will, to be a new generic type, we would suggest for it the name *Isogramma* (ἴσος, equal; γραμμὴ, a line), in allusion to the remarkable equality of the concentric lines of the surface.

To whatever genus our shell may really belong, it is evidently very closely allied, even specifically, to a form figured by Mr. Davidson from the Carboniferous limestone of Scotland, in his valuable Monograph of the British Carboniferous Brachiopoda, vol. ii, part v, pl. lv, fig. 13. Mr. Davidson referred his shell, with much doubt, on the authority of Dr. De Koninck, to *Chonetes concentrica*, of the latter author. We fully concur with Mr. Davidson, however, in the opinion that it is distinct from Prof. De Koninck's* species, as it is much longer, and instead of being marked with only 12 to 13 large concentric ridges, has about 37 regular, more concentric lines. In our species there are about twice the number of lines seen on that figured by Mr. Davidson, in specimens of the same size; and as this character is remarkably uniform in all our specimens, we cannot believe it otherwise than a specific difference.

Locality and position. Upper Coal Measures, Marion County, Illinois, where it occurs associated with nearly all the fossils in the Upper Coal Measures of Kansas and Iowa, and in those in Nebraska referred by Profs. Marcou and Geinitz to the Permian.

SPIRIFER FASTIGATUS, M. and W.

Shell attaining a rather large size, moderately convex, very transverse, or distinctly more than twice as wide as long; greatest breadth on the hinge line; lateral extremities very attenuate and acutely pointed in young specimens, but becoming more obtuse in larger individuals; front and anterior lateral margins broadly and rather regularly rounded. Dorsal valve nearly as convex as the ventral; beak depressed, somewhat incurved, and scarcely projecting beyond the hinge line; area of rather more than usual breadth for that of a dorsal valve, and arched with the beak; mesial fold commencing at the beak scarcely larger than one of the ribs on each side of it, but increasing gradually in breadth and prominence to the front, where it is occupied by about six to eight costæ, which, however, coalesce into one or two at the beak. Ventral valve regularly convex over the central region, and somewhat compressed toward the lateral extremities; mesial sinus commencing narrow and very small near the beak, and widening and deepening gradually to the front, where it is occupied by about eight depressed, rounded costæ, which, like those on the fold of the other valve, coalesce with those on each side and with each other, so as to leave but one that extends quite to the beak; beak rather depressed and not projecting much beyond the hinge line, arched or moderately incurved; area rather narrow, and extending with almost perfectly parallel margins, quite out to the lateral extremities of the hinge, marked by the usual transverse and vertical striæ; foramen wider than high, rather large, and extending close up under the rather flattened apex of the beak.

Surface ornamented by depressed, rounded, bifurcating or trifid, more or less fasciculated costæ, about five of which, on each side of the mesial sinus and fold, are larger than the others, and divide before reaching the front, so as to form as many fasciculi of two or three ribs each, the furrows between which are less strongly defined than those between the bundles. Toward the lateral extremities some eight or ten smaller, simple, obscure costæ, that do not reach the beaks, may also be counted, on each side of each valve, gradually becoming obsolete near the ends. Crossing the whole, fine obscure, undulat-

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* It is due to Prof. De Koninck that we should state that it was only doubtfully he referred the English specimen to his species.

ing striæ, and a few stronger marks of growth may be observed on well preserved specimens, the striæ, however, excepting near the front and lateral margins, not being readily seen without the aid of a magnifier.

Length, about 1·45 inches; breadth, 2·20 inches; convexity, about 1·50 inches; height of area at the beak, 0·26 inch.

We have had specimens of this fine *Spirifer* under consideration for a long time, and after numerous careful comparisons, we have been unable to identify it with any of the described species. It seems to be most nearly allied to our common Coal-Measure species *S. cameratus*, of Morton, with which it agrees in the fasciculated character of its costæ, and in general appearance. It differs, however, in several characters by which it can be readily distinguished on comparison. In the first place, its larger fasciculated costæ are distinctly broader, and rather more depressed on the anterior slope of its valves, and proportionally less numerous. The incurved apex of the beak of its ventral valves is always less abruptly curved, and much more flattened. The most marked character, however, is to be observed in its cardinal area, which has its margins almost perfectly parallel, instead of being always sloping from the beak to the lateral extremities. The same characters and its narrow mesial fold and sinus distinguish it from the variety of *S. striatus*, with somewhat fasciculated costæ. It belongs to the subgenus *Trigonotreta.*

Locality and position. Keokuk division of the Lower Carboniferous series, at Crawfordsville, Indiana.

STRICKLANDINIA DEFORMIS, M. and W.

Shell (internal casts) longitudinally subovate, oblong, or sometimes in young examples nearly or quite as wide as long; valves very nearly equal, and sometimes showing very faint traces of an obscure mesial prominence on the dorsal valve, and of a corresponding depression near the front of the ventral valve; hinge line straight, and less than the breadth of the valves; surface apparently smooth, or only with concentric lines on the young shell, while casts of the adult show some traces of a few obscure, irregular, radiating ridges. Beaks, area and finer surface markings unknown.

Length of a young internal cast, 1 inch; breadth, 0·97 inch; convexity, 0·46 inch. Length of a large specimen, 1·93 inches; breadth, 1·58 inches; convexity, 1 inch.

This shell varied so greatly in form at different stages of its growth that it is very difficult to give a description that will convey a correct idea of it. Young examples from 0·70 to one inch in length, approach a broad obovate form, being truncated on the hinge line, and somewhat narrowly rounded at the middle of the front; while their posterior lateral margins are more or less straightened and inflected, as we often seen in *Rensselaeria.* After attaining this size and form, the shell, judging from some four adult examples we have seen, seems to have suddenly commenced a more vigorous growth, mainly forward and antero-laterally, so as to attain a much larger size, leaving the valves of the young shell, as it were, opened and spread upon the beaks, thus completely destroying the symmetry of the entire shell. At this stage of growth the shell has a curious constricted appearance at the connection of the young and adult shell; while the whole breadth posteriorly is only that of the young shell, and the widest part is then some distance in advance of this, and the posterior margins are strongly flattened by their sudden inflection towards each other there.

The casts show that the chamber in the beak of the ventral valve is of moderate size, and supported upon a rather short mesial septum. The socket processes are seen, by their impressions in the cast, to be small, not united, and scarcely assuming the character of plates; while the crural processes extended from their inner lower sides forward nearly parallel, so as to leave two slender, deep perforations in the cast. The surface of the young shell appears to have been smooth, or only marked with the concentric striæ, but internal casts of large individuals sometimes show very faint traces of a few broad irregular, radiating, flattened ridges.

It is probable that this species is most nearly allied to *Stricklandinia Davidsoni*, of Billings (Geol. Mag. vol. v, pl. iv, fig. 1, 1 a), which, in some stages of its growth, it resembled rather nearly in form. In all the large examples, however, it differs extremely from that shell, in its remarkable narrowness across the umbones, and its truncated or flattened posterior lateral margins. Its front is also less produced and less narrowly rounded in the middle in these larger specimens.

Locality and position. All the specimens of this species we have seen were found loose in Carroll County, Illinois, near rocks of the age of the Niagara group. They are all in the condition of white quartz casts of the interior.

LAMELLIBRANCHIATA.

Monotis ? gregaria.

Shell very small, extremely thin, compressed, oblique, varying from truncato-suboval to subcircular; hinge line less than the breadth of the valves; auricles small, obtusely angular, undefined by any sinuosity of the margins; posterior (?) margin rather regularly rounded in outline, and rounding into the pallial margin; anter. (?) border prominent below and rounding into the base, but straight and ascending with a backward slant to the hinge; beaks located near the middle of the hinge line, above which they seem scarcely to rise. Surface marked by extremely fine concentric striæ, and a few somewhat larger furrows or wrinkles of growth, crossed on the anterior (?) half of each valve by small radiating costæ, generally not defined near the anterior (?) margin.

Antero-posterior diameter, 0·25 inch; height, or diameter at right angles to the hinge, 0·20 inch; convexity unknown.

Of this little shell we have numerous specimens, all compressed to entire flatness on the surfaces of the laminæ of shale, many of them lying with the two valves opened out and connected by their hinge margins. As thus seen, their small size causes them to appear much like the valves of *Posidonomia*, or those of some of the little phyllopod Crustacea. This form, however, is found, on closer examination, to be different, while their radiating costæ also indicate different affinities. Some individuals are a little wider proportionally, in their antero-posterior diameter, than that from which the above measurements were taken, and these have much the outline of the left valve of some forms of *Aviculopecten*, excepting that the auricles are not in the slightest degree defined (in either valve) by any traces of a marginal sinus.

It is possible that this little shell may be a true *Lima*, as it has much the form of some species of that genus, and there certainly are in the Western Coal-measures, two or more species apparently agreeing in all respects with that genus. If a *Lima*, of course the side we have described as the anterior must be the posterior, and *vice versa.* The reasons for doubting its relations to the genus *Lima*, however, are, (1), its extreme thinness; (2), the fact that it seems to have a prismatic structure; and (3), its very small size. It is possible, however, that the extremely thin fibrous shell, as we now see, may consist only of the external lamina, left after the decomposition of the inner layers. If so, and the fibrous appearance is really the original structure, it would more probably belong to some perhaps undescribed genus, allied to *Aviculopecten*, of the family *Aviculidæ.* If a true *Monotis*, it would be the only known species of that genus in our Carboniferous rocks, the common Western Coal-measure shells usually referred to that genus, belonging to a very distinct group, to which Beyrich has applied the name *Pseudomonotis.*

Locality and position. Jacksonville Shaft, Illinois, from near the middle of the Coal-measures.

AVICULOPECTEN SPINULIFERUS, M. and W.

Shell of medium size, rather compressed, having a moderately oblique, truncato-suboval, or suborbicular outline. Hinge apparently nearly equaling the antero-posterior diameter of the shell; ventral margin forming a broad semiovate outline, being more abruptly rounded up behind than in front. Posterior wing rather pointed, apparently not quite as long as the rounded margin of the valves below, from which it is separated by a rounded sinus. Anterior wing compressed, narrow, as long as the anterior margin of the valves; in the left valve pointed, and separated from the margin below by a narrowly rounded, rather deep sinus. Beak of the left valve moderately prominent, and placed a little in advance of the middle. Surface of same valve ornamented with numerous, distinct, unequal, radiating costæ, arranged usually with one or two smaller ones between each two of a somewhat larger series, the latter of which bear numerous little round, regularly arranged, somewhat oblique spines; crossing the whole there are also numerous minute concentric striæ. (Right valve unknown.)

Height of left valve, about 1·50 inch; antero-posterior diameter, near 2 inches.

This is a delicate species, apparently with thin valves. Its costæ seem to be nearly equally developed over the whole of the left valve, including the wings, or at any rate the posterior one. On the body of this valve, near the ventral margin, about five of the larger spiniferous costæ, and some six or eight of the smaller non-spiniferous ones may be counted in the space of half an inch. The spines of the larger costæ were short, round and pointed (not being formed by vaulted laminæ of growth), and arranged along these costæ at regular intervals of about 0·10 inch apart, those at the ventral margin being larger than the others, and projecting a little below the border. An impression of a part of the anterior wing of the right valve shows that it was distinctly costate, two or three of the costæ running nearly parallel to the hinge margin, and bearing short spinules.

In casts of this species without the spines, the costæ present much the same subnodose appearance as those seen on *A. fallax* (=*Pecten fallax*, McCoy, Carb. Foss. Ireland, pl. 14, fig. 2), but that species seems to have had no spines. It is also much less oblique, and higher in proportion to its antero-posterior diameter.

We place this species in the genus *Aviculopecten* only provisionally, as we have not seen its hinge. It is highly probable that there are a number of undescribed genera among the Palæozoic species usually included in the genus *Aviculopecten*, or wrongly referred by some to the genus *Pecten*.

Locality and position. Crawfordsville, Indiana. Keokuk division of the Lower Carboniferous series.

Genus CARBONARCA, Meek and Worthen.

Shell (as determined from internal casts) equivalve, inequilateral, very convex, transversely oblong or oval; umbones gibbous, prominent, and strongly incurved with subangular or prominent posterior slopes; valves closed all around, with smooth margins; ligament external; cardinal margin a little arched, with, at the anterior extremity in each valve, two rather oblique, comparatively stout teeth, and extending along its entire length from immediately behind these, a row of minute interlocking teeth or crenulations, as in *Arca*.

This genus seems to belong to the *Arcidæ*, near *Isoarca*. It differs, however, very decidedly from that genus, in having, in addition to the small interlocking crenulations along the whole length of the hinge, two well developed and independent larger teeth at the anterior end of the hinge. The specimens seen are all internal casts, but an impression of the hinge of a right valve, in the matrix, shows its characters very clearly. There is no gradation from the series of minute teeth into the two large ones at the anterior end of the hinge, the first of the smaller series immediately behind the two larger ones being as minute as any of those farther back, so that the contrast between the two sets of teeth is well marked and abrupt. The hinge margin was doubtless provided with a cardinal area, but as we only have internal cast, it has not yet been seen.

CARBONARCA GIBBOSA, M. and W.

Shell transverse, short-oblong, very convex; posterior side wider than the other, and vertically subtruncated; anterior margin rather narrowly rounded; ventral margin nearly straight along the middle, but sloping and rounding up anteriorly, and more abruptly behind, cardinal edge equaling two thirds of the whole length; larger anterior teeth inclined forward and upward, and those of the small series ranging nearly vertically, or slightly inclined forward anteriorly, and a little backward behind; umbones gibbous, but with their outer and upper surfaces a little flattened, so as to impart a slightly subangular or prominent character to the post-umbonal slopes; immediate apices of the strongly incurved beaks placed about one-fourth the entire length of the shell behind the anterior extremity. Surface markings unknown.

Length, 0·82 inch; height to top of cardinal margin (of cast) behind the beaks, 0·56 inch; do. to top of umbones, 0·65; convexity of the two valves, 0·57 inch.

Locality and position. Springfield, Illinois; Upper Coal measures. Also same horizon at Lasalle, Ill. The specimens from the latter locality are, in some examples, more depressed and oblique than the typical form from near Springfield, and these may possibly belong to a distinct species, if the differences noted are not due to accidental distortion. If really distinct, this form might be called *C. depressa.*

* MACRODON DELICATUS, M. and W.

Shell small, about twice and a half as long as high, moderately convex, elongate rhomboidal in outline; posterior margin obliquely truncated, so as to be angular at the base; cardinal margin about three-fourths the entire length, and nearly parallel with the base; anterior extremity very narrowly rounded; basal margin nearly straight along the middle, but rounding very gradually upward anteriorly; beaks depressed, and placed about one-fourth the entire length of the valves behind the anterior extremity; posterior umbonal slopes subangular from the beaks obliquely backward and downward, to the sharply rounded or subangular posterior basal extremity, while the spaces behind and above these slopes are compressed or slightly concave. Surface marked by small ridges and lines of growth, which are crossed by raised radiating lines or linear costæ, rather widely separated posteriorly, but more closely arranged, and less strongly defined toward the front part of the valves. (Cardinal area, hinge and muscular impressions unknown.)

Length, 0·45 inch; height, 0·19 inch; convexity, about 0·11 inch.

This little shell will be readily distinguished from its associate, formerly described by us under the name *M. tenuistriatus*, by its much more oblique and less gibbous form; but more especially by having its linear radiating costæ separated by wide intervening spaces, instead of being closely crowded together. Indeed, we know of no species with which it could be confounded.

Locality and position. Springfield, Illinois. Upper Coal Measures.

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* In the Proceedings of the Chicago Academy of Sciences for March, 1866, p. 17, we suggested that in case the name *Macrodon*, Lycett, could not be retained for this genus, because it had been previously used by Muller for a genus of fishes, that it might be called *Parallelodon.* In that case the name of this species would have to be written *Parallelodon delicatus.*

MODIOLOPSIS SUBNASUTA, M. and W.

Shell rather small, elongate, narrow and slightly arcuate, rather distinctly convex, the most gibbous part being along the posterior umbonal slopes, above the middle; dorsal and ventral margins slightly diverging posteriorly, so as to make the widest (highest) part of the valves nearest the posterior end, while the most sinuous part of the ventral margin is a little in advance of the middle; anterior end narrow, a little produced, with an oblique forward slope of its upper margin, to its narrowly rounded extremity; posterior margin somewhat cuneate, with an oblique truncation more or less convex in outline, to the posterior basal extremity, which is narrowly rounded; cardinal margin long and a little arched; beaks much depressed, and placed rather nearer the anterior edge than to the middle; posterior umbonal slopes prominent, and forming an obtuse ridge, which extends obliquely backward to the posterior basal edge of each valve; anterior muscular scar comparatively large, round, shallow, and placed near the edge of the valves; small pedal muscular scars distinct just above those of the anterior adductors; surface of internal cast showing moderately distinct, irregular, concentric undulations, which are most strongly defined below, and in front of the posterior umbonal slopes, on the flattened or concave flanks.

Length, 1·31 inch; height, 0·50 inch; convexity, 0·40 inch.

This is a neat, symmetrical shell, resembling *M. nasuta*, Conrad (sp.), but differs in having the narrowed anterior end less produced, the beaks being placed farther forward; while its posterior end is broader, and obliquely truncated, instead of being rounded. Its general outline is more like that of *Orthonota contracta*, Hall (Palæont. N. Y., vol. i, pl. 32, fig. 8), though its lower margin is less distinctly sinuous, its beaks more depressed, and its posterior margin more oblique; while it wants the oblique dorsal wrinkles seen on casts of that shell, being a true *Modiolopsis*.

Compared with foreign species, our shell is found to be very closely allied to an English Upper Silurian species described by Mr. Salter under the name *M. platyphylla*. Our shell, however, has the anterior end narrower and more produced, with more prominent posterior umbonal ridges.

Locality and position. Galena Limestone of the Lower Silurian, in Carroll County, Illinois.

SCHIZODUS AMPLUS.

Shell attaining a large size, as determined from internal casts, moderately convex, oblong-suboval in outline, or about one-fourth of its length longer than high; anterior side short, rounding from above the middle into the base; outline of ventral margin forming a broad semi-ovate curve; posterior margin nearly vertically subtruncated, but rounding abruptly into the dorsal margin above and into the base below; cardinal border nearly straight, and sloping very slightly from the beaks posteriorly; beaks much depressed, nearly anterior, incurved, closely approximated, and directed forward and inward. Posterior adductor muscular scar shallow, rather large, suboval, and located close up under the posterior extremity of the hinge; anterior do., smaller, deeper, subovate, and placed very near the anterior margin a little above the middle, with rather distinct, nearly detached, pedal muscular scars at their upper ends. Posterior umbonal slopes with each a distinct sulcus extending from the beaks obliquely backward and downward, becoming wider and more shallow as they descend, so as to die out before reaching the posterior basal margin. (External surface unknown.)

Length of cast, 2·60 inches; height of do., 2·15 inches; convexity, 1·56 inches.

This is the largest species of *Schizodus* (if it belongs to that genus) we have yet seen. Our only specimen is an internal cast, giving no idea of the nature of the hinge. From its general appearance, however, and the nature of its muscular and simple pallial scars, together with the remains of its external ligament, we can have little doubt in regard to its being a *Schizodus*. In size and general outline, its internal cast closely resembles *Amphicœlia Leidyi*, described by Prof. Hall from the Upper Silurian Limestone at Bridgeport, near Chicago. It has, however, obviously no near relations to that shell. For a *Schizodus*, its beaks are unusually depressed and oblique. We know of no other species resembling it in general form.

Compared with *Schizodus occidentalis* (= *Cypricardia ? occidentalis*, Swallow), which seems to be a true *Schizodus*, and agrees with our shell in size, it is at once distinguished by its much more depressed beaks, less convex valves, and broadly round posterior outline. Prof. Swallow's species also occurs in our Coal Measures, but we have yet only seen it from a higher part of the series, at Lasalle.

Locality and position. Seaville, Fulton County, Illinois, Coal No. 1, of Coal Measures.

SCHIZODUS (PRISCONAIA) PERELEGANS, M. and W.

Shell attaining a moderately large size, ovate-subcordate in general form, very gibbous, apparently closed all around, rather thin. Anterior and posterior views presenting a neat cordate outline. Pallial margin semiovate, the most prominent part being in front of the middle; anterior side very short, and rounding up abruptly from below; posterior side narrowly rounded, or subangular; hinge line apparently rather short. Beaks very gibbous, prominent, pointed, and strongly incurved, so as to bring their points nearly or quite in contact; located near the anterior margin; lunule excavated, but not distinctly defined. Surface appearing to the unassisted eye almost perfectly smooth, excepting very regular, raised, concentric striæ, or small costæ, on the anterior part of the valves, with obscure traces of smaller striæ crossing the same. Under the highest power, however, that can be well used as a hand magnifier, the whole surface is seen to be covered by an extremely minute, perfectly regular, crowded sculpturing, as if made by crowded, microscopic cross lines, entirely invisible even under a good common pocket magnifier.

Height of a small specimen, 0·90 inch; convexity of same, 0·80 inch; length, about 1·18 inches. Other imperfect specimens show that the species sometimes attained three or four times the size of that from which the above measurements were taken.

The extremely minute ornamentation mentioned on this shell may be properly considered microscopic, being entirely invisible under a good common pocket lens, by the aid of which it shows apparently an almost polished surface. When examined in a strong light, however, with a sufficiently high magnifier, the finer markings are seen to present a delicacy, fineness, regularity, and beauty that art could scarcely attain, even by the aid of the most accurate mathematical ruling machine. In some specimens this delicate marking has been, in places, partly removed, as if by the abrasion of an extremely thin external layer, or epidermis, to which it appears to be, to some extent, confined. When this layer has been in this way removed, however, traces of the same marking can be seen on the surface of the layer beneath, by the aid of a sufficiently strong magnifier.

The stronger concentric, raised striæ, or small costæ, seen on the anterior part of the valves, do not run exactly parallel to the very obscure marks of growth, but cross them obliquely. On following these little costæ back toward the gibbous part of the valves, they all seem to become suddenly obsolete; but on examining them with a common pocket lens, they are seen to be continued over the convex part of the valves, as minute, impressed hair lines, very regularly disposed, so as to leave comparatively rather wide spaces between. Here, too, they are seen not to be exactly parallel to the faint marks of growth, and on following them back they are observed to terminate suddenly at a similar impressed hair-line, descending with a slight curve from the posterior side of each beak, apparently to near the middle of the posterior margin. Above and behind this oblique line, some three, four, or more similar parallel, regularly disposed lines also extend from the back part of each beak to the posterior margin of the valves, thus marking off, as it were, a kind of corselet, somewhat similar to what we see in *Protocardia*, excepting that these radiating lines are scarcely visible to the unassisted eye and separated by spaces many times their own breadth. In the spaces between these posterior radiating lines the magnifier also shows numerous minute, raised granules, but these are much larger and more prominent than, and entirely distinct from, the extremely minute, crowded sculpturing seen by the aid of a higher magnifier over the whole of the surface. It is probably mainly due to the fact that the specimens have had the whole substance of the shell replaced by brilliant iron pyrites, that the delicate ornamentation mentioned has been preserved.

We know nothing of the nature of the hinge and interior of this beautiful shell, and consequently only place it provisionally in the genus *Schizodus*. We only know that other species found in our Coal-measures, agreeing apparently in their internal characters with *Schizodus*, show the same kind of very minute sculpturing seen on this. As some of these are very similar to the type on which Mr. Conrad proposed to found his genus *Prisconaia*, from the Coal-measures of Kansas, we requested him to examine his typical specimen to see if any traces of such minute surface markings could be seen on it by the aid of a strong magnifier, and he informed us that his shell shows the same sculpturing. As this marking is very peculiar, and entirely unlike any ornamentation we have ever seen on any other fossil, even in examples of various types in exactly the same state of preservation, it is not improbable that our shell will be found to possess the internal character of Mr. Conrad's type.

Locality and position. From the shales over the fifth coal bed of the Illinois Coal-measures, at Danville, of that State. For the use of the typical specimens we are under obligations to Dr. J. C. Winslow, of Danville.

Genus CLINOPISTHA, M. and W.

Shell transversely oval, very thin, rather ventricose, equivalve, very inequilateral; beaks near the posterior extremity and directed backward; that of the right valve with its immediate apex curving under the beak of the left, which seems to be a little excavated for the reception of the same; ligament external, short, rather prominent, and occupying an oval, or lance-oval shallow cavity, formed by the slight inflection of the margins of the valves immediately behind the beaks; valves with their margins smooth within and closed all around; hinge apparently edentulous; surface polished, and with merely fine lines or marks of growth, sometimes crossed by very faint traces of radiating lines, which are usually obsolete externally, but often seen on internal casts; muscular impressions shallow, those of the anterior side larger than the others and subquadrangular in form, with a faint oblique ridge along the upper margin; posterior muscular impressions oval and occupying somewhat flattened spaces near the truncated margin; pallial line faintly marked and simple.

Although we have not seen very clearly the hinge of this shell, we have been able, from impressions of it in the matrix, to be satisfied that it is not crenated, as in the *Nuculidæ* and *Arcidæ;* and we believe it to be entirely edentulous. In regard to the affinities of this type, however, we are left in doubt. In its thinness, and the posterior position of its beaks, as well as in the form and general appearance of its muscular and pallial impressions, and its apparent edentulous hinge, it reminds one of *Solenomya*. It differs, however, from that genus, remarkably, in its short gibbous form, rather ventricose beaks, and general physiognomy, as well as in wanting the internal ridge extending downward from the beaks, and apparently the partly internal ligament. It likewise differs from the existing species of *Solenomya* in having the valves neatly closed all around, and the beak of its right valve curving under that of the left. In this latter character, however, it agrees with the carboniferous species of the West that have been referred to *Solenomya*, all of which have the point of the right beak passing under that of the left, and Prof. McCoy has noticed this character in British carboniferous species. These carboniferous species, however, agree almost exactly in all their other known characters with recent typical species of *Solenomya*, even to the general form and the presence of an internal ridge under each beak, and differ as widely from our shell in all respects, excepting in the one character of the slight inequality of the beaks, as the recent species of *Solenomya* do.

We are aware that Prof. King proposed to found a genus *Janeia*, for the reception of the carboniferous and permian forms usually referred to *Solenomya*, and afterwards abandoned it, after farther comparisons with recent species. As he makes no allusion to the inequality of the beaks, it is probable he had no specimens of the fossil species with the two valves united. From this character, and the greater excavation for the internal part of the cartilage, under and extending a little in advance of the beaks, in the Western carboniferous species referred to *Solenomya*, that we have had an opportunity to examine, we think it not improbable that the name *Janeia* may yet have to be retained for the carboniferous and permian species, at least in a subgeneric sense. Even in this case, however, it would still be necessary to establish a new genus for our shell, in consequence of the differences already noted, which separate it nearly as widely from the forms for which *Janeia* were proposed as from the recent *Solenomyæ.*

It is proper to remark here, that some able conchologists, to whom we showed specimens of the form under consideration, did not think it related to *Solenomya*, as typified by the recent species, but more nearly allied to the *Anatinidæ*. As none of the numerous specimens of internal casts we have had an opportunity to examine, however, showed any indications of a cavity or process for the reception or attachment of an internal cartilage, as we see in that family, and the pallial line has no traces of the sinus usually (though not always) seen in the same, its relations to the *Anatinidæ* seem to us doubtful.

CLINOPISTHA RADIATA, *var.* LEVIS.

Edmondia ? radiata, Hall,(?) 1858. Iowa Geological Report, Vol. I, part 2, Palæont., p. 716, pl. 29, fig. 3.

Shell oval, approaching oblong, the height being from two-thirds to three-fourths the length, moderately convex in young examples, and becoming ventricose with age; anterior side much longer and wider than the other, regularly rounded in outline; posterior side very short, rather narrow below the beaks, and vertically truncated; ventral margin most convex a little in advance of the middle, thence round upward into the front, while behind the middle, or nearly under the beaks, it is slightly contracted, or sinuous; dorsal outline subparallel to the base, the margins of the valves being erect anteriorly and rounding into the anterior margin; hinge line rather short; beaks rather ventricose, rising above the hinge line and placed about half way between the middle and the posterior end; posterior umbonal slopes often rendered somewhat prominently rounded by a slight flattening of the valves behind the beaks, near the truncated margin; ligament lance-oval in form, rather short, and placed immediately behind the beaks, exactly in the position we would expect to see the lunule if the shorter side of the valves were the anterior; surface with a polished appearance, and generally only showing fine lines of growth, but in some examples also having obscure radiating marks near the ventral margin, which are nearly always defined on internal casts.

Length of a large specimen, 1 inch; height, 0·62 inch; convexity, 0·51 inch.

A careful examination of the typical specimen (now before us) of *Edmondia? radiata*, of the Iowa Report, cited above, has clearly satisfied us that it has the ligament on the short side, and certainly belongs to the genus we have here described, and we can scarcely doubt that it is really the same species as our type. As none of our numerous specimens, however, show the radiating markings so distinctly as that described by Prof. Hall, we have concluded to view them as belonging to a smooth variety, which we propose to designate under the name *levis*.

Locality and position. Near base of Coal-measures, Seaville county, Illinois. Prof. Hall's specimen came from the upper beds of the Coal-measures at Grayville, Illinois.

GASTEROPODA.

DENTALIUM ANNULOSTRIATUM, M. and W.

Shell very small, rather distinctly tapering and slightly arched; aperture and section circular; surface ornamented by regular, distinct, annular costæ, which pass around a little obliquely and are separated by rounded furrows of the same breadth as the costæ themselves.

Length of a specimen incomplete at both ends, 0·28 inch; diam. at the larger end, 0·06 inch; do. at the smaller end, 0·04 inch.

Of this delicate little shell we have seen but a single specimen, which is imperfect at both ends. At a first glance, it might be mistaken for another more common species, of near the same size, occurring at the same locality, and which we are inclined to think is the *D. Meekianum* of Geinitz. On examining it under a magnifier, however, it can be at once distinguished by its comparatively strong, regular costæ, instead of mere microscopic lines of growth.

It is with some doubt that we have referred this little shell to the genus *Dentalium*, because its small size and comparatively strong, regular costæ give it much the appearance of the non-spiral part of the shell of a *Cæcum*. It is more arched, however, and more tapering than we generally see in the body part of shells of that genus, which are likewise, we believe, unknown in any of the Palæozoic rocks.

Locality and position. Shales over the Danville Coal, holding a position about the horizon of the fifth Coal of the Illinois; or, near the upper part of the lower Coal-measures.

STRAPAROLLUS (EUOMPHALUS) PERNODOSUS, M. and W.

Shell attaining a rather large size, subdiscoidal, or with the spire nearly on a plane with the upper outer edge of the body volution; umbilicus broad, moderately deep, and showing all the inner turns; volutions about five and a half, flattened-convex, and a little oblique on the broad periphery, but distinctly carinated near the outer side above (the carina being rugose), while a little outside of the middle below, they are prominent and ornamented by a row of moderately distinct nodes, of which about sixteen may be counted on the last turn; those on the last half of the outer volution becoming nearly or quite obsolete toward the aperture. Upper side of each whorl flattened and sloping distinctly inward from the carina to the suture; lower side of same sloping rapidly inward and slightly concave just within the prominent nodose ridge, and then rounding rather abruptly into the umbilicus. Surface marked by distinct lines, and at some places ridges, of growth; on the upper side of the whorls these lines pass obliquely outward and forward from the suture to the carina, thence obliquely backward in crossing the periphery; while in crossing the under side they curve a little backward.

Greatest breadth of a specimen not quite complete at the aperture, 2·50 inches; height at the aperture, about 0·84 inch.

This species is evidently closely allied to *E. nodosus*, of Sowerby, from the Mountain Limestone of England. It may be distinguished, however, by its much less convex periphery, and by having its carina on the upper side of the outer whorl, nearer the outer side, as well as more rugose from an apparent effort to form irregular nodes. The true nodes around the prominent portion of its under side are more numerous than in *E. nodosus* (which has ten instead of fourteen to each whorl), and differ in being more irregular and nearly obsolete on the last half of the outer whorl.

Even if Montfort's name, *Straparollus*, must be adopted for this genus, we think Sowerby's name, *Euomphalus*, should be retained in a subgeneric sense for these planorbicular species with angular whorls, such as *E. pentangulatus*, for which it was at first proposed.

Locality and position. Alton, Ill. Lower Coal-measures.

STRAPAROLLUS (EUOMPHALUS) SUBQUADRATUS, M. and W.

Shell attaining nearly a medium size, discoid or subplanorbicular, concave, and showing all the whorls both above and below, though the concavity is deeper below than above. Periphery nearly flat, rather broad, and generally more or less oblique, with a distinct carina at the upper and lower edges, the former of which is more acute than the other, and irregularly crenate, or subnodose, and projecting nearly upward, while the lower one is a little rounded and projects outward. Volutions five or six, not embracing, nor coiled exactly in the same plane; on the upper surface, each sloping, with a slight concavity, distinctly inward from the marginal carina to the suture, while the flattened outer side usually has an obscure longitudinal sulcus near the upper and lower angles, the upper one being a little deeper than the other. On the under side the whorls slope gently inward from the marginal angle, so as to form a broad, depressed-subconical umbilicus. Surface marked with rather strongly defined lines of growth, which, at places, become subimbricating, or form little irregular ridges. In crossing the upper side of the whorls, these lines start, at first, nearly at right angles out from the suture, but curve a little backward as they approach the marginal angle; and immediately after crossing this angle, and passing downward upon the nearly vertically flattened periphery, they are deflected a little forward, but soon after pass straight down to, and over the lower marginal angle to the under side, where they extend obliquely backward and inward, with a rather distinct curve, to the immediate vicinity of the suture, and then curve a little forward. Aperture and sections of interior of whorls subcircular, or transversely oval.

Greatest breadth of a specimen with apparently about one-third of the outer volution broken away, 1·25 inches; height, 0·50 inch. When entire, this specimen was probably not less than 1·43 inches in breadth.

From the foregoing description, it will be seen that this shell is nearly allied to the common western Coal Measure species figured and described by Prof. Hall, in his Jour. Geological Report, under the name *Euomphalus rugosus* (not *E. rugosus*, Sowerby*). Indeed, it is so nearly like that species that we at one time suspected that it might be only a gigantic and more ventricose variety of the same. Yet on comparing our shell with an extensive series of good specimens of *E. rugosus*, Hall, it is found to be greatly larger than any known authentic examples of that shell, its breadth being a little more than twice and a half that of the usual mature examples of *E. rugosus*. Its umbilicus, and the concavity of its upper side, are also proportionally deeper, particularly the former, while the flattened outer side of its whorls is broader, and generally less oblique. Its lines of growth also differ in being rather distinctly deflected backward at the marginal angle of the upper side, so as to indicate an obscure sinus of the margin of the lip at the termination of this angle, though

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* If Sowerby's species is really congeneric, the American form called *E. rugosus* by Prof. Hall might be distinguished by the specific name *subrugosus*.

there are no traces of a band, as in *Pleurotomaria*. This character would probably place the species in the group for which the name *Schizostoma* was proposed by Bronn, but palæontologists have generally regarded the type for which that name was proposed, as not being sufficiently distinct from *Euomphalus* to be retained as a separate genus.

Associated with the above, a single specimen was found, of the same size, and agreeing very closely with that from which the foregoing description was drawn up, but differing in being proportionally wider, and not so oblique on the periphery, which is also more convex in the middle. The angle of its under side also differs in being a little farther in from the outer margin, and directed downward, instead of outward, while its umbilicus is proportionally deeper. This may be a distinct species, but without more specimens for comparison we do not feel willing to regard it as being entitled to a separate name.

These shells, including *E. rugosus*, Hall, and *E. catilloides*, Conrad (sp.), are related to *E. quadratus* of McCoy, from the Mountain Limestone of Ireland, though sufficiently distinct specifically. At one time we were inclined to think that *E. rugosus*, Hall, and *E. catilloides*, Conrad, together with a few others, should be separated from *Euomphalus*, under a distinct generic name; but after seeing the large species we have here described, which so closely connect these little shells with such forms as *E. pentangulatus* and *E. catillus*, upon which the genus was originally founded, we can no longer doubt that all of these shells really belong to one genus. This series of intermediate forms connecting the small, nearly planorbicular species mentioned above with the typical forms of *Euomphalus*, shows clearly that none of the former belong to the articulate genus *Spirorbis*, as has been thought by some, but that they are really true mollusks.

Locality and position. Upper Coal Measures, Montgomery County, Illinois. Collected by Mr. G. C. Broadhead, of the Illinois Geological Survey.

SUBULITES INFLATUS, M. and W.

Shell very ventricose, subfusiform; volutions about five and a half to six, those of the spire moderately convex in the (external?) cast; last one very large, ventricose, and composing much the larger part of the whole, produced and contracted below so as apparently to terminate in a short canal; aperture narrow, rhombic and pointed, or angular above and below; suture well defined in the cast; surface unknown.

Height of a specimen with apparently about two whorls at the apex, and portions of the lower extremity of the produced body whorl broken away, 1·85 inches; breadth of body volution, about 1·15 inches.

It is barely possible that this may be a ventricose, fusiform *Murchisonia*, as we only know it from rough casts, apparently of the exterior. As it shows no traces, however, of any revolving band or line, and has much the general physiognomy of *Subulites*, we have concluded to refer it provisionally to that group.

Its most marked character is the large size and very ventricose form of its body volution, in which it resembles some of the Carboniferous species of *Macrocheilus*. It differs from these, however, in the produced and subcanaliculate peculiarity of the lower part of its body whorl.

Locality and position. Galena beds of the Lower Silurian: Carrol County, Illinois.

CEPHALOPODA.

Genus NAUTILUS, Auct.

Subgenus SOLENOCHILUS,* M. and W.

We propose the above name for a group of *Nautili* which we believe to be

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* *σωλὴν*, a channel; *χεῖλος*, lip.

the same as *Cryptoceras* of D'Orbigny, published in 1850. This change of name becomes necessary, however, because Dr. Barrande had used the name *Cryptoceras* for another widely distinct group of *Cephalopoda* in 1846. It is true he has since changed the name of his genus to *Ascoceras*, for the reason that Latreille had applied the name *Cryptocerus* to a genus of *Hymenoptera* in 1804. But if Latreille's name *Cryptocerus* is not considered sufficiently distinct, on account of its different termination, from *Cryptoceras* (which we should think is the case), it would, for the same reason, of course, be equally necessary to change the name of D'Orbigny's group. On the other hand, if we regard Latreille's name as being distinct enough to permit D'Orbigny's name to stand also, or if Latreille's genus is not a valid one, in either case Dr. Barrande's original name *Cryptoceras* would have to be retained for his genus, and, as it has priority of date, it would still become necessary to find another name for the group described by D'Orbigny.

The type of D'Orbigny's group was *Nautilus dorsalis* of Phillips, only known, we believe, from a mere fragment, showing the siphuncle to be marginal, or on the outer side of the curve, as in *Ammonites*.* In this country we already know several Carboniferous species that agree with D'Orbigny's type in the character or position of the siphuncle, and we find in all of these another remarkable peculiarity of the lip on each side. That is, it is drawn so as to form a kind of little canal, or spout-like channel, much as we see in *Argonauta gondola*, Adams. A good example of one of these shells is figured and described by Dr. White and Prof. St. John, under the name *Nautilus* (*Cryptoceras*) *Springeri*, in vol. i, p. 124, of the Transactions of the Chicago Academy of Sciences for 1867; and this may be regarded as the type of the group. It also includes our *N.* (*Cryptoceras*) *Leidyi*, *N.* (*Crypt.*) *capax*, and the species described below, with possibly our *N.* (*Crypt.*) *Rockfordensis*.

The mere fact that these shells have the siphuncle marginal, as in *Ammonites*, would perhaps not alone be a sufficient reason for placing them in a separate group from the typical *Nautili*, since the siphuncle occupies various positions in the different fossil species of the latter. But when we take into consideration the additional fact that the marginal position of the siphuncle in these shells is always accompanied by the peculiar character of the lip we have described, it becomes of more importance.

NAUTILUS (SOLENOCHILUS) COLLECTUS, M. and W.

Shell thin, attaining a moderate size, slightly compressed or subglobose in general form; umbilicus rather small, but deep, perforated, and provided with very abrupt walls, particularly near the aperture. Volutions about one and a half, increasing rapidly in size, and a little wider transversely than their dorso-ventral diameter; moderately embracing, with a subquadrangular section, the angles being rounded, and the lateral and outer or ventral surfaces more or less flattened. Septa moderately concave, distant about one-fourth the transverse diameter of the volutions at the point of measurement, and showing a slight backward curve in crossing the sides and periphery; aperture large, and, as near as can be determined from the specimens, with a subquadrangular or subcircular outline, more or less sinuous on the inner side for the reception of the small inner turn; siphuncle small. Surface smooth, or only showing small lines of growth.

Greatest diameter of a small specimen, with body chamber broken away, 1·70 inch; transverse diameter of same, about 1·25 inch.

As in other species of this group, the small siphuncle is so very nearly in contact with the ventral, or outer side, that in casts with the shell removed it often gives the appearance of a very narrow, deep lobe along the middle of that side. It is easy to see, however, that this appearance is merely produced

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* M. Chenu figures on p. 72, vol. i, of his Manual of Conchology, under the name *Cryptoceras Bowerbankii*, Sowerby, a shell certainly not belonging to D'Orbigny's group as he understood it, but, if correctly figured, belonging to the *Ammonitidæ*.

by the breaking away of a thin part of the matrix between the siphuncle and the outer shell. None of our specimens are in a condition to show the margins of the lip, but some of them show very clearly the commencement of the protuberance, or pinching up of the margin on each side near the umbilicus, evidently terminating at the aperture in the usual spout-like auricles. The lines of growth also show the same, by their flexures on each side.

Specifically this shell is probably most nearly allied to our *N.* (*Solenochilus*) *Leidyi*, from the Keokuk division of the Lower Carboniferous, though it differs in having more rapidly expanding and subquadrangular whorls, which are also slightly embracing at the aperture, instead of being merely in contact. Its volutions, however, are much less rapidly expanding than in our *N.* (*Sol.*) *capax*, or in *N. Springeri* of White and St. John, as well as different from both in their subquadrangular form.

Locality and position. New Providence, Indiana, from a limestone of the age of the St. Louis division of the Lower Carboniferous.

Subgenus TEMNOCHILUS, McCoy.

NAUTILUS (TEMNOCHILUS) LATUS, M. and W.

Comp. *N. nodocarinatus*, M'Chesney, 1865. Illustrations Palæozoic Fossils, pl. 3, fig. 6 (5 by error, in explanations of plate.) Not *N. nodocarinatus* of same author in text of same paper (1860) p. 66.

The only specimen of this fine species we have ever seen consists of about half of one volution, which, being without septa, must belong to the part composing the last or body chamber, originally occupied by the body of the animal. It is broken at both ends, and measures around the curve of the outer side, 8·50 inches, with, at the larger end, a dorso-ventral diameter of 2·10 inches, and a transverse diameter (including the nodes) of 3·60 inches. The dorso-ventral diameter at the smaller end is about 1·60 inches, and the transverse about 2·40 inches. A section of the body volution is transversely subelliptical, with a tendency to an oblong outline; the outer (often called the dorsal) side of the whorl being very broad and flattened convex, and each lateral margin, exclusive of the nodes, being rather narrowly rounded, or a little flattened, while the inner side is a little concave. The broad flattened outer side has two very obscure longitudinal ridges, with a distinctly flattened space between. Along each (so-called) dorso-lateral margin there is a row of prominent flattened nodes, arranged at intervals of about their own greater (antero-posterior) diameter. About sixteen of these nodes occupied each side of the outer or last volution. The inner side of the whorl rounds regularly into the umbilicus, which appears to be wider than the dorso-ventral diameter of the volution at the aperture. The surface is without longitudinal lines, but the striæ of growth are moderately distinct, especially on the broad flattened outer side, where they make a deep backward curve in crossing, so as to indicate the presence of a very deep sinus in the lip on that side of the aperture of the shell.

In the specimen described, the substance of the shell is thin, and scarcely mineralized, though it retains no pearly lustre.

This species resembles very closely the form figured by Prof. McChesney in the memoir cited at the head of the foregoing description, and referred by him (by mistake) in the explanations of his plates, to his *N. nodocarinatus.*

Our shell differs, however, in not having so many nodes, as well as in having a proportionally wider umbilicus, and particularly in having the sides of its whorls rounding regularly into the umbilicus, instead of being subcarinate around its margins.

Locality and position. Carbon Cliff Mines, Rock Island County, Illinois. Lower Coal-Measures.

NAUTILUS (TEMNOCHILUS) WINSLOWI, M. and W.

Shell attaining a moderately large size, subdiscoidal; periphery broad and nearly flat, the middle third being rather distinctly flattened, while on each side of this there is a very slight slope outward to the lateral margins. Umbilicus broad, moderately deep, and showing nearly the full breadth of each inner volution on each side. Volutions apparently about four and a half, with transverse diametar nearly one-third greater than the dorso-ventral; each ornamented around the lateral margins of the broad periphery by about sixteen very prominent, rounded nodes, which project obliquely outward, at an angle about intermediate between the general plane of the shell and that of the broad periphery, those on opposite sides being alternately arranged; from these rows of nodes the sides slope abruptly inward, with a moderate convexity, to their inner margins within the umbilicus. Surface marked by rather well defined lines of growth, which curve gently backward in crossing the sides of the whorls from the inner margin, and make a stronger backward curve in crossing the periphery, so as to indicate the presence of a deep rounded sinus in the outer margin of the lip. (Siphuncle and septa unknown.)

Greatest breadth of a specimen with a part of the outer volution broken away, 4·60 inches; transverse diameter of outer turn, measuring across the periphery without including the nodes, 2·46 inches; do. including the nodes, 2·95 inches; dorso-ventral diameter of the outer volution, 1·66 inches.

This species is evidently closely allied to the last, in form and general appearance, but differs in having its volutions proportionally narrower, measuring at right angles to the plane of the shell. Its most marked difference, however, consists in the form of its nodes, which are round, instead of being distinctly compressed. It seems to be also related to *N. tuberculatus* of Sowerby, but differs from the published figures of that species in having its periphery proportionally broader, and distinctly more flattened; while its nodes are placed nearer the outer margin of the whorls, as well as more prominent. From *N. Occidentalis*, Swallow, (= *N. quadrangularis*, McChesney), it will be readily distinguished by the greater transverse diameter of its whorls, which are also without the flattened sides of that species, and differ in wanting the two mesial rows of nodes on the periphery.

This specific name of this fine *Nautilus* is given in honor of Dr. J. C. Winslow, of Danville, Illinois, to whom we are indebted for the use of the specimen from which the description was drawn up.

Locality and position. Danville, Illinois, from the shale over the fifth bed of coal, of the corrected Illinois section; being near the horizon of the upper part of the Lower Coal-Measures.

NAUTILUS (TEMNOCHILUS) COXANUS, M. and W.

Shell rather small, subdiscoidal, broadly rounded, or depressed convex over the periphery; umbilicus wide, rather deep, perforated, and showing more than three-fourths of the dorso-ventral diameter of each inner turn. Volutions about two and a half to three, increasing gradually in size, wider transversely than dorso-ventrally, very slightly concave along the dorsal or inner side for the reception of the periphery of each succeeding turn within, more or less narrowly rounded (subangular in some small specimens) and ornamented by about fifteen small nodes around the middle of each side, from which point the inner side rounds very abruptly into the umbilicus. Septa separated, on the outer or ventral side, by space about one-fifth or one-sixth the transverse diameter of the volutions at the point of measurement; arching very slightly backward in crossing the periphery. Body chamber composing about half of the outer volution. Siphuncle small, and situated subcentrally, or somewhat nearer the outer side. Surface ornamented with distinct, regular, longitudinal, raised lines, or small costæ, narrower than the rounded furrows between ; those along the middle of the ventral or outer side being smaller and more crowded than those toward the lateral regions ; crossing these are numerous very fine, crowded striæ of growth, which curve strongly backward in passing over the periphery, parallel to the margin of the very profound sinus in the lip on the ventral side.* Aperture transversely oval.

Greatest diameter of a mature specimen, 2·23 inches ; thickness, or transverse diameter, about one inch ; dorso-ventral diameter of last turn near aperture, 0·86 inch.

Among the specimens before us there seem to be two varieties, which may possibly prove to be specifically distinct. One of these, which we regard as the typical form of the species, has the periphery very depressed-convex, while in the other, this part is distinctly more convex or rounded. As they agree, however, apparently almost exactly in all other characters, and both forms vary somewhat in the convexity of the periphery, we are inclined to view this as merely a sexual difference. In the more convex forms the lateral nodes seem to be generally a little more inclined to become slightly elongated in the transverse direction of the whorls, though this character appears not to be entirely constant. In both forms the longitudinal or revolving surface ridges and furrows become nearly or quite obsolete, toward the aperture, on the outer volution.

Internal casts of this species seem to be almost exactly like specimens figured by European authorities under the name *N. tubrculatus*, Sowerby. As that species, however, attains a much larger size, and has, according to Prof. McCoy's description, a very large siphuncle, while none of the figures or descriptions of it we have seen either show or mention the distinct longitudinal, or revolving costæ, so well defined on the surface of our species, we can entertain no doubt in regard to its being clearly distinct. It is true the figures of *N. tuberculatus* alluded to all represent only internal casts, while the longitudinal markings mentioned on our shell are not seen on internal casts ; but it is scarcely possible that such markings would never have been observed, as impressions in the matrix, if not otherwise, had they existed in Sowerby's species.

This species is named in honor of Prof. E. T. Cox, State Geologist of Indiana.

Locality and position. Three miles west of New Providence, Indiana ; from a light gray, brittle limestone, of the age of the St. Louis division of the Lower Carboniferous.

LITUITES GRAFTONENSIS, M. and W.

Shell rather small, with isolated portion discoid, planorbicular, and slightly concave on both sides ; volutions four or more, slightly embracing, increasing very gradually in size, with transverse section nearly or quite circular, excepting the slight concavity on the inner side. Surface ornamented by numerous distinct, very regularly arranged costæ, which cross the sides of the volutions very obliquely backward from the inner side, curving strongly backward as they approach the periphery, and after crossing the middle of the same, again deflected forward as on the opposite side, thus indicating a profound sinus in the outer side of the lip ; the sinus being very narrow, but not exactly angular at its termination, and widening rapidly forward ; fine, somewhat imbricating striæ of growth also run parallel to the costæ. Septa apparently moderately distant and running nearly straight across the sides. Siphuncle and free part of the body chamber unknown.

Greatest diameter of the coiled part, 2·10 inches ; transverse diameter, 0·54 inch ; dorso-ventral diameter of outer turn, about 0·52 inch.

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* This would be the dorsal side according to the nomenclature in most general use.

As we have not seen the siphuncle, or the free part of the body chamber of this species it may, possibly, not be a true Lituite. Still, as there is not the slightest appearance of any obliquity of the volutions, as in the genus *Trochoceras*, we have scarcely any doubt in regard to its being a true Lituite. Compared with *Lituites Marshii*, of Hall, (20th Ann. Rep. Regents Univ., N. Y., pl. 16, figs. 6 and 7,) from the same horizon, at Kankakee, in this State, our species will be at once seen to differ in having its volutions more compactly coiled together, much less rapidly increasing in size, and ornamented with smaller and much more closely arranged costæ. Its costæ also make a stronger or deeper backward curve in crossing the periphery, which is rounded instead of being flattened, as in the *Marshii*. In general appearance it is more like *L.* (*Trocholites*) *ammonius*, of Conrad, from the Lower Silurian, though its costæ are much more oblique, and differ in being separated by rounded furrows quite as wide as the costæ themselves; while its surface shows no traces of the finer sculpturing seen on that shell.

Locality and position. Grafton, Illinois; from a very light drab magnesian limestone of the age of the New York Niagara group. Upper Silurian.

CRUSTACEA.

Phillipsia tuberculata, M. and W.

Attaining a large size. Head and thorax unknown. Pygidium semielliptic, the length being very nearly four-fifths the breadth, very convex; posterior margin obtusely rounded; lateral margins diverging rapidly forward, with convex outlines. Axial lobe well defined, obtuse, and rather prominent behind, and gradually widening forward, with nearly straight sides; rather distinctly more elevated than the lateral lobes, which it nearly equals in breadth at the anterior end, as seen in a direct view from above, but one-fourth narrower than the latter, measuring over the curve of each; showing sixteen or seventeen straight, well defined segment, each of which is provided with six small tubercles, arranged so as to form six rows. Lateral lobes with about fourteen segments each, the very short posterior ones being nearly on a line with the axial lobe, while the others grow gradually more transverse anteriorly, so as to show only a moderate obliquity toward the front; all extending down so as to leave only a very narrow, undefined, smooth marginal space, and each ornamented by from two or three to about twelve tubercles, the number increasing regularly with the length of the segments toward the anterior. Surface between the segments and tubercles smooth.

Length of pygidium, 0·95 inch; breadth, 1·45 inches; convexity, 0·40 inch.

This fine species resembles *P. ornatus*, Portlock, perhaps more nearly than any other, but it attains a larger size, and its pygidium is more broadly rounded behind, with its mesial lobe less rapidly tapering posteriorly; while the rows of tubercles on the segments of its lateral lobes are distinctly more numerous. In general outline, its pygidium more nearly resembles a form figured by Prof. de Koninck, under the name *Phillipsia gemmulifera*, Phillips, (Animaux Foss., pl. liii, fig. 4), though its axial lobe is distinctly narrower, while its lateral lobes are merely provided with tubercles, along the segments, instead of short spines.

Locality and position. Kinderhook, Pike County, Ill. Burlington division of the Lower Carboniferous.

Phillipsia (Griffithides) bufo, M. and W.

Entire outline elliptical, the breadth being to the length as 75 to 130. Cephalic shield forming more than a semi-circle, round in front and nearly straight behind; posterior lateral angles terminating in short, abruptly pointed spines extending back to the anterior edge of the third thoracic segment.

Glabella rather depressed convex, wide anteriorly and narrowing posteriorly to the neck furrow, just in front of which, and connected with the palpebral lobes on each side, it has a single small, obscure lateral lobe; neck furrow broad, and well defined both across the glabella and across the posterior margins of the cheeks; neck segment rather wide, depressed below the level of the highest part of the glabella in front of it. Eyes of moderate size, reniform, nearly as prominent as the glabella, placed but little in front of the continuation of the neck furrow across the cheeks, apparently smooth, but showing, when the outer crust is removed, numerous very minute lenses beneath. Cheek sloping off rather abruptly from the eyes to the thickened margin, which does not continue around the front of the glabella; facial sutures cutting the anterior margin in front of the eyes before, and a little outside of them behind.

Thorax nearly twice as wide as long, distinctly trilobate; mesial lobe but moderately prominent, nearly twice as wide as either of the lateral lobes, its eight segments merely rounded and without furrows. Lateral lobes narrow; pleuræ curving moderately downwards at less than half their length out from the axial lobe, but not distinctly geniculated, each provided with a furrow extending nearly half-way out. Pygidium approaching semi-circular, with the anterior lateral angles obliquely truncated; mesial lobe but slightly wider anteriorly than the lateral; segments about eleven; lateral lobes with eight or nine segments.

Surface finely granular, the granules being most distinct on the glabella, and the segments of the mesial lobe of the thorax.

This species will be at once distinguished from our *P. Portlockii*, from the same horizon, by its much broader and less ventricose glabella, and the peculiar tuberculiform eyes of that species, as well as by the broader and less prominent mesial lobe of the pygidium, in the form under consideration.

Locality and position. Crawfordsville, Indiana. Keokuk division of the lower Carboniferous series.

ASAPHUS (ISOTELUS) VIGILANS, M. and W.

Body small, elliptic in general form, and moderately convex. Head rather more than half as long as wide, approaching a subcrescentic outline, with the posterior lateral angles abruptly rounded or subangular; anterior margin apparently somewhat narrowly rounded; posterior outline broadly and distinctly concave, but rather straight along the middle, without any traces of marginal or occipital furrows. Glabella not rising above the general convexity of the head, and entirely undefined by any traces of dorsal furrows. Eyes situated about their own antero-posterior diameter in advance of the posterior margin, and apparently about half way between the latter and the front, rather widely separated from each other, and very prominent, nearly round, and truncato-sub-conic in form; visual surface elevated almost entirely above the general convexity, and curved around so as to form about three-fourths of a circle, presenting a smooth surface; palpebral lobes as elevated as the eyes, and much contracted, or merely connected with the glabella on the inner side by a narrow neck. Facial sutures extending obliquely outward and backward from the eyes behind, so as to intersect the posterior margin about half-way between a line drawn longitudinally through the middle of each eye, and the posterior lateral margins of the cheeks; and in front, at first curving slightly outward a little in advance of each eye, beyond which point they converge forward so as apparently to intersect the front margin in such a manner as to leave a rather narrow anterior edge to the glabella.*

Thorax longer than the head or pygidium, as measured over the curve of a

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* As the specimen is imperfect here, it is possible these sutures may not reach the anterior margin in front.

rolled-up specimen, showing scarcely any traces of trilobation, and composed of eight segments. Mesial lobe, as indicated by very faint impression on each side of the body segment, very wide and depressed, with segments nearly flat. Lateral lobes very narrow, sloping off regularly from the mesial one on each side; pleuræ without furrows, and with the exposed surfaces seen in a rolled-up specimen, narrowing off laterally very rapidly, with a strong backward curve; all more or less angular at the extremity, the posterior ones being rather pointed; lapping surfaces apparently wide.

Pygidium subtrigonal and of near the same size as the head, entirely without any indications of trilobation or segments.

Whole surface smooth, excepting a minute pitting, most distinct on the movable cheeks.

Length (measuring over the curve of the specimen as rolled together), 2·75 inches; breadth, 1·30 inch; length of head at the middle, about 0·75 inch; breadth between the eyes, 0·47 inch; height of eyes on the outer side, 0·20 inch. Breadth of axial lobe of thorax, 0·85 inch; antero-posterior diameter of each of the first four or five segments of same near middle, 0·15 inch.

This species seems not to be nearly related to any of the described forms with which we are acquainted. Its most marked characters are the prominence of its eyes, and the almost entire absence of any traces of trilobation in its thorax and pygidium, as well as the great breadth of the mesial lobe of the same, as indicated by a very obscure depression, and a minute projection on the anterior margin of each thoracic segment, on a line nearly behind the outer edge of each eye. These little projections do not extend upward, but forward, and fit into corresponding notches in the posterior margin of each succeeding segment in front. As the anterior margin of its head and the posterior edge of its pygidium are in the specimens more or less imperfect, we cannot determine exactly their outlines.

In some respects this species resembles young individuals of *Isotelus megistos*, of Lock, though it differs in not having its cheeks produced into pointed terminations behind, while its eyes are more prominent and situated farther forward, and the mesial lobes of its thorax much less defined and distinctly wider. Its pleuræ also differ in being angular, or a little pointed, instead of rounded at the ends.

Locality and position. Carrol County and Osage County, Illinois. Cincinnati group of the Lower Silurian.

ILLÆNUS (BUMASTUS) GRAFTONENSIS, M. and W.

Attaining a rather large size. Head (as determined from internal cast) transversely subelliptic, as seen from above, when placed with the under side on a horizontal plane, its breadth being to its length very nearly as 50 to 30; moderately convex, the height being rather distinctly less than half the breadth, and the most prominent part a little behind the middle, while the curve over the middle, from its posterior to its anterior margin, forms about a quarter of a circle. Anterior margin, as seen from above, presenting a nearly transversely semi-elliptic curve, and a subrectangular outline, as seen in a side view; lateral margins rather narrowly and regularly rounded in outline, into the posterior side. Axial furrows distinct, converging forward to a point nearly opposite the middle of each eye, where they terminate in little flattened oval impressions. Eyes large, forming nearly semi-circular curves, with their posterior ends as near the posterior as to the lateral margins of the head; each with a broad, very deep, rounded furrow around beneath its outer side, so as to form a kind of obtuse shoulder below, from which the cheeks drop off nearly vertically, with a slight convexity of outline, to the inferior margins; palpebral lobes less elevated than the middle of the glabella, and sloping a little outward, with an even convexity over their whole surface; visual surface forming rather narrow convex bands, and showing (in the internal cast) under a magnifier numerous very minute reticulations. Facial sutures cutting the anterior margin distinctly within a line drawn antero-posteriorly through the inner ends of each eye, and intersecting the posterior margin nearly on a line with the middle of each eye. Rostral shield flat, with a subfusiform outline and obtuse lateral extremities; just three times as wide as its antero-posterior diameter. Surface of the internal cast of the whole upper part of the head without lines or furrows, but rather distinct transverse furrows are seen on the rostral shield. (Body and other parts unknown.)

Length of head, about 1·20 inches; breadth of do., 2·47 inches; height or convexity, 1·05 inch. Length of eyes, 0·55 inch; height of visual surface of same, 0·10 inch; distance between the eyes at posterior and anterior ends, 1·65 inch.

This fine species is perhaps most nearly allied to the common and widely distributed *I. Barriensis* of Murchison. It may be readily distinguished, however, by several important differences in the head, which is the only part yet known to us. In the first place, its head is much wider in proportion to its length, and has its lateral margins, as seen from above, much more narrowly and regularly rounded in outline, so that the cheeks do not project any farther out from the eyes posteriorly than laterally, the outline of the lateral margins having almost exactly the same curve as the eyes themselves. Its rostral shield also has a very different form from that of Murchison's species, being narrower in its antero-posterior diameter, and distinctly obtuse, instead of pointed, at the lateral extremities. Our species likewise shows no traces of the furrows on the cast of the upper side of the head, so strongly marked in *I. Barriensis.*

It is still more widely removed from *I. insignis* of Hall; and we know of no described species having the head so nearly elliptic in outline (transversely) as seen from above, excepting possibly *I. Salteri* of Barrande, which, however. differs widely in other characters, belonging, as it does, to the small-eyed section of the genus.

Locality and position. Grafton, Illinois, from the Niagara division of the Upper Silurian.

DITHYROCARIS CARBONARIUS, M. and W.

We only know this fossil from a specimen showing the caudal appendages. —that is, the telson and stylets.* These are lanceolate in general outline, and rather flattened. The telson seems to be a little shorter than the stylets, and more rapidly tapering toward the extremity. Below it is flat, and has a faint. undefined, obtuse longitudinal ridge along the middle, with on each side an equally undefined, shallow sulcus between this and the lateral margins, which are sharp. On its upper side there is a well defined mesial carina, with a slightly concave slope on each side to the lateral margins, thus presenting much the form of a broad bayonet. The stylets have each, on the flattened under side, about six or seven small longitudinal ridges, and on the upper side a distinct longitudinal mesial carina, between which and the lateral margins there is on each side a smooth rounded concavity or broad furrow; along each lateral margin there are two closely approximated carinæ, one above, and one below, with a narrow rounded sulcus between.

Length of telson, about 0·75 inch; breadth of do., 0·12 inch; length of stylets, about 0·80 inch; breadth of same near the articulating end, 0·12 inch.

This species will be readily distinguished from *D. Scouleri* of McCoy, by its proportionally broader and more lanceolate stylets and telson, the latter of which is also smooth instead of being marked by oblique divaricating striæ, as

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* If the middle one of the three nearly equal caudal appendages in this genus is not articulated at its base, it would only be properly an attenuated terminal part of the telson. and not the whole of that segment.

in the *Scouleri.* Its stylets are also flattened and carinated, instead of being rounded. From Portlock's *C. Colei* it will be distinguished by having the carinæ of its stylets and telson smooth, instead of crenate.

So far as we are informed, this is the first species of this genus found in America. It is another decidedly Carboniferous genus, found in our Coal Measures, directly associated with numerous fossils that occur in the beds on the Missouri, in Nebraska, that have been wrongly referred by some authors to the Permian (Dyas).

Locality and position. Near the middle of the Coal Measures at Danville, Illinois, associated with numerous Upper Coal Measure species.

Descriptions of FOSSILS collected by the U. S. Geological Survey under the charge of Clerence King, Esq.

BY F. B. MEEK.

WASHINGTON CITY, March 21st, 1870.

PROF. JOSEPH LEIDY.

Dear Sir,—I send herewith, to be presented for publication in the Proceedings of the Academy, descriptions of a few of the fossils brought in by the United States Geological Survey under the direction of Clerence King, Esq. You will please state, in presenting the paper, that the Trilobites described in it from Eastern Nevada, are decidedly Primordial types, and, so far as I know, the first fossils of that age yet brought in from any locality west of the Black Hills. Mr. King's collections also establish the fact that the rich silver mines of the White Pine district occur in Devonian rocks, though the Carboniferous is also well developed there. The Devonian beds of that district yet known by their fossils, seem mainly to belong to the upper part of the system. Mr. King, however, has a few fossils from Pinon Station, Central Nevada, that appear to belong to the horizon of the Upper Helderberg limestone of the New York series.

The Tertiary fossils described in this paper, from the region of Hot Spring Mountains, Idaho, came from an extensive and interesting fresh-water Lacustrine deposit, and are all distinct specifically, and some generically, from all the other Tertiary fossils yet brought from the far west. Two of the species belong to the existing California genus Carinifex, or some closely allied group, while another beautifully sculptured species was thought, by Mr. Tryon, to whom I sent a specimen of it, to be possibly a true *Melania*, and allied to existing Asiatic forms.

It is an interesting fact, that among all of our fresh-water Tertiary shells from this distant internal part of the Continent, neither the beaks of the bivalves, nor the apices of the spire in the univalves, is ever in the slightest degree eroded; even the most delicate markings on these parts being perfectly preserved, if not broken by some accident. From this fact it may be inferred that the waters of the lakes and streams of this region, during the Tertiary epoch, were more or less alkaline, as is the case with many of those there at the present day.

These descriptions, as well as others that I expect to send you soon, are merely preliminary and will be re-written, and presented with full illustrations, now in course of preparation, in Mr. King's report of his survey.

Very respectfully yours,
F. B. MEEK.

Tertiary Species.

SPHÆRIUM RUGOSUM, Meek.

Shell of medium size, rather gibbous, moderately thick, quadrato-suborbicular in outline, the length being a little greater than the height; greatest convexity slightly above the middle; anterior margin more or less regularly rounded; base semielliptic in outline; posterior margin generally a little wider than the anterior, and faintly subtruncate with an anterior slope; dorsal outline rounding into the anterior and posterior margins, but more regularly into the former. Beaks not eroded, nearly central, rather prominent and incurved, but not oblique. Surface ornamented by sharply defined, often elevated, concentric striæ, separated by rounded furrows, in which very minute lines of growth may be seen under a magnifier; the elevated concentric striæ becoming more regular, coarser, more distantly separated, and more prominent on the umbones. Cordinal margin and lateral teeth comparatively stout.

Length of largest specimen, 0·34 inch; height, 0·30 inch; convexity, 28 inch.

The most marked characteristics of this species, are its quadrato-suborbicular, rather gibbous form, very nearly central beaks, and particularly its sharply elevated concentric striæ, growing stronger, more prominent, and more distantly separated on the umbones, until near the points of the same they often assume the character of sharp, raised plications. In some of the smaller specimens, these raised, rather distantly separated, stronger striæ, extend over nearly the whole surface; while in others they pass gradually into mere irregular lines of growth, on most of the surface, occasionally separated by wider furrows.

In form this species is very similar to the existing *S. Vermontanum*, of Prime, with which it also agrees nearly in size. It is more regularly rounded in front, however, and has stouter lateral teeth; while its concentric raised striæ and sulcations are generally larger and grow more distinct on the umbones than below, instead of the reverse. In this latter character of marking it agrees more nearly with *S. aureum*, Prime, from which, however, it differs entirely in form.

Locality and position. Hot Spring Mountains, at Fossil Hill, Idaho Territory.

SPHÆRIUM? IDAHOENSE, Meek.

Shell attaining a very large size, moderately convex, rather thick in proportion to size; orbicular-subovate in outline, being wider in front than posteriorly; anterior margin regularly rounded; base semioval in outline; posterior margin somewhat narrowly rounded below and sloping forward above; dorsal margin short. Beaks placed in advance of the middle, a little compressed and directed obliquely forward and inward. Surface marked by concentric striæ and furrows. Later teeth stout.

Length, 0·98 inch; height, about 0 92 inch; convexity, about 0·54 inch.

The specimens of this shell are not in a very good state of preservation, being, with one exception, internal casts, and this one only retains a part of the shell. They certainly differ, however, from the last not only in their much larger size, but in being less nearly equilateral, more produced, and rather more narrowly rounded posteriorly, as well as proportionally less convex. The internal casts have the umbonal region, from a little above the middle of the valves, compressed. Some of these casts show a few rather distinct, broad, irregular concentric undulations, that were doubtless more strongly defined on the exterior of the valves.

None of the specimens of this shell show the hinge very clearly, but from its large size and thickness I was at first inclined to believe it a *Cyrena* or a *Corbicula.* Impressions in the matrix, however, show that its lateral teeth are not striated, nor of the form seen in the latter genus. Possibly, I should call it *Cyrena Idahoensis.* As its pallial line is certainly simple, however, and not sinuous, as in all the American living species, and, so far as known, in all the fossil Cyrenas and Corbiculas of this continent, I have concluded to place it provisionally in the genus *Sphærium*, until better specimens can be obtained for study.

Locality and position. Same as last, and from same formation at Castle Creek, Idaho.

ANCYLUS UNDULATUS, Meek.

Shell thin, attaining a very large size, elliptic-oval in outline, being sometimes slightly widest a little in advance of the middle; apex much elevated, pointed, curved backward and placed about half-way between the middle and the posterior margin; posterior slope concave; lateral slopes nearly straight; anterior slope distinctly convex. Surface marked with fine, rather obscure lines of growth, and strong, comparatively large concentric undulations, most distinct and regular on the anterior slope, where there are sometimes very obscure traces of about three radiating ridges.

Length of the largest specimen seen, 0·67 inch; breadth of do., 0·54 inch; height, 0·35 inch.

The specimens show some variation in their proportions, as well as in the regularity and distinctness of the undulations, the largest individual from which the above measurements were taken being proportionally a little wider and more elevated than some of the smaller ones, while its undulations are less distinctly and regularly defined. As there are various gradations, however, in these characters, I am at present inclined to regard them as mere individual modifications of one species.

Owing to the thinness of the shell, the undulations are often quite well defined on internal casts, particularly along the anterior slope.

The only N. American recent species, with which I am acquainted, that approaches this in size, is the *A. Newberryi*, described by Dr. Lea, from California. From this the species under consideration differs in having its apex nearer the posterior, and much more pointed and curved backward. The undulations of its anterior slopes also give the shell quite a different appearance.

Locality and position. Fossil Hill, Hot Spring Mountains, Idaho Territory.

MELANIA (GONIOBASIS ?) SCULPTILIS, Meek.

Shell of medium size, conoid-subovate; spire more or less elongate-conical, with convex slopes, the apical angle being greater in the young than in the adult, not eroded at the apex; volutions six to seven, rather distinctly convex; suture strongly channeled; aperture ovate, a little oblique, rather narrowly rounded below; lip sharp, most prominent below the middle, and slightly sinuous at the lower inner side. Surface elegantly ornamented by numerous very regularly disposed, slightly flexuous or sigmoid vertical costæ, which are crossed by equally distinct and regular spiral ridges, about four of which may be counted on each volution of the spire (excepting those near the apex, which are smooth), and eight to ten on the last turn, on the under half of which they are most strongly defined; minute lines of growth may also be seen by the aid of a magnifier; costæ slightly nodulous at the points where they are crossed by the little revolving ridges.

Length, 0·63 inch; breadth, 0·33 in.

This is a neat species, remarkable for its sharply defined and very regular cancellated sculpturing. The vertical costæ are equally well defined on all the volutions excepting those near the apex and on the under side of the last one, while the revolving lines or ridges become a little more distinct on the lower part of the body turn. Although there are nearly always four of these revolving ridges on the volutions above the last one, in a few examples as many as six may be counted on these turns, but this is due to the intercalation of a smaller one between two of the others, and the exposure of another above the suture, that is usually hidden beneath it by each succeeding turn.

Locality and position. Hot Spring Mountains, Idaho.

MELANIA (GONIOBASIS) SUBSCULPTILIS, Meek.

Shell apparently not attaining a medium size; spire conical with convex slopes; apex pointed, not eroded; volutions about seven and a half, flattened convex; suture channeled; aperture ovate, slightly oblique, rather abruptly rounded below; margin of lip most prominent below the middle, and faintly sinuous on the lower inner side. Surface ornamented with small, regular, slightly sigmoid, vertical costæ, with an obscure revolving ridge just below, and a slight angle above, the suture, to which prominences the costæ impart a somewhat crenated appearance; lower half of last turn marked with a few distinct revolving raised lines.

Length, 0·43 inch; breadth, 0·19 inch; length of aperture, 0·14 inch; breadth of do., 0·10 inch.

This species may be at once distinguished from the last by its less convex whorls, and the absence of revolving ridges or lines, excepting on the lower part of the body volution, and the one just below and above the suture. As in the last, its apical whorls are smooth. The only good specimen of it seen is considerably smaller than the adult size of the last described species.

Locality and position. Same as last.

CARINIFEX BINNEYI, Meek.

Shell attaining a large size, depressed subglobose in form; spire scarcely rising above the body whorl; umbilicus large, but rapidly contracting within. Volutions about three and a half, increasing very rapidly in size; those of the spire a little convex, last one forming more than nine-tenths the entire bulk of the shell, widest above, and produced below so as to form a prominent ridge or subangular margin around the widely excavated umbilical region; all without revolving carinæ. Aperture large, obovate, being widest above and narrowed abrubtly to a subangular termination below. Lip remarkably oblique, apparently reflexed and strongly produced forward above. Surface marked with extremely oblique lines of growth, which sometimes form little regular costæ.

Height, 0·59 inch; breadth, 1 inch; height of aperture, about 0·50 inch; breadth of do., 0·54 inch.

This species differs too widely in nearly all of its characters to require any comparison with *C. Newberryi*, the typical and only known living species, which it also exceeds in size.

All of the specimens of this species in the collection are incrusted by a laminated, smooth calcareous deposit, that has to be removed before the surface marking can be seen. This is continuous over the suture, and covers all the volutions of the spire. At first I was inclined to think this might have been secreted by the mantle of the animal enveloping the whole shell; but farther examinations have led me to think it more probably merely an inorganic incrustation, precipitated over the surface after the death of the animal. Named in honor of W. G. Binney, Esq.

Locality and position. Fossil Hill, Hotspring Mountains, Idaho Territory. Apparently of Miocene or later age.

CARINIFEX (VORTIFEX*) TRYONI, Meek.

Shell depressed subglobose, approaching subdiscoidal, the spire being much depressed. Volutions four and a half to five, increasing rather rapidly in size; those of the spire slightly convex; last one sometimes becoming a little concave on the upper slope near the aperture, and more or less ventricose below, the most prominent part being near the rather small, deep umbilicus, into which it rounds abruptly; all rounded on the outer side, and without any traces of carinæ or revolving markings. Suture well defined. Aperture rather large, subcircular, its height being to its breadth about as 29 to 34; lip sharp, oblique, and produced forward above, faintly sinuous at the middle of the outer side as well as at the inner side of the base, where it is a little thicker. Surface ornamented with small, distinct, regular ridges, and much finer lines of growth running parallel to the very oblique outline of the lip.

Height, 0·35 inch; breadth, 0·64 inch; height of aperture, 0·29 inch; breadth of do., 0·34 inch.

This shell differs from the last, not only in its smaller size, more rounded, less rapidly enlarging whorls, and more prominent spire, but particularly in its very much less excavated umbilical region. It evidently varies consider-

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* I propose the subgeneric name *Vortifex* for these shells, which differ from the typical forms of *Carinifex*.

ably in form and surface markings, some of the specimens being proportionally more ventricose, or, in other words, have the body volution, and consequently the aperture, higher in proportion to breadth than the others, while more or less difference in the elevation or depression of the spire is observable. The most marked differences, however, are to be observed in the character of the surface markings. Generally the little regular costæ parallel to the lines of growth are pretty well defined, but in some cases they fade away so as to be scarcely distinguishable from the fine incremental lines; while in others they are strongly marked, regularly disposed costæ. Sometimes, different parts of the surface of the same individual specimen present the variation of sculpturing mentioned. It may be found convenient to designate the more ventricose form as variety *ventricosa.*

Named in honor of G. W. Tryon, Jr., of Philadelphia.

Locality and position. Same as last.

CARINIFEX (TRYONI, var.) CONCAVA, Meek.

The only two specimens of this form obtained are considerably smaller than the adult size of the last described species, and differ in having the spire so strongly depressed as to be really concave, and thus to give the entire shell a subplanorbicular outline. Its umbilicus is proportionally of about the same size, as in the *C. Tryoni,* and its two or three volutions, as in that form, are rounded and without carinæ. Its aperture is more nearly circular, being about as wide as high, in consequence of the body volution being proportionally less prominent below. Its costæ are very strongly defined and regularly disposed.

It seems improbable that this can be merely the young of *C. Tryoni*, because, of some forty odd specimens now before me, not one has the apex or first two volutions concave, though they vary somewhat in prominence in different individuals.

Height, 0·18 inch; breadth, 0·30 inch; height of aperture, 0·18 inch; breadth of do., 0·17 inch.

Locality and position. Same as foregoing.

Devonian Species.

SPIRIFER (TRIGONOTRETA) PINONENSIS, Meek.

Shell attaining about a medium size, somewhat wider than long, varying from transversely subovate to a nearly semicircular general outline; rather gibbous in adult examples; cardinal margin nearly or quite equaling the greatest breadth, and terminating in rectangular or rather more obtuse extremities; lateral margins rounding to the front, which is sometimes rounded, sometimes slightly sinuous, or in other examples more prominent and subangular in the middle. Ventral valve generally rather more gibbous than the other, its greatest convexity being in the umbonal region, from which it rounds off evenly toward the front and lateral margins, as well as to the beak, which projects beyond that of the other valve, and is rather distinctly incurved; cardinal area of moderate height, narrowed to the lateral extremities, more or less inclined backward, and strongly arched with the beak; foramen having nearly the form of an equilateral triangle, and provided with slightly raised, sharp lateral margins; mesial sinus shallow, rounded, smooth, and of moderate breadth narrowed regularly, and well defined to the apex of the beak. Dorsal valve generally more than semicircular, most convex in the central and anterior regions; beak projecting little beyond the cardinal margin, and with the narrow area incurved; mesial ridge depressed, smooth, and faintly furrowed along the middle, corresponding in outline to the form of the sinus in the other valve. Surface of each valve ornamented by from eleven to about fourteen simple, regular, rounded, radiating plications on each side of the mesial fold and sinus, and also showing, under a magnifier, minute, regular, crowded radiating striæ, crossed near the front by stronger undulating lines of growth.

Length of a medium sized specimen, 0·92 inch; breadth of do., 1·20 inch; convexity, 0·72 inch.

As nearly as can be determined from a description only, this shell would seem to be closely related to *S. macrothyris*, Hall, from the Upper Helderberg Limestone of New York and Ohio (see 10th Report Regents, p. 133), but differs in being always narrower in proportion to length, never being near "twice as broad as long." Its area also differs in narrowing regularly to the lateral extremities of the hinge, instead of having parallel margins. On comparison, with good specimens of *S. Oweni*, Hall, from the Upper Helderberg Limestone at the falls of the Ohio, which species our shell nearly resembles, it is found to differ in having the beak and area of its ventral valve always more strongly arched. Its area is also proportionally narrower, and its plications larger and less numerous. There are in the collection a large number of well preserved specimens, showing the characters given to be very constant.

Locality and position. Pinon Station, Nevada. Devonian, probably of the age of the Upper Helderberg Limestones of New York.

Lower Silurian Species.

EUOMPHALUS (RAPHISTOMA?) ROTULIFORMIS, Meek.

Shell small, sublenticular, or more than twice and a half as wide as high, with the periphery sharply angular, and the much depressed spire a little more prominent than the convexity of the last turn below the angular periphery; umbilicus very wide, deep, and depressed conical; volutions six or seven, exceedingly narrow, and increasing very gradually in size, all obliquely flattened, or sometimes slightly concave on the upper slope, which is nearly coincident with that of the spire, and with the under side sloping downward and inward, and nearly one-third wider than the upper surface to the umbilicus, around which they are rather distinctly angular; aperture obliquely rhombic. Surface unknown.

Breadth, 0·32 inch; height, 0·12 inch; breadth of last turn on the upper slope, 0·15 inch; do. on the under slope, 0·18 inch; breadth of aperture, 0·09 inch; height of do., 0·07 inch.

This species is evidently nearly allied to *Euomphalus polygyratus*, Roemer, from the Lower Silurian rocks of San Saba, Texas (see Kreid. Von Texas, tab. xi, fig. 4 a, b). It differs, however, in being much smaller, its greatest diameter being less than one-fourth that of Roemer's species, although it shows nearly the same number of volutions. Its volutions are also proportionally more convex below, and slope more abruptly into the umbilicus.

Locality and position. Ridge south of Muddy Creek, Nevada Territory, from a gray subcrystalline limestone of Lower Silurian age, probably of the same horizon as the Calciferous sand rock of the New York series.

EUOMPHALUS (RAPHISTOMA?) TROCHISCUS, Meek.

Shell sublenticular, about twice and a half as wide as high, spire much depressed, or but little higher, measuring from the horizon of the sharply angular periphery, than the convexity of the last turn below the same; umbilicus wide, deep and depressed conical; volutions four and a half to five, increasing gradually in size, all obliquely flattened (or sometimes slightly concave) above, nearly on a line with the slope of the spire, and sloping downward and inward below to the umbilicus, into which the curve is so abrupt as to form an obtuse angle around the same; aperture wider than high, and rhombic subtrigonal in outline. Surface unknown.

Breadth, 0·40 inch; height, 0·15 inch; breadth of last turn, 0·12 inch; breadth of umbilicus, about 0·25 inch.

This is similar in general appearance to the last species, but may be readily distinguished by its less numerous whorls, which increase more rapidly in size. It is much more nearly allied to a form now before me in masses of chert from the west side of Lake Pepin, in Minnesota, found in beds of about the age of the Calciferous Sand rock of the New York series. The latter, however, attains a much larger size, some of the specimens being an inch in diameter, with about six volutions. The Minnesota form is also more sharply angular on the periphery, and has the upper side of the volutions distinctly more concave, and the spire more depressed.*

Locality and position, same as last.

PARADOXIDES? NEVADENSIS, Meek.

The only specimen of this Trilobite obtained, consists of a natural cast, formed by a moderately thick crust of *Arragonite*, deposited in a mould or impression of a part of the thorax and the pygidium, with the free borders of the latter broken away. Its rather large size, much depressed form, spiniferous pleuræ, and general physiognomy, as far as seen, at once recall to the mind the well known genus *Paradoxides.* A closer inspection, however, shows its pygidium to be proportionally larger than we see in the known species of that genus, with possibly the exception of *P. Forchhameri*, of Angelin.

Of the thorax, eight of the posterior segments are preserved. These show the axial lobe to be much depressed, and about as wide as the lateral ones, exclusive of the free recurved points of the pleuræ. The segments of the axial lobe are defined by a broad rounded furrow or depression across the anterior side of each, and have much the general appearance of those of some species of *Paradoxides*, being a little thickened, squarely truncated, and slightly curved forward at the ends. But they differ in showing distinct remains of a mesial spine or tubercle on each, and in having an obscure, oblique furrow or depression on each side, passing outward and backward from the broad anterior transverse furrow to the posterior lateral angles, so as partly to isolate the slightly thickened and truncated extremities of each. The lateral lobes are nearly flat, and composed of pleuræ that extend straight outward at right angles to the axis, to their free extremities, which are abruptly contracted (almost entirely on the posterior side) into slender, rounded, very sharp spines, which curve backward and outward. Each of the pleuræ is also provided with a broad, rather deep, flattened furrow, which commences near the inner end, and extends straight outward for some distance, with parallel sides, but gradually tapers, mainly on the anterior side, to a lanceolate point, before reaching the free extremities. These furrows have not the obliquity usually seen in those of *Paradoxides*, but run parallel to the direction of the pleuræ, so as to leave slender straight ridges, of equal size, along the anterior and posterior margin of each rib.

The pygidium, exclusive of the portions of the free border broken away, has a nearly semicircular outline, being about twice as wide as long, while it is as much flattened as the thorax. The part remaining equals in length the five thoracic segments next in advance of it. Its mesial lobe is much depressed, and about three-fourths as wide, anteriorly, as the breadth of that of the thorax at its widest part seen. Posteriorly it tapers very little, and extends nearly the entire length of the pygidium, as seen with the free border broken away. It is evident, however, that the flattened border projected more or less behind its termination. It shows distinctly five segments, with indications of about two others at the posterior end. The lateral lobes have each three segments, the anterior one being extended out nearly parallel to those of the thorax, while the others are directed more obliquely backward, and rapidly widen outward. Like the pleuræ, they have each a broad flattened furrow, that of the anterior one being nearly parallel to those of the pleuræ,

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* This Minnesota shell probably belongs to an undescribed species, as it has more volutions than the form described by Dr. Owen, under the name *Stroparollus* (*Euomphalus*) *Minnesotensis.* (See his large Geological Report of 1852, p. 581, pl. 11, fig. 12 and 13.) If so, it might be called *Euomphalus Pepinensis.*

while those of the other two are directed more obliquely backward, particularly the posterior one, which is almost parallel to the longitudinal axis of the body. These furrows are so deep and broad as to give the three segments of each lateral lobe the appearance of six irregular ridges, the irregularity being produced by the posterior two segments instead of passing along the middle of each segment, being curved backward so as to divide these segments very unequally, leaving the anterior part much broadest. No fine surface markings are preserved on the specimen.

Entire length of the imperfect specimen, 2·75 inches, of which remaining 8 thoracic segments form 1·70 inch; breadth of the thorax, exclusive of the free spiniferous ends of the pleuræ, 2·05 inches, and including the projecting ends of the pleuræ, 2·40 inches; length of what remains of the pygidium, 1·03 inch; breadth of do., about 1·80 inch. Supposing it to be a true *Paradoxides*, with not less than sixteen thoracic segments, the entire specimen, when complete, could not have been far from six inches in length.

It is possible I should call this species *Olenus* or *Conocoryphe Nevadensis*, but its large size seems to be an objection to placing it in any section of either of these genera. In the possession of a node or spine on each of the thoracic segments, as well as in the direction of the posterior segments of the lateral lobes of the pygidium, it agrees with the type of *Parabolina*, but unfortunately the specimen is not in a condition to show whether or not these segments of the pygidium terminated in produced marginal spines, while the furrows of its pleura have not the obliquity of those seen in that type, but agree more nearly with those of some species of *Conocephalites*. The comparatively large size of its pygidium, and the nodes or spines on its thoracic segments, as well as the nature of the furrows of the pleuræ, are rather against its reference to *Paradoxides*, and lead me to think that it may belong to an undescribed genus.

CONOCORYPHE (CONOCEPHALITES) KINGII, Meek.

Entire form ovate, and much depressed, with breadth equaling about two-thirds the whole length. Cephalic shield semicircular, or a little wider than long, with the anterior and antero-lateral borders regularly rounded in outline, and provided with a narrow, slightly defined marginal rim; posterior margin nearly straight, with the lateral angles terminating in abruptly pointed extremities, so short as scarcely to project as far backward as the posterior margin of the second thoracic segment. Glabella depressed nearly even with the cheeks, about two-thirds as long as the entire head, and between one-third and one-fourth the breadth of the same behind, but narrowing forward to its subtruncated anterior end, and separated from the cheeks on each side and in front by a shallow furrow; occipital furrow moderately well defined, and continued as rather deep broad furrows along the posterior margins of the cheeks out nearly to the points where the facial sutures cut the margin; lateral furrows not clearly defined in the specimens, but apparently consisting of four pairs. Facial sutures directed at first, for a short distance, forward from the inner anterior end of each eye, then curving gracefully outward as they extend forward, until near the anterior margin of the head, where they are a little wider apart than the distance between the eyes, but again curving rather abruptly inward, so as to reach the anterior margin nearly on a line with each eye; posteriorly these sutures extend at first outward, nearly at right angles to the longitudinal axis, from the posterior end of each eye, and then curve gracefully backward so as to intersect the posterior margin between one-fourth and one-third the distance from the lateral angles, inward toward the glabella. Eyes rather depressed, slightly arched outward, and separated from each other by a space somewhat less than half the entire breadth of the head, and placed less than their own length in advance of the posterior margin, and about once and a half their length behind the front margin of the head; visual surfaces narrow, and not showing any lenses under a good magnifier.

Thorax with its length bearing the proportions to that of the head, of 79 to

52, and to its own breadth of 79 to 107, being very slightly wider near the middle than in front, and narrowing posteriorly, with gently convex lateral margins, from behind the middle to the pygidium. Axial lobe depressed, narrow, or only about two-thirds the breadth of each lateral lobe at its anterior end, and narrowing regularly with straight sides posteriorly; segments thirteen, nearly or quite straight, and each with a small node or prominence at each end.* Lateral lobes depressed or nearly flat; pleuræ almost transverse or arching slightly backward, to near the extremities, which are abruptly pointed; each with a well defined furrow, which commences small near the anterior inner end, and widens and deepens for about half-way out, and then narrows and becomes more shallow, so as to die out before reaching the lateral extremities.

Pygidium subsemicircular, being rounded posteriorly, with a narrow, slightly flattened border, and somewhat rounded anterior lateral extremities; length bearing to that of the thorax the proportions of 30 to 79, and to that of the head of 30 to 52, with a breadth of not quite two-thirds of that of the head; axial lobe more than two-thirds the length, narrow, depressed, and showing more or less distinctly about five segments; lateral lobes much depressed, nearly twice as wide at the anterior end as the middle one, each with about three segments, which curve a little backward and become obsolete before passing upon the narrow smooth border; segments each provided with a comparatively large longitudinal furrow, corresponding to those on the pleuræ.

Entire surface apparently smooth, excepting fine radiating striæ on the anterior and lateral portions of the cephalic shield that are scarcely visible without the aid of a magnifier.

Whole length, 1·60 inch; breadth of thorax, 1·07 inch; do. of cephalic shield (somewhat flattened by pressure), about 1·12 inch; length of thorax, 0·70 inch; do. of pygidium, 0·30 inch; breadth of do., 0·60 inch.

Of this fine Trilobite three entire specimens and a part of another were obtained. They are, however, all merely sharply defined natural casts, formed by the deposition of a crust of arragonite in the original moulds left by the fossil in some kind of a matrix. The specimens were evidently somewhat flattened by pressure before or at the time they left their impressions in the rock. This compression has obscured the lateral furrows of the glabella, but most of the other characters of the upper side of the fossil are clearly seen, even to the facial sutures, and the faintly marked radiating striæ seen around the front and lateral margins of the cheeks.

The genus *Conocephalites* (or more properly *Conocoryphe*, for a strict application of the rules of priority would, I should think, require that the latter name should be adopted for the genus to which they were both applied) is so nearly allied to *Olenus* that it may not be always easy to distinguish the two types without seeing the hypostoma, and hence it is possible that the form under consideration may be more properly an *Olenus*. As it has more the regular oval outline of the former, and less pointed and produced pleura than the latter, while it shows clearly the fine radiating striæ around the anterior and lateral margins of the head so often seen in *Conocoryphe*, it more probably belongs to that genus. It is worthy of note, however, that all of the specimens seem to be much more depressed or flattened than any of the species yet described of that genus, while only one of them shows any traces of the slender ridge usually seen passing from the anterior end of each eye to the front extremity of the glabella, and in this one the ridge is so faintly marked as to leave doubts whether or not it is natural.

Locality and position. Antelope Springs, Dryont Mountains, Nevada. Lower Silurian, and probably, judging from the known position of the genus *Conocephalites*, in the rocks of this country and Europe, from the Primordial zone.

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* In some specimens these nodes seem to be wanting, while in others they do not exist on all of the segments.

May 3d.

DR. KENDERDINE in the Chair.

Eleven members present.

PROF. LEIDY exhibited the internal organs of generation of a Hog, which were of an anomalous character, and had been sent to him for examination by Dr. S. C. Thornton, of Moorestown, New Jersey. The animal, Dr. Thornton informed him, had been bought for breeding purposes, and from outward appearances was considered as a good sow. The animal was frequently in heat, and as often received the boar. At these periods it would froth at the mouth, and champ in the manner usual under such circumstances in the male. As the animal would not breed, it was fattened up for meat, and when killed, the butcher, surprised at the peculiar appearance of the internal genital organs, sent them to Dr. Thornton. The condition of the external organs the latter did not ascertain, as they had not been preserved.

In the specimen exhibited, the uterus and vagina were about as well developed as ordinarily in the sow, but approaching the usual position of the ovary, the uterine horns abruptly narrowed into an impervious cord extending along the inner edge and included in the peritoneal fold enclosing an epididymis.

A testicle with the epididymis occupied the usual position of an ovary in relation with the uterus. The testicles were equally well developed on both sides, but no traces of ovaries were evident. The body of the testicle measured about an inch and a half long, by one and a quarter broad, and one thick. The interior exhibited the ordinary appearance. The well developed epididymis terminated in a vas deferens extending along the course of the uterine horns, enclosed in the fold of the broad ligament, to the anterior wall of the vagina, in which it pursued its way to the incised extremity of the latter. The vaginal portions of the vasa deferentia were enlarged and provided with lateral cœca. The epididymis and vas deferens were distended with a milky liquid, but this on examination was found to contain no spermatozoa, only epithelial cells and granular matter.

May 10th.

The President, DR. RUSCHENBERGER, in the Chair.

Twenty-four members present.

May 17th.

The President, DR. RUSCHENBERGER, in the Chair.

Thirty-five members present.

PROF. LEIDY directed attention to a few fossil bones lying on the table. One of the specimens, a well preserved tibia, had been obtained by Prof. Hayden from the pliocene formation of Little White River, a tributary of White River, in the Mauvaises Terres of Dakota. A second specimen, a radius, looking as if it might have belonged to the same skeleton as the former, together with an astragalus, were found by Prof. Hayden in the pliocene deposit of the Niobrara River, Nebraska. These bones indicate a small robust species of *Rhinoceros*, not likely to have been the same as the *Hyracodon Nebrascensis* or the *Aceratherium occidentalis*, which belong to the miocene formation of the Mauvaises Terres. They are too small to have belonged to the *Rhinoceros crassus*, whose remains were found in association with two of the specimens. Their relation to *R. meridianus* of Texas, *R. hesperius* of California, and *R. matutinus* of New Jersey is uncertain.

The tibia has an extreme length of 9½ inches; the breadth of the head is 4¼ inches; of the lower end 3½ inches.

The astragalus at its condyles is 2⅓ inches wide; the width of the anterior articulation is 2¼ inches.

The radius has an extreme length of 9 inches; the width of the upper extremity is 3 inches; of the lower extremity 3¼ inches.

The remaining specimen, obtained by Prof. Hayden on the Niobrara River, is the lower portion of the humerus, having about the same size and construction as the corresponding portion in the Bengal Tiger. It probably pertains to *Aelurodon ferox*, which was established on a specimen of a superior sectorial molar, from the same locality.

May 24th.

The President, Dr. Ruschenberger, in the Chair.

Twenty-eight members present.

May 31st.

The President, Dr. Ruschenberger, in the Chair.

Fifty-three members present.

The report of the Microscopical and Biological Section for April and May was read.

The following were elected members of the Academy:

Miss Grace Anna Lewis, Miss H. T. Smallwood, Miss E. Horner, Messrs. G. Rice, D. B. Smith, D. D. Willard, Walter D. Comegys, Wm. H. Gumbes, T. H. Speakman, John T. Morris and H. St. G. Elliott.

The following were elected Correspondents:

Col. R. S. Playfair, of Algiers; Prof. Carl Wilhelm Bœck, of Christiania; Prof. Frank H. Bradley, of Knoxville, Tenn.; and Prof. Rawson W. Rawson.

June 7th.

The President, Dr. Ruschenberger, in the Chair.

Sixteen members present.

The publication of the Proceedings for January, February, March and April was announced.

June 14th.

Dr. Bridges in the Chair.

Twenty-four members present.

The following paper was presented for publication: "Description of New Species of Grasshopper from Colorado." By Prof. Cyrus Thomas.

Prof. Leidy stated that he had recently received for examination several small collections of mammalian remains, from three different localities, which were especially interesting, as indicating faunæ and formations similar to those of the Mauvaises Terres of White River, Dakota, and of the Niobrara River, Nebraska.

One of the collections, received from the Smithsonian Institution, and obtained by Clarence King during the U. S. Geological Exploration of the 40th parallel, consists of specimens found on Sinker Creek, Idaho. These indicate a later tertiary formation like that of the Niobrara River. Among them are fragments of jaws and teeth of *Mastodon mirificus* and of *Equus excelsus*, both of which belong to the Niobrara pliocene fauna.

A second collection, accompanying the former, consists of specimens obtained by Mr. King in Utah. Among them are remains of *Protohippus perditus*, *Merychippus mirabilis*, and *Cosoryx*, all of which belong to the Niobrara pliocene.

A third collection, received from Prof. H. S. Osborn, of Lafayette College, Easton, Pa., was obtained on John Day's River, Oregon. The fossils indicate a miocene fauna and formation like that of the Mauvaises Terres of White River, Dakota. Among them are remains of *Oreodon Culbertsoni*, and what is suspected to be *Stylemys Nebrascensis*.

A fourth collection, received yesterday from the Smithsonian Institution, was obtained by the Rev. Thomas Condon, of Dalles City, Oregon, from the same locality as the latter. It consists of a few specimens, mostly uncharacteristic fragments, but among them are recognized several which pertain to species of the miocene fauna of the Mauvaises Terres. Small fragments of jaws with portions of molars belong to *Oreodon Culbertsoni*, though two exhibit slight peculiarities. In an upper molar of one, a small accessory fold projects from the outer concavity of the postero-internal lobe, as in the Deer. In another specimen the inner surface of the outer lobe of part of a molar is longitudinally rugose. In a third specimen there is no peculiarity. Another small fragment of an upper jaw, with portion of a molar, apparently belongs to *Agriochœrus latifrons*. The specimens indicated are labelled "John Day's, Oregon."

Accompanying the last collection there is a portion of the head of a tibia, about the size and form of the corresponding part in a Horse, thoroughly petrified, and marked "Alkali Flats, Oregon." A few additional but uncharacteristic fragments are marked "Crooked R. D."

Prof. Leidy further made some remarks on *Hadrosaurus* and its allies, as follows: In the "Synopsis of the Extinct Batrachia and Reptilia," published August, 1869, Prof. Cope has referred the supposed dinosaur *Thespesius* to *Hadrosaurus*, apparently from my not having expressed the distinctive characters of the two genera with sufficient clearness.

Specimens of teeth of a herbivorous dinosaur, obtained by Dr. Hayden on the Judith River, a tributary of the Upper Missouri, I referred to a relative of the Iguanodon with the name of *Trachodon* (Pr. A. N. S. 1856, 72; Trans. Am. Phil. Soc. 1859, xi, 140).

At the same time several vertebræ, together with an ungual phalanx, collected on Grand River, were referred to a genus with the name of *Thespesius* (Pr. 1856, 311; Trans. Am. Phil. Soc. 1859, xi, 151).

Subsequently the great part of the skeleton of an *Iguanodon*-like animal was discovered in the green sand formation of New Jersey, and described by me under the name of *Hadrosaurus* (Pr. 1858, 215; Cret. Rept. U. S. 1865, 76).

The teeth of the latter animal are identical in form with the most characteristic specimen originally referred to *Trachodon*, but differ in having the enameled border of the crown tuberculate.

Recently I have regarded *Trachodon*, as indicated by the teeth, as not distinctive from *Hadrosaurus* (Pr. 1868, 199).

From my remarks that "had the remains of *Thespesius* and *Trachodon* been found in a deposit of the same age I should have unhesitatingly referred them to the same animal" (Cret. Rept. 84), Prof. Cope, from a misconception of the meaning, has regarded *Thespesius* the same as *Hadrosaurus*.

The difference in character of the corresponding vertebræ render the two genera distinct, though, as in a multitude of other instances, they may have possessed teeth nearly alike, or even identical in form and construction.

The caudal vertebræ of *Hadrosaurus* are biconcave or amphicœlian; those of *Thespesius*, at least the larger, more characteristic ones, are convexo-concave or opisthocœlian.

In the present condition of knowledge of the remains of *Hadrosaurus* and its allies, the following appear as distinct:

HADROSAURUS.

Caudals biconcave or amphicœlian; cervicals and dorsals convexo-concave or opisthocœlian.

HADROSAURUS FOULKII.

Leidy: Pr. A. N. S. 1858, 218; Cret. Rept. U. S. 1865, 76, pls. ii, figs. 9—11; viii, fig. 13; xii, xiii, figs. 1—19, 24—28; xiv—xvii, figs. 4, 5.

Crowns of the teeth tuberculate at their enameled margins.

HADROSAURUS MIRABILIS.

Trachodon mirabilis, Leidy: Pr. 1856, 72; Trans. Am. Phil. Soc. 1859, 140.

Crowns of teeth non-tuberculate at the enameled margins.

Remarks.—The non-tuberculate character of the borders of the teeth was not unlikely associated with others in the skull, &c., which if known would probably separate this species as a distinct genus from *Hadrosaurus*.

HADROSAURUS TRIPOS.

Cope: Pr. A. N. S. 1869, 192.

Founded on several caudals from the cretaceous formation of Sampson Co., North Carolina. The robust character of the vertebræ, with their strongly developed articular processes for chevrons, recalls to mind the caudals of *Iguanodon*, as represented in Tab. xxxvii of Owen's Monograph of the Reptilia of the Cretaceous Formation, published by the Palæontographical Society. The specimens probably represent a true *Iguanodon*.

HADROSAURUS MINOR.

Marsh: Pr. A. N. S. 1870, 2.

Indicated by several vertebræ from the cretaceous green sand of New Jersey.

THESPESIUS.

Caudals convexo-concave or opisthocœlian.

THESPESIUS OCCIDENTALIS.

Leidy: Pr. A. N. S. 1856, 311; Trans. Am. Phil. Soc. 1859, 151, pl. x, figs. 1—5.

Hadrosaurus (?) *occidentalis*. Cope: Syn. Ext. Batr. and Rept., Aug., 1869, 98.

It is not improbable that part or the whole of the teeth originally referred to *Trachodon mirabilis* may belong to this animal. Even if such should prove to be the case, the different character of the vertebræ would render *Thespesius* quite distinct from *Hadrosaurus* or *Trachodon*.

It is uncertain, nay improbable, that the small caudal, with the plano-concave body, represented in figs. 6, 7, pl. 10, of the Trans. Amer. Philos. Soc. 1859, should belong to *Thespesius occidentalis*.

PROF. LEIDY next made some remarks on the family of the Vinegar-eels, the substance of which was as follows: The number of species and genera of nematoid worms, represented by the Vinegar-eels, and constituting the family *Anguillulidæ*, is astonishingly great. They are found in multitudes frequently in and about moist decaying and fermenting organic substances. Mr. Bastian, of London, a few years since contributed to the 25th volume of the Transactions of the Linnean Society a paper, in which he has given descriptions, with characteristic figures, of most of the known species, including about one hundred new ones, which he observes he discovered from a few limited regions in England in the course of fifteen months. In seeking for the source of the small thread-worm, or *Oxyuris vermicularis*, which infests man, I have also been led to discover some new species, of which I propose in due time to publish descriptions with drawings. As is commonly the case in organic nature, we find the specific form changing with the change in condition, but the species are often found to differ where difference in the conditions are hardly appreciable.

Mr. Bastian, in a note to his description of the Vinegar-eel, *Anguillula aceti*, says he was indebted to Dr. Davaine for the opportunity of examining the animals, and adds that "they are much less frequent than is generally imagined, at all events in England; and this may be due in great measure to the adulteration of our vinegar with sulphuric acid." It would thus appear that the *Anguillula aceti* he examined was contained in a specimen of what may be suspected to have been the wine vinegar of France. The cider vinegar so commonly used in this country usually teems with Vinegar-eels. Our cruets, when held up to the light, even to the sharp sight of a naked eye frequently exhibit the worms swarming, especially at the border of the surface, as if in search of both air and light. By comparison of our cider Vinegar-eel with Mr. Bastian's description and drawings of the true *Anguillula aceti*, which I infer to be the wine Vinegar-eel, it appears to belong to a different species. From the descriptions of previous authors of the European Vinegar-eel, I had considered ours as the same. I shall not now give a description of the animal, proposing to do so in future, together with other species. I may say, however, while it has nearly the size and form of the *Anguillula aceti*, it has the œsophagus of the form in the genus *Cephalobus* of Bastian.

June 21st.

Wm. S. Vaux, Vice-President, in the Chair.

Twenty members present.

Prof. Leidy remarked that the two fossils presented this evening by Dr. W. F. McAllister, of Burlington, Kansas, were obtained in that vicinity from gravel, at a depth of thirty feet, in digging a well. One of the specimens consists of a plate from a large molar of the American Elephant, *Elephas Americanus*. The other is the fore part of a ramus of a lower jaw of an Ox, perhaps of a large individual of the *Bison Americanus*. In comparison with the corresponding part of the jaw of the existing animal, the measurements are as follow:

	Fossil.	Recent jaw.
Depth at fore part of first molar	24 lines.	21 lines.
Depth at incisive foramen	26 "	24 "
Depth at lowest part of hiatus	21 "	18 "
Length of hiatus in advance of molar	52 "	52 "
Thickness below first molar	14 "	11 "

Prof. Leidy further stated that he had recently received for examination a small collection of fossils, through the New York Lyceum of Natural History and the aid of his friend Mr. George N. Lawrence, which belonged to Mr. Wm. Newcomb, of New York. The collection is said to have been brought from the Rocky Mountains, but the exact locality has not yet been ascertained. Most of the fossils consist of fresh-water shells, evidently of tertiary age, but adherent matrix indicates them to have been derived from several different strata. Accompanying them there are a few bones, of which one is the coronary bone, apparently of *Equus excelsus;* the others mostly pertain to two fishes, a large cyprinoid and a ray. As the living cyprinoids are fresh-water fishes, the association of the remains of a ray may perhaps indicate that this was also a fresh-water species, though it is not unlikely that it may belong to a marine formation. The two fishes, apparently extinct species and genera, not previously noticed, are indicated by the remains briefly described as follows:

Oncobatis pentagonus (Ογκος, a boss or tumor; βατις, a ray).—Founded on a dermal boss, with a pentagonal outline, the sides of which are convex. Under surface strongly convex. Upper surface with five planes sloping from a central summit and defined by as many prominent borders. From the summit an oval enameloid areola occupies rather less than half the extent of the upper surface. The areola is shining, nearly smooth, and exhibits concentric lines of structure. The very summit of the boss appears composed of a harder, more translucent substance protruding through the opaque white areola. Greater diameter of the boss, 16 lines; shorter diameter, 15 lines; thickness from summit, 8 lines; greater width of areola, 8 lines; shorter width, 6 lines.

Mylocyprinus robustus.—Founded on specimens of pharyngeal bones with teeth. There are eight of them of different sizes, all imperfect. The largest have been double the size of the smallest, and perhaps they may have pertained to several species. They are robust, and indicate a large and powerful fish. They have the general form of the posterior pharyngeals in the carp and other cyprinoids. The posterior ramus is prolonged above in a stout pedicle, with an inner triangular articular surface for attachment to the cranium. Its posterior surface, below the pedicle, is broad, nearly flat, with the outer border convex and acute, the inner border concave and sustaining a single row of teeth.

The anterior ramus is thick, and abruptly narrows forward, but is broken at its fore part in all the specimens. At the angle of conjunction of the rami the bone is massive, thicker fore and aft than transversely. The outer border of the bone forms two flexures. The antero-external surface is broad, vertically concave, transversely convex, in some cases entire, in others excavated into pits communicating with the bottoms of the teeth or extending through the bone where the latter have been shed.

The teeth form a single vertical row of four, and are supported on the inner side of the conjunction of the two rami of the pharyngeal bone, projecting a short distance below the level of the inferior ramus, and extending rather more than half-way up the superior ramus. They have stout bony bases, and are of the true masticatory type. They bear a striking resemblance to human premolar teeth—the largest in size as well as form. They are all of the same character, or present no variety. They successively increase in size from below upward. The crown of the teeth is transversely oval, with a broad triturating surface depressed at the centre. The enameloid structure is everywhere smooth.

In all the specimens the uppermost tooth has been shed and not replaced, its position being indicated by a large quadrate pit of the pharyngeal, in some specimens extending through the bone. In most of the specimens the teeth are but little or scarcely worn. In one specimen they are half worn away, very obliquely from within, outward and forward. Measurements from several specimens are as follow:

	Lines.	Lin.	Lin.	Lin.	Lin.	Lin.
Length of posterior ramus to level of middle of second tooth	22					
Width on level of third tooth	8½	8	7½		6	5½
Thickness on level of second tooth	11	9	9		7½	6½
Length of series of four teeth		13	12			8
Transverse diam. of first tooth		2½	2			
" " second tooth		4	4			2½
Vertical diam. " "		2¾	2¼			1¾
Transverse diam. of third "		4½	4½	4¼	3½	
Vertical " " "		3½	3	3¼	3	

No. 1 appears to be from an old individual; the teeth have all been shed or broken away. No. 2 is the most robust specimen. The uppermost tooth has been shed and not replaced. The bone is not excavated in pits beneath the position of the contained teeth. No. 3 has the upper tooth shed and the bone perforated in its position. The lower three teeth are retained, but half worn away. In No. 4 the bone is perforated in the position of the upper shed tooth. In Nos. 5 and 6 the bone is perforated in the position of the upper shed tooth, and deep pits exist beneath the position of the two teeth below.

Since communicating the above, Prof. Hayden presented a specimen of a pharyngeal bone of the same fish from Castle Creek, Idaho.

June 28th.

The President, Dr. Ruschenberger, in the Chair.

Thirteen members present.

July 5th, 1870.

The President, Dr. Ruschenberger, in the Chair.

Fifteen members present.

The following papers were presented for publication:

"Remarks on Huxley's Classification of Birds." By T. Hale Streets.

"On the Stipules of Magnolia and Liriodendron." By Thomas Meehan.

The resignation of Mr. Gilbert Coombs as a member was read and accepted.

Mr. Meehan exhibited some specimens of *Rumex oblongifolius*, a naturalized Dock from Europe. He said that so far as he could ascertain from European specimens, and the descriptions of Babington, Bromfield and other English botanists, the plant was there hermaphrodite; but here, as correctly stated by Dr. Asa Gray, it was monœciously polygamous. He thought the fact that plants hermaphrodite in one country becoming unisexual in another, was worthy of more attention by those engaged in the study of the laws of sex than had been given to it. This *Rumex* did not stand alone; *R. crispus* and *R. patienta* exhibited the same thing. *Fragaria* was another instance well known to horticulturists, although the fact scientifically had not received due weight. The average tendency of the strawberry in Europe was to hermaphrodism,—here to produce pistillate forms.

He also called attention to the fact that in these American specimens unisexuality was in proportion to axial vigor. This law he had already explained in times past to the Academy, and new instances were scarcely necessary. Here, however, the moderately weak plant had more hermaphrodite flowers than the strong one; and in both classes of specimens the number of male flowers gradually increased with the weakening of the axis, until the ends of the raceme were almost wholly of male flowers. The first flowers on the strong verticels were usually wholly pistillate.

Prof. Cope inquired whether the facts now noted by Mr. Meehan did not conflict with those he had before brought to the notice of the Academy in coniferous plants? He understood that in them the female flowers were at the apex of the young shoots, and the male flowers in lower and more exterior positions.

Mr. Meehan replied that the facts were identical in both instances in this, that the female flowers in coniferous plants were borne only on the strong vigorous shoots. These vigorous shoots would in time be crowded and weakened by shade, when they would cease to bear female, and produce male flowers only.

Prof. Cope suggested that, without reference to the relative vigor of the shoots, the male flower was below, and the female flower above; in these Docks the female flower was below, and the male above.

Mr. Meehan said he had never placed any value on relative position, unless relative vigor went with it. In the case of coniferous trees,—*Pinus* particularly,—the male flowers were evidently partially formed the fall before expansion, and at the same time that bud scales were forming, and growth forces nearly at rest for the season. They were still in the weaker position, although appearing at the base.

Prof. Leidy remarked that the interesting communication of Mr. Meehan had recalled to his mind a result of his experience, which he thought would accord with that of others,—viz. : that species viewed as common to both Europe and America frequently exhibit slight peculiarities, which are distinctive of those of the two countries. It is what might be inferred even if we admit the evolution of existing species from a common remote ancestry. A wide separation, with a considerable lapse of time and a modification of circumstances, are sufficient to account for the slight and acquired differences. Even where differences are not observed in form and structure, they may exist in the habit of the species. Thus the common wolf of Europe and America, viewed by many naturalists as of the same species, differs strikingly in character in the two countries. In the former it is a more fearless animal, not hesitating to attack man ; in the latter, it is said never to attack man.

At an early period observers saw, or thought they saw, many of the same species of plants and animals indigenous to America that occur in Europe, and hence the common names of European species were applied to those of America. Gradually the list of species common to the two countries was much reduced, and now is comparatively small.

As might be anticipated, in descending in the scale the species common to the two countries become more frequent; nevertheless many of these common species exhibit geographical peculiarities, which by some naturalists would be regarded as sufficient to consider them distinct. The singular rotifers *Melicerta ringens* and *Limnias ceratophylli* are described by European authors as being most generally solitary. Here they frequently occur in compound bunches, up to several dozen in a bunch. Agassiz observes : "In the American Hydra, as in the European, there are two types,—the brown and the green. The American green Hydra, unlike the European, has the power of extending its body in a remarkable degree. Our brown Hydra has very short tentacles, while the European has long ones." Agassiz views the differences mentioned as characteristic of a difference of species, and names the American green Hydra *H. gracilis*, and the brown one *H. carnea.* Ayres indicates a brown Hydra, in California, which he says differs from the latter "in the same point and to about the same degree as *carnea* differs from *fusca*." He names this one *H. tenuis.* Whilst ready to admit the existence of the peculiarities in these different Hydræ, I do not feel so ready to regard them as distinctive of species, unless the principle is adopted of viewing each peculiarity in a plant or animal as distinctive of species. I have long been familiar with both green and brown Hydræ in the vicinity of Philadelphia, but I have not been able to satisfy myself that they are distinct from *Hydra viridis* and *H. fusca*, two of the four species usually indicated as found in Europe. Our brown Hydra is very common, and may be obtained on the under side of stones in the Delaware and Schuylkill, or on the submerged stems of plants. Though ordinarily its arms appear no longer or shorter than the body, I have seen them elongate after some days of rest in a glass vessel of water to three or four times the length of the body, which is about five lines. In one instance I saw a brown Hydra from the Schuylkill, the body of which was five lines in length, elongate its arms to nearly three inches. The green Hydra is found more especially on the under side of floating leaves in quiet ponds. It usually has five arms, though I have observed six, and more rarely seven; and this is also the case with the brown Hydra, which sometimes has but four arms. As in *H. viridis*, the arms of our green Hydra are shorter than the body.

July 12*th.*

The President, Dr. Ruschenberger, in the Chair.

Ten members present.

Poof. Leidy exhibited a fossil, submitted to his examination by the Smithsonian Institution. It consisted of a much mutilated portion of a ramus of the lower jaw of a large ruminant. The specimen, very friable and encrusted, was found 22 feet below the surface, in clay, on the "bench" or "second bottom" of Boyer River, Harrison Co., Iowa, and was presented to the Smiths. Inst. by D. R. Witter, of Woodbine, Iowa. Other bones were discovered in association with the specimen, but crumbled to pieces.

The jaw fragment was especially interesting, as it is supposed to belong to *Ovibos cavifrons*, and is the first specimen of a lower jaw yet discovered which may be attributed to that animal. It contains the last molar tooth nearly entire, but much worn. This tooth is constructed after the type of the corresponding one in the Sheep, and exhibits no trace of the accessory fold between the anterior and median pairs of lobes such as exists in the Ox, nor of a tubercle such as is found in the same position in the Deer. The fore and aft measurement of the crown of the tooth is full two inches; the width at the fore part of the crown is nearly an inch.

An isolated tooth, a last lower molar which had not yet protruded from the jaw, from Natchez, Mississippi, preserved in the Museum of the Academy, by comparison with the tooth in the jaw fragment, would appear to belong to the same animal. The specimen is two and a quarter inches long and three-fourths of an inch wide at the fore part, and is two inches in its antero-posterior measurement.

Mr. T. Hale Streets made the following remarks on the cranium of an owl:

Among the Academy's collection of birds' crania there is one belonging to a species of owl (supposed to be the *Nyctale acadica*), which presents a very remarkable instance of the want of symmetry in corresponding parts of opposite sides.

In this skull the squamous portion of the temporal bone is thin and scroll-like, and joins the post-frontal plate. What is interesting about it is the manner in which this union takes place. On the right side the lower end of the scroll-like squamous bone turns upward and forward, and unites with the post-frontal. On the left side the contrary to this is the case; the upper extremity of the bone curls over and joins the post-frontal, while the lower extremity is free.

If there had been but a single specimen of this cranium I would have been led to regard this instance of symmetry as abnormal; but as the same peculiarity of structure is presented by two (these being the only representatives of the species in the collection), it would rather suggest itself as a normal condition, although instances of coincidence of abnormality exist, especially in the lower forms of life.

July 19*th.*

The President, Dr. Ruschenberger, in the Chair.

Fourteen members present.

PROF. LEIDY exhibited a fossil which had been submitted to his examination by Prof. Hayden, who obtained it on the Moreau River, a tributary of the Upper Missouri, and was probably derived from the cretaceous formation. The specimen consists of the body of a vertebra of a saurian, devoid of the neural arch, which was separated at the suture. It bears a resemblance to the corresponding part of *Nothosaurus*, a saurian of the triassic deposits of Europe. The body is cylindroid, moderately narrowed towards the middle, and has the articular ends slightly concave. The sutural connection of the neural arch, including transverse processes, extends some distance down the sides. The measurements of the specimen are as follow: Length of body inferiorly, 11½ lines; superiorly, 1 inch; depth in front, 11 lines; width, 10 lines.

The specimen probably indicates a marine saurian allied to *Nothosaurus*, and from its resemblance, the animal to which it belonged may be named *Nothosaurops occiduus*.

July 26th.

The President, DR. RUSCHENBERGER, in the Chair.

Ten members present.

On favorable report of the Committees, the following papers were ordered to be printed:

Descriptions of GRASSHOPPERS, from Colorado.

BY PROF. CYRUS THOMAS.

ANABRUS, Hald.

The characters of this genus were not fully given by Prof. Haldeman when he established it, and those subsequently added by Girard are scarcely sufficient to distinguish it from other closely allied genera. Having both sexes of three species, I give the following as the principle characters that distinguish it.

Gen. Char. Head large, smooth, advanced in front between the antennæ. Pronotum selliform, extending over the base of the abdomen; rounded and smooth; anterior portion of the sides reaching below the eyes; posterior margin and angles rounded. Prosternum bidentate; posterior angles of the meso-sternum elevated and acute. Elytra very short, having the form of scales in the males; covered by the pronotum in the females. Antennæ longer than the body, sometimes extending beyond the ovipositor. Eyes ovate. Labrum round. Maxillary palpi twice the length of the labial; three outer joints nearly equal; terminal enlarged at the tip. Abdomen stout, moderate length; the sub-anal plate of the male large, slightly notched at the tip, furnished laterally with filiform appendages which appear to be articulated at the base; the cerci (or subsituted appendages) sub-cylindrical, enlarged and generally bifurcate at the extremity. Ovipositor long, bent beyond the middle. Cerci, in the female, small, generally hairy. Legs slender; posterior pair very long, femora enlarged next the body, but slender and straight beyond the middle, as long as the body (omitting the head); posterior tibiæ long as the femora, slender; all the tibiæ provided with four rows of spines, the anterior rows often scattered and apparently irregular. A stout denticuloid process above the anterior coxa. The tarsi broad, soles concave; third articulation cordate.

This genus differs so slightly, in description, from *Thyreonotus*, Serv., that there is scarcely a necessity for its retention. But an examination of the species is necessary to decide this point. *A. purpurascens*, Uhler, must be excluded from this genus, as the prosternum is not spined; it may belong to *Pterolepis*, Rambur, but I have seen no species of this genus, and therefore cannot speak positively.

A. STEVENSONII, n. sp.

Female. Purple, mottled with yellow; form and coloring somewhat similar to *A. purpurascens*, Uhler, but smaller and slenderer in all its parts. Face white, the transverse suture below the front fuscus; tips of the mandibles piceous; palpi pale, the penultimate joints of the maxillary palpi striped with purple above; antennæ long and slender, reaching nearly to the extremity of the ovipositor, dusky; cranium cinereous, with the vertex, and a line extending back from each eye, dull white. Pronotum short, not carinated, a slight transverse incision near the front; the two oblique dorsal impressions very narrow and dark; surface smooth, lurid; a large black spot occupying the central portions of the sides behind the transverse incision; lateral margins broadly and anterior margins narrowly bordered with pale yellow; posterior angles tipped with piceous-black. Tegmina hid beneath the pronotum. Abdomen dull purple, somewhat darker along the sides. Ovipositor slightly curved beyond the middle, piceous at the tip; cerci slender, hairy. Beneath, dull white. Anterior and middle legs short, femora slender and straight; posterior legs very long and slender, femora and tibiæ each the length of the body omitting the head; all pale, purplish-yellow; femora smooth; tibia with spines irregularly placed on the angles, also on the rounded portion, black at the tips. The spine above the anterior coxa pale, slender, and bent abruptly downward.

Length 1·13 in.; pronotum ·26 in.; posterior femur ·93 in.; ovipositor ·75.

Hab. Southern Colorado, on elevated grassy terraces near the mountains; and the parks. Collected by C. Thomas while accompanying Dr. Hayden's Geological Expedition to Colorado and New Mexico.

It is named in honor of Mr. James Stevenson, a member of the expedition, who has for years accompanied Dr. Hayden in his western explorations, and has been a diligent collector of specimens in all departments of Natural History.

A. MINUTUS, n. sp.

Male. Similar in coloring and appearance to the *A. Stevensonii.* Face mottled with purple; a dark spot below each eye; a narrow yellow line running back from the upper corner of the eye; cranium cinereous, head somewhat covered by the pronotum. Pronotum short, rounded, smooth; transverse incision almost obliterated; oblique dorsal impressions irregular; the dorsal portion cinereous; sides with a triangular black spot, interrupted by light spaces; broadly margined with dull white; lateral angles tipped with piceous-black. Tegmina short, extending over the second abdominal segment; margins pale yellow, central portions brown. Abdomen cinereous, a darker line along the sides; notch of the sub-anal plate very small; appendages small, hairy; the tip of the last dorsal segment strongly bifid, denticulate. The cerci (I use this term for those appendages supplying the place of cerci) slightly bent, bifurcate. Legs same color as abdomen and cranium; anterior pair quite short; middle pair a little longer; the posterior pair very long, the femur marked with a dark line along the upper angle; tibia slender, spines tipped with brown. Antennæ at least twice as long as the body.

Length ·75 in.; posterior femur ·62 in.; tegmina beyond the pronotum ·1 in.

Female similar to the male in appearance, coloring and size. Cerci small, hairy. Ovipositor bent, somewhat narrowed in the middle; brown at the tip.

Length as in the male. Ovipositor ·55 in.

Hab. Same as *A. Stevensonii.* Some specimens in each of the species have, on the under side of the posterior femur, about four or five abortive spines, especially the older or more mature ones. This may be important in fixing the position of the genus, which is evidently one of transition.

THAMNOTRIZON, Fischer.

T. PURPURASCENS, Uhler.

Found in the parks of the Rocky Mountains and on the more elevated plains of Colorado and New Mexico. I have removed this from *Anabrus*, the prosternum not being spined.

T. TRILINEATUS, nov. sp.

Female. Small, somewhat like *A. minutus*, Thos., but presenting some marked differences. Head moderate size, immersed in the pronotum nearly to the eyes; occiput very short, convex; vertex rounded between the antennæ, slightly advanced in front, this advanced portion triangular and deflexed; face short, broad, smooth, somewhat convex; labrum large, round. Palpi rather longer than usual, slender, cylindrical; terminal joint of the maxillary palpi the longest. Pronotum small, rounded, not carinated; advanced in front over the back of the head, margin round, or sub-truncate; posterior extremity extended over the base of the abdomen, round; sides narrowed below, reach only about the lower border of the eyes; posterior margin of the sides sloped quite obliquely, slightly sinuate. Antennæ reach the tip of the ovipositor. Ovipositor about the length of the body, slightly bent; cerci short, stout, covered with minute depressed hairs; the plate between them triangular. Prosternum not spined. Anterior tibiæ with two spines in front; medial with two rows on the outside 4 (counting the one at the base) and 2. (Posterior legs wanting in the only specimen obtained.)

Color. (Siccus) testaceous green striped and varied with pale yellow. Face testaceous, palest below, with a brown spot at each lower corner. Three pale, tolerably broad, yellow stripes reach from the head to the end of the abdomen; one along the back and one along each side. Two oblique black marks on the back of the pronotum about the middle; lower margins of the sides yellow; beneath pale. Ovipositor fuscus. Antennæ fuscus. Legs purplish, tarsi piceous.

Dimensions. Length ·75 in.; to the end of the pronotum ·34 in.; ovipositor ·73 inch.

Hab. S. E. Colorado.

EPHIPPITYTHA, Serv.

This is given by Serville only as a subgenus of *Phaneroptera*, but the characters which distinguish it from the rest of the Phaneropteres certainly justify me in raising it to a genus. Prothorax selliform, more or less scooped transversely, elevated posteriorly. Front tuberculate.

E. GRACILIPES, nov. sp.

Male. Small, slender, legs very long and delicate. Occiput short, convex, terminating in a triangular tubercle at the vertex, not raised above the first joint of the antennæ, nor passing between them; face vertical, straight, flat; terminating upward just above the central ocellus in a sharp angle; ocellus situated exactly between the lower borders of the folds around the base of the antennæ. Pronotum selliform, sub-cylindrical in front, widened and elevated posteriorly; a slight transverse indenture each side a little behind the middle; not carinated, surface smooth, with a very soft velvety appearance. Elytra very narrow and straight, passing the abdomen one-third their length; wings narrow, longer than the elytra. Abdomen sub-cylindrical; sub-anal plate notched and bi-spinose; cerci stout, hairy, curved and mucronate; upper plate semicircular. Prosternum not spined; meso- and metasternum have the posterior angles obliquely raised, obtuse.

Color (siccus) pale yellow. A roseate stripe on the frontal tubercle; second joint of the antennæ orange yellow; a bright yellow curved line runs from the upper canthus of each eye to the pronotum; there they meet with broader lines on the pronotum, which, converging posteriorly, fade near the middle of the dorsum. Anterior portion of the pronotum dotted with red. Stridulating organs very small, roseate. Elytra and wings pellucid. Abdomen minutely dotted with reddish-brown. Tips of the cerci black.

Dimensions. Length ·75 in.; to tip of the wings 1·25 in.; wings pass the elytra (about) ·25 in.; femur 1· in.; tibia ·95 in.

Hab. Southern Colorado. Unique specimen.

ORCHELIMUM, Serv.

O. VULGARE, Harr.

The specimens I have marked as belonging to this species may prove to be new, as they vary considerably from the type.

O. GRACILE, Harr.

Hab. Found in Colorado.

UDEOPSYLLA, Scudd.

U. ROBUSTA, Hald.

I have marked my specimens by guess, as I have no description of this species at hand; but think from allusions to it in the descriptions of other species, that my specimens belong there. Found in the parks.

CENTHOPHILUS, Scudd.

C. DIVERGENS, Scudd.

My specimens vary in having the hind femora of the females spined, spines very short. Yet I am inclined to believe they belong to this species.

ACRIDIDÆ.

(*Truxalides.*)

OPOMOLA, Serv.

O. NEO-MEXICANA, nov. sp.

Female. Long, slender, truxaloid. Head conical; occiput convex, ascending to the somewhat elevated vertex; vertex convex, ascending, sub-margined, rotund, rather elongate before the eyes; face very oblique; frontal ridge distinct, sides parallel, slightly sulcate; lateral carinæ distinct, obtuse, divergent, reaching the lower corners of the face. Antennæ strongly ensiform, triquetrous, reaching to the tip of the pronotum; situated in deep foveolæ under the front of the cone. Pronotum about as long as the head; sides parallel; all its parts very regular; tricarinate, carinæ not elevated but distinct, all about equal; obtusely rounded anteriorly and posteriorly. Elytra a little shorter than the abdomen; wings a little shorter than the elytra. Posterior femora reach the extremity of the abdomen; very slender. Prosternal point short and obtuse, scarcely more than a pointed tubercle.

Color (immediately after being taken out of alcohol, in which it had been immersed for some months). Face yellow, dotted with red; lateral carinæ rosaceous; on the top of the head a faint roseate stripe runs from the end of the cone to the pronotum, bordered each side by a yellow stripe; from the lower part of each eye starts a bright red stripe which, running back across the head, continues along the upper portion of the side of the pronotum to its extremity and is lost on the elytra. Median carina of the pronotum red, the dorsal spaces yellow; lower portions of the sides yellow. Elytra semitransparent; base and stripe along the dorsal margin roseate. Wings transparent, veins ochreous. Abdomen dirty yellow, reddish on the basal segments. Legs rufous; posterior femora have a pale stripe along the upper edge; spines of the posterior tibiæ tipped with black.

Dimensions. Female. Length 1·62 in.; to tip of elytra 1·50 in.; to extremity of pronotum ·52 in.; femur ·88 in.; tibia ·86 in.

Hab. N. E. New Mexico.

I have not seen the male. This species comes near *O. mexicana*, Sauss, but differs from it in the following respects: The antennæ are not rotundate, but sharply triquetrous; the pronotum is carinate, although the carinæ are but raised lines; and although the posterior lobe is minutely punctured, the pronotum cannot be truly called densely punctate. This species approaches closely to *Truxalis*.

(*Mucronate.*)

ACRIDIUM, Geof.

A. flavo-fasciatum, De Geer.

But one specimen obtained, near the line between Colorado and New Mexico.

CALOPTENUS, Serv.

C. spretus, Uhler.

C. bivittatus, Say.

I have other *Calopteni* which approach very near these species, yet appear to be distinct, but I will not attempt to name them until I have an opportunity of further comparison.

PEZOTETTIX, Burm.

P. borealis, Scudd.

In the cañons and parks of the mountains.

P. picta, nov. sp.

Medium size, body elongate, stout, sub-cylindrical. Occiput convex; vertex sloped, flat and narrow between the eyes, suddenly widening in front, this part transverse and triangular; the frontal ridge somewhat convex, with a very slight depression at the central ocellus; eyes large, prominent, oval; antennæ filiform, nearly as long as head and thorax. Sides of the pronotum parallel in the male, and very slightly divergent posteriorly in the female; carinæ obliterated by the sub-cylindrical form; posterior margins of the sides obliquely sloped but not sinuous; posterior angle rounded; a slight transverse incision each side close to the front margin; the three usual transverse incisions distinct, crossing the dorsum in the female, the posterior one only crossing in the male; anterior margin and posterior lobe densely punctate, remainder smoother, sparsely punctate. Elytra very small, oblong-ovate, reaching tip of the second segment; not meeting on the back; nerves reticulate prominent. Wings minute. Posterior femora stout, short, not reaching the extremity of the abdomen. Subanal plate of the male recurved, with a kind of tubercle on the convex surface; upper plate falcate; cerci small. Prosternal spine stout, conical.

Color (siccus). Alternating rings of dark purple and white. The dark stripes are placed as follows: Down the frontal ridge; on the occiput; down each cheek; two interrupted broad stripes running obliquely upward and backward from the anterior margin and angle of the pronotum; four spots on the base of each dorsal, and two on each ventral segment of the abdomen; posterior femora crossed by three broad bands. The nerves of the elytra white, the spaces black. Colors of the male and female the same.

Dimensions. Female. Length 1·30 in.; femur ·6 in.; pronotum ·28 in. Male. Length ·95 to 1· in.; femur ·5 in.; pronotum ·26 in.

Hab. Eastern Colorado, on the plains and foothills at the base of the mountains.

When alive this is a very pretty insect, stripes of red, black and white alternating; when immersed in alcohol the red fades, and the black becomes paler.

(*Mutici.*)

BRACHYPEPLUS, Charp.

As Charpentier, at the time he established this genus, failed to give its characters, and the description of Girard is so short and deficient, I give, from a large number of specimens, what I conceive to be the distinguishing characters.

Gen. Char. Body very robust, acridoid. Occiput broad, convex, smooth; vertex margined; frontal ridge broad, short, slightly sulcate, expanding below; lateral carinæ distinct, with a sulcus behind each; antennal foveolæ deep, oblong; cheeks prominent. Pronotum large, elongate, tricarinate; carinæ distinct, continuous; widest below, expanding posteriorly, sides straight, chagrined above, sides glabrous; no transverse incisions on the dorsum; anterior margin rounded, extending slightly on the head; posterior margin round. Elytra and wings rudimentary (in the known species). Legs very robust; posterior femora long as the abdomen, swollen; tibiæ strongly spined nearly the entire length. Antennæ filiform, joints distinct; long as head and thorax. Sub-anal plate of the male tumid; cerci very short; female appendages stout, broad.

A well marked and distinct genus.

B. MAGNUS, Girard.

This ponderous species is easily recognized by fig. 1, pl. xv, Marcy's Expl. Red River La., but the description is quite deficient; therefore, to aid future investigations, I give it more minutely.

(Siccus). Yellow, spotted with brown. Occiput very slightly scabrous; with fine shallow punctures; elevated margins of the vertex meet in about a right angle at the front; frontal ridge, although narrow above and gradually expanding as it descends, is not narrowed opposite the antennæ, margins distinct obtuse; sulcus shallow, expanding and fading below, punctured. Pronotum with three distinct, continuous, piceous carinæ; dorsum strongly chagrined, yellowish, with æneous lustre; sometimes, especially in the females, there is a yellow line along each margin of the dorsum; sides purplish at the upper angles, yellowish below. Elytra ovate, reaching the third abdominal segment; nerves longitudinal, slightly branching near the extremity; light brown spotted with black. Wings very small, yellow. Abdomen carinated above; each segment with a brown spot each side, and margin marked with a row of white dots.

Legs as described by Girard.

Dimensions. Length (female) 2 in.; pronotum ·55 in.; elytra ·3 in.; femur 1·25 in. Males about one fourth less; size varies considerably.

Hab. First observed near Arkansas River (going south) in the vicinity of Canon City. From thence southward to Santa Fe, N. M.

ŒDIPODA, Latr.

Œ. CORALLIPES, Hald.

Dimensions. Female. Length 1·80 in.; femur ·90 in.; tibia ·75 in.; to tip of elytra 2 in. Male about two-thirds as large as the female.

Hab. Found at Cheyenne; along the Divide, and south of Raton Mountains. The bright vermillion tint of the posterior legs fades in alcohol. I am inclined to believe the *Œ. pardalina*, Sauss, is synonymous with this species.

Œ. CAROLINA, Linn.

Found occasionally throughout our route.

Œ. ÆQUALIS, Say.

Colorado. Appears to be replaced further south by *Œ. pruinosa*, Thos., a very closely allied species.

Œ. PRUINOSA, nov. sp.

About the size and somewhat similar in coloring and appearance to *Œ. æqualis*, Say, but broader across the meso- and meta-thorax. Head oblong, seen from the front or side; occiput convex, ascending; vertex strongly declined, broad, flat, not foveolate, very slightly margined, slightly contracted between the eyes; frontal ridge prominent and rounded anteriorly above, somewhat sulcate below, expanding at the ocellus, and slightly contracted immediately below it, divergent and fading near the clypeus; lateral carinæ distinct, sinuous and divergent below (in the males these carinæ are more distinct and extended than in the females). Pronotum short, sub-cylindrical and somewhat coarctate in front, expanded and more angulate posteriorly; cross incisions 1 and 3 apparent, 2 very indistinct in the male, apparent on the sides in the females, 1 arcuate above, 3 slightly sinuous and situated about the middle of the pronotum; central carinæ merely a raised line; the lateral carinæ obliterated in front, obtuse on the posterior lobe; truncate in front, posterior angle obtuse. Elytra and wings considerably longer than the abdomen. Posterior femora broad, not reaching the extremity of the abdomen. Antennæ stout, reaching the middle of the abdomen in the males, a little shorter in the females, joints distinct.

Male. Color (siccus). Ash-colored varied with brown. Head pruinose, except the vertex, which is mouse-colored. Pronotum lilac on the back, sides pruinose. Elytra crossed by three broad fuscus bands, middle one the broadest and darkest; apex transparent. Wings transparent yellow at the base; crossed by a dusky band as in *Œ. æqualis*; apex pellucid. Posterior femora pruinose at the base, crossed by an oblique brown band beyond the middle; tip brown; basal half of the inside black; tibiæ orange yellow; tarsi pale. Venter pale yellow. Antennæ fuscus.

Female differs as follows: Seldom pruinose; occiput brown; pronotum reddish-brown, varied with dots and lines of yellow. The front part of the pronotum more regular and smooth; the posterior lobe of each is densely punctured, but that of the female is intersected by irregular, slightly raised lines. The dark lines across the elytra narrower, paler and more irregular.

Dimensions. Male. Length 1·10 in.; to tip of elytra 1·42 in.; pronotum ·26 in.; femur ·60 in.; tibia ·58 in. *Female.* Length 1·48 in.; to tip of elytra 1·70 in.; pronotum ·34 in.; femur ·76 in.; tibiæ ·70 in.

Hab. Quite abundant in Southern Colorado and Northern New Mexico.

Œ. CINCTA, nov. sp.

Female. Very similar in appearance and coloring to *Œ. æqualis*, but in the carvings of the head approaching the *Tomonoti* (Sauss) of which *Œ sulphurea*, Burm., may be taken as the type. Vertex channeled; the margins strongly and sharply elevated, waved, descending; truncate squarely in front; a slight median line visible. Frontal ridge vertical, straight, sulcate, narrowed immediately below the antennæ, expanding at the base, reaching the transverse suture; lateral carinæ distinct, divergent. Pronotum rugose, tricarinate, truncate in front, angled at the tip; median carina only a raised line, cut by incisions, 1 and 3; lateral carinæ distinct on the posterior lobe, obliterated in front; coarctate in front, expanding posteriorly; incision 3 (posterior) situated before the middle. Elytra narrow, passing the abdomen one-third their length; wings nearly as long. Posterior femora not passing the abdomen. Antennæ reaching beyond the pronotum slightly.

Color (siccus). Rusty-brown varied with lighter and darker shades. Face and the sides of the pronotum yellow mottled with brown; two black bands pass round the front, one immediately above and the other just below the antennæ, (the lower a little broader than the upper) converging behind these they pass through the eye (plainly to be seen in fresh specimen) and become a single black stripe behind the eye which reaches to the posterior incision of the pronotum, decreasing in width as it passes along the lateral angle. Pronotum ash-colored on the dorsum, posterior lobe palest, with minute brown tubercles scattered over it, a dark brown spot on each side. Elytra brown, darkest next the base, semi-transparent at the apex. Wings transparent yellow next the base; apical half dusky; this dark marginal band is broad in front, but tapering toward the inner angle but does not reach it; reaches along the front submargin nearly to the base; is somewhat darkest at the inner and outer borders, reaching to the apex. Posterior femur reddish with two oblique darker bands on the outer face, and three black bands inside.

Dimensions. Length 1 in.; to tip of elytra 1·26 in.; to the end of pronotum (from the front of the head) ·31 in.; femur ·54 in.; tibia ·44 in.

Hab. New Mexico.

Œ. CARLINIANA, nov. sp.

Female. This species at first sight has much the appearance of *Œ. Carolina*, but an examination of the head or thorax, or spreading the wings will soon undeceive the observer. Although smaller than that species it is more robust, compared with its length. Head carved much the same as *Œ. corallipes.* Occiput short, sub-convex, not ascending; vertex very broad, slightly deflexed; the broad shallow central foveola divided by a median carina into two elongate pentagonal spaces, the median carina and margin next the eye being the longest sides; the lateral shallow foveolæ triangular; at the top of the frontal ridge is a lunate depression; frontal ridge somewhat broad, obtusely margined, expanded at the ocellus, vertical, reaching the cross suture; lateral carinæ distinct, reaching the corners of the face. Antennæ filiform, sub-planate. Pronotum sub-cylindrical in front, flat on the lateral lobe, expanded posteriorly, not constricted; median carina a raised line, cut by the cross incisions 1 and 3; posterior incision before the middle; lateral carinæ obliterated in front, distinct on the front of the posterior lobe; posterior lobe densely punctate. Elytra and wings extend slightly beyond the abdomen. Posterior femora short, not reaching the extremity of the abdomen; inflated.

Color (siccus). Ash-colored. Vertex and posterior lobe of the pronotum tinged with reddish-brown. Elytra opaque and somewhat brownish at the base, semi-transparent at the apex; dotted with pale brown. Wings when fully expanded present a very broad fuscus band across the base parallel with the body, the outer border reaching beyond the middle; a large triangular space at the apex transparent, with dark and white veins. Posterior femora spotted with black inside; tibiæ yellow.

Male. The male differs only in size, and in having the elytra crossed by irregular brownish bands, somewhat as in *Œ. æqualis.*

Dimensions. Female. Length 1·38 in.; to tip of elytra 1·58 in.; to tip of the pronotum (measuring from the vertex) ·45 in.; femur ·64 in. *Male.* Length 1·16 in.; to tip of elytra 1·36 in.; to tip of pronotum ·42 in.; femur ·58 inch.

Hab. Eastern Colorado.

Named in honor of Col. Carlin, for the assistance rendered the expedition by him.

Œ. NEGLECTA, nov. sp.

Female. Much like *Œ. corallipes*, about the size of the male of that species, for which it has doubtless often been taken. In its carvings, as well as size, it comes very near *Œ. Mexicana*, Sauss. Vertex very broad, transverse, foveolate; the large central foveola divided, by the recurving margins, into three contiguous foveolæ, these margins, seen from the front, form a W, with a line across the middle angle; lateral foveolæ obsolete; frontal ridge bisulcate above the ocellus, sulcate below, expanded at the ocellus. Pronotum flat above, rough; median carina an elevated line, very distinctly severed by cross incision 3, before the middle; incisions 2 and 3 come together at the carina; anterior portion rugose; posterior lobe covered with elongate tubercles, its sides granulose. Wings and elytra extend beyond the abdomen. Posterior femur about the length of the abdomen. Antennæ filiform, reaching the tip of the pronotum.

Color (siccus). Dirty-brown, with fuscus spots. Each elytrum has a narrow yellow stripe near the dorsal border; the base brown, fading toward the apex, which is semi-transparent; marked with groups of fuscus spots which at two points form irregular bands somewhat as in *Œ. æqualis.* Wings yellow at base; a dark band of moderate width crossing just beyond the middle, curving inward to the posterior angle; apex transparent, veins dusky. Posterior femora crossed on the outside by two very indistinct oblique reddish bands; inside, beneath and tibiæ orange yellow (probably bright red in the fresh specimens); spines of the tibiæ tipped with black. Antennæ pale at base, apical portion dusky.

Dimensions. Female. Length 1·16 in.; to tip of elytra 1·38 in.; to end of pronotum ·44 in.; femur ·63 in.

Hab. N. Mexico.

This species agrees so nearly with *Œ. Mexicana*, of Saussure, that I would have marked my unique specimen as such, but for the fact that its wings are yellow at the base.

TOMONOTUS, Sauss.

T. NIETANUS, Sauss.

T. MEXICANUS, Sauss.

I have labelled my specimens with some hesitancy, especially those belonging to the first species. *T. nietanus*, when living appears black, and may easily be recognized when flying by its black body and bright red wings. It is closely allied to *Œ. sulphurea*, Burm., which belongs to this genus.

T. PSEUDO-NIETANUS, nov. sp.

Male. Size and appearance much like *T. nietanus*, Sauss., from which it differs only as follows: The facial costa is slightly broader and less excavated below the ocellus; the occiput and pronotum less rugose; the antennæ nearer cylindrical. The color is darker, the sides being deep black throughout to the tips of the elytra; the posterior part of the occiput and dorsum of the pronotum an ashy-yellow, the front lobe and lateral margins of the pronotum dotted with black; the upper edge of the posterior femur has two yellow spots, one next the base the larger. Beneath shining black. Wings as in *nietanus;* base rosaceous, posterior border broadly margined with black, and a fascia of the same running along the anterior margin nearly to the base.

Dimensions. Male. Length 1 in.; to tip of elytra 1·25 in.; femur ·67 in.; tibia ·53 in.

Hab. Found near Cañon City, Colorado, in a mountain cañon.

I have not seen the female. It may possibly be a variety of *T. nietanus*, but its variations from that species added to the fact that it was found at but one point, justify me in describing it as new.

STAURONOTUS, Fischer.

S. ELLIOTTI, nov. sp.

Medium size, robust, sub-angulate. Head large, widest below; face subvertical, strongly deflexed below the transverse suture; occiput convex; vertex slightly declined, foveolate; foveolæ shallow, the central broad, lateral triangular, the points of the three meeting in a sharp angle midway between the upper angle of the eye and the antennæ; frontal ridge not sulcate, narrowest above; lateral carinæ distinct, strongly divergent below; eyes medium size, ovate. Pronotum short, sub-truncate in front, posterior angle obtuse and rounded; the three transverse incisions distinct and closely approximate, anterior shortest, 2 and 3 connect at their termini on the side of the pronotum by an oblique depression; incision 3 about the middle; median carina distinct, not elevated; lateral carinæ distinct on the anterior lobe and front part of the posterior lobe; the spaces on the anterior lobe between the median and lateral carinæ depressed, basin-like. Elytra and wings about as long as the abdomen. Posterior femora inflated at the base, attenuate near the tip. Pectus not broader than the head. Antennæ filiform, reaching the end of the pronotum.

Color (siccus). Yellow varied with brown. Head yellow, occiput dotted with brown, forming imperfect waved lines; antennæ pale at base, remainder brown. Pronotum with a yellow cross on the back, beginning at the lateral angles of the posterior lobe, converging anteriorly they cross about the middle and fade on the anterior lobe; a triangular brown spot on the posterior lobe; sides brownish fading below. Elytra brown, a yellow stripe along the inner margin; lower half dotted with dark brown. Wings transparent, the veins white except at the apex where they are dusky. Posterior femora yellow with two or three oblique brownish spots near the upper edge, which cross and become distinct bands on the inside; knee brown; tibiæ dusky above, and at the tips, rest yellow (probably bluish in fresh specimens.)

Dimensions. Female. Length 1·07 in.; to tip of elytra 1·10 in.; to end of pronotum ·34 in.; femur ·62 in. *Male.* Length ·88 in.; to tip of elytra same; femur ·60 in.

Hab. Eastern Colorado.

Named in honor of Mr. Henry Elliot, artist of the expedition, who, in addition to his arduous duties, was constant in his efforts to collect specimens of Nat. Hist., and who rendered me valuable assistance in collecting plants and insects.

BOOPEDON, Thos., nov. gen.

Gen. Char. Body somewhat like *Pezotettix*, Burm. Head large, exceeding the thorax in width, widest below; seen from the side presents a somewhat semi-circular front; occiput convex; vertex sloping, broad, sometimes exhibiting a shallow foveola, usually rhomboidal, with a slight median carina; frontal ridge prominent, not sulcate, margins obtuse and nearly parallel. Antennæ nearly as long as head and thorax, inserted in deep oblong foveolæ. Pronotum of medium length, sides parallel; sub-truncate in front; posterior angle obtuse; three transverse incisions; posterior about the middle, cutting the median carina; median carina distinct, not elevated; lateral carinæ obsolete. Elytra shorter than the abdomen in the female, about the length of the abdomen in the male; inflated near the base, narrowed at the apex; two longitudinal veins dividing it into three nearly equal fields. Posterior femora stout, narrowed at the tip, passing the abdomen; tibiæ spined, enlarged at the tip. Ultimate joint of the maxillary palpi enlarged at the end, truncate. Prosternum with the anterior half tumid; latter half divided by a longitudinal sulcus. Pectus sub-convex or flat. Anal appendages of the female short and obtuse; sub-anal plate of the male keeled, trigonal and turned up.

B. NIGRUM, nov. sp.

Black, medium size, female much larger than the male.

Female. Occiput smooth, a few punctures on the vertex, a faint median line visible; eyes about midway between the front and back margins; frontal ridge convex, with a very slight indentation at the ocellus, punctured on the margin, reaching nearly to the cross suture, where it suddenly expands; lateral carinæ distinct, obtuse, sinuate and divergent; a deep sulcus below each eye. Pronotum nearly as broad as the head; median carina distinct, straight; posterior lobe punctate; central portions of the sides levigate; cross incisions 1 and 2 not reaching the median carina. Elytra narrow, covering about two-thirds of the abdomen, lanceolate; the two longitudinal veins strong, approaching at the apex, along the borders, the reticulate veins coarse. Wings shorter than the elytra.

Color (siccus). Dark ferrugineous. Lower angles of the face and sides of the lip black. Tips of the elytra black. Apex of the wings dusky, rest transparent. Two reddish spots inside the posterior femora; tibiæ transparent red.

Male. Similar in coloring only darker. Elytra black, somewhat paler at the base; wings transparent, cloudy at the apex (I think they are roseate when living.)

Dimensions. Female. Length 1·5 in.; pronotum ·32 in.; elytra ·55 in.; femur ·95 in.; tibia ·80 in. *Male.* Length ·87 in.; pronotum ·25 in.; elytra ·55 in.; femur ·62 in.; tibia ·56 in.

Hab. South Colorado and New Mexico, from Cañon City south, near the mountains; mostly in the narrow valleys behind the first range of parallel hills called "Hog-backs."

B. FLAVO-FASCIATUM, nov. sp.

Very much like *B. nigrun* in size and carving.

Female. Central foveola of vertex very shallow, divided into two parts by a median carina; frontal ridge convex, sparsely punctured. Pronotum differs from previous species only in having the transverse incisions less distinct.

Color (siccus). Yellow varied with brown. Head yellow; lower angles of the face black; a very distinct yellow line, starting from the upper corner of each eye, reaches the posterior margin of the pronotum, bowing inward near the middle; bordered on each side by an irregular dark brown line; a dark line borders each eye posteriorly. Median carina of the pronotum dark brown or piceous-black; the transverse incision black; rest of the pronotum brownish, palest on the sides. Elytra formed as in *B. nigrum*, brown, a pale yellow stripe near the upper and lower margins of each, the upper divided near the base; three oblong yellow spots in a line along the middle, and a few smaller spots near the apex; reach the third abdominal segment. Wings transparent, dusky at the tips. A brown stripe along each side of the abdomen, near the dorsum; a yellow spot in it on each segment near the upper border. Venter yellow.

Male. Unknown.

Dimensions. Female. Length 1·5 in.; pronotum ·38 in.; elytra ·50 in.; femur ·85 in.; tibia ·76 in.

Hab. Same as preceding, but a much rarer species.

Remarks on Huxley's Classification of Birds.

BY T. HALE STREETS.

In arranging and classifying the collection of birds' skeletons, crania, and sterna in the possession of the Academy, I was induced to compare some points in their osteology with the statements made by Prof. Huxley in an article entitled "On the Classification of Birds," which appeared in the Proceedings of the Zoological Society of London, 1867, Part II.

In this article Prof. Huxley divides birds principally according to the modifications presented by the bones forming the roof of the mouth, namely, the palatines, the maxillo-palatine processes, the pterygoids, the basi-pterygoid processes, and the vomer.

After these the sternum, clavicles, coracoids, and occasionally other points claim attention as affording a basis for the classification.

He makes three orders. The first contains a single bird, the extinct Archæopteryx. The second comprises the Struthious, or Ostrich family. The third embraces all the remaining existing birds. To this last he gives the name Carinatæ.

The Carinatæ he subdivides into four sub-orders, namely, the Dromæognathæ, which have the Cassowaries as their type; the Schizognathæ, which are "characterized not only by the complete distinctness of the maxillo-palatines from one another and from the vomer, but by the slender and usually pointed form of the latter bone." The third suborder are the Desmognathæ. In these the maxillo-palatines unite with one another in the median line, thus filling up or bridging over the space which exists as a fissure in the Schizognathæ. The fourth suborder, the Ægithognathæ, "have a palatine structure, which is, in some respects, intermediate between that of the Schizognathous and that of the Desmognathous groups, while in others it is peculiar."

This introduction was deemed necessary in order to render intelligible the remarks which are to follow.

SCHIZOGNATHÆ.

This suborder is divided into six groups, named, respectively, the Charadriomorphæ, or Plover-form; the Geranomorphæ, or Crane-form; the Cecomorphæ, or Gull-form; the Spheniscomorphæ, or Penguin-form; the Alectoromorphæ, or Cock-form; and the Peristeromorphæ, or Dove-form.

In the group Cecomorphæ, Mr. Huxley states that the "*Procellaria gigantea* alone has presented basipterygoid processes." He had not been able to observe them in other Procellaridæ. I have come to the conclusion, from this statement, that his observations must have been limited to *Procellaria gigantea* and to the Diomedeinæ, else he could not have failed to observe them. The following are the species belonging to the Procellarinæ which were examined by me: *Procellaria gigantea*, *P. glacialis*, *P. glacialoides*, *P. Lessonii*, *P. capensis*, *P. mollis; Puffinus tenuirostris*, *Puf. fuliginosus*, *Puf. Anglorum*; *Prion vittata*, and *Thalassidroma Leachii.* In all of these the basipterygoid processes were present, and well developed (except in *Thalassidroma*, where they were rudimentary), articulating with the pterygoid bones.

From the species examined it will be seen that the possession of these processes is characteristic of the subfamily. Their presence is the rule rather than the exception. Their absence is rather the exception. This fact is sufficient I think to justify a separation of them from the other Cecomorphæ, and to make a separate group of them under the name of Nectriomorphæ.

The Nectriomorphæ may be looked upon as an intermediate group, connecting the Cecomorphæ (which contains the Laridæ, the Columbidæ, the Alcidæ, and the Diomedeinæ) and the Charadriomorphæ (which contains the Charadriadæ and Scolopacidæ).

The presence of the basipterygoid processes allies it with the latter.* Its lamellar and concavo-convex maxillo-palatines is a feature common to both, but more characteristic of the Charadriomorphæ. The absence of the recurved process at the angle of the mandible connects it with the Cecomorphæ.

The vomer in Nectriomorphæ differs from that found in either of the two groups mentioned above. In these latter it is forked posteriorly, and embraces the basisphenoidal rostrum on each side. In most of the Cecomorphæ a boat-shaped fossa is left between the divergent posterior ends of the vomer. In Diomedeinæ the sides are more or less pressed together, obliterating the fossa. The vomer tapers to a point anteriorly. The upper portion of it is flattened

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* In *Glareola orientalis* the basipterygoid processes are absent. The maxillo-palatines are less lamellar than those found in the other Charadriomorphæ. The vomer is cleft posteriorly, but slender and rod-like anteriorly. The angle of the mandible presents the recurved process which is characteristic of the group.

This genus is evidently an aberrant form, but in which direction it inclines I am not prepared to say.

out horizontally, while the lower portion is vertical in direction, and scythe-shaped. This form of the bone may be more or less modified. It is not confined altogether to these groups.

In Nectriomorphæ the sides of the scaphoid fossa are flattened down, and the whole bone is compressed horizontally. It is somewhat tongue-shaped.

The group Geranomorphæ is not so well defined as the Charadriomorphæ and Cecomorphæ. It is represented by the Rallidæ, by the Psophinæ and Gruinæ of the family Ardeidæ, and by Otidinæ of the Struthionidæ.

The following are the characteristics of the group, as given by Huxley:

"The rostrum is relatively stronger than in the preceding group (Charadriomorphæ), and may even be short and arched.

"The basipterygoid processes are absent (ex. *Grus antigone*).

"The maxillo-palatines are concavo-convex and lamellar.

"The angle of the mandible is truncated.

"In the typical groups the sternum is comparatively narrow and elongated, and may be deeply notched or entire."

In that portion of the article where he considered the cranial characters alone, he states that the Rails are always devoid of basipterygoid processes.

I found them to exist only in *Ortygometra porzana*,* where they are well developed.

In addition to the sternal characters mentioned, I may state the following: From the situation of the principal pneumatic foramen on the internal surface of the sternum there rises a ridge which is produced upward to the anterior border, where it becomes forked or branched, and may present either a Y- or T-shaped appearance. In the former case it looks very much like the bifurcated manubrium of the true Passerine birds. It was present in all the representatives of this group examined,† except Fulica and Otis.

In all of the Rails and in some of the others there is a small process produced upward from the symphysis between the clavicles. This is a character which is constant in the Herons. Its presence in the Rails shows an inclination towards the Ardeinæ.

In Alectoromorphæ,‡ or Cock-form, "the rostrum may be slender and depressed, or high and arched. Oval, flattened basipterygoid facets, sessile upon the basisphenoidal rostrum and articulating with corresponding surfaces upon the pterygoids, are always present. The maxillo-palatines are always lamellar, but vary greatly in size, being sometimes very small.

"The palatine bones are relatively long and narrow, with obsolete internal laminæ and rounded-off postero-external angles.

"The angle of the mandible is produced into a strong upcurved process."

In Peristeromorphæ, or Dove-form, "the rostrum is swollen at the tip.

"The skull is provided with narrow, but prominent, basipterygoid facets."

"The maxillo-palatines are elongated and spongy.

"The angle of the mandible is not produced and recurved.

"The sternum has two posterior notches, the inner pair of which may be converted into foramina."

Mr. Huxley states that "the Pteroclidæ in some respects, but not in cranial characters, approaches the Pigeons."

Pterocles arenarius I hold to be as much, if not more, Peristeromorphæ as Alectoromorphæ, in cranial as well as sternal characters.

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* The cranium was the only portion of this bird examined. It belonged to the Duc de Rivoli collection purchased by Dr. T. B. Wilson. It was labelled by that French naturalist *Rallus porzana*.

† *Rallus crepitans*, *R. aquaticus*, *R. maximus*; *Porphyrio martinica*, *P. smaragdinus*, *P. hyacinthinus*; *Gallinula chloropus*; *Grus monachus*, *G. americana*, and *Balearica pavonina*.

‡ The writer was not aware of the existence of Prof. Huxley's paper on the Alectoromorphæ until this article had passed through proof.

The basipterygoid processes are situated, like those in Columbidæ, at the juncture of the basisphenoidal rostrum with the body of the sphenoid. As in the Doves, they are prominent and articulate with the pterygoids about midway between their anterior and posterior ends; while in the Alectoromorphæ they are flattened facets, sessile upon the rostrum, and articulate with the pterygoid bones near their anterior extremity. The other cranial characters resemble the Cocks.

The sternum is almost completely Peristeromorphic. The inner posterior notch on each side is converted into a foramen; the outer is wide and deep; both of which are Dove characters. The anterior inferior angle of the keel is less produced forward. In this particular it is like the walking birds.

In all the Gallinaceous birds examined the clavicles presented a large, broad process, which is developed downward from the summit of their symphysis. In the Doves it is wanting, as it also is in *Pterocles arenarius.*

On the whole, I think that it approaches the Peristeromorphæ more closely than the Alectoromorphæ.

DESMOGNATHÆ.

The third suborder, Desmognathæ, is divided into seven groups. They are named the Chenomorphæ, or Goose-form; the Amphimorphæ, a type intervening between the Goose and Stork form; the Pelargomorphæ, or Stork-form; the Dysporomorphæ, which have the Gannets as their type; Ætomorphæ, or Eagle-form; the Psittacomorphæ, or Parrot-form; the Coccygomorphæ, or Cuckoo-form; and the Celeomorphæ, or Woodpecker-form.

In the Chenomorphæ "the lachrymal region of the skull is remarkably long.

"The basisphenoidal rostrum has oval, sessile, basipterygoid facets.

"The flat and lamellar maxillo-palatines unite and form a bridge across the palate.

"The angle of the mandible is greatly produced and recurved.

"The sternum has a single pair of notches at its truncated posterior margin."

In this group Prof. Huxley places the *Palamedea.* The following are the peculiarities presented by the bones situated at the roof of the mouth in *Palamedea cornuta.* The maxillo-palatines are inflated. They unite with one another across the median line; but this union is not so extensive as that seen in the Anatidæ. The bridge across the fissure is very narrow. The maxillo-palatines, anteriorly and posteriorly, are separated by a wide interval. The septum is entirely wanting, as it is in the Gallinaceous birds. Like this group, again, the anterior processes of the palatines are long and slender, and their posterior ends are rounded off. The posterior extremities of the palatines and the anterior extremities of the pterygoids do not articulate directly with the basisphenoidal rostrum, as stated by Huxley. A space, the tenth of an inch, intervenes between the rostrum and the upper surface of the palatines. The basipterygoid processes are long and prominent.

The lachrymal region of the skull is remarkably short. It presents the same condition in the Gallinæ.

The angle of the mandible is produced and recurved. This character exists as well in the Gallinæ as in the Anserine birds.

The sternum bears no resemblance either to the Gallinaceous birds or to the Anatidæ. The external angles of the posterior extremity are produced more than the middle portion. A slight notch exists on one side. This backward extension of the postero-external angles of the sternum is characteristic also of the Albatrosses.

From the above description it will be seen that the *Palamedea cornuta* exhibits a decided resemblance to the Gallinaceous form. The closed palate should not exclude it from the Alectoromorphæ; for the Cracidæ show the same structure in this respect.

A bird may present characters which are analagous to those found in another bird of a different family without there necessarily being any affinity between them. This is doubtless the case between the *Palamedea* and Anatidæ.

The following two characters may be added to those already laid down as belonging to the *Ardea*. They will be found to be highly characteristic.

A rather long and well-developed process is produced upward from the symphysis between the clavicles. The second peculiarity is in the internal angles of the distal ends of the coracoids. They override one another. This last peculiarity was first pointed out to me by Prof. O. C. Marsh, of Yale College.

In Coccygomorphæ, according to Prof. Huxley, "basipterygoid processes are present only in one genus (*Trogon*).

"The maxillo-palatines are usually more or less spongy. The palatines are not developed into vertical plates, but are, as usual, horizontally flattened.

"The sternum usually presents two notches on each side, and has no bifurcated manubrial process (ex. *Merops*).

"The clavicles are convex forward, and without any process developed backward from the summit of their symphysis."

Basipterygoid processes were found in *Priotelus temnurus*, of the family Trogonidæ. They are present in *Turacus albocristatus*, of the Musophagidæ, but here they are rudimentary. They do not articulate with the pterygoids.

Huxley states that in *Merops* the "palatines are devoid of any postero-external elongations." In *Merops œggpticus*, *M. Leschenaultii* and *M. amicta* the postero-external elongations are quite prominent.

In *Psilopogon pyrolophus* and *Megalaima chrysopogon*, of the family Capitonidæ, the vomer presents an appearance which is somewhat singular. It is well developed. Its anterior extremity is bifurcated, and each prong of this forked end is produced to the maxillo-palatine process of the corresponding side, and becomes united with it. This form of the vomer is doubtless a family characteristic.

It was chiefly in the sternal characters that the members of the group Coccygomorphæ were found to differ from the statements laid down by Mr. Huxley.

In all the members of the family Cuculidæ examined,* the clavicles presented a well-developed process at the summit of their symphysis. The same process was also observed in *Priotelus temnurus*. In this bird the manubrial process of the sternum presented a groove on its upper surface, showing a tendency for it to become bifurcated.

The clavicles may or may not be convex forward. In the Musophagidæ (*Turacus*) and in *Bubutus Duvaucelii*, the anterior surfaces of the clavicles are straight from above downward. This is an Owl character. The family Musophagidæ is stated by Prof. Huxley as approaching the Ætomorphæ.

In *Psilopogon* and *Megalaima*, of the family Capitonidæ, and in *Ramphastos*, the proximal extremities of the clavicles are expanded and T-shaped. This character is common to the Celeomorphæ and the true Passerine birds. Its presence in Capitonidæ and Ramphastidæ serves to connect them rather with the Woodpecker than with the Passeres.

The two families under consideration present another character in common. The distal ends of the clavicles are not anchylosed, but are separated by an interval.

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* *Saurothera Merlini*, *Phœnicophaus viridis*, *Bubutus Duvaucelii*, *Cuculus canorus*, *C. lucidus*, *Eudynamys orientalis*, and *Centropus gigas*.

Aug. 2d, 1870.

Mr. Vaux, Vice-President, in the Chair.

Twelve members present.

Prof. Leidy exhibited in a vessel of water, numerous living specimens of a leech, which he said was abundant in the vicinity of Philadelphia, but appears to be an undescribed species. He had first observed it in a pond, on the Delaware, near Beverly, Burlington Co., N. J., from which he obtained the largest specimens. It was found especially beneath half-submerged dead limbs of trees, sometimes between the bark and wood, and in crevices and holes of the latter made by insects. It was also found in the Delaware and Schuylkill rivers near shore, beneath stones. In ditches below the city, and communicating with the rivers mentioned, smaller leeches, apparently the young of the same, were frequent between the leave sheaths of submerged stems of aquatic plants, such as *Zizania aquatica*, *Scirpus fluviatilis*, *Sagittaria*, *Sparganium*, &c. When disturbed, the animal receded from its position of rest, and swam rapidly like the ordinary medicinal leech, *Hirudo decora.* It appears to belong to a different genus from the latter, and approaches most in character *Nephelis,* though it even exhibits points of difference from this as ordinarily described. The more mature animal from the Beverly pond may thus be characterized:

Body elongated, flattened cylindroid, narrowing anteriorly, smooth, indistinctly annulated, margin acute, above blackish olivaceous, below translucent grayish, with a more or less reddish tinge due to the blood. No striæ or markings visible beneath, and the annuli in this position scarcely perceptible. Annuli about 98, above minutely punctated with yellowish olivaceous or dusky whitish, and narrowly defined by the same hue. Head continous with the body, obtuse. Mouth large, obliquely terminal, subbilabiate; lower lip crenulate. Jaws three rudimental folds without teeth. Œsophagus capacious, with three longitudinal folds. Intestine simple. Anus dorsal, conspicuous, in the penultimate annulus. Eyes six; anterior pair largest and approximated: second pair in second annulus corresponding with the lower lip; third pair smallest, more deeply situated than the others, and placed slightly external and posterior to the second pair. Acetabulum terminal, inferior, circular, nearly as wide as the body. The larger male aperture conspicuous, and situated about one-fifth of the length of the body from the head; the smaller female aperture scarcely visible, and situated two or three annuli back of the former. Length to 2½ inches by two lines wide; by contraction becoming shorter and wider.

Smaller specimens, from half an inch to an inch in length, from the ditches communicating with the Delaware and Schuylkill Rivers, and from the latter, agree in form and constitution with the preceding, having the same number of annuli to the body, and the same number and disposition of the eyes. The color is translucent pale indian-red, passing into darker shades and without the colored punctæ. Some young pale individuals exhibit a few scattered minute black punctæ down the back, due to single pigment cells, but mostly these are absent. Intermediate sized individuals from the Delaware and Schuylkill exhibit a gradation of character between the two forms indicated. Further, numerous young from the ditches, kept in an aquarium for the last month, have gradually assumed the appearance of the more mature animal as first described.

Nephelis vulgaris of Europe has eight eyes; and the generative apertures are included between the 34th and 38th annuli. In the species above described I could detect but six eyes, and the annuli at the fore part of the body are too indistinctly defined to determine the exact relative position of the generative apertures.

The new species of *Nephelis* I would propose to name N. punctata.

I take the present opportunity of observing that yesterday, during a stroll in the meadows below the city, to procure specimens of the leech just described, I observed that many of the ditches, and several ponds, were teeming with the minute plant *Wolffia*, probably *W. Columbiana*, mingled with *Lemna polyrrhiza* and *L. minor*. In several places I also observed *Stentor polymorphus* swarming upon *Ceratophyllum demersum*, conspicuous by its bright pea-green hue upon the darker hue of the latter plant. In similar positions I also observed an abundance of *Volvox globator*. This latter I have frequently seen in the vicinity of our city, and, preserved in an aquarium, have observed it pass through the various stages representing what were formerly viewed as distinct species under the names of *V. aureus* and *V. stellatus*.

In the course of my walk, I noticed upon the margin of a ditch a large mass of jelly, about two feet in breadth and about two inches in thickness, the character of which I at first did not recognize. It reminded me of the jelly-fish or medusa (*Cyanea arctica*), so frequently seen stranded on the ocean shore of New Jersey. A nearer inspection proved it to be a mass of the remarkable compound ciliated fresh-water polyp, or polyzoon, formerly described by me under the name of *Pectinatella magnifica*, which had, by an unusual recedence of the tide, been left to die on shore. On examining the ditch in the vicinity, I observed many masses of the same polyp, varying from the size of one's fist to that of a boy's head, mostly attached to the pendent leaves of aquatic plants growing at the margins of the ditch.

Prof. Cope called attention to a large specimen of a *Trigonocephalus*, of which some fourteen inches was enclosed in the œsophagus and stomach of a larger *Oxyrrhopus plumbeus*. The specimens were from the island of St. Lucia, W. I. He stated that a species not distantly related to the latter (*Ophibolus getulus*) was said to have a similar habit of devouring our native Crotalidæ. The islands of Martinique and Guadaloupe had become so infested with the fer-de-lance, *Trigonocephalus lanceolatus*, as to be in parts almost uninhabitable, and that it was chiefly on account of the danger from this venomous reptile that collecting naturalists had of late years so seldom visited them. The annual number of deaths in Martinique from this cause was said to be very large. Some means had been adopted to check the increase of this pest, but with small results. Prof. Cope thought that as the *Oxyrrhopus plumbeus* was very numerous in Venezuela and Brazil, and since it was very harmless and easily procured, that its introduction in large numbers into Martinique, etc., would be a simple matter, and one probably to be attended with good results in the diminution, at least, of this enemy of agriculture.

Mr. Thomas Meehan called attention to the arrangements of some plants for preventing fertilization through any other than insect agency, as discovered by Darwin. The *Salvia* family of plants had the most elaborate arrangements for insect agency, but it had been objected to Darwin's theory that insects made no use of them. Bees bored holes through the tube from the outside for the honey, and do not enter by the mouth of the flower, as they ought. In the same way, in the *Petunia*, bees bore for honey from the outside. He had discovered that in these cases, where day insects failed to make use of these apparatuses, fertilization was carried on by night moths, so that the objections to Darwinism were removed.

He also referred to the common sweet chestnut, as bearing two classes of male flowers, only one of which probably aided in fertilization. The first class appeared ten days before the other, and are those which give whiteness to the trees. They appear in the axils of the weak shoots. The female flowers appear on the apices of strong shoots, according to his theory of the laws of sex. The second class of male flowers appear at the ends of the vigorous shoots bearing the female flowers. Whatever affects the vigor of the tree interferes with the production of female but not of male flowers, and this was the reason why some seasons had short crops.

Mr. J. H. Redfield remarked that, on a recent visit to the northern part of the State of New York, he had noted the *Botrychium lunarioides* and *Botrychium lanceolatum* growing under circumstances that seemed to confirm the idea that these species are really underground parasites, or *epiphytic* plants. More than twenty plants were noticed scattered over a space of a mile in length, and in every instance they were growing near the common blackberry (*Rubus villosus*), and every plant that was lifted had its roots in contact with the root of the blackberry. He referred to the peculiar character of the root of this genus,—so different from that of other ferns, and so similar to that of some orchids,—and to the fact that these species, so widely distributed, seem nowhere abundant,—as favoring the idea of their epiphytic character. Mr. Newman some years ago expressed the opinion that the British *Botrychium lunaria* is an underground parasite, but Moore and others have doubted. Mr. R. desired to call the attention of botanists to the conditions under which these and other species of *Botrychium* may be found, with a view to determine the question.

Aug. 9th.

Mr. Vaux, Vice-President, in the Chair.

Fifteen members present.

The following paper was presented for publication:

"On some new species of Fishes obtained by Prof. Orton from the Maranon River, Upper Amazon and Napo Rivers." By Theo. Gill.

Mr. Thomas Meehan said very little had been written about the causes of those bunches of branches often seen in trees, and called by the people "crow's nests," and by botanists *fasciations*. Dr. Masters, in *Teratology*, briefly refers to them, and refers to "over-nutrition" the cause of their existence. He had watched almost daily the past year one of *Abies balsamea* on his own grounds. The branchlets were weak, the leaves were comparatively long and slender, not distichously arranged, pale in color, deciduous, and many of the branchlets died in the winter. All these were evidences of weak nutrition.

He had found two trees of sassafras, apparently of the same age, growing within a few yards of each other, but one with numerous fasciculated bunches. In addition to the characters in the other case, here the fasciculated tree was not as large as the other one.

That weakness, not strength, was the cause, was also proved by facts from an opposite direction,—namely, the law of sex. He had already shown that a low condition of vitality favored male, at the expense of the female organs. He had found a large number of fasciculations in the common blackberry, and in all instances, besides the yellowness and the other marks, there was a tendency to abortion in the pistils, an increase in the number of petals, and a development of foliaceous points to the usual calyx segments. So that his law of sex, as well as the usual phenomena of weakened vitality, indicated that it was this and not over-nutrition which caused fasciations in trees.

Aug. 16th.

Mr. Vaux, Vice-President, in the Chair.

Seven members present.

Aug. 30th.

The President, Dr. Ruschenberger, in the Chair.

Fifteen members present.

On favorable report of the Committee, the following paper was ordered to be published:

On some New Species of FISHES obtained by Prof. Orton from the Maranon, or Upper Amazon, and Napo Rivers.

BY THEODORE GILL, M. D, PH. D.

In an expedition to the Andes of Ecquador and Peru, and thence across the continent of South America, under the command of Prof. James Orton, a considerable zoological collection was formed, and the fishes being submitted to the writer for determination, the following appeared to be undescribed. Of previously known species, the most noteworthy were *Chalcinus nematurus* Kner, *Gasteropelecus stellatus* Kner, *Pimeletropis lateralis* Gill, and *Cyclopium Humboldtii* Swains.

Subfamily TETRAGONOPTERINÆ.

Tetragonopterus Ortonii Gill.

D. 11. A. 34. L. l. 31.

The height is contained about twice in the distance between the snout and the median margin of the caudal, and the head about four times in the same, or three and a half in the length, exclusive of the caudal. The profile is concave at the parietal region; the interorbital area is transversely convex. The diameter of the eye is contained two and a half times in the head's length. The supramaxillary extends nearly to the vertical of the anterior margin of the pupil. The dorsal is immediately behind the roots of the ventrals; its height equals about ¾ of that of the body. The pectoral equals ¾ the length of the head; the ventrals extend to the anal.

The scapular spot is indistinct; that at the base of the caudal well defined.

Most nearly related to *T. orbicularis* Val.

I dedicate this species to Prof. Orton.

Astyanax Carolinæ Gill.

D. 11. A. 26. V. 9. L. lat. 37—38 $\frac{6\frac{1}{2}}{5}$.

The height of the body enters 2¾ times in the length, exclusive of the caudal; the length of the head 3⅔; the profile to the convex snout is rectilinear, and the interorbital space scarcely arched; the latter is as wide or rather wider than the diameter of the orbit, and about a third of the head's length. The maxillary ceases in front of the vertical of the front of the pupil, and the end of the first suborbital. The dorsal commences considerably behind the origin of the ventrals. The pectorals extend beyond the same point, and the ventrals to the anus. The usual silver tinged lateral band, and humeral and caudal spots exist, but are very faint.

The species is represented by a single specimen, 4½ inches long, taken in the river Napo or Maranon and belongs to the same group as *A. peruvianus* (Tetragonopterus peruvianus *M. T.*), *A. humilis* (T. humilis *Gthr.*), *A. scabripinnis* (T. scabripinnis *Jen.*), *A. maculatus* (T. maculatus *M. T. ex L.*), *A. Brevoortii* (Poec. Brevoortii *Gill*), *A. fasciatus* (T. fasciatus *Cuv.*) *A. microstoma* (T. microstoma *Gthr.*) and allies.

Subfamily HYDROCYONINÆ.

Ræboides Myersii Gill.

P. 16. V. 9. D. 12. A. 53.

The height enters two and a half times in the length, exclusive of the caudal; the head three and a half times. The eyes are large, the diameter being contained only three and a half times in the length of the head. The supramaxillary ends under the posterior border of the pupil. The surface of the intermaxillary has four larger equidistant conical teeth, directed forwards, and a smaller one on each side and farther back, between the external and internal; the surface of the mandible has also four conical processes. The dorsal commences nearly over the anus; its height at least equals three fourths of the head's length.* The anal commences nearly under the third dorsal ray. The pectorals extend beyond the anus, and the ventrals, which are inserted nearly midway between the axils of the pectorals and the origin of the anal, extend to about the third ray of the latter.

The scapular spot is very distinct; the caudal indistinct. The fins, especially the pectorals, minutely punctuated between the rays.

I dedicate this specimen to Mr. Philip V. Myers, a travelling companion of Prof. Orton, in compliance with a request of the latter gentleman.

Hydrolycus Copei, Gill.

D. 11. A. 43.

The height enters 2¾ times in the length (exclusive of the caudal), the length of the head 3⅓; the profile between the nape and convex snout is moderately incurved; the interorbital space is slightly arched, and about equal to the orbit, the snout, and a quarter of the head's length. The maxillary passes considerably behind the vertical of the posterior border of the orbit. The dorsal fin commences above the anus. The pectorals pass for a third of their own length beyond the axillæ of the ventrals, and the ventrals extend backwards to the third or fourth anal ray.

The lateral spot is faint, and above the lateral line, just in advance of the vertical of the anus.

Four specimens, the largest of which is four and a quarter inches long, were obtained in the Napo and Maranon rivers.

I dedicate this species to my esteemed friend, Prof. Cope, in recognition of his important contributions to herpetology and ichthyology.

Subfamily SERRASALMONINÆ.

Pygocentrus altus Gill.

P. 17. V. 7. D. 17. A. 33.

The height of the body is contained about 3 4-5ths in the length, exclusive of the caudal; the length of the head (measured from the prominent lower jaw) about 2¾. The back declines very slowly towards the nape of the neck, and thence is boldly decurved downwards. Snout obtuse, less than the diameter of the eye. The diameter of the eye equals a fifth of the head's length, and the interorbital width enters 2⅓ in the same distance. The second suborbital bone is separated from the preoperculum by a lunate naked area. There are fourteen teeth in each jaw. The origin of the dorsal fin is nearer the eye than the root of the caudal; its height is less than half the head's length. The origin of the anal is under the last dorsal rays. The pectorals scarcely reach the bases of the ventrals; the latter are two thirds as long as the former. Gill-rakers of the outer branchial arch short and pointed like those of the other arches. Abdomen armed with about twenty-seven serratures.

The color is greyish, iridescent, and tinged with blueish; there is no well defined scapular spot, but the region above the operculum is darker.

Nearly related to *P. scapularis* (Serrasalmo scapularis *Gthr.* v. p. 368).

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* The anterior dorsal rays are broken.

Family *SILURIDÆ.*

Subfamily PIMELODINÆ.

RHAMDIA DORSALIS Gill.

B. 6. P. I. 8. V. 6. D. I. 6. A. 9.

The body is moderalely slender; the height rather exceeding a fifth of the length (exclusive of the caudal), while the height of the caudal peduncle is about an eleventh. The head forms rather more than a fourth of the length, and is about three fourths as wide as long, or more than twice as wide as the interocular area; the skin is moderately thick and smooth; and the supraoccipital spine is pointed and extends beyond the vertical of the bony opercular margin. The eyes enter about eight times in the head's length, are entirely in the anterior half of the head, and are about equally distant from each other and the middle of the upper jaw. The upper jaw projects but little beyond the lower. The intermaxillary band of teeth is widest near the angles, where it is truncated and obtusely angulated, and rather narrowest at the middle; the greatest width exceeds a sixth of the length. The intramandibular flaps are considerably wider than the dentigerous bands. The maxillary barbels extend to or beyond the middle of the ventrals; the external mandibular extend beyond, and the internal nearly to, a line with the bases of the pectorals.

The dorsal fin is oblong, the longest rays equalling the distance from the second to the axilla. *The adipose fin is contained between three and four times in the length.* The pectorals terminate under the second or third dorsal ray, and are not much larger than the ventrals. The porus axillaris is very minute.

The color is dark brown. The dorsal has the usual broad clear basal band.

SORUBIMICHTHYS ORTONI Gill.

B. 14, 14 D. I. 6. A. 13. C. iii, I, 7, 8, I, iv. P. I. 10. V. 6.

The head forms rather more than a third of the length, exclusive of the caudal fin; the outline above is oblong, convex in front; the width is less than half its length, and the width between the orbits less than a third; the hinder margin of the orbit is midway between the snout and opercular flap; the profile is perfectly straight. The dentigerous area of the upper jaw projects almost entirely beyond the lower jaw, and equals the chin or two diameters of the orbit; it is uninterrupted, except behind at the middle, where there is a broad but shallow triangular sinus; the palatal bands externally describe half an ellipse, and are only interrupted at the middle by a linear furrow widening backwards into a hastiform sinus; their antero-internal angles are, however, rounded. The maxillary barbels extend to the anal; the external mandibular terminate at some distance from the pectoral fins, and the internal are less than the width of the upper jaw.

The dorsal spine is unarmed, or scarcely rough behind; the adipose fin obliquely truncated, shorter than the anal and nearly coterminal with it; the pectorals terminate nearly under the last dorsal ray, and in advance of the ventrals, than which they are considerably larger. The caudal is shorter than the head, the lobes are acutely prolonged, and the upper lobe is somewhat larger than the lower.

The color is ashy with a broad silvery band bounded above by a narrower blackish one, which is bifurcated in front, and below by a still narrower one, or rather a series of partly confluent spots; numerous spots, generally much smaller than the eyes, cover the entire upper portions of the body and head, as well as the dorsal, adipose, and pectoral fins.

This species is among those described most closely related to *S. Artedii* (Platystoma Artedii *Gthr.* = Mystus No. 6 *Artedi*), but the length of the barbels and coloration at once distinguish it, and still more decided differences may appear on re-examination of the latter, the dentition and other characteristics not yet being known.

SCIADES MARMORATUS Gill.

B. 9. P. I. 10. V. I, 5. D. I, 10. A. 11.

The head is little longer than broad. The diameter of the eye is contained nine or ten times in the head's length. The vomerine teeth are in two oval patches, nearly as large as the eye, and separated by a moderately narrow interval; the palatine patches are transversely oval, and smaller than the pupil of the eye. The maxillary barbels extend beyond the base of the caudal; the external mandibular beyond the tips of the pectorals, and the internal beyond the bases of those fins. The dorsal fin is three fourths as high as the head is long. The adipose fin is half as long again as the dorsal.

The ground color is greyish, and forms meandering lines between the large blackish spots by which it is covered. All the fins are similarly colored, but the spots at the base of the dorsal are fused into a band. The barbels are indistinctly annulated.

Closely allied to *S. longibarbis* (Arius? longibarbis *Castlenau*), but appears to be distinguished by the longer adipose fin and the number of rays; it may, however, prove to be only a form of that species. Castelnau has doubtless overlooked the two small areas of teeth on the palate.

Subfamily CETOPSINÆ.

CETOPSIS VENTRALIS Gill.

P. 10. V. 6. D. 1, 6. A. 29.

The greatest height enters 4½ times in the length exclusive of the caudal, and 5½ times inclusive thereof. The head enters 4⅓ times in the length exclusive of the caudal fin, and 5½ inclusive of it; its breadth does not exceed half its length. The gape is continued under the entire eye. The teeth are in a villiform band on the lower as well as upper jaw, and on the vomer. The ventrals are inserted entirely behind the vertical of the dorsal, and are connected together by a membrane which is, however, closely connected with the abdomen along the middle, and is not free even at the margin; the extremities of the fins extend to or beyond the anus. The barbels are nearly equal and about two or three times as long as the diameter of the eye.

The color is greyish, darker above; the basal half of the dorsal is punctulated with black.

This species is most closely related to *Cetopsis gobioides* Kner, but is distinguished hy the more compressed head, posterior ventrals, and longer anal.*

Subfamily TRACHELYOPTERINÆ.

CENTROMOCHLUS STEINDACHNERI Gill.

P. I, 7, D. I. 5. A. 7.

The greatest height equals two thirds of the length of the head, which itself enters about 3¾ times in the total length, exclusive of the caudal. The eyes are moderately large, the diameter equalling a quarter of the head's length. The maxillary barbels are nearly coterminal with the elongated pectoral fins. The dorsal buckler behind is cordate, and its branches expand inwards and extend as far back as the third soft ray. The height of the dorsal is not much less than the head's length; its spine is obsoletely serrated behind. The pectorals equal nearly a third of the length, and do not reach the ventrals. The

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* The number of anal rays is not given by Kner, but the figure represents twenty-two.

ventrals are inserted midway between the branchial apertures and the base of the caudal. The caudal is forked.

Color greyish, tinged with silvery on the sides.

The species is eminently distinguished from its congeners by the form of the dorsal buckler; it is most nearly related to *C. megalops.*

I dedicate this species to the meritorious ichthyologist and herpetologist Dr. Franz Steindachner, as a slight recognition of his labors.

Sept. 6th.

Mr. Vaux, Vice-President, in the Chair.

Seventeen members present.

The following paper was presented for publication:

"Notice of some Crustaceans of the Genus Libinia, with descriptions of three new species." By T. Hale Streets.

Prof. Leidy stated that he had just returned from a short visit to Boston and Cambridge, and that while there he had had the opportunity of examining the collection of Mastodon remains of the Warren museum and the Cambridge University museum, which had so much interested him, that he thought a brief notice of them would be interesting to the members.

The private museum of the late Dr. Warren, now in possession of his heirs, contains a magnificent skeleton of the American Mastodon (*M. americanus*), the best preserved and most complete which has yet been found. It was discovered in 1845, at Newburgh, N. Y. It is that of a mature male. The jaws contain the last two molars on both sides, besides the tusks above, and one of those below, together with the alveolus of that of the opposite side. This skeleton forms the basis of Warren's book on the Mastodon, published in 1852.

Besides the skeleton indicated, Dr. Warren's museum contains the skull of another, a well preserved specimen, found in Orange Co., N. Y. It is even larger than that of the skeleton, and also pertained to a mature male. The jaws contain on both sides the last two molars; and on one side the fourth molar is also retained. The specimen is described and figured in Warren's book on the Mastodon. (Pls. xvi, xviii, xix.)

The Warren collection further contains a number of other remains of Mastodon, mainly fragments of jaws with teeth, isolated molars, and casts in plaster of others. I may add it also contains a number of molars of the American Elephant (*Elephas americanus*), together with many vertebræ of the Basilosaurus.

The museum of the University of Cambridge contains the most interesting series of remains of the American Mastodon which I have yet seen collected together in one place. The most important of these are as follow:

1. A skeleton, discovered, in 1844, in Warren Co., N. J. It pertains to a mature female. The jaws contain the last two molars on both sides, and no traces of inferior tusks remain.

2. A complete skull of what I take to have been a female approaching maturity. The jaws contain the fourth and fifth molars in functional position. The sixth molar had not protruded and is visible within the jaws. On one side of the lower jaw the third molar is retained but is nearly worn out. On the other side and in the upper jaw the alveoli of the corresponding teeth are partially obliterated. The incisive sockets of the lower jaw are likewise obliterated. (The specimen is represented in plates v, vi, of Warren's book on the Mastodon.)

3. Another complete skull of an animal younger than that of the preceding

specimen. The jaws contain the third and fourth molars in functional position. The fifth molar had not protruded and is visible within the jaws. The alveoli of the second molars are partially obliterated, and this is the case also with the inferior incisive alveoli. (Represented in pls. iii, iv, xvii, of Warren's book.)

4. A lower jaw of a quite young animal. It contains the first, second, and third molars in functional position and but little worn. The crown of the first molar has two transverse divisions; that of the second, two principal transverse divisions and a less well developed or rudimental third division; that of the third molar has three divisions. Large sockets for incisive tusks occupy the sides of the symphysis. (The specimen is represented in plate ii of Dr. Warren's work.)

An examination of many specimens of jaws and teeth of the American Mastodon leads to a confirmation of the view that the dental series consists of an incisive tusk and six molars on each side of both jaws. Whether the usual upper tusks are preceded by a temporary pair has not been determined. Small lower tusks appear to belong to the young of both sexes, but are lost and their alveoli obliterated in the female, while one or both are frequently if not usually retained permanently by the male.

The molar teeth in the order of protrusion successively follow one another from behind, but none of the series of six appear to have vertical successors.

The young animal exhibits the anterior two and then three molars together with tusks in both jaws, in functional position. As the third and fourth molars assume a functional position the first and second are shed, and as the fifth molar protrudes the third is shed. With the functional existence of the fifth and sixth molars the fourth is shed. Finally, in the old animal the sixth or last molar may alone remain, though usually the fifth and sixth appear to have been retained to the last.

In the Museum of Comparative Zoology of Harvard College, Prof. Shaler exhibited some Mastodon and other vertebrate remains, the results of his explorations at Big-bone-lick, Ky. Prof. Shaler incidentally informed me that he had detected no evidences of glacial action in the latter region. He supposes that the specimens of teeth and tusks, the wearing off at the sides of which I formerly attributed to glacial action, probably had been imbedded in stiff clay in the pathway of Mastodons, to whose tread the wearing was due.

The collection contained a multitude of remains of the Bison, but these Prof. Shaler found more superficially than those of the Mastodon and Elephant, and not associated with them. With the remains of the latter two genera were also found those of *Bootherium cavifrons*, of which the collection contains a skull without the face. There were also found with these some remains of the Horse, and also the fragment of a lower jaw, which appeared to me to belong to the existing Domestic Hog.

In referring to *Bootherium* I may add that I had the opportunity of examining a skull of the recent Musk Ox, preserved in the Museum of the Natural History Society of Boston, the first complete skull of the animal I have ever seen. In this skull I observed that the lachrymal fossa in advance of the orbit is a shallow depression even less distinct than in the Sheep. In *Bootherium* it is a deep, well defined hemispherical depression, being as different from that of the recent Musk Ox as is that of the Deer.

In the same museum, besides a few Mastodon remains, I remarked several molars of the American Elephant, interesting from their size. One of them, apparently a last upper molar, is from Brazos R., Texas, and is of the coarse plated variety, corresponding with the *Elephas columbi* of Falconer. The triturating surface is flat, not terraced, ten inches by four and three quarter inches in extent, including the enveloping cementum, and also fourteen and a half worn lobes or double plates. Behind, are four additional unworn and less well developed lobes. The breadth of the tooth obliquely is thirteen inches; the depth posteriorly to the broken root, eight inches.

Another molar is from St. Mark's River, Florida. It is an inferior one, and of the coarse plated variety. The grinding surface is irregular or terraced, eight and a half inches long, four inches wide; and it includes eleven lobes or double plates. Five additional unworn lobes succeed. The breadth of the tooth is ten and one-half inches; its depth to the root, eight inches.

Taking advantage of my proximity, I went to Amherst, and spent a couple of hours with Prof. C. N. Shepard in examining the Museum of Amherst College.

Prof. Shepard has recently collected together many interesting fossil remains of vertebrata. Among these are a multitude of specimens obtained by his son from St. Helena Island, and the famous Ashley River deposits of South Carolina. Those from the latter locality consist mainly of Zeuglodonts, Cetaceans and Fishes, but also include remains of Mastodon, the Elephant, and of *Equus major* and *E. fraternus*. The St. Helena Island fossils consist of bones, fragments of jaws and teeth of the Mastodon. Among them were noticed two inferior tusks, which measured about ten inches in length and two inches in diameter at the base.

The same collection contained a large molar of the American Elephant, of the coarse plated variety, from California. Some remains of Mastodon from the latter place struck me from their peculiarity, and these Prof. Shepard was so kind as to loan to me for examination and description.

One of the specimens, which lies on the table, is the fragment of a tusk from "Dry Creek," Stanislaus Co., California. It indicates a species totally different from the American Mastodon, and in its peculiarities exhibits a relationship with the *Mastodon angustidens* of the middle tertiary period of Europe. The fragment is six inches in length, is slightly curved in two directions, and in transverse section is ovate with the anterior pole acute. The pulp cavity, opening half the diameter at the broken base of the specimen, extends about half its length to the end. The convex side of the tusk possesses, as in *Mastodon angustidens*, a broad band of enamel, which reaches from the acute edge more than two-thirds the depth of the surface. The enamel is somewhat rugose and is two-thirds of a line thick. At one spot, towards the smaller end of the fragment, it has been irregularly worn through for the extent of about an inch and a half. The opposite side of the specimen, from the acute edge, has been worn off to an extent about equal to two-fifths of the surface. The broken ends of the fragment exhibit very conspicuously the beautiful arrangement of decussating curved lines so characteristic of the ivory in the tusks of the great proboscidians.

The vertical diameter of the base of the fragment is 28 lines, the transverse diameter 19 lines; the vertical diameter at the opposite end is 22 lines, the transverse diameter 16 lines. The entire length of the tusk appears to have been less than two feet.

The question arises as to what species the tusk fragment shall be attributed. It certainly does not belong to the common American Mastodon, nor is it probable that it belonged to the pliocene *Mastodon mirificus*. May it probably pertain to the hardly known *Mastodon obscurus ?* In the present uncertainty I would look on the specimen as characteristic of a peculiar species, allied to the *M. angustidens* of Europe. For the name of the species I would propose that of MASTODON SHEPARDI, in honor of Prof. C. N. Shepard, whose name has so long been identified with the interests of natural history.

The second specimen, exhibited to the members, consists of a fragment of a lower jaw containing the last molar tooth, and was discovered in Contra Costa county, California. No information in regard to the age of the deposit, or the character of the locality in which the fossil was found, accompanies it. The bone is friable, and measures, below the position of the tooth, five and a half inches in depth. Attached to the fossil there is a portion of soft gray rock, part of the matrix in which it has been imbedded. The tooth is perfect and well preserved. It has the same general form and constitution as the corresponding tooth of the American Mastodon, but is considerably smaller. It bears sufficient resemblance to the plaster cast (represented in fig. 14, pl. xxvii., of "The Extinct Mammalian Fauna of Dakota and Nebraska, &c,") of a tooth, the original of which is lost, from a miocene formation of Maryland, to be viewed as pertaining to the same species. This I had named *Mastodon obscurus.*

The crown of the tooth consists of four transverse divisions together with the merest trace of a heel. As in the cast of the Maryland tooth, the inner lobes of the crown of the California tooth are more mammillary, and less angular than in *M. Americanus.* The outer lobes, likewise as in the Maryland tooth, have better developed offsets fore and aft internally than in the latter, giving rise to a greater degree of obstruction of the transverse vallies of the crown than in the American Mastodon. The fourth division of the crown is proportionately less well developed, in comparison with those in advance, than in the latter, agreeing also in this respect with the Maryland tooth. The outer lobe of this division is formed of a pair of connate mammillary tubercles, as in the latter, but the tubercles are more equally developed. The inner lobe is a single mammillary eminence not more than half the elevation of the outer lobe. In the Maryland tooth, the corresponding lobe resembles the outer one, consisting of a connate pair of tubercles as well developed as in the outer lobe. The heel in the California tooth, as in the Maryland tooth, is formed by a short mammillary eminence occupying the angular space posteriorly of the lobes of the fourth division of the crown. A basal ridge is better developed externally in the California than in the Maryland tooth.

Comparative measurements of the California tooth, with the cast of the Maryland tooth, and one of the *Mastodon americanus* are as follows:

	California tooth.	Maryland tooth.	Mastodon americanus.
Fore and aft diameter of the crown of the last molar tooth	6 in. 4 lines.	6 in. 4 lines.*	7 in. 3 lines.
Transverse diameter of do.....	2 in. 9 lines.	2 in. 9 lines.	3 in. 4 lines.
Depth of do. internally.........	2 in. 2 lines.	2 in. 2 lines.	3 in. 0 lines.

It is not improbable that the California tooth may have pertained to the same species as the fragment of tusk previously noticed, and, perhaps these, together with the Maryland tooth, and others previously referred to *Mastodon obscurus* may likewise belong to the same animal. The positive determination of this question must be left for the discovery of additional material to throw light on the relationship of the different specimens which have been thus far presented to our notice.

Sept. 13*th.*

The President, DR. RUSCHENBERGER, in the Chair.

Twelve members present.

The following paper was presented for publication:

"On the flowers of Aralia spinosa and Hedera helix." By Thos. Meehan.

Sept. 20*th.*

The President, DR. RUSCHENBERGER, in the Chair.

Twenty-three members present.

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* Partially estimated, as the specimen is imperfect at its fore part.

Prof. Leidy, exhibited the fragment of a jaw of a Crocodile, recently sent to him for examination by Prof. F. V. Hayden, now engaged in geological exploration of part of our western territories. The specimen, together with a multitude of small fragments of bones, scales, and teeth of ganoid and other fishes, was found at the junction of the Big Sandy and Green River.

The fragment from the fore part of the jaw indicates an animal about the size of the Alligator of the Mississippi, and apparently a head of nearly the same form. The external surface of the jaw is exceedingly rough and pitted. Two entire teeth, and the remains of two others are retained in the specimen. The larger of the perfect teeth, apparently, holding the position corresponding with a canine, has a blunt conical crown strongly carinated fore and aft, and with the enamel finely rugose. The length of the crown is 8 lines; its diameter antero-posteriorly 7½ lines; and transversely 6¼ lines. The specimen pertains to an extinct species, probably different from any heretofore indicated. The character of the formation from which it was obtained and its geological age I have not learned.

I propose to dedicate the species to Mr. Henry W. Elliott, a young and able artist, attendant on Prof. Hayden's expedition, with the name of Crocodilus Elliotti.

Prof. Leidy stated that during the last summer he had made some further observations on *Urnatella*, a genus of ciliated polyps of the family Pedicellinidæ, discovered by him some years ago (Pr. Ac. Nat. Sc. 1851, 321; 1854, 191) in the Schuylkill River. It is found abundantly below the dam at Fairmount, adhering to stones and rocks, on the sides and under part not in contact with the ground. Occasionally it is observed attached to the shell of the living *Unio complanatus*, and *Melania virginica*, and less frequently to the stem of *Schollera graminea* and the leaves of *Vallisneria spiralis*. In the locality named, on the rocks, there may be observed, in association with *Urnatella*, the following animals: *Spongilla fragilis; Limnias ceratophylli*, usually abundant and in compound bunches; *Cothurnia pusilla*, parasitic on *Urnatella* and *Limnias; Hydra carnea*, Ag., *Paludicella elongata*, *Plumatella vesicularis;* and the worm *Manayunkia speciosa*, etc.

Unlike the marine genera of Pedicellinidæ, the polyp stocks of *Urnatella* are erect or semi-erect, and not prostrate or creeping attached along the surface of bodies. *Urnatella* starts by a thin membranous disk or expansion tightly adherent to the point of support. Usually two stems or stocks (occasionally three or only one,) start from the same disk, and diverge from each other in a gentle curve. The stems may be seen from a simple pedicle without division, to a series of eleven divisions or segments, exclusive of the polyp head. A colony of *Urnatella* recalls to mind a miniature patch of plants in a flower garden. The smallest polyps are translucent whitish or nearly colorless; the largest are less than two lines long, and alternately white and blackish or brownish. When disturbed the polyps retract their arms, hang their heads, and bend downward, so that the heads touch the basis of support, or the stems even become somewhat involute. Voluntarily the polyps are often observed abruptly to move from one side to the other in the most singular manner, as if wearied of remaining too long in the same position. In these movements the stems bend the entire length, but there is no contraction or shortening. In attempting to detach a polyp, the heads suddenly bend downward in such a manner as if the violence elicited a feeling of pain in the animal.

The terminal two or three segments of the parent stems usually give off a branch on each side, and this branch sometimes gives off a second. The branches always consist of a pedicle or single joint supporting a polyp head.

In a polyp stock of more than two divisions, independent of the polyp head, the additional segments are urn shaped. The penultimate segment is barrel shaped; the last one cylindrical, or clavate.

The polyp heads are provided with from a dozen to sixteen ciliated arms.

The internal structure of the polyps including that of the stems, bears a resemblance to that of *Pedicellina*, and will be more particularly described in a memoir preparing on the animal.

The youngest independent polyp stems of *Urnatella* consist of a simple cylindrical pedicle starting from the disk of attachment to the rock, and supporting a single polyp head. The pedicle elongates and divides into two segments. The ultimate segment grows in length and again divides; and in this manner all the segments are produced. After the production of three segments, the antepenultimate segment assumes the urn form. Budding commences from the second and third segments after their production, and from the succeeding segments, but not usually from the first segment. The buds originate from opposite sides of the base of the segments, and form branches of a single segment with a polyp head. The pedicle of these branches also frequently gives off a bud, which forms a secondary branch of the same kind as the primary ones.

In the longer *Urnatella* stocks, branches are usually observed only from the one two or three terminal segments. In the posterior urn-shaped segments, in the position in which branches emanate in the terminal segments, cup-shaped processes are observed. These were formerly mistaken for buds, but evidently result from the dehiscence or separation of branches, which leave the parent stock to establish colonies elsewhere. Though I have not observed this separation take place in *Urnatella*, yet all the points of structure appear to indicate that it actually takes place in the manner intimated.

It thus appears that the first step towards the multiplication of *Urnatella* is the segmentation of its stem. The segments put forth buds which develop polyps, and these then separate from the parent stock to settle elsewhere, and become the source of other series of polyps.

The ultimate history of the segmented polyp stock of *Urnatella* I have not ascertained. The stocks which I have preserved in an aquarium for several months finally lose their terminal polyps. Late in the season, also, all the polyp stocks which I could obtain on the river shore within the reach of my arm, at low tide, were deprived of their terminal polyps. The destruction of these, however, I have suspected to have been due to their having been uncovered in lower tides earlier in the season. I hope yet to be able to determine this question in the course of the next few weeks.

It has occurred to me that the segmented stems of *Urnatella* after the decay of the polyps, remained through the winter with little obvious change, and that in the following season, the segments served as reproductive bodies, in the same manner as the statoblasts in Plumatellidæ and their allies. This view is, however, not confirmed by specimens retained in the aquarium, and those collected on the edge of the river which had lost their polyps.

In relation to the production of ova, or the reproduction of *Urnatella* through sexual agency I have yet learned nothing.

Among the animals mentioned, as found in association with *Urnatella*, is the singular Annelide, *Manayunkia speciosa*, discovered by me some years ago, (Proc. A. N. S., 1858, 90.) The worm is closely allied to the marine genus *Fabricia*, and like it, lives in tubes constructed of mud. It is abundant in the locality indicated. Individuals of about two lines in length, are usually seen in a state of division near the middle into two. The anterior division of the body consists of five bristle-bearing annuli in addition to the head. The posterior division consists of six bristle-bearing annuli in addition to the partially developed head. The anterior head is provided with about thirty-six ciliated tentaculi supported on four lobes. It is also furnished with a pair of eyes; besides which the tentacle-bearing lobes exhibit a number of pigmentary spots, apparently of the nature of eyes. No eyes exist in the tail of *Manayunkia* as they do in *Fabricia*. The blood is green and is pumped intermittently into a large vessel occupying one tentacle on each side of the middle of the head.

I have studied the development of *Manayunkia*, which will be fully dedescribed in a future memoir on the animal. Curiously enough the development of the young takes place within the tube of the parent, and the young remain in this position for a considerable time after their development. Thus I have obtained the young from the tube of the parent, after it was one-third of a line in length, and consisted of ten annuli, including the head, from which projected ten tentacles.

Mr. Thomas Meehan said that last year he had called the attention of the Academy to the fact that *Gymnocladus* and some other plants had a series of buds, not in the usual order of *Phyllotaxis*, accordant with the leaves, as we have believed axillary buds ought to be; but in a direct line, one above another; and that in these cases the upper bud, the one the farthest removed from the axil, was the strongest bud. He had overlooked the fact long known to botanists, until pointed out by Dr. Engelman, that *Lonicera* had this longitudinal string of buds; but in this case the largest bud was the one nearest the axil. He had since noted that these buds all followed the same law in this, that it was the large buds which had a flower-producing character, while the small ones were those which continued the axial growth.

By the help of this last observation he was now able to explain some facts in *Solanaceous* plants which he believed had not hitherto been understood. It was well known that many of these had a habit of producing their flower scapes at varying positions between the nodes, and not at the nodes, as is usual with most flowering plants. He exhibited specimens of the common Cherry Tomato, in which a few of the flower clusters sprang apparently opposite to a node, but the majority were at least one-fourth of the way down to the node below; also other species of the genus, in which the flower peduncle pushed out almost down to the lower axil. This was especially the case in some Egg plants, wherein the leaf axil, the axillary bud, and the bud producing the flower peduncle, were closely together in a direct line, as in *Gymnocladus*, before noted. The point to which he wished the particular attention of the members was that this internodular flower bud really belonged to the system of buds apparently originating at the node below.

He then showed that the flowering character of *Solanum* had a numerical law of its own. Every third node produced a flower spike or cluster. The node next following the flower had barely the rudiment of an axillary bud; the second one had a stronger bud; the third had a bud which in the Tomato and Eggplant pushed again into axillary growth, and had the extra bud beyond, before noted—the flowering one. Other *Solanaceous* plants had similar characters, which, unless we remembered what we had learned in these common *Solanums*, we might not understand. For instance, in *Nycterium violaceum* the two nodes between the flowering one approached very close together, so as to appear nearly opposite, but still one axillary bud stronger than the other. In *Datura* all three nodes approached and formed a sort of fascicle with the flower proceeding from the irregular centre of the mass.

He now exhibited some specimens of the common Poke weed, *Phytolacca decandra*, and showed that the inflorescence was exactly on the same law. The flower raceme only appeared at every third node, and sometimes was as much as a quarter of an inch above the node. It was directly in a line with the lower bud, as in the cases of *Gymnocladus*, *Lonicera*, *Solanum*, &c., and there was no difficulty in assuming that the flower spike had really belonged to the lower system, just as in the other cases. The ratio of vigor in the axillary buds was just the same. The leaf opposite or near by the raceme had scarcely any axillary bud; the next stronger; the next strong enough to push into a secondary axillary growth; and then the flower above this. In this we saw *Phytolacca* to have the same characters as *Solanaceous* plants. The seeds of *Phytolacca* were of very similar structure to *Solanum*, and it had many other characters in common. He was not prepared to speak positively without further investigation, but thought it quite likely, in spite of the hypogynous flower, *Phytolacca* would be found more nearly related to *Solanaceæ* than to *Chenopodiaceæ*, near which it was now placed.

He then exhibited some shoots of Grape Vine, and said that Dr. Engelman had pointed out, when at the Academy last year, that there was some numerical order in the tendrils of grape vines. In the specimen he exhibited every third node had no tendril; but he had seen some grape vines in which as many as eight nodes with tendrils had followed one another. In the mature wood, however, those without tendrils perfected the strongest buds. But he had found in the allied genus *Ampelopsis* a nearly regular system of buds and tendrils. In *A. hederacea*, the common Virginia or five fingered creeper, the strong shoots running up a wall or tree had at every third node a strong axillary bud, *without any tendril;* while the two intervening nodes had tendrils *without axillary buds.* Occasionally, but very rarely, two successive nodes would have axillary buds, in which case the lower one would be smaller, and have also a small tendril on the opposite side. *Ampelopsis Vietchii* had the same character. He had attempted to propagate this by using nodes from which the tendrils pushed, as single bud cuttings, but failed to get any development from the axils. He believed they had not a trace of a bud in even the most rudimentary state. It had been said in Darwin's paper on motion in tendrils that the gland on the end of the tendril did not develop itself until it approached the object it was to cling to. In *Ampelopsis Vietchii*, they developed before this, in the shape of small globes, looking like rudiments of the same flower which ultimately appeared. In fact tendrils here were incipient flower branches, as any one could see by tracing the common *Ampelopsis hederacea* up to its final flowering condition, when, the axial growth ending in a terminal bud, instead of the usual lateral tendril, it seemed to erect itself and bear flowers. It would seem as if it was only by the elongation of the axis, demanding and drawing to itself nutriment which would otherwise go into the tendril, which made it a tendril, and not a flower shoot.

He did not, however, intend at this time to attempt any explanation of these series of observations. He thought there was nothing in any known law of *Phyllotaxis* which would explain them; and that by following them up matters of much interest to botany might be evolved. But, as he might have more to say about it some day, and winter was approaching, he thought to call the attention of the Academy to the facts, so that those interested might examine them for themselves before the frost destroyed the specimens.

The death of Mr. Wm. P. Wilstach was announced.

Sept. 27th.

The President, Dr. Ruschenberger, in the Chair.

Twenty-one members present.

The report of a Committee appointed to draft resolutions regarding the death of the late Wm. P. Wilstach was received, and the following Resolutions adopted:

The death of William P. Wilstach, at Saratoga, Sept. 17, 1870, has been announced to the Academy of Natural Sciences of Philadelphia.

Mr. Wilstach during his connection of ten years with this institution has been distinguished among its members by his liberal, intelligent and prompt encouragement of every enterprise calculated to increase and diffuse knowledge of the Natural Sciences. Besides many donations at different times, he gave a thousand dollars towards the publication of the last volume of the Academy's Journal; a thousand dollars to the building fund, and in addition he made a conditional subscription of five thousand dollars to the same fund. These facts are cited in evidence of Mr. Wilstach's interest in the progress of

Science and culture;—they are among the reasons why the Academy recognizes in his death the loss of a liberal patron, a judicious counsellor and an agreeable associate.

Resolved, That this expression of the Academy's appreciation of Mr. Wilstach's worth be communicated to his widow and family, in token of its sympathy with their bereavement.

W. S. W. Ruschenberger,
Jos. Leidy,
(Signed) Wm. S. Vaux.
S. B. Howell, Rec. Sec.

The following gentlemen were elected members of the Academy: Green Smith, Thos. Stewardson, H. Weir Workman, W. B. Rogers, Thos. G. Gentry, Wm. H. Pancoast, M. D.

The following were elected correspondents: Prof. Igino Cocchi, of Florence, Italy; Prof. John Jas. Stevenson, Ph. D., of Morgantown, W. Va.

On favorable report of the Committees, the following papers were orderd to be published:

Notice of some Crustacea of the Genus LIBINIA, with descriptions of four new Species.

BY T. HALE STREETS.

Much uncertainty has existed with regard to the identity of certain species belonging to the genus Libinia. *Libinia dubia*, ever since it was first established by Milne Edwards, has been regarded as a doubtful species. In the description of it by Edwards, he states that it resembles *L. canaliculata* very much, and that it is not improbable that it is the young of that species. Naturalists in this branch of science down to the present time appear to have accepted this statement as the truth.

De Kay, in his Natural History of New York, states that the "younger individuals, 1 –4 in. in length, are more pyriform in shape, are entirely covered with a dense, downy hair, and the spines are not so prominent as in the adult. In this state I suppose it to be the *L. dubia* of Edwards."

Gibbes in an article in the Proceedings of the American Association for 1850, regards the two species as distinct, but says that no absolute characters can be indicated by which they may be separated.

I do not know how to account for this prevailing ignorance, as the characters existing, separating the two species, are so plain.

Libinia dubia, Edwards. His. Nat. des Crust. vol. 1, p. 300, pl. 14, fig. 2.
L. distincta, Guerin.

Besides the characters usually given as distinguishing this species, the following may be observed, and they will be found to be highly characteristic.

In the median line of the body, counting backward from the depression separating the gastric and genital regions, there is a row of four spines; one on the genital region, two on the cardiac and one on the intestinal. One small spine on the posterior part of the gastric region in the median line, and five arranged transversely on the anterior part of the same region. Three prominent spines on the branchial region independently of those on the lateral margin. The *hepatic region* is usually devoid of spines or tubercles; sometimes there is a very small, sharp one on each side, or, again, it may be present on one side and absent on the other. There is never more than one on a side. The regions are very distinctly marked out.

Rostrum prominent. Its bifurcated extremity diverging, and directed nearly horizontally. The cleft deep.

Habitat. Common species of the Southern Atlantic coast. Very common in the Delaware Bay. In the Academy's collection are four specimens from the coast of Long Island; and one from West Africa, by Duchaillu.

LIBINIA CANALICULATA, Say. Jour. Acad. Nat. Sc. vol. 1, p. 77, pl. 4, fig. 1.
L. emarginata, Leach.

In the median line of the body, counting backward from the depression separating the stomach from the genital region, there is a row of five spines; one in the genital region, two in the cardiac and two in the intestinal. On the gastric region there is a longitudinal row of four spines. The second one counting from behind forward is generally double. The anterior one is situated in front of the transverse row, which contains four spines or tubercles, two on each side. The hepatic region always presents more than one spine, usually three, sometimes more; sometimes three on one side and two on the other. One large spine situated on the posterior part of the branchial region, on a line with the lower spine on the intestinal region, another smaller one intervening between. The whole surface of the carapax studded over with numerous spines and tubercles arranged more or less regularly. The spines on the lateral margin not as prominent as in *L. dubia*, but of the same number.

The cleft of the bifurcated extremity of the rostrum is very shallow. The teeth of the rostrum not on the same plane as in *L. dubia*, they present a direction downward. In the largest specimens the anterior extremity is considerably hooked.

The characters here enumerated as distinguishing *L. canaliculata* will be found to hold good through all variations of size—in those that are no more than an inch in length, as well as in those that are from four to five inches long, the latter being the largest of the kind that I have ever seen.

Habitat. Common to the North Atlantic coast, but extends down to the West Indies.

LIBINIA AFFINIS, Randell. Jour. Acad. Nat. Sc. vol. VIII, p. 107.

Gibbes says of this species that it "so closely resembles *L. dubia*, that if from the Atlantic coast, I should not regard it as different, but as it comes from Upper California I cannot venture to pronounce it the same."

The author here quoted undoubtedly made a mistake when he said that *L. affinis* closely resembles *L. dubia*. Stimpson approached the truth more nearly when he stated that "it is very closely allied to *L. canaliculata*." It is undoubtedly nothing more than the young of *canaliculata*. That it is so will be evident to any one who will take the trouble to compare them closely. It agrees with *L. canaliculata* in every respect excepting size.

LIBINIA SUBSPINOSA, Streets, n. s.

Carapax pyriform. Regions distinct. Spines and tubercles few. Three small tubercles arranged transversely on the anterior portion of the gastric region, one on the median line and one on each side. On the posterior part of the stomach, in the usual situation of a spine or tubercle, there is a slight elevation. Genital region compressed from before backward. Two spines on the cardiac region, and one, rather large, on the intestinal region. Five spines on the lateral margin of the branchial region; the posterior one large. On the upper portion of the same region, near the superior border, are two more, arranged in a line from before backward. Hepatic region devoid of spines, smooth. Just beneath this region, on the antero-lateral border, are two spines, the anterior one large.

Rostrum prominent; teeth short and their apices directed forward and toward each other. A short obtuse spine projecting over the inner canthus of the eye. On the inferior border of the orbit are two small tubercles. External antennæ cylindrical.

Anterior pair of feet shorter than the second. The fingers come in contact along half the extent of their denticulated margins. The second pair of feet about the same length as the carapax, rostrum included.

The surface covered with close, short hair. Length of the body to the tip of the rostrum one inch and a half.

Habitat.—Chili.

(Cabinet Phila. Acad. Nat. Sci.)

LIBINIA RHOMBOIDEA, Streets, n. s.

Carapax nearly circular. Regions distinct; those in the median line of the body flattened. Six small but sharp spines on the gastric region; five arranged transversely on the anterior part. The two outer ones and the middle are larger, and are placed in a direct line with one another; the two intervening ones are smaller, and are situated a little in front of the others. One spine situated on the posterior part of the stomach. All the spines on the central regions small. Genital region quadrilateral and bearing a small spine. One on the cardiac region and one on the intestinal. On the posterior part of the cardiac region is an elevation which presents a depression in its summit. Four large and sharp spines on the branchial region independently of those on the lateral margin. These are placed so as to inclose a rhomboidal-shaped figure between them. A prominent spine on the hepatic region; five on the lateral margin. These with the one on the hepatic region form nearly half a circle. Below the lateral row anteriorly are two prominent spines.

A prominent spine above the inner canthus of the eye; a small one at the external canthus. External antennæ cylindrical. A spine situated to the outer side of them, and one beneath directed downward.

Rostrum not so broad as in *L. dubia*, and its bifurcation less divergent, the teeth being directed nearly horizontally forward. Anterior pair of feet short and granular; a short spine on the lower portion of the arm. Second pair of feet nearly one and a half times as long as the body. Length of the body three inches and a half.

Habitat.—East Indies.

(Cabinet Phila. Acad. Nat. Sci.)

In the Academy's collection is a single specimen, which very much resembles the preceding, and in the absence of any others of the same kind to confirm the characters, I will not venture to call it a new species. The following are the chief points of difference. The regions in the median line of the body less depressed. The transverse row of spines on the anterior portion of the gastric region are arranged somewhat differently. The two lateral ones on each side are placed in a direct line, while the middle one is situated a little posteriorly. The bifurcation of the rostrum is more divergent and the teeth are inflated to their tips. Second pair of feet but little longer than the body. Length of the body two inches and four-fifths.

Habitat.—West Indies.

If this should prove a new species, I propose for it the name of *Libinia inflata.*

CHIONOECETES CHILENSIS, Streets, n. s.

Body very much depressed, flattened on top; nearly as broad as long. Posterior border rounded; broad anteriorly. Anterior and middle portions of the carapax covered with small wart-like prominences, which are depressed. These terminate in a more or less well-defined line drawn transversely through the centre of the cardiac region. All that portion of the surface not covered with prominences, granular. Regions not very distinct; gastric region somewhat triangular. External angle of the orbit projecting. Rostrum very short, and flattened. Eyes large, of a brown color with black spots.

Anterior pair of feet but little longer than the body. Internal and external borders of the under surface of the arm minutely spinous. These as well as the other feet granular. Fingers long and slender, more than half the length of the whole hand; denticulated along the whole length of their approximated margins. The third article of the second pair of feet flattened; that of the third pair less so. The same article of the fourth pair nearly cylindrical; that of the fifth pair cylindrical. This article is long, straight and inflated; largest diameter in the middle, gradually tapering anteriorly; no enlargement at the nodes. Hair on the body very short, scarcely discernable. Length of body about one inch.

This species can very readily be distinguished from *Peloplastus* (Chionoecetes) *Pallasii*, Gerstæcker. Unlike this the upper surfaces of the tibiæ are not covered with short spines, and the double row of granules is wanting on the tarsi.

C. Chilensis may be distinguished from *C. Behringianus*, Stimpson, by the wart-like prominences not increasing in acuteness anteriorly and at the sides, except at the inferior antero-lateral margin. Here, instead of there being fourteen small bifid spines as in *C. Behringianus*, there are but eleven or twelve; the first five or six only being of any size. The third articles granular below as well as above. Only the inferior angles of the arms of the first pair of feet are muricated.

Habitat.—Chili.

(Cabinet Phila. Acad. Nat. Sci.)

HUENIA BIFURCATA, Streets, n. s.

Carapax smooth, elongated, narrowing in front. Antero-lateral margins acute. On the gastric region three low tubercles arranged in a triangular form with the base of the triangle directed forward. A low tubercle on the cardiac region. The antero-lateral borders produced into sharp processes, directed forward, outward and slightly upward from the base of the rostrum. Rather broad lateral projections at the junction of the antero-lateral and postero-lateral borders, directed somewhat upward. These projections present two teeth at their extremities, separated by a concave interval. Postero-lateral borders rounded. Posterior border projecting backward lip-like, slightly everted on each side.

Rostrum about two-tenths of an inch in length; bifurcated at its point; flattened horizontally at the anterior extremity, which is on a lower plane than the base. Upper surface covered with hooked hairs. Under surface of the rostrum concave.

Eyes small, slightly projecting from under the lateral borders of the carapax. External antennæ slender and completely concealed under the anterior prolongation. Basal article cylindrical, slightly clubbed at its anterior extremity; the second article more than half the length of the first; the third very delicate.

Anterior pair of feet about the same length as the carapax. On the distal extremity of the upper surface of the third article is a small tooth directed forward. Second pair of feet longer than the first pair,—about one inch in length. The following feet considerably shorter, and each presents a spine at about the middle of the under surface of the fifth article. Carapax, rostrum included, nine-tenths of an inch in length.

Habitat.—New Zealand.

(Cabinet Phila. Acad. Nat. Sci.)

On the Flowers of ARALIA SPINOSA, L., and HEDERA HELIX, L.

BY THOMAS MEEHAN.

The study of *Aralia spinosa, L.*, affords some interesting facts which do not seem to have attracted the attention of other observers.*

In Dr. Gray's indispensable *Manual of Botany*, it is said to be "more or less polygamous." I have had many specimens under my daily observation this season, from the earliest opening till the last blossom appeared, and find that it is much more nearly monœcious than the above quotation would imply.

There are three different sets of flowers corresponding to the thrice compounded branchlets of the large panicle. When the flower scape elongates, it seems suddenly arrested at a given point, and a very strong umbel of *female* flowers appears at the apex. A great number of secondary branches appear along this main one; and they also suddenly terminate each with an umbel of female flowers. From these secondary branches a third series appear, and these flowers are well filled with anthers that are abundantly polleniferous. The female organs of these flowers of the third class, are, however, defective, as only a few bear capsules, and in these, a large portion of the seeds have no ovules. The polygamous character is confined to this third series of flower, the first two having purely pistillate blossoms. In these there do not seem to be the rudiments of stamens.

The most remarkable part of this process of development is, that the whole of this first series of female flowers should open so long before the male ones come, that they fall unfertilized. Most part of the second series also fall, and the crop of seeds is mainly made up of a few of the last opening ones of the section, and the comparatively few hermaphrodite ones which are found in those of the third class. It is a matter for curious speculation what special benefit it can be to the plant to spend so much force on the production of female flowers too early to mature, and then producing such an immense mass of pollen to go utterly to waste.

It may not be amis to note, that in the common carrot the earlier strong umbels have often a male flower in the center; and that while the usual flowers are of a pure white, this one is of a crimson color. In the central umbels of *Aralia spinosa*, and at times on spurs along the branchlets of the panicle are similar colored processes, so small that their form cannot be made out by a common pocket lens. Our fellow member, Dr. J. Gibbons Hunt, makes them out, under the dissecting microscope, to be vase-like forms with five minute reflexed segments, and with a small solid disk in the centre. It is interesting as evidently being a successful attempt of an abortive flower to simulate in some respects a real one of another character.

Examining, also, the flowers of the allied European Evergreen Ivy, *Hedera Helix, L.*, I find similar laws of distribution of the sexes as in *Aralia spinosa*, with the addition of a somewhat different structure in the male from the female flowers.

In Europe the plant is described as often having a single umbel as a flower spike. It is quite likely in these cases the flowers are hermaphrodite. In all the cases I have met here, the inflorescence is a compound of several umbels,—a terminal one—female, and the lateral ones male, as in *Aralia*. But there are rudiments of stamens in the flower, and in occasional instances I find a filament developed; but never, so far, with any polleniferous anthers. The flowers of the central female umbel have rather longer and stronger pedicels than the lateral male ones. The calyx is united with the ovarium for one-half its length, and the latter much developed in the unopened flower. In the male the segments of the calyx are two-thirds free, and the petals are much longer than in the female flowers.

As in *Aralia spinosa*, the male flowers do not open until some time after the female ones; and not before some of the latter, impatient of delay, have fallen unfertilized.

I have so often and in so many varied ways demonstrated to the Academy that in plants the male element is a later and inferior creation, that it seems almost superogatory to point out that these plants illustrate the same principle. But it is part of the record of what I believe to be unobserved facts in relation to these species, therefore I briefly allude to them.

Issued November 1st, 1870.

Oct. 4th.

The President, Dr. Ruschenberger, in the Chair.

Twenty-nine members present.

Prof. Leidy directed attention to a small collection of fossils recently received from Prof. F. V. Hayden, now engaged in a geological exploration of part of our western territories.

Most of the fossils were collected on the Sweet Water R., eighteen miles west of Devil's Gate, Wyoming Territory.

The most numerous and characteristic remains in the collection are those of a species of *Merycochœrus*, the skull of which was little more than two-thirds the diameter of that of *Merycochœrus proprius* from the head waters of the Niobrara River. The species is particularly indicated by a number of fragments of jaws, with teeth of half a dozen individuals. The anatomical characters are the same as in *M. proprius.* The infra-orbital arch is of great proportionate depth, as in the latter when compared with its condition in the different species of *Oreodon.* The face has the same abruptly contracted character in advance of the orbits, and the infra-orbital foramen occupies a corresponding position as in *M. proprius.* In *Oreodon* the face narrows more gradually forward, and has a more triangular outline when viewed from above; and the infra-orbital foramen is situated farther forward. There may be other important anatomical points distinguishing *Merycochœrus* from *Oreodon*, in portions of the skull of the former, which we have not yet had the opportunity of examining.

The inspection of these specimens leads me to suspect that the remains from the pliocene sands of the Niobrara River, which I referred to another genus under the name of *Merychyus medius*, perhaps belong to the same animal, and those from the same locality referred to *Merychyus major*, perhaps belong to *Merycochœrus proprius.* The material at command is insufficient for me to determine whether this is the case, and under the circumstances I am disposed to refer the remains in question, from the Sweet Water R., to a distinct species with the name of Merycochœrus rusticus.

A series of lower molars of this species measures ....4 inches.
A series in another individual..4¼ inches.
The series in *M. proprius* is ....5⅔ inches.

It has occurred to me that the remains thus referred to a smaller species of *Merycochœrus*, may have pertained to the female of *M. proprius.* The specimens, however, of all the individuals, indicate a smaller animal than those upon which the latter was founded.

In association with the remains are a few fragments indicating a small equine animal, perhaps a *Hipparion.* There are also several small fragments of jaws indicating the presence of *Canis vafer* and *Merycodus necatus*, originally based on specimens from the pliocene sands of the Niobrara River, Nebraska.

The remaining fossils consist of two interesting specimens, from near Fort Bridger. One of them is an upper back molar, apparently of a small species of *Lophiodon.* The crown of the tooth is perfect and but slightly worn at the acute summits of the lobes. The tooth has nearly the form, size, and constitution as the corresponding ones in *Anchitherium Bairdi*, but the ridges extending forward and outward from the inner lobes in advance of the outer lobes exhibit no trace of a disposition to form intervening lobes to the four principal ones. The fore and aft diameter of the specimen is a little over seven lines; the transverse diameter a little under that measurement. For the name of the species I would propose that of Lophiodon modestus.

The other specimen consists of a portion of the right ramus of a lower jaw of a small pachydermous animal, containing the true molars, much worn together with the mutilated remains of the preceding premolar. The teeth are too much worn to enable me to determine the original anatomical characters, but nevertheless are sufficiently perfect to indicate an animal probably allied to the suilline family. The specimen belongs to a genus and species distinct from any heretofore met with by me from the North American geological formations, and, so far as I can make the comparison, appears different from any obtained elsewhere. I propose at present to refer it to a species with the name of HYOPSODUS PAULUS, and in future will give a more detailed description of it accompanied with a drawing.

The length of the true molar series in the specimen is half an inch. The last molar is a little over two lines in its fore and aft diameter. The depth of the jaw below the second true molar is three and a half lines.

Oct. 11*th.*

The President, DR. RUSCHENBERGER, in the Chair.

Twenty-six members present.

The following papers were presented for publication:

"Observations on some fishes new to the American Fauna, found at Newport, R. I., by Samuel Powell." By Edward D. Cope.

"Note on Silphium laciniatum." By Thos. Meehan.

MR. THOMAS MEEHAN said he had noticed a singular habit in the common "Stink bug" of gardens, *Reduvius novenarius*, Say, which might lead to some important physiological discoveries by those more closely devoted to entomological studies. Wondering what made some abrasion on the bark of a *Pinus cembra* on his grounds, he was attracted by a female insect of this species near it; and noticed that on the thigh of the middle leg the usual gray color was of a polished black. Supposing that possibly the insect may have had something to do with the injury to the bark, through which the turpentine was oozing, he waited a few minutes to re-assure the insect—usually timid under observation—that there was no danger. It then went to work to take the turpentine with the heel of the tarsus of the fore leg, and place it on the thigh of the second leg. It took several dozen "heelsful," winding it round the gathering ball on the leg, as one would wind a ball of string. After it had collected together a ball of turpentine about the size of a pin's head, it gently wiped it off with the femora of the hind leg, and applied it to the anus, where it was very rapidly absorbed. It then walked very leisurely to the top of the nearest branch, when it flew away. This was in the end of September. He saw no more of these insects till a week afterwards, when he cut off a small branch on which was another female, and carried it to the pine tree, applying the branch to the stem so that the insect could walk on to it, without much suspicion of human agency in the matter. As soon as it got to the turpentine, it went through the same operation as the other one, taking two doses of it before it walked away; which it did leisurely, and with much apparent satisfaction.

Up to this time he had not been able to find a male, so as to ascertain if it also had any similar use for turpentine.

THADDEUS NORRIS, after making some observations on a project now on foot for stocking the Delaware river with the black bass of the Potomac (*Grystes salmoides*), brought originally from the Ohio, mentioned in the same connecnection an experiment about to be tried of introducing Salmon by artificial culture. He thought that the Delaware had many characteristics of rivers producing large salmon in Canada, while its summer temperature was scarcely higher; that it was unobstructed by impassable dams on some of its fine tributaries and on both of its principal branches to their sources. Mr. Norris also remarked that the experiment was of much importance in ascertaining if this valuable fish—the salmon—may not be gradually acclimated in rivers further south than those they now frequent.

Oct. 18*th.*

The President, Dr. Ruschenberger, in the Chair.

Twenty-one members present.

Prof. Leidy directed attention to a collection of fossils, recently received for examination, through the Smithsonian Institution, from Rev. Thomas Condon, of Dalles City, Oregon. The fossils consist of remains of mammalia, obtained by Mr. Condon from the valley of Bridge Creek, a tributary of John Day's River, Oregon. They appear petrified in the same manner as the similar remains from the Mauvaises Terres of White River, Dakota, but generally are less well preserved.

The greater number and more striking specimens belong apparently to a species of *Oreodon*, larger than any previously discovered and equaling in size *Merycochœrus proprius.* Indeed, so far as we are familiar with the skull of both, the two are so nearly alike that one may be regarded as only a variety of the other, or at most both may be viewed as distinct species of the same genus. I am, however, disposed to view one as the offspring, by selection, of the other, and regard them as corresponding species of two genera which existed probably in different times or localities.

The species, which I propose to distinguish under the name of Oreodon superbus, is indicated by a much mutilated skull, together with mutilated crania, and portions of jaws with and without teeth, of half a dozen or more individuals. The specimens indicate a little variation in the size of the animal, but it appears to have been on the average about the same as *Merycochœrus proprius.*

The form and constitution of the cranium are the same as in *Oreodon Culbertsoni*, but large inflated ear capsules or tympanic bones exist as in *Oreodon major* and *O. bullatus.*

The face is intermediate in character to that of *Oreodon major* and *Merycochœrus proprius.* It is rather more abruptly narrowed in advance of the orbits than in the former, but not to the same degree as in the latter. The infraorbital arches are proportionately of much greater depth than in *Oreodon major*, and the other species of the Mauvaises Terres of Dakota, but are not so deep as in *Merycochœrus proprius.* Thus in *Oreodon major* it measures 9 lines in depth, in *O. superbus* 18 lines, in *Merycochœrus proprius* 23 lines.

The orbits are comparatively small, as in all the family of the Oreodonts. The lachrymal fossa is proportionately shallower than in *O. Culbertsoni* and *O. major*, and in this respect is more like that of *O. gracilis.*

The infra-orbital foramen in *Oreodon superbus* holds an intermediate position to that of *Merycochœrus proprius* and that of the Mauvaises Terres Oreodons.

The jaws of *O. superbus* appear not quite so robust proportionately as in *Merycochœrus proprius*, and the bone of the lower jaw is of less thickness.

The teeth of *O. superbus* and *Merycochœrus proprius* agree in size and constitution, but the premolars and canines of the former appear more compressed laterally, or they are of less thickness from within outwardly, and are somewhat wider fore and aft.

I am prepared to admit that all the characters by which I have attempted to discriminate different species of *Oreodon* and *Merycochœrus* are not fixed, but I nevertheless view them as sufficient to eliminate animals which would be generally recognised as distinct.

The estimated length of the skull of *Oreodon superbus* is about fourteen inches. The length of the skull of *O. major* is about nine inches and one-third.

In a fragment of a lower jaw of *O. superbus*, imbedded in the matrix, the crown of the canine is an inch in width fore and aft. The three premolars behind occupy a space of two inches and a third. In *Merycochœrus proprius* the crown of the lower canine is little more than three-fourths of an inch fore and aft, and the premolars behind occupy a space of less than two inches.

Of other remains in the Oregon collection there are a few fragments of jaws of *Oreodon Culbertsoni*, one of which contains a series of the upper last premolar and the true molars. There also occur a few small fragments of molar teeth, which are recognizable as pertaining to *Agriochœrus antiquus.* There is also here an inferior true molar of *Leptomeryx Evansi*, and likewise there are several mutilated molars of *Anchitherium Bairdi.* These specimens are all marked as having been obtained from the "Big-bottom of the John Day."

An interesting specimen from Bridge Creek consists of a small fragment of an upper jaw, containing two teeth, apparently of a tapiroid animal, and probably the same as that indicated by a tooth from the Mauvaises Terres, and referred to a species with the name of *Lophiodon occidentalis.* The teeth appear to be the hinder two premolars, or perhaps are the last of these and the next true molar. They are much worn, and the second tooth has its back part broken off. They may belong to a different genus from *Lophiodon*, and they do exhibit slight peculiarity, but their condition renders a positive determination uncertain. The specimen indicates an animal about the size of the living *Tapirus terrestris.*

At least two species of *Rhinoceros* are indicated by remains from Bridge Creek valley. One of these I think to be the *Rhinoceros occidentalis*, originally founded on remains from the Mauvaises Terres of White River, Dakota. Several well preserved upper molars, and a fragment of the lower jaw with an entire molar, marked "John Day's," neither differ in constitution, form or size from those of the last named species.

An isolated upper molar, marked "Alkali Flat," clearly belongs to a different species from the former, and may perhaps pertain to the species *Rhinoceros hesperius*, founded on the ramus of a lower jaw from California. From the outer wall of the crown there project into the median valley three folds, and a small fold projects in the vicinity of the latter from the postero-internal lobe. The arrangement of these folds resembles that of a temporary molar from the Niobrara River, of Nebraska (fig. 5, pl. xxiii, Ext. Mam. Fauna of Dakota and Nebraska) referred to *Rhinoceros crassus.* It is not improbable that the tooth may belong to a peculiar species, but the material thus far brought to our notice is insufficient to determine the question positively.

Fragments of a canine tooth in the collection indicate apparently a huge species of *Elotherium*, perhaps the *E. superbum.* Another mutilated canine apparently belongs to a smaller species, perhaps the *E. ingens.*

Two inferior molars apparently indicate a Peccary about the size of the living *Dicotyles torquatus.*

A small fragment of an upper jaw contains a mutilated molar tooth, indicating a species of *Anchitherium*, larger than *A. Bairdi*, of the Mauvaises Terres of White River. It may perhaps indicate a different though closely allied genus, as the median lobes are proportionately better developed in relation with the inner and outer ones than in the true *Anchitherium.* The animal would appear to hold a position intermediate to *A. Bairdi* and *Anchippus texanus.* Awaiting the opportunity of examining additional material, I would propose for the species the name of ANCHITHERIUM CONDONI, in honor of the Rev. Thomas Condon, the discoverer of these and the preceding fossils which have been the subjects of examination. The fore and aft diameter of the tooth has measured about eight lines, the transverse diameter about three-fourths of an inch.

Prof. Leidy further stated that in a recent visit to the Schuylkill river at Fairmount, to seek for specimens of *Urnatella*, though he had been unsuccessful in obtaining living ones within reach from the shore, he had found in the same positions occupied by the former, an abundance of *Cordylophora*. This is the first time that he had noticed this interesting compound hydroid polyp in the vicinity of Philadelphia, and he was surprised that until now it had escaped his notice. *Cordylophora* was first detected by him in this country at Newport, R. I. He had not been able to satisfy himself that it was a different species from the European *Cordylophora lacustris*, first described by Prof. Allman of Edinburgh. It appears, however, to be much smaller. Prof. Allman represents the *C. lacustris* several inches in length, with the polyps a line in length. Ours is not more than half the size. As a variety it might be named *Cordylophora americana*.

Oct. 25th

The President, Dr. Ruschenberger, in the Chair.

Twenty-four members present.

Prof. Leidy stated that he had recently received from Prof. Hayden, at the latest date, at Fort Bridger, several boxes of fossils, most of them remains of Crocodiles and Turtles from Church Buttes, the junction of the Big Sandy and Green Rivers, &c. Of these he proposed to give a notice at another period. Among the mammalian remains there were some of special interest, and to these he wished to direct attention at the present time. The first exhibited consisted of the crowns of teeth and fragments of others, of a pachydermous animal, approaching in size the common Ox. Thecrown of a lower true molar resembles in its constitution those of *Palæotherium*, *Chalicotherium* and *Titanotherium*, being composed of a pair of fore and aft conjoined pyramidal lobes with crescentic summits. It measures 16 lines antero-posteriorly and 10 lines transversely. Fragments of upper true molars exhibit the outer part of the crown composed of a pair of lobes exactly as in *Hyopotamus*. The inner portion of the crown is composed of a pair of simple cones, broad and low, the front one considerably larger than the back one. One of the specimens in the entire condition of the crown measured about 22 lines fore and aft and 18 lines transversely. The crown of an upper premolar has its outer part composed of a pair of conjoined cones with acute summits and sides. The inner portion of the crown consists of a single broad simple cone embraced in front and behind by a basal ridge. The antero-posterior diameter of the crown externally measures 9½ lines; the transverse diameter is an inch.

The teeth indicate an animal apparently allied to *Chalicotherium* and *Titanotherium*, but different from either. The name of Palæosyops paludosus was proposed for it. The remains were obtained at Church Buttes, and belong, as Prof. Hayden reports, to the tertiary formation of the Bridger Group.

Another fossil exhibited was discovered by Prof. Hayden at Black's Fork.

It consists of a fragment of the lower jaw, containing two teeth, of an animal about as big as a Rabbit. The teeth, consisting of the two last molars, resemble in their construction those of the Peccary, but the constituent lobes of the crown are more pointed and smoother. The second true molar has four lobes; the last, an additional lobe. The two teeth together occupy a space of less than 5 lines; the depth of the jaw beneath the penultimate molar is three lines. For the animal, the name of Microsus cuspidatus was proposed.

Another fossil consists of the greater part of the right ramus of a lower jaw partially imbedded in sandstone, and was also obtained by Prof. Hayden at

Black's Fork. The specimen apparently indicates an animal allied to the Raccoon, than which it was nearly a third smaller in size. The ramus contained a series of seven molars, immediately succeeding the canine, without hiatus. All the molars remain except the first, and this like the succeeding one was inserted by a pair of fangs.

The teeth in the specimen are much worn, so that their original character is obscure. The crowns of the premolars appear to have been nearly like those of the Raccoon. In the true molars the postero-internal cusp of the crown existing in the latter, appears to have been but feebly developed in the extinct animal.

The body of the jaw, though much shorter, is absolutely deeper than in the Raccoon. The coronoid process has been comparatively narrow; the external masseteric fossa feeble, and the condyle is remarkably small, not being more than a third in size of that of the Raccoon.

The measurements of the specimen are as follow: length from symphysis to back of condyle, 2½ inches; space occupied by the series of seven molars, 16 lines; depth of lower jaw below the first true molar, 6 lines.

For the animal the name of NOTHARCTUS TENEBROSUS was proposed.

Remains of *Palæosyops paludosus*, have since been received from Henry's Fork of Green River, Wyoming.

The following gentlemen were elected members: Chas. K. Mills, M. D.; J. Solis Cohen, M. D.; Bushrod H. James, M. D., and Mr. J. Blodget Britton.

On favorable report of the Committees, the following papers were ordered to be published:

On the Stipules of Magnolia and Liriodendron.

BY THOMAS MEEHAN.

An examination of the stipules of *Magnolia* afford some highly interesting facts; most, or perhaps all of which are known to leading botanists, but which do not appear to be as generally known as they deserve to be; and which facts may have a more intimate bearing on many of the questions connected with the laws of development than is suspected.

In most species of *Magnolia* a scar peculiar to the genus exists on the petiole. This scar is elevated somewhat above the surrounding tissue, as if the matter forming it had been laid on the surface after the rest of the petiole had been formed. The tint of green is not the same as the rest of the petiole, but it is always of the same tint as that of the leaf blade. In *Magnolia macrophylla* the petiole and under surface of the leaf is gray; the leaf blade is pale green on the upper surface. The surface of the scar is pale green, corresponding to the surface of the leaf blade. The whole appearance of the scar is such as if a portion of a leaf blade had been grafted by its under surface on the petiole.

On the upper point of the scar next the leaf blade are two small articulation points, where the membranaceous stipules finally parted from the leaf. Examining a leaf before these stipules have fallen, the main veins forming the skeleton of the stipules are found connecting with these articuli, and, spreading out, diverge downward toward the base of the leaf. In separating at maturity from the petiole, they part first from the base, and last from their place of articulation. Their weakest hold is the point farthest away from what thus appears to be their source at the apex of the scar.

Magnolia Frazeri elongates its petiole beyond the stipule several inches generally. The leaf blade then exhibits the auricle so well known in this species. The structure of this auricle is similar to the stipules in *M. macrophylla* or *M. tripetela*. The veins start out in nearly as close a fascicle as in these stipules, and they diverge and curve downwards just as these stipules do. Above these strong veins of the auricle are very weak veins, necessitating a very narrow blade portion there, until another set of strong veins push out and make the main part of the lamina.

If we press these auricles back against the petiole, and imagine an union with it, then a separation from the main leaf blade, and an union of the edges of the separated auricle, both above and below, we have a sheathed stipule exactly as we find them, and we see how easily *Magnolia Frazeri* might be a pinnate leaf of five leaflets on the supposition that the stipular portions really have taken the course we suppose these auricles might take.

I suppose no one of experience in living plants doubts the possibility of the adhesion of some parts and the separation of others, so as to make new parts or organs. If such is desired, I would refer to the *adhesion* of the carpellary leaves by their backs in the capsules of *Staphylea trifolia;* and for *separation* to the pinnate leaf often formed out of an entire blade in *Fraxinus excelsior, heterophylla*, and many other plants with entire leaves which often have pinnate ones amongst them.

It is scarcely possible, with these facts before us, to avoid the suspicion that the stipules of *Magnolia* are not formed like the stipules of most plants, which are perhaps leaf portions which have never been well developed, but rather are the tolerably well developed side pinnules of a trifoliate or deeply auricled leaf, which in an early stage had adnated with the petiole, and by their edges, and thus formed the stipular sheath we see. The suppositious case I have drawn from the auricles of *M. Frazeri* is still better illustrated by leaves of some Ranunculaceous plants. For instance, *Anemone Pennsylvanica.* Lay the lower lobes flat against the petiole, imagine the adnation by their backs, and cohesion of the edges, and we have the idea clearly.

It is difficult to conceive that these stipular sheathes could have been formed in harmony with all the appearances we have detailed, in any other way; but ideas and possibilities are not as good as direct facts. These are furnished in good part in other ways.

In the East Indian species, *M. fuscata*, the flowers are axillary, not terminal as in most other species. Three of the leaf axils on the growth of last year produce flowers. The lowest flower is the weakest, the upper the strongest. The bracts which enfold the flower buds are of course transformed leaves; and here, in these weak flowers, where the tendency of the vital course is almost as near to foliar organs as to floral parts, we find these leafy-looking bracts are trifoliate. The central lobe is composed of a short petiole, and a small oval leaf blade. Sometimes this attempt of the lower axil to produce a flower proves abortive. The already formed petals die away. In such cases the two lateral leaflets die away also, and the little miniature central leaf goes on and developes into one as large as the average on any part of the plant. But in the stronger flowers we find, just in proportion to their strength, the two lateral leaflets enlarge, and the central one diminish until at length it disappears, petiole and all. The laterals then *adhere by their edges*, become fleshy, and end in being petals. These are clearly seen to be formed out of the adnated lateral leaflets, which form the stipular sheaths in other cases, with the central of the trifoliate leaf type absorbed. This observation, in addition to the use I wish to make of it, confirms the views of some botanists, as I have learned from Professor Asa Gray, that it is by metamorphosis of the petiolar and stipular parts, rather than by modifications of the leaf blade, that petals are formed.

From these facts we gather the certainty of a trilobate type of leaf, and see the adnation of the edges; and only the dorsal adhesion to the petiole which I have shown so probable as almost to amount to a certainty, is left to be established by actual fact.

This ternate division of the leaf is a marked character in Ranunculaceæ, and with this exposition of a ternate type in Magnoliaceæ, its claim to a place in the Ranal alliance, strong as it always has been acknowledged to be, is still more strengthened.

It is impossible to suppose that a so closely allied genus as *Liriodendron* should be founded on a different type from *Magnolia*. We shall see that only very slight causes, which we can well understand, have made some of the chief foliar distinctions, and the few which we cannot prove from actual facts, can be made almost certainties from parallel observations. The identity of type will in this way be manifest.

First, as to the premorse or cut off appearance of the end of the leaf blade. This all results from the stipular portions being adnate with the stem axis, instead of being wholly on the petiole as in *Magnolia*. In the latter the stipules are carried along as the petiole advances, the leaf blade cannot grow beyond, and so in vernation has to lie flat up against them. In *Liriodendron*, the stipules being fast to the main stem, the petiole carries the leaf blade beyond them, over which it is bent until its apex is brought down in contact with the straight line formed by the union of stipule and stem. Here it is pressed as into a mould by the elongating petiole, and the form of the leaf which we see is the necessary result. These processes in *Magnolia* and *Liriodendron* can readily be seen on an examination of the buds at any time during the growing season ; and to those who have no specimens the figure of the latter in Gray's Genera will easily give the idea. It may be here noted that those who look only to Mr. Darwin's principle of natural selection to account for the laws of form, might be troubled by such cases as these. It is scarcely conceivable that a square-edged leaf blade, as we find it in *Liriodendron*, is of any special benefit to the species; yet if this form is the consequence of some other act, which is a benefit, the selection principle may still hold.

If the ternate type of leaf is probable in *Liriodendron*, as in *Magnolia*, the lower portion of the petiole, and lateral or stipular portions, must have adnated with the stem prior to the full development of the leaf. This view necessitates the idea that the leaf does not always originate at the node from which it seems to spring. I do not believe it does; but I am well aware that in this I have opposed to me the weight of our best botanical authorities, from whom I would not yet dare to positively differ until I shall have the weight of more facts. I would only say that in the case of *Liriodendron* the appearances are much in favor of the belief that in an early stage the petiole clasped the stem, and for a considerable length ultimately became an integral part of its cortical system. The vessels which are seen connected in direct lines with the petioles below and above the node, as they are in existence before the leaf bud has opened, and the leaf blade has had any chance to elaborate sap from the light or air, supposed to be necessary just above before they could be formed, do not seem to originate at the node ; while the fact that these vessels suddenly curve from the opposite side towards the supposed petiolar base is much more characteristic of an unfolding sheath than of a descending current of matter which would most naturally go down in a straightish line. But that the petiole has really adnated with the stem in this way in *Liriodendron* seems most probable from the fact that on the opposite side from the leaf is often seen a ridge which could hardly be formed except by the meeting of two edges enclosing a stem, with a little to spare ; and at other times there is a slight depression, as if the two opposite edges barely met. There seems to be every evidence short of an actual witnessing of the fact, that the petiole in *Liriodendron* became adnate with the stem, and in this way the two lateral sections (stipules) were brought in contact with the stem with which they united. This would bring them nearer the sources of nutrition, and enable them to assume a more leaf-like and permanent character than if on the petiole. They become rather primary than secondary leaf organs, and this is just what we see them to be.

Thus we may assume that *Magnolia* has typically a ternate leaf structure; that the stipules are the two lateral lobes which by a peculiar process of adnation became stipular sheaths after having been partially organized as leaf blade; and that *Liriodendron* differs from *Magnolia* only in possessing a greater power of adnation.

Notes on SILPHIUM LACINIATUM, L.—The Compass Plant.

BY THOMAS MEEHAN.

It is at once the strength and the weakness of science that it takes little on trust. One would suppose that, after the positive facts given by President Hill in his paper before the recent meeting of the American Association, there was no room for doubt that the edges of the leaves of *Silphium laciniatum* had an average bearing north. But I find men—excellent, acute observers—who doubt the facts. They say "We took the trouble to examine the plants on the spot, and found not the slightest trace of any such tendency; we want no better evidence than that of our own senses."

As before suggested, it is an excellent habit to verify, for ourselves, the facts reported by others—there is far too little of this habit,—but when the observations conflict, it is safer to assume that both are right, and that there is something yet undiscovered which would harmonize the opposition, than that either one is wrong.

In this matter of the *Silphium* or "compass plant" I was able to find this missing link, and to see that both parties were right.

When I first saw the *Silphium*, to any great extent, in its natural localities, there was not the slightest indication of this northern tendency. It was a great surprise, as a limited knowledge of it before had taught the reverse. I determined to watch a plant carefully on my own grounds the next year. The result was just as described by President Hill. There was the unmistakable northern tendency in the leaves when they first came up, and until they were large and heavy, when winds and rains bore them in different directions, and they evidently had not the power of regaining the points lost. This often took place by their own weight alone, especially in luxuriant specimens. Mr. Hill says it was in June when he saw them on the prairies, all bearing north; when I saw them, and not doing so, it was early in September, and then no doubt the mechanical causes I have referred to, had been in operation.

The plant I have had in my garden now for some years affords much interest in many respects. I learned an useful lesson from it this year, in reference to the relative rates of growth in the different parts of the inflorescence. Noticing that there appeared to be no growth in the disk florets in the day, I determined to note accurately one morning during the last week in August, exactly when growth did commence. The ray flowers close over the disk during night, and at 4 A. M., with day just dawning in the east, I found the ray petals just commencing to open back. In the disk there are about fifteen coils of florets in the spiral. There appeared no motion until 4.40, although no doubt growth commenced at 4, when the ray petals were in motion, but too slow to be perceptible. At 4.40, however, the five outer circles were evidently slightly elevated above the others in the disk. Then follows the following record in my diary:

4.45. The five divisions of the corolla split open.

4.50. Corollas grown three thirty-seconds of an inch.

4.55. Divisions of corolla fully expanded.

5. Florets two-eighths above the rest of the disk. It might be well to say here that there was no growth in any this morning but in the five outside rows we are speaking of.

5.5, 5.10. No apparent change except that some which were not so perfectly opened as the others seemed to become so.

5.15. Pistil and mass of stamens slightly elevate above the level of the corolla.

5.20. Corollas now about five-sixteenths of an inch above the others in disk. Pistils and stamens about two lines above the corollas. Long yellow ray petals half open, with no appearance of pollen on their pistils.

From this time forward there was no further growth of the corolla, so that this portion of the daily labor was accomplished in about three-quarters of an hour.

5.25. Pistils and stamens beyond the corolla . . . 1-32d inch.
5.30. " " " . . . 1-16th "
5.35. " " " . . . ⅛th "
5.40. " " " . . . ⅜th "
5.45, 5.50. No change.

5.55. Pistils begin to project beyond the stamens. The first insect, a sand wasp appears. He inserts his proboscis down between the clavate pistil and the stamens, carrying away the pollen, which is all over his head.

6, 6.5. Pistils one line; stamens no longer lengthen.

6.10. Anthers are falling away from the pistils, which are two lines beyond.

6.15. No change.

6.20. The ray petals now fully open, that is horizontal.

No change was noticed after this, except the free visits of sand wasps; none of these, however, carried any pollen to the pistils in the ray florets.

About 9 o'clock (there had not been the slightest indications of any growth since 6.20) heavier insects began to arrive, and then the slightest touch broke off the florets, which fell on the ray pistils which happened to be below them, and in this way they were fertilized. These pistils died very soon afterwards. Those pistils on the upper side (the flower leaning a little) were quite fresh the next morning, awaiting some chance to be fertilized, insects, evidently, not performing that office.

We here see that there were three phases of growth, with a slight rest between each, the pistil taking the most time, then the stamens, and the corolla the least; but the whole growth of the day included within two hours.

I have used the term pistil for the clavate process which occupies the place of the true organ in the ray florets. Of course only the ray floret of *Silphium* have perfect pistils. This clavate false pistil, or ovary, has hitherto been supposed to be a necessary production for the fertilization of the plant. It was supposed to push out the pollen, which was thereby scattered to the ray florets about it. But these observations show that this is probably an error, and that fertilization is chiefly carried on by the easy falling away of the mass of stamens, as I have shown in a paper on *Euphorbia Jacquinæflora*, in last years *Proceedings*, is the case with that species.

I am anxious to call particular attention to the different ratios of growth in connection with the appearance of different floral organs in this plant, because I think I see traces of a general law in plants that there are vibrations or varying intensities during each season's growth, and that the production of various organs depends on degrees of these vibrations.

Observations on some Fishes new to the American Fauna, found at Newport, R. I. By Samuel Powell.

BY E. D. COPE.

A number of interesting additions to the ichthyological fauna of the United States having been sent to the Museum of the Academy of Natural Sciences by our fellow-member Samuel Powell, I place them on record for the convenience of ichthyologists. Several of the species, it will be observed, were new to science at the time they were received; some of these have been described by Prof. Gill. Most of these are of West Indian affinity, some being simply well known species of that region, which have wandered, as has been suggested by Gill, along the Gulf Stream, and turned aside on the southern coast of the New England States.

ACANTHOPTERYGII.

Apogon americanus *Apogonichthys* Castelnau, Voyage Amer. Merid. Tab. I. Cope, Trans. Amer. Philos. Soc. 1866, 400.

Priacanthus altus Gill, Proc. Acad. Nat. Sci., Phila., 1862, 132.

Hyporthodus flavicauda Gill, l. c. 1861, 98; 1862, 133.

Promicropterus decoratus Gill, Proc. A. N. Sci., 1863, 164.

D. II. 26. A. 16 scales 11—98—46, counted from base of second dorsal spine. Dorsal fins connected by membrane as elevated as that of the first dorsal. Head (from premaxilla to end of spine) more than four times in length including caudal fin. Pectorals not narrowed. Eye 5.33 times in length of head. Otherwise as in *P. maculatus* Hol.

Color dark brown, covered with large round pale spots as large as the orbit, each with a brown central spot. They extend on the dorsal and proximal caudal fins. Second dorsal, anal, and caudal fin broadly blackish edged.

Another character in which this species differs from *P. maculatus* is the gentle and gradual rise of the lateral line from the suprascapula. In the latter, it forms a weak sigmoid with abrupt upward curvature. From Newport, Rhode Island; discovered by my friend Samuel Powell of that place, among many other highly interesting fishes. As no one else has detected the *Promicropterus decoratus* on any other part of the coast of the United States, it must be a rare species. Prof. Gill originally described it as coming from Panama.

Vomer curtus Cope, sp. nov.

This species is intermediate in form between *Vomer setipinnis* Mitch., and *Selene argentea* Lac. It is, therefore, shorter and deeper than the former, and with dorsal and ventral outline more convex. The pectoral fin is also longer, and the eye larger. The prominence of the front is anterior in position to that which it occupies in the latter, hence the fish has a less rhomboid, and more regular form. The first anal ray is further in advance of the first of the second dorsal than in *V. brownii*, and not so far as in *S. argentea.*

Radii D. III with membrane, III without,—22. A 19. The pectoral reaches the ventral outline at the tenth soft anal ray. The greatest depth of the head measured along the anterior limb of the orbit enters the total to the caudal emargination 1·8 times—in *V. setipinnis* 2·5 times; depth at first anal ray, in the same, 1·66 times; in *V. setipinnis* nearly twice. Eye into length of head, horizontally through orbit, 2·75 times; into length along front, 4·6 times. Muzzle projecting enclosing a strong concavity with front line much stronger than in *V. brownii* or *S. argentea.* Total length 0m. 165. Length of head from muzzle along lower margin of orbit 0m. 046. Color silvery, without spots.

A second specimen from the North American Atlantic coast, the precise locality not recorded. Bonaparte collection in Mus. Academy Natural Sciences.

The structure of the fins in this species is precisely similar to that seen in *V. setipinnis*, and in general it resembles that species very closely. The differences are readily observed on comparison with specimens of the latter of the same size.

Sarothrodus maculocinctus Gill, Pr. A. N. Sci., 1861, 99. Only found at Newport.

Glyphidodon saxatilis Linn.
An abundant West Indian species.

MALACOPTERYGII.

Hemirhamphus unifasciatus Ranzani.
A West Indian fish.

PLECTOGNATHI.

BALISTES POWELLII Cope, sp. nov.

This is a species allied in form and color to the *B. moribundus*, but apparently nearer to the species of Hollard's group II. A.*

Radii 2 D. 26, A. 22, preanals 9 or 10 on each side; P. 13—4, C. 12, rounded. Form elevated, pelvic depth 1·75 times in total length. Front convex from basis of dorsal fin to spines of premaxillaries. Orbit 3·65 times in muzzle; jaws equal. Scales without prominent spines, those of the cheek in oblique series. Two or three scapular plates. First dorsal spine 1·25 times in length of muzzle, rugose. Third dorsal spine well developed. Anterior rays of second dorsal and anal not much longer than the median rays. Length of head (to opercular slit) 3.5 times in total; anal depth 2·25 in the same.

Color above, ashy, below white. Numerous longitudinally oval azure spots extend in series on the sides everywhere except between the chin, pectoral fin and pelvic bone. The dorsal and anal fins are marked with smaller spots of the same.

This species was discovered by my friend Samuel Powell, at Newport, Rhode Island, Sept., 1867. It must be a very rare species, as it has not been met with elsewhere, so far as I am aware. I have pleasure in dedicating it to the discoverer, whose attention to ichthyology has been so often attended with interesting results.

TETRAODON TRICHOCEPHALUS Cope, sp. nov.

Belly spinous to near vent; dorsal region from a little behind the nares to above the ends of the pectoral fins spinous, those on the head long, close set, like seal bristles. Profile suddenly descending from the prefrontal region to the premaxillary region, arched from the former point backwards. Eye 3·5 times in head, 2·66 times in muzzle; length of head 3·5 times in total including caudal fin. Radii, D. 8, A. 7. Caudal fin even with prominent points, concave when closed. Anal fin behind opposite the dorsal. Frontal width 1·25 times in orbit. Length four inches.

Color, below to a line from the chin to the inferior third of the caudal fin, white; above yellowish passing into brown on the dorsal region. The latter color is faintly verniculated with the paler color, as it descends on the sides. Fins uniform straw colored; a brown spot at the base of the pectoral fin.

This species differs in color from *T. turgidus* Mitch., and in the less extent and longer form of the spines, as well as in the declive front. The young of *T. turgidus* of one-fifth the length have a more slender muzzle and other characters of the adult. The numerous dorsal bristles and form of the cranium distinguish it from *T. lævigatus*. It was found by Samuel Powell at Newport, R. I., with the following species:

TETRAODON GEOMETRICUS *L. Anechisoma* Kaup, Voy. Sulphur, plate.

A West Indian species not before detected on the coasts of the United States. We have it from the Mexican coasts and from Panama.

Supplementary note on two new fishes from the Southern Coast.

CENTROPRISTIS SUBLIGARIUS Cope.

Radii, D. X. 14; A. III. 8. Scales, counted transversely to vent, 5½—48—18. Median dorsal spines subequal, median anal appressed extending beyond basis of anal fin. Caudal fin truncate behind. Form elongate oval, the head narrow conical, its profile continuous with that of the anterior back, together descending regularly from D. I to the end of the acute muzzle. Mandible projecting a ltttle beyond upper lip. Maxillary bone extending to opposite posterior margin of pupil. Operculum with three points, the superior very

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* (*B. capriscus* type); the description is taken from a specimen only 3·5 inches in length.

short. Maxillary smooth; cheeks and operculum scaly, the cheek minutely. Scales ceasing on vertex at a point behind a vertical drawn from the posterior margin of the pupil. Interorbital width ·70 of the diameter of the orbit. Latter a little less than length of muzzle, four times in length of head to base of longest spine. Depth at ventral fins 2·75 times in length without caudal fin. Length of head (without opercular flap) 2·66 times in same.

The coloration is handsome. Ground chocolate brown, the cheeks interoperculum, mandible and maxillary region with a coarse net-work of white lines. Pectoral region paler, and fading on the belly to a white and then metallic citron yellow, which is bounded abruptly by the ground color behind, at a point a little in advance of the anal fin. The posterior outline rises irregularly half way to the lateral line and then turns forward and descends a short distance behind the pectoral fin. From this patch backwards to the basis of the caudal fin there are five vertical cross-bands, two on the peduncle and two rising from the anal fin. The latter diverge above and another band rises, expanding to the point of junction of the dorsal fins, and spreads in a rounded black spot to their margin. The pectoral and caudal fins are white, with rows of small brown spots, the second dorsal and anal brown with rows of small white spots.

Length 0m.075; to basis DI. ·026, to basis of anal ·044; longest dorsal spine ·010; depth caudal peduncle ·0095; length do. above ·0055.

The habitat of this sea perch is the southern coast near Pensacola. It was contained in a bottle with *Abastor erythrogrammus*, *Elaps fulvius*, etc. Its zoological affinities are to the *C. phoebe* of Poey, and other West Indian species; it is one of the most elegant of the genus.

GOBIESOX STRUMOSUS Cope, sp. nov.

Radii, D. XI; C. 16; A. 10; P. 21. Head exceedingly wide, width 2 5-6ths times in total including caudal fin. This width is partly produced by a large fleshy mass which extends from the end of the prominent extremity of the maxillary bone to the end of the interoperculum. Subopercular spine short, stout. Eyes small, diameter 2·5 times in interorbital width, over seven times in head, more than twice in muzzle. Superior dental series twelve on each side externally, but the three median conceal some series of which the second three external are a continuation. Inferior teeth eleven on each side; four median incisors, horizontal and subequal; no marked canine. Vertex flat, profile descending abruptly from posterior line of the orbits to labial margin. Anterior basis of dorsal in front of last fourth of length exclusive of caudal fin.

Length two and a half inches. Color in spirits bluish lead-color; fins blackish.

From Hilton Head, S. Carolina. Presented to the Academy of Natural Sciences by Thos. J. Craven.

Note on Fishes from Atlantic City, N. J.

A small and interesting collection of fishes, made at the above locality, was placed in my hands for determination by Edward S. Keed. He has added two species to the marine fauna of New Jersey, which I here note:

PRIACANTHUS ALTUS Gill, supra.

HEMIRHAMPHUS MACRORHYNCHUS C. V. Putnam, Proceed. Bost. Soc. N. H., 1870, p. 236.

This West Indian species was not known from the Eastern coast of the United States prior to the notice of Prof. Putnam, above cited, who procured it from the coast of Massachusetts.

November 1st.

Wm. S. Vaux, Vice-President, in the Chair.

Twenty-nine members present.

Prof. Leidy exhibited the tooth of a reptile which had been submitted to his examination from the Smithsonian Institution. The specimen, he observed, was especially interesting, as it apparently pertained to a mosasauroid, and was obtained from the miocene tertiary deposit of Gay Head, Martha's Vineyard.

The crown of the tooth is curved conical, and is without divisional planes. The inner surface is only feebly defined from the outer, by a single imperfectly developed ridge postero-internally.

The enamel is singularly roughened, due to short vermicular, somewhat ramifying and more or less interrupted ridges, giving it a fretted or lettered appearance. The transverse section of the crown is circular.

The fang of the tooth, broken below and on the inner side so as to expose the interior pulp cavity, is longer than the crown and very gibbous. It is curved in the direction of the crown and is ovoidal in shape. The texture of the fang appears as dense as ivory. No impress exists on the exterior of the fang, resulting from contact with a successional tooth, but a deep groove occupies its inner side at the terminal extremity.

The crown is broken at its apex, but when perfect has been about 16 lines long, measured on the outer side. The diameter at base is a little over half the length. The fang has been about two inches long; its diameter is 17 lines.

The tooth evidently indicates an animal heretofore unknown to us, and I therefore propose for it the name of Graphiodon vinearius; the generic term having allusion to the lettered appearance of the enamel of the tooth.

Prof. Leidy further remarked that he had recently received from Prof. Hayden's expedition a collection of fossils, mostly consisting of remains of turtles and crocodiles. He formerly had expressed surprise at the absence of remains of the latter among the great profusion of remains of mammals and turtles in the Mauvaises Terres deposits of White River and the sands of the valley of the Niobrara River. He now felt some wonder at seeing so many crocodilian remains, apparently of cotemporaneous age with some of the latter. The reptilian remains are generally in a very fragmentary condition, and have been picked up from the surface of the country. Several undescribed species of turtles were recognizable, but these would be characterized at a later period.

From among the crocodilian remains he had been able to obtain a large portion of those of a skull of Crocodilus Elliotti, indicated a few evenings ago from a jaw fragment. The skull appears to have nearly the form of that of *C. vulgaris* and *C. biporcatus*. It is about a foot and a half in length. Teeth appear to have been absent at the extreme fore part of the jaw. Immediately behind their usual position the palate presents a deep pit at each side of the naso-palatine orifice. The jaw is deeply indented laterally, just back of the position of the fourth tooth, and a less indentation is situated back of the ninth tooth.

Prof. Leeds called attention to a crystalline specimen of the variety of Apatite called Staffelite, which he had not previously noticed in that condition.

Mr. Willard made some remarks on a deposit of clay, of which a specimen was presented this evening. The deposit, at White Hall, Bordentown, N. J., had been found to be too hard and tough for digging, and required blasting to be removed.

November 8th.

The President, Dr. Ruschenberger, in the Chair.

Twenty-two members present.

A paper was presented for publication entitled, "Bud Varieties," by Thomas Meehan.

Prof. Leidy directed attention to some remains of reptiles on the table, which were part of the collection of fossils recently sent to him from Wyoming by Prof. Hayden. They consist of the remains of three species of turtles and a lacertian, which were briefly characterized and named as follows:

Emys Jeanesi.—The species is founded upon a shell consisting of the nearly complete carapace and sternum, the former much crushed and distorted laterally. The carapace has been prominently convex, with the margins acute and without conspicuous indentations. The sternum is as well developed as in our common living emydes and of the same shape. The fore part of the sternum forms a semicircle slightly truncate; the back part is moderately notched, the notch being about half an inch in depth.

The intermediate vertebral scutes are longer than broad, and their anterior margin is transversely bow-like, with a deep median angle forward. The sides of the second vertebral scute, joining the first pair of costal scutes, are convex outwardly; joining the second of the latter, are convex inwardly.

The axillary and inguinal scutes are broader than long. The abdominal and femoral scutes are of nearly equal depth, about 2½ inches; the humeral are half an inch less; and the pectoral and caudal an inch less.

The sternum is a foot in length; its anterior portion is 3¼ inches deep and 5 inches wide; its posterior portion 3¾ inches deep and 5¼ inches wide.

The length of the carapace in the curve has been about fifteen inches; the width about nine and a half inches.

The species I have dedicated to my friend Joseph Jeanes, through whose aid we have been enabled to make many additions to the store of palæontological knowledge.

Emys Haydeni.—This species is founded upon an imperfect carapace of an animal probably about the size of the last, but which had not yet reached maturity. It may be distinguished from it by the form of the scute impressions. The intermediate vertebral scutes are longer than broad, as in the former. The anterior border of the second vertebral scute is straight, as are also the sides of junction with the first pair of costal scutes, the three lines together forming three sides of a square. The anterior border of the third vertebral scute is nearly straight; and that of the fourth is deeply bow-like and convex backward.

Notwithstanding I have already dedicated several extinct species of animals to my friend Prof. Hayden, I still add another to the list in commemoration of the very many discoveries he has made in vertebrate palæontology.

Baena arenosa.—The genus and species are founded on the greater part of the shell of a turtle, with the carapace broken away in front and fractured in other positions. The sternum, more perfect, has lost its fore extremity. The shell belonged to a mature animal, as indicated by the obliteration of the sutures of the plates composing the carapace. The surface of the latter, but more especially that of the sternum, presents a finely fretted appearance.

The carapace is moderately convex and bears a resemblance to that of our common Snapper (*Chelydra serpentina*). It is, however, not depressed along the middle, which is the most elevated portion of the fossil. The lateral marginal plates are comparatively large and broad, and are abruptly bent. The posterior portion of the carapace, both laterally and at the extremity, is notched much in the same manner as in the Snapper. The intermediate vertebral scute impressions have nearly the form and proportions as in the latter, but are not carinated in the median line, and the posterior line of the fourth vertebral scute impression is deeply and widely notched forward.

The sternum is very unlike that of the Snapper, and rather approaches that of the emydes in its form and proportions. The interspaces of the carapace and sternum are, however, intermediate in capacity to those in the former and latter. The sternal pedicels are deep and wide, and are impressed by a pair of large scutes, separating the large axillary and inguinal scute, as in the existing *Dermatemys.* The posterior extremity of the sternum in outline is half oval and feebly notched.

When complete the shell has measured between a foot and fourteen inches in length and about ten inches in breadth. The sternum has been about ten and a half inches long; its pedicels are 5¼ inches deep; and its posterior extremity is 3 inches long by 4¼ inches wide at base.

For the genus I have adopted a name which, according to Prof. Hayden, is used by one of the Indian tribes of the Upper Missouri as that of a turtle. The species I propose to name BAENA ARENOSA.

SANIWA ENSIDENS.—Among the fossils obtained in Prof. Hayden's expedition are the remains of a lacertian, labeled as having been discovered near "Granger." The bones consist of those of most parts of the skeleton, but are all in a fragmentary condition, and are imbedded in freshly broken pieces of an ash-colored rock. Before disturbance they appear to have been mostly entire and preserved nearly in conjunction. They are black, and their interior is occupied with crystalline calcite.

Fragments of bones exhibit well developed limbs, with long toes, strong ribs, and a long tail, altogether indicating a form like that of ordinary living lacertians. The long bones, even to those of the toes, are hollow. The vertebræ exhibit the ball and socket articulation of their bodies, but only a single pair of zygapophyses in front and behind. No zygantral and zygosphenal articulation appears to have existed.

The articular ball of the vertebral body is much wider than high, and is directed upward, with an inclination backward.

The body of several dorsals is quite straight inferiorly, fore and aft, and measures half an inch in length. The ball is four lines wide, and about half as thick. The breadth at the anterior zygapophyses is eight lines, and at the articulations for the ribs, just exterior to the latter, three-fourths of an inch.

An anterior caudal has its body the same length as in the preceding. Its ball is 3½ lines by 2½ thick. The width at the anterior zygapophyses is half an inch.

Hypapophyses for the articulation of chevrons are situated one-fourth the length of the body from the posterior extremity.

A tooth was found, after careful search, in proximity to what appear to be traces of the skull. It consisted of the crown, broken from its connection, the character of which therefore cannot be ascertained.

The crown of the tooth is compressed conical, slightly curved inwardly and backward, sharp-pointed, with abruptly impressed trenchant borders; is smooth and shining. It is hollow and has thick walls. The transverse section is rhomboidally oval, with acute poles. The length is about 1¼ lines; the breadth ¾ of a line; the thickness ½ a line.

The remains would indicate an animal as large as the largest of our living iguanians.

For the generic name of the animal I would propose to use the euphonious one of SANIWA, which, according to Prof. Hayden, is that used by one of the Indian tribes of the Upper Missouri for a rock lizard. The species may be named SANIWA ENSIDENS.

[Nov.

Issued November 29th, 1870.

Mr. Thomas Meehan referred to a potato presented to the Academy some months ago by Mr. Henszey, a member, which had the appearance of one potato growing out of the centre of another. The opinion of all who saw it was that it was really a case of this kind. It had been handed to him by the curators, and on dissection, though no exact place of origin could be traced, there seemed nothing to indicate any other theory of origin than that one potato had really grown out of the centre of the other.

But there were serious physiological reasons in the way of such a theory. A potato tuber is really but a thickened axis, in which the greater part of the interior structure would be incapable of developing a bud which would produce a tuber such as this one had done. The origin of a new tuber from an old one would be nearer the old ones surface. He had been looking for some further explanatory facts, and believed he had them here this evening, in the potato tubers he now handed to the members. They were about the size of hen eggs, and were pierced in every dircetion by stolons of the common couch grass, *Triticum repens.* They had gone completely through, as if they were so much wire, and in one instance two tubers had become strung together by the same stolon, as if they were two beads on a string. One would suppose that the apex of the stolon, when it came in contact with the hard surface of the tuber, would turn aside and rather follow the softer line of the earth ; but there was no appearance of any inclination to depart from their direct course. They had gone apparently straight through. He had no doubt the potato before referred to was a similar case, a potato stolon had penetrated another potato, and instead of going through as these grass spears had done, terminated in the centre, and formed the new potato there.

It was worthy of thought whether so much attention had been given to this direct force in plants as the subject deserved. It was well known that a mushroom would lift a paving stone many times it own weight, rather than turn over and grow sideways, which it would appear so much easier for it to do; and tree roots growing against walls would throw immensely strong ones over, though one would think the pressure against the softer soil would give room for their development, without the necessity of their expending so much force against the wall.

November 15th.

The President, Dr. Ruschenberger, in the Chair.

Twenty-seven members present.

A paper was presented for publication entitled " A Sketch of the Classification of the American Anserinæ," by B. H. Bannister.

Prof. Leidy directed attention to some fossil bones which had been submitted to his examination by Prof. J. D. Whitney. According to the accompanying label, they were found under Table Mountain, near Shaw Flat, Tuolumne Co., California.

The bones are friable, and have attached portions of a light ash colored gravel. Several masses of the latter substance, accompanying the bones, contain casts of some fruit.

The bones are as follow:

1. A metacarpal bone of a ruminant of large size. In form and construction it bears more resemblance to that of the Lama and Camel, than of other ruminants with which I have the means of comparing it. As in the Lama and Camel the lower articular extremities are divergent, and the articular surfaces are provided with a median ridge only at the back part. In ordinary ruminants, as in the Ox, Deer, Sheep, etc., the median ridge is produced the entire extent fore and aft of the articular surfaces. The peculiar arrangement

in the extinct animal, as in the Lama and Camel, allowed a greater spread or divergence of the toes in the extended condition. The fossil bone is 19 inches long; the breath of its proximal end is 3½ inches, of its distal end 4 inches. In the skeleton of a Camel in our museum, the corresponding bone is 13 inches long.

2. The distal extremity of another metacarpal of the same animal.

3. The proximal end of a femur, probably of the same animal, with the head of the bone 3 inches in diameter. An acetabulum of corresponding size appears to have belonged to the same individual.

4. Two fragments of a tibia probably of the same animal.

The bones mentioned probably represent a large extinct species of Lama, which may be distinguished with the name of Auchenia Californica. Perhaps the fossils represent a distinct genus, allied to the Lama, but this is a question only to be determined by the discovery of other and more characteristic remains of the animal.

5. A first phalanx, in the collection, resembles in form that of a representation of the same bone in the Lama, and is about the size of that in the Camel. Perhaps it belongs to a small individual of the preceding extinct form; probably to a smaller species. It is 3½ inches long, 1½ inch wide at the proximal end, and 1¼ inch wide at the distal end. The articulation of the latter is not expanded beneath, as in the Camel, for the apposition of the sesamoid bones.

6. The proximal three-fourths of a metacarpal, probably of a Deer. It is of rather more robust proportions than the corresponding bone of the Virginia Deer.

7. An incisor tooth of a small Horse, partially imbedded in a coherent mass of gravel, which also contains the impress of a nut-like fruit.

8. Portion of a tibia of a small Horse, probably pertaining to the same individual as the tooth just mentioned.

9. The lower extremity of a metacarpal, probably of the same Horse. It is proportionately thicker and less wide than in the corresponding bone of the Domestic Horse. The articulation is 1½ inch wide, and 16 lines fore and aft at the median ridge.

The equine remains perhaps belong to a Hipparion.

10. A few fragments of undetermined bones of other animals.

Prof. Leidy further directed attention to a fossil fragment of the lower jaw of a small pachyderm, which Prof. Hayden had obtained from Henry's Fork of Green River, Wyoming. The specimen contained the fourth, the sixth and the seventh molars. The teeth resemble in form and constitution those of the *Lophiotherium cervulum*, a small pachyderm, described by Prof. Gervais, from an eocene formation of France. The crowns of the fourth to the sixth molars have four lobes; that of the seventh molar has an additional lobe. The crescentic summit of the postero-external lobe joins, by its anterior horn, the antero-internal lobe. A proportionately well developed basal ridge embraces the crowns, except internally, where it is entirely absent. The series of the back four molars occupies a space of 16 lines. The last molar is 5½ lines fore and aft. The base of the jaw is nearly straight the length of the fragment, which is an inch and a half. The depth of the jaw below the fifth molar is half an inch. The species may be named Lophiotherium sylvaticum.

Prof. Leidy also remarked that the Philosophical Transactions of the Royal Society of London, Pt. II, 1869, presented this evening, contained a paper by Prof. Owen, on the fossil remains of Equines from Central and South America. It was of special interest to him on account of its being accompanied with excellent illustrations of the dentition of the various species of existing horses, which, in the absence of original specimens, afforded him the opportunity of making comparisons with the many equine teeth discovered in the tertiary and quaternary deposits of North America.

Prof. Owen describes a new species of Equus from South America, which he names *E. arcidens.* From peculiarities of the teeth, he refers this species, together with two others, also from South America, and named by Dr. Lund *E. principalis* and *E. neogaeus*, to a genus with the name of *Hippidion.* From some of the more important distinctive characters, viz., the extension backward alone of the internal peninsular folds on the triturating surface of the upper molars, a dozen years ago was established the genus *Protohippus* (Pr. A. N. S. 1858, 26, with reference to fig. 1, pl. 7 of Gervais' Rech. s. l. Mammiferes Fossiles de l'Amérique meridionale). On the same grounds were also included in this genus the *E. principalis* and *E. neogaeus* of Lund, together with *E. macrognathus* of Gervais, so far as the remains of the latter appeared to me to be the equivalent of *E. principalis*, (Extinct Mammalia of Dakota and Nebraska, &c., 1869, 276).*

The species of equine animals referable to the genus thus far indicated are as follow:

PROTOHIPPUS, Leidy, 1858.

Hippidion, Owen, 1869.

1. PROTOHIPPUS PERDITUS.
   Equus (*Protohippus*) *perditus*, Leidy: Pr. A. N. S. 1858, 26; Ext. Mam. Fauna of Dakota, &c. 1869, 275, 327, 401.
2. PROTOHIPPUS ARCIDENS.
   Equus arcidens, Owen: Phil. Tr. Roy. Soc. London, 1870, 559.
   Equus (*Hippidion*) *arcidens*, Owen: Ibidem, 572.
3. PROTOHIPPUS PRINCIPALIS.
   Equus principalis, Lund: K. Danske Vidensk. Selskab. 93, pl. xlix, fig. 1.
   Equus neogaeus, Gervais: Rech. Mammif. Fos. de l'Amer. Merid. 1855, 33, pl. vii, fig. 1.
   Equus macrognathus, Gervais: Ibidem, pl. vii, fig. 1.
   Equus (*Hippidion*) *principalis*, Owen: Phil. Tr. 572, 573.
4. PROTOHIPPUS NEOGAEUS.
   Equus neogaeus, Lund: K. Danske Vid. Sels. 93, xlix, fig. 3.
   Equus (*Hippidion*) *neogaeus*, Owen: Phil. Tr. 572, 573.
5. PROTOHIPPUS PLACIDUS.
   Leidy: Ext. Mam. Fauna of Dakota, &c. 277, 328, 401.
6. PROTOHIPPUS SUPREMUS.
   Leidy: Ext. Mam. Fauna of Dakota, &c. 328, 401.

In the same Transactions appears a paper, by Prof. W. Thomson, "on *Holtenia*, a genus of vitreous sponges," accompanied with beautiful illustrations. The genus, however, appears to me to be synonymous with *Pheronema* (Pr. A. N. S. 1868, Biolog. and Micros. Dep. 9). A comparison of the figures of *Holtenia Carpenteri*, with those of *Pheronema Annæ* (Am. Naturalist, 1870, 21, 22), leads me to suspect that the two are probably the same.

November 22d.

MR. J. D. SERGEANT in the Chair.

Six members present.

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* On page 261 of the Ext. Mam. Fauna of Dakota and Nebraska, figs. 2, 3, have been erroneously quoted instead of fig. 1 of Gervais, pl. vii, of the Rech. sur les Mammif. Fos. de l'Amer. Merid.

November 29th.

The President, DR. RUSCHENBERGER, in the Chair.

Thirty-three members present.

The report of the Microscopical and Biological Section for September, October and November was read, and referred to the Publication Committee.

The publication of pages 109 to 124 inclusive, of the Proceedings for 1870 was announced.

The following gentlemen were elected members:

E. Wildman, M. D., David L. Collier, William H. Dougherty, W. H. Wahl, M. D., Chas. Schaffner, M. D., J. Ewing Mears, M. D.

On favorable report of the Committees the following papers were ordered to be printed.

BUD VARIETIES.

BY THOMAS MEEHAN.

A few years ago, Mr. Isaac Burk, of the Academy, called my attention to a form of *Rubus villosus*, L., in which the terminal leaflet was very large, cordate, and on very long petioles. It is a very striking variety, the leaflets appearing at first glance like large linden leaves. He found them in Delaware County. I have since gathered the same form near the intersection in Chester County, near Port Clinton on the Reading Railroad, and along the west bank of the Susquehanna, between Harrisburg and the mouth of the Juniata.

The general forms of *Rubus villosus* are found uniformly in all parts of the State, and, of course, without any break in their appearance between the localities named above. The plant so easily maintains its existence by pieces of roots, and grows as well in sunshine as in shade, in dry and poor as well as in rich and damp places, that it is not easily eradicated when once it obtains possession of the soil. On the idea that varieties originated from one common centre, it is not easy to account for the existence of the same forms so many miles apart, as we find in the above, except by the accidental carrying of seeds.

But I have reason to believe that seeds of *Rubus* rarely germinate in a wild state. In experiments which I have made in raising the seed artificially, none of the seedlings come exactly like the parent. There is a certain general resemblance, but some distinction, more or less, can be traced in each individual But, in native places, one exact form will be found to occupy extensive tracts. Sometimes several forms will be together, but only a very few. If the seeds made plants readily, there would be innumerable forms, instead of the very few we see. I found, in my experiments, that it took a long time for a blackberry seed to germinate; sometimes a whole year. Such seedlings have a poor chance to vegetate in a state of nature. Other more rapidly-growing vegetation would crowd it out. The only distributing agency I can think of is that of birds. But I find no birds eat blackberry seeds; and, if they did, when we consider that of the millions of seeds which fall about the place of their origin, few, if any grow; the chance of those growing which birds may carry, even if there be some to eat them, which I have failed to find, is extremely small. Hence, we find great difficulty in believing that identical forms of *Rubus*, widely separated, can have originated from a common centre.

Something like this exists in some forms of *Rubus occidentalis*. There is a form with a fruit having soft pulp, of a light purplish red, and comparatively few seeds. This is known amongst botanists, though I do not know that a description has been published, as *R. neglectus*, Peck. This form is found in isolated places in New York, Northern Pennsylvania, Ohio, and Iowa, and perhaps elsewhere. As in the case of the form of *R. villosus* referred to, there does not seem to be any connection between the localities, as a common centre spreading by roots would imply, while there is the same difficulties in the way of spreading by seeds as in the other. How, then, does this form originate in these widely separated places.

Horticulture may help us to answer this question. It is well known that fruits, after being grown for some time in one locality, will change their characters to such an extent that a person acquainted with one will fail to recognize it elsewhere, and all this without the intervention of any seminal power. Thus, the nectarine is believed to be a bud evolution from a peach; the Penn apple is a similar creation from Baldwin, and the Reading from the common Isabella grape. Though apparently originating in this way from external or local causes, the characters peculiar in this change are retained when, by grafts or cuttings, the plants are removed to other localities. It has also been noted that the pears grown at Rochester, New York, have longer stems than the same varieties grown further south; but I do not know whether this peculiarity, once originated, would follow the grafts or cuttings taken from them. The curled-leaved willow, *Salix babylonica annularis*, was a branch from the common weeping willow, which character it usually retains, though sometimes a branch, resembling the common weeping, will push out from the tree. Of like character is the well-known instance of purple-flowered laburnums sometimes pushing out from the common yellow-flowered one. But perhaps the best known instances are those of the common potato. It is not at all unfrequent to find some of quite another character and color in the same hill. Those who contend for seed agency as the sole originator of varieties will rather believe that there was some other variety of potato accidentally planted with the other than that a new variety sprung from the bud alone. But the evidence of origin from the same original potato-set has, in many instances, been too direct to be doubted; but, even here, rather than admit the doctrine of development through buds, I have heard it *assumed*, by intelligent botanists, that the flowers in such cases *must have been* impregnated with other pollen, and, in *some way*, the descending sap brought about a sort of hybridism or bud change in these tubers. I have also heard excellent and leading botanists (two of them authors of some of our leading works) suggest that many of the varieties of *Rubus* in existence *must be* "hybrids." Of course, this is all assumption, founded on extensive observation, no doubt; but yet on probably no better foundation than my own idea with which I set out in this paper—that often, at least in the cases I have referred to, hybridization is highly improbable.

I have here, however, and exhibit with this paper, evidence of bud variation, in which there is no possibility of hybridism. A root of the common sweet potato, *Convolvulus batatas*, in which some of the tubers are of the red Bermuda, and the others of the white Brazilian variety.

The sweet potato never flowers in this part of the country, so that seminal power could have had no influence whatever on the phenomenon. Even in the south, and I believe elsewhere, where this plant is cultivated for its roots, it rarely flowers, and I think there is little doubt but that the whole ten or twelve varieties under culture have originated without seed, and in the way we see them here.

The points I wish to make in this paper are:—

1st. That identical varieties sometimes appear in localities unfavorable to the idea of a common centre of origin.

2d. Varieties have originated in which *probably* no hybridism or any seminal agency operated.

3d. Varieties have *certainly* originated in the sweet potato by evolution, without seminal agency, and that the same variety in this way has appeared in widely-separated districts.

4th. As the discoveries of Darwin have shown in many cases, varieties to be the parents of species, species may originate in widely-separated localities by bud variation.

A Sketch of the Classification of the American ANSERINÆ.

BY B. H. BANNISTER.

The following remarks are based upon an examination of the specimens of American geese in the collection of the Smithsonian Institution.

The subfamily Anserinæ by many recent authors is made to include the genera *Dendrocygna* and *Chenalopex*, and doubtless correctly. In the present paper, however, we shall not consider these genera, leaving them provisionally out of the subfamily; if included, they would form at least one well marked section, following those we are about to describe.

The distinguishing characters of the Anserinæ, as thus limited to the true geese, are, the lengthened tarsus, covered with hexagonal or subquadrate scales; the neck more elongated than in the ducks and less so than in the swans; the short, high bill gradually narrowing toward the tip, which is altogether composed of the large recurved nail; together with the more or less terrestrial habit of life, and the usually similar plumage of the two sexes.

The geese of the North American continent have been long known, and being for the most part closely allied to, and in many cases identical with, well known European forms, they fall readily into the systematic subdivisions based upon the latter. In the temperate regions of South America, however, the Anserinæ are of a rather aberrant type, and have been less completely studied. They differ chiefly from the North American and European species in possessing metallic tints on the plumage, and in having in two of the genera the coloration of the two sexes widely different. These differences appear to be exclusively regional, none of the aberrant forms being found in North America, and *vice versa*.

Another basis of division of the American Anserinæ is found in the presence, in two species—one North American and the other a Southern form—of deep rough superorbital depressions and reversed relative proportions of the tarsus and middle toe, together with an exclusively sea coast habitat, and a carnivorous diet, corresponding in some of these respects to the Oidemiæ and Somateriæ amongst the ducks.

These latter characters we have taken as the basis of the two sections into which we divide the subfamily, as at present considered, since they correspond with equivalent characters in one of the subdivisions of the Fuliguliuæ. The presence of the deep superorbital depressions is a very general character amongst the carnivorous natatores, though not universal.

The following is offered as an outline of the divisions and genera of the subfamily, noting briefly the principal generic characters, the American species and their geographical distribution. The principal characters of the subfamily have been already given at sufficient length.

Subfamily *ANSERINÆ*.

Section A. *Ansereæ.* Habits terrestrial; tarsi longer than middle toe with claw, skull without superorbital depressions.

a. *Typical.* Plumage without metallic reflections, color of sexes invariably similar.

1. ANSER, Vieill.

Gen. Char. Bill as short as head or shorter, gaping at the sides, the lamellæ appearing prominently below the edge of the upper mandible. Bill and feet light colored; colors of plumage generally sober, the shades of brown and gray predominating.

Species *Anser hyperboreus*, Pall. N. America and West Indies.
" *rossii*, Baird. Central regions H. B. Terr.; Cala.
" *cærulescens*, L. Central U. S.; Hudson's Bay.
" *ferus.* ? Pr. William's Land.
" *segetum*, Gm. ? Hudson's Bay.
" *gambelli*, Hartl. N. America.

2. BRANTA SCOPOLI.*

Gen. Char. Bill short, lamellæ not projecting below upper mandible. Bill and feet black; neck always black.

Species *Branta canadensis*, L. N. America.
" *hutchinsii*, Rich. & Sw. N. America.
" *bernicla*, L. Eestern and central N. America.
" *nigricans*, Lawr. West coast of N. America.
" *leucopsis*, Bechst. N. E. of N. America. Rare.

b. *Aberrant.* Plumage with metallic reflections on speculum; colors of sexes not invariably similar. Membrane of toes somewhat scolloped out in front.

3. ORESSOCHEN, n. g.

Gen. Char. Bill very robust, light colored, lamellæ not projecting. Feet robust, light colored, hallux well developed. Plumage of sexes similar; colors simple.

Species *Oressochen melanopterus*, Gay. Highland regions of Chili.

4. CHLŒTROPHUS, n. g.

Gen. Char. Bill moderate, black. Feet particolored, black and orange. Colors of sexes similar. Plumage rather brilliant for this subfamily.

Species *Chlœtrophus poliocephalus*, Gray. Coasts of Patagonia and adjacent islands.
" *rubidiceps*, Sclater. Falkland Islands.

5. CHLŒPHAGA, Eyton.

Gen. Char. Bill as in the last genus. Feet varying in color with the sex—black in the male, yellow in the female. Plumage of the two sexes quite different, and generally less bright colored than in *Chlœtrophus*.

Species *Chlœphaga magellanica*, Gm. Chili and Patagonia.
" *picta*, Gm. " "

Section B. *Philacteæ.* Skull with well marked rough superorbital depressions. Tarsus as short as or shorter than the middle toe with its claw. Habits littoral.

6. PHILACTE, n. g.

Bill short, moderately robust, light colored, nail of both upper and lower mandibles quite prominent, lamellæ appearing as pointed processes in the posterior part of the commissure. Feet moderate, light colored. General tint of plumage light, no metallic reflections.

Species *Philacte canagica*, Lewast. N. W. coast of N. America; ? Caspian.

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* The genus *Brante* was adopted from Klein by Scopoli in 1769, the first species being *Anas bernicla*, L. This, according to usage, will have to be substituted for *Bernicla* of Boie (Isis, 1822), and also antedates his genus *Branta*, established at the same time, the type of which is *Anas rufina*, Pall.

7. TÆNIDIESTES, Reich.

Gen. Char. Bill robust, varying in color with the sex, as also does the plumage; lower mandible deep, nail prominent, lamellæ not projecting. Feet robust, varying in color with the sex, tarsus shorter than middle toe with claw. Colors of female with metallic reflections on the speculum.

Species *Tænidiestes antarctica*, Gm. Southern extremity of S. America, and adjacent islands; Chili.

December 6th.

The President, Dr. Ruschenberger, in the Chair.

Thirty-three members present.

Prof. Cope made some observations on a number of species of reptiles from the Cretaceous beds of Kansas, which he had recently studied. He stated that the specimens included parts of *Elasmosaurus platyurus* Cope, *Polycotylus latipinnis* Cope, *Liodon proriger* Cope, and two new Liodons, which he named *L. ictericus* and *L. mudgei* respectively. They both belonged to the division with depressed vertebral centra, and the *L. ictericus* was near *L. validus* Cope, of New Jersey, but exhibited a less anterior, and less prominent proximal external angle of the quadratum, which Prof. Cope stated indicated a less extensive lateral flexibility of the ramus of the mandible.

In *L. Mudgei* the angle was still more posterior, and the pterygoid teeth were not pleurodont, as in *Platecarpus tympaniticus.* Remains of the cranium indicated a reptile of 30 feet in length, while those of the *L. ictericus* belonged to two individuals of 40 and 50 feet in length. A third new Mosasauroid of the size of the *L. Mudgei* was described under the name of *Clidastes cineriorum.* It was stated to be much the largest species of the genus, and to differ from the three now known in having the plane of the articular extremities at right angles to the long axis of the centra, and not oblique to it. From near Sheridan, Kansas; described by Prof. B. F. Mudge. He described a third new Liodon, of gigantic size, stating it to exceed by very much the Mæstricht reptile, and even the *Mosasaurus brumbzi* Gibbes, which was till now the largest known species. He pointed out the characters of the vertebræ, which were very much depressed as to the centrum, which measured 5¾ inches in diameter. It was allied to the *M. brumbzi*, but differed in having a strong emargination of the articular faces to accommodate the neural canal. He named it *Liodon dyspelor.*

Prof. Cope also exhibited the humeri and femora of *Polycotylus*, which were like those of *Plesiosaurus*, and measured 18 inches in length.

Mr. Thomas Meehan exhibited several specimens of the *Maclura aurantiaca*, the common osage orange, in which the plants were inarched together in pairs in a remarkable way. He said the osage orange was extensively grown as a hedge plant, and in digging up the one year plants, these united twins were usually found in the proportion of about one score in ten thousand. Double kernels were common occurrences in many seeds. There were double peaches, almonds, and double yolks in eggs. But these all had their separate seed coverings or membranes, and the yolks their own albuminous envelopes, consequently the separate embryos produced distinct plants. But these indicated that there had been two separate embryos under one seminal covering, and that the radicular portions of this double embryo, having no membrane to separate them, had inarched themselves together while passing to the ground. If this was the true explanation, he thought there was no such case recorded. That it was true seemed probable, from the fact that all the specimens were united in exactly the same manner, showing that time, place, and the circumstances of the union were uniformly the same. The scars showed that there were four cotyledons and two germs, and that the place of union was midway between the pairs of cotyledons. From the base of the cotyledons extending the whole length of the radicle, the union existed. The length of this united part was from half an inch to one inch, according to the vigor of the plant.

Another lesson he thought was afforded by these specimens. Dr. Asa Gray had recently remarked, in *Silliman's Journal*, that European botanists still believed what American botanists had learned to doubt, that the radicle was a true root, rather than a morphologized joint of stem. Here was, he believed, an illustration of the American view. These radicles, which had evidently united together under the seed coat, had elongated after protrusion, just as a young shoot with all its parts formed in the bud elongates after the bursting of the bud scales. They comprised the half inch, or inch united portions before referred to. If these radicular portions of the seed were of the nature of root rather than of stem, we might expect to see lateral fibres push from them, as we do see from the true roots, which start out below the union. But these parts are as free from rootlets as any portion of the true stems above the cotyledon points, indicating, as had been suggested, that their properties were rather of stem than of root.

December 13th.

The President, Dr. Ruschenberger, in the Chair.

Thirty-five members present.

The following paper was presented for publication:

"Remarks on Dr. Asa Gray's Notes on Buckley's Rare Plants of Texas." By Prof. S. B. Buckley.

Prof Leidy exhibited a lower jaw of an aged man, recently obtained in his dissecting room. The teeth had all been lost except one, and the alveolar border had been absorbed so that the body of the bone was reduced as usual to half its original depth. The remaining tooth is a completely developed and full grown third molar of large size, which lies imbedded in the jaw horizontally, with the unworn triturating surface directed towards the position which had been occupied by the teeth in advance. The tooth is perfectly sound, and in this old jaw, in which all the other teeth had been lost and the alveoli obliterated, favors the view that the teeth are liable to caries only when exposed to exterior influences. Similar specimens of teeth remaining imbedded in the jaw are not unfrequent, but the one exhibited is the oldest which Prof. Leidy had seen.

Prof. Leidy also exhibited a wood carving from St. Paul de Loando, Western Africa, presented to him by Dr. Charles L. Cassin, U. S. N. The carving, by a native African, represents two adult human figures, apparently of the two, united by an intervening plate, so as to remind one of the famous Siamese twins. The connection may have been merely intended for support, though Prof. Leidy thought the carving may have been intended to represent a pair of united twins, similar to those just named, and which existed in the locality in which the carving was made.

December 20th.

Mr. Vaux, Vice-President, in the Chair.

Twenty-two members present.

The following paper was presented for publication:

"A new classification of the North American Falconidæ, with descriptions of three new species." By Robert Ridgway.

PROF. LEIDY directed attention to a preparation of the trunk of an adult male subject, from the dissecting room of the University, in which all the viscera were reversed in the order of their usual position. The heart is reversed in position with its apex directed to the right. The aorta descends on the right side; and the cavæ are placed on the left of the vertebral column. The liver is placed in the left, the spleen in the right side. The stomach is reversed, and the large intestine commencing in the left iliac region terminates in the rectum from the right side.

THEO. D. RAND called the attention of the Academy to a remarkable exposure of rock on the North Pennsylvania Railroad, between Abingdon and Edge Hill stations, about eleven miles from Philadelphia. The rock is Potsdam sandstone, highly micaceous, in strata nearly vertical, and divided by frequent joints. Its strike is about N. by E. At the point mentioned a quarry has been opened following the crest of the hill, the northern end of the quarry giving therefore a section. At the bottom of the excavation the layers seem undisturbed and perfectly vertical, but above they are thrown to the southwest and crushed and broken in a remarkable manner, the layers nearest the surface being horizontal or even dipping to the S. W., but still retaining their relative positions. The breaks in the rocks are fresh and sharp, and the spaces between them empty, and the whole appearance is as if a very recent force acting near the surface had thrown them from a vertical into their present positions. Some of these spaces were two or three inches in width and apparently of great depth.

It is probable, however, that it is due to a folding of the strata, as in the cut of the Railroad immediately west of this exposure. The rocks of the quarry appear perfectly vertical while south of them, probably fifty feet, is a well defined anticlinal axis or fold. Still the broken, not bent condition of the rocks, their very marked and sudden change from the vertical, the freshness and sharpness of the fractures seem almost irreconcilable with a fold taking place as long ago as this anticlinal axis, and it is well worthy of examination by geologists.

December 27*th.*

The President, DR. RUSCHENBERGER, in the Chair.

Thirty-four members present.

On motion, the election of members was postponed until the next meeting for business.

PROF. LEEDS called attention to an interesting geological phenomenon in the vicinity of Wayne station on the Germantown Railroad, about three miles from Philadelphia. At the point where Wayne street cuts through a fold in the micaceous schists of this district, there occur huge imbedded boulders of very hard compact hornblende rock. The matrix of mica schist has the appearance of an altered argillaceous slate, and rapidly decays on exposure. The hornblende rocks are thus left protruding above the soil, aud would be difficult to account for if attention had not previously been called to them in place. As occurring in the schist, they are rounded upon their corners and edges and smooth upon the sides. It does not appear an improbable conjecture to suppose that they constituted a part of a primitive surface formation—perhaps the original earth crust—which was broken up before the deposition of the metamorphic rocks which make up the azoic rocks of undetermined geological age, overlying the southeastern angle of Pennsylvania. And that by stream and current actions, perhaps in part by glacial, they were brought into the shape of boulders at a time anterior to the deposition of the sedimentary mica schists.

And it is a fact of interest in this connection that the highly garnetiferous mica schists of this district, are charged with dodecahedral garnets, which probably have belonged to pre-existent rocks, inasmuch as their angles and edges are rounded off, and the crystals reduced to an almost globular form. This is true of the garnets while still firmly imbedded in the mica schists, and applies to the garnetiferous mica schists extending over a wide area.

On favorable report of the Committees, the following papers were ordered to be printed.

Remarks on Dr. Asa Gray's notes on Buckley's new Plants of Texas.

BY PROF. S. B. BUCKLEY.

In the spring of 1862 Dr. Asa Gray had two papers in the Proceedings of the Academy of Natural Sciences of Philadelphia, both of which were reviews of some new plants described by me in the same publication a few months previous. I left Philadelphia prior to the appearance of Dr. Gray's papers, being employed by the Sanitary Commission at Washington to make scientific examinations and measurements of Soldiers for anthropological purposes.—*See Anthropological Investigations of American Soldiers, by Dr. Gould*, lately published by the Sanitary Commission. At the end of the war I returned to Texas, where I have been ever since. I did not see Dr. Gray's notes till August, 1867. I have few Botanical works here, and no Herbarium, and have delayed to notice some points in which I think Dr. Gray has not done me justice, in hopes to be able to have a better chance than I have here, but as time is passing I will offer what facts I have now, leaving others for another opportunity.

During 1859, '60 and '61, I made a large collection of rare plants, in Georgia, Alabama. Mississippi, Louisiana and Texas, which I had boxed and started with for the North prior to the war. These were stopped and destroyed at Lavaca, Texas. They were intended for, and directed to, the Academy of Natural Sciences of Philadelphia.

The few I saved I brought with me, but I found the Herbarium of the Academy not as complete as I supposed. I expected to find all the plants which Nuttall had described, as well as full collections of Wright and other botanists who had explored Texas and other southwestern parts of our country. But these were not as full as I imagined, and the Library was deficient in some works which would have aided me in my investigations. I appreciate these facts more fully now, than I did then, and can understand how very likely it is that I have made some mistakes. There are very few botanists who have not had to regret similar errors under similar circumstances. Indeed the object of this paper is to show that Dr. Gray himself has fallen into error in many particulars in the papers in which he criticises mine. For instance, *Clematis Texensis*, Buckley, Dr. Gray says is his " *C. viorna* var. *coccinea*, Pl. Wr. 2 p. 7, *C. coccinea*, Engelman." It is referred to *C. viorna* with the remark that its " leaves are more glaucous, and the thick sepals of a pure carmine red, very rarely purplish." I do not know that Engelman has ever *published* his name of *C. coccinea.* I believe all that has been published is in the extract quoted. If, therefore, it *is*, as I have no doubt the majority of botanists will agree with me that it is, a distinct species from *C. viorna*, my name has the right by priority of publication. It grows in the vicinity of Austin.

Zanthoxylum hirsutum Dr. Gray thinks but a variety of *Z. carolinianum.* There is a variety I know, and I suppose this is to what Dr. Gray refers. I am very familiar with it. It is abundant in the vicinity of Austin. But this is always small, the largest specimens with a trunk rarely exceeding three inches in diameter. This was a small tree, one foot at least in diameter, and attracted my particular attention by its very peculiar appearance, as I rode horseback in the vicinity of Corpus Christi. Its hairy leaves are a constant and distinctive character. I expect to get specimens again.

Ampelopsis heptaphylla Dr. Gray says is "a small leaved state of *A. quinquefolia*, with *some* of the leaves 6–7 foliate." They are all, or *nearly all*, 7 foliate. If *A. quinquefolia* were known to be variable in respect of the number of leaflets on the same plant, there might be room to look for a variety with another number of leaflets. But this species is noted for the regularity with which it bears five leaflets only, both in the north and in the south. It grows in the same locality with my *A. heptaphylla*, constantly with five leaflets only. But this is not all; my plant not only has 7 leaflets almost constantly, but they are smaller than *A. quinquefolia*, and it flowers in *cymose panicles* at the *end of April;* while *A. quinquefolia* has compound racemes 3–4 inches in length, and does not open its flowers till the middle or end of June.

Vitis monticola, he says, is *V. rupestris* of Schule. In *Plantæ Lindh.* 2, p. 166, Dr. Gray himself says of *V. rupestris*, "It does not climb, but the stems are upright, and only two or three feet in height." This is right. I am familiar with it. But my *V. monticola does* climb, sometimes to the height of 15 feet. But in addition to this there is nearly *two months difference in the time of ripening of the fruit.* All the inhabitants of this region readily distinguish them as different things.

Vitis Lincecumii he refers to *V. labrusca*, and says that "the Louisiana specimen (of Dr. Hale) exactly agrees with what we formerly cultivated in Cambridge Bot. Garden as the Isabella grape." The Isabella grape is well known here, yet this is readily distinguished by the people of Texas, who call it the "Postoak grape." It has larger and less lobed leaves than the Isabella. The Isabella has naturally but one short bunch—this is shouldered or branching; the berries drop easily from the stems—these are strongly adherent; the skin is rather thick and the berries comparatively large,—while these are thin-skinned and smaller. The *V. labrusca* is a rampant species, this rarely grows 15 feet, and often bears fruit on bush like specimens, 3–4 feet high. I have studied both species very closely, both before and since Dr. Gray's criticisms, and can have no doubt of their distinctness.

Vitis mustangensis Dr. Gray says "is not the mustang grape of Florida, but is the well known *V. candicans* of Engelman." He asserts further that *V. coriacea*, of Shuttleworth, is a thick-leaved form of it, the *V. caribæa* of Chapman, whether of DeCandolle I am still uncertain." I believe the only description of *V. candicans published*, before my description of *V. mustangensis*, is the following from *Plant. Lindh.* 2, p. 166, where Dr. Gray says, "Under the name of *V. candicans* (N. S.) *Engel. ined.*, I have from Lindheimer, as also from Mr. Wright, Texan specimens of what appears to be a variety of *V. californica*, Benth., with the leaves somewhat less dentate, and more densely tomentose underneath." Again, in *Plantæ Wrightiana*, p 32, in a note at the bottom of the page, he states, "*Vitis candicans*, *Engel. ined.*, which is also the *V. coriacea* of Shuttleworth, *Pl. Rugel. ex. sic.* from southern Florida, is not the same as *Vitis californica*, Benth., to which I was disposed to refer it in *Pl. Lindh*, 2, p. 166. Perhaps it may be *V. caribæa* of D. C." If this is, as I believe, the only description of *V. candicans* ever published, is Dr. Gray justified in terming it "well known?" Surely Dr. Gray does not own to much acquaintance with it, and makes no allusion whatever to its native name "mustang."

Dr. Gray "warns the reader that mustang is not the name of a town or country, as the termination *ensis* would imply, but of a wild horse." I may add that it is *also* the name of a stream along which this grape grows in great abundance.

I saw Lindheimer at New Braunfels in Texas in 1860. He told me that Gray and Engelman, with whom he was in close correspondence, were both uncertain about this grape, and that it was still undescribed. He regarded it as "scientifically unnamed." Under the rules of priority of description, I claim my name.

It is unlikely that my mustang grape is the *V. coriacea* of Shuttleworth, for be it remembered I had travelled extensively in Florida, and should have seen this grape there if they had been the same, but I never saw it in Florida; but the greater probability of this is that Chapman, who had resided in Florida 25 years, describes no such grape as mine, but refers the *V. coriacea* of Shuttleworth to *V. caribœa*, D. C., and further says the mustang of Florida is a *form of V. vulpina.* See Flora of Southern States, p. 71.

Vitis bipinnata, with which name the authority of "Torr. & Gray" is associated, belongs really to Wildenow.

Astragalus Brazoensis, Dr. Gray has, on a second examination, done me the justice to declare a good species.

Hoopesia arborea I am charged with "making up from a flowering specimen of *Cercidium texanum*, Gray, a fruiting one of *Acacia flexicaulis*, Benth, and a sterile branchlet of *Acacia rigidula*, Benth." Of course, no one would suppose I would mix plants purposely with the object of making a new genus or species. That no such a mixture was possible, I claim from the following facts. I was careful to select a large number of specimens with *both flowers and fruit on the same branches.* I also cut from sprouts which grew up from the base of the tree, so that I might have all its characteristics, for I felt then that it would prove to be undescribed. I spent a long time in getting these specimens. I was then engaged with Dr. Shumard in the geological survey of the state. Drs. Shumard and Riddell were then with me,— they in a buggy, I on horseback—at Corpus Christi together, and we started next day for Austin, my press and plants in the buggy. They went on hurriedly, agreeing to change my plants, I arrived in Austin three days after them, and found my plants mostly spoiled.. I saved only a few damaged specimens of *Hoopesia.* Familiar as I was with them in cutting, and again in my anxiety so few days after to select from the damaged specimens the best left, I do not see the possibility of any mistake; but intend to take the first opportunity to visit again the locality, and get specimens for the Academy and other public institutions. Trees of the *Hoopesia* grow on the banks of the Gulf, from one to two miles below Corpus Christi.

Drejera parviflora and *Morus microphylla* are admitted to be good species.

Juncus filipendulus has also, since Dr. Gray's criticisms, been decided by Dr. Engelman to be a good species. But he has changed the name, on the ground that my name is "inappropriate." My name was suggested by the thread-like hanging stems of its fruit and flowers. Even were the name less appropriate than it manifestly is, if botanists had a right to change names to accord with each compiler's sense of fitness, how many synonyms should we not have?

Juncus diffusissimus Dr. Gray says is *J. debilis.* Dr. Engelman has since decided Dr. Gray to be wrong in this, but I have not Dr. Engelman's monograph by me to refer to what he decides it to be.

Cyperus Heermanii is not referred to any other species, and

Eleocharis microformis, though said to be "near intermedia," is probably a good species also.

For want of books and material, as I have before remarked, I am unable to follow up these corrections further; but finding myself right in so many which I have been able to reconsider, I hope to be able to clear myself from some of the other charges in future.

Dr. Gray was particularly severe in his preliminary remarks. He accuses me of a "gross appropriation and suppression of the names of Nuttall and others, as recorded in a public herbarium." The laws of botanical nomenclature say "a name which has never been clearly defined in some *public journal or work*, shall be changed for the earliest name by which the object shall have thus been defined." See *Edinburg Philosophical Jour.*, 1863--4. Indeed, in the language of science, a plant has not been *named* until it has been *described* in some "journal or work." One may by courtesy adopt a name he finds on a label attached to a herbarium specimen; but if in his opinion, from the smallness or imperfection of the specimen, or from other reasons, he believes the interest of science would be served by the use of another name in his description it is his duty to do so.

I feel that I have been wronged by Dr. Gray's personal remarks in his review of my papers. Considering such a course out of place in a scientific discussion, I have avoided anything like retaliation. But I have thought it due to me as the author, and the Academy as the publisher, of the papers criticized by Dr. Gray, that no more errors should be laid to their charge than they legitimately deserve.

A New Classification of the North American FALCONIDÆ, with Descriptions of Three New Species.*

BY ROBERT RIDGWAY.

INTRODUCTORY REMARKS.

Having been engaged for a considerable time upon an investigation of the North American Falconidæ, I have found it necessary to arrange the subfamilies with their sections, the genera and their subgeneric divisions, in a manner somewhat different from the classification usually adopted. The following scheme is intended to express the arrangement that I have been led to make, as the result of the study alluded to.

Of course, the classification presented is based entirely upon the external anatomy, and may, very probably, be found to differ from one founded upon the internal structure. As, however, the former is more convenient for practical purposes, and, moreover, there being no sufficient material at my command for a classification of the second kind, I trust that I may be excused for offering one based upon comparatively artificial characters. In the descriptions, every available character has been used, it having first been traced through the group to test its importance.

The present paper is intended as a preliminary to a "Monograph of the North American Raptores," now completed, and soon to be published, in a volume of the series of reports of the "U. S. Geological Exploration of the 40th parallel," under the direction of Mr. Clarence King. This work is intended to embrace full descriptions of all the species of the order belonging to the fauna of North America,† their differences from any analogue of South America or Europe being expressed by a diagnostic table; in which manner are also distinguished all the closely-allied species. The different stages of plumage of each species are elucidated in detail, and all doubtful questions as to the relationship of allied forms or the validity of others are fully discussed, and the complete synonymy given in full.

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[*] One, however, belonging only to West Indies.

[†] As defined by Prof. Baird.

Family *FALCONIDÆ.*

I. *Eye shaded by a projecting superciliary shield,** *covered with naked skin.*

A. Nostril circular, with a conspicuous central bony tubercle.†
  a. Prominent tooth on commissure; lower mandible truncated, and with a deep notch corresponding with the tooth on the upper.
    1. A web or membrane uniting the outer and middle toes at their bases. *Falconinæ.*

B. Nostril *not* circular, and without bony tubercle.
  a. A "ruff" or circle of short stiff feathers around the face, as in the *Strigidæ.*
    1. Membrane between toes well developed............................*Circinæ.*
  b. No ruff.
    1 Membrane well developed...*Accipitrinæ.*
    2. Membrane rudimentary..*Haliætinæ.*

II. *No superciliary shield.*

C. Middle toe longer than bare portion of tarsus in front.................*Milvinæ.*
D. Middle toe shorter than tarsus in front.....................................*Polyborinæ.*‡

I. *Eye shaded by a projecting superciliary shield, covered with bare skin.*

A. Nostril circular, with a central bony tubercle.

Subfamily *FALCONINÆ.*

Bill strong, its breadth at base equalling or exceeding its height; upper outline of cere rather lower than base of the culmen; gonys much arched, the chord of the arch equalling about half that of the culmen. Near the tip of the upper mandible is a prominent tooth on the commissure, and near the end of the lower mandible, which is truncated, is a deep notch corresponding; the end of the upper mandible is compressed, giving the situation of the tooth an inflated appearance when viewed from above. *Nostrils circular, with a conspicuous central tubercle.* Orbital region bare; projecting superciliary shield conspicuous, arched, but not very prominent. Tail shorter than wing, the feathers hard and stiff. Primaries very strong, elongated, tapering rapidly toward their points; only the first or first and second with their inner webs emarginated. Tarsus never with a single series of transverse scutellæ either in front or behind; middle toe very long.

Diagnoses of generic and subgeneric divisions.

A. *Tarsus with no transverse scutellæ,* but, instead, covered with numerous irregular small scales; second quill longest; first always longer than fourth; only first emarginated on inner web.
  a. Middle toe *longer* than tarsus—the latter scarcely feathered below the knee. First quill equal to or *longer* than third.

Genus FALCO, Auct.

1. First and second quills equal; outer web of second only sinuated; inner web of first emarginated; of second, sinuated.
   Sp. *peregrinus*, Gmel., and "*anatum*," Bonap., (= *peregrinus* var. *anatum.*

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* This "shield" is formed by the bony process of the *lachrymal* projecting backward over the orbit. In *Falconinæ* (only) it consists of a single narrow process; in the other subfamilies, it is broader, and composed of two separate pieces, with cartilaginous junction. the posterior part or "hinged" plate forming the "shield."

† The only other American *Falconidæ*, having a similar nostril, are *Milvago, Phalcobænas*, and perhaps a few other genera, belonging to, or generally placed with, the *Polyborinæ;* they also have the tooth, notch, etc., of the bill decidedly indicated; other characters, however, separate them very widely from the *Falconinæ.*

‡ *Ibycter* alone forms an exception; but the other characters of this genus are eminently *Polyborinæ.*

2. Second quill longest, but difference between first and second less than half that between second and third. Outer web of first and second sinuated; inner web of first emarginated; of none, sinuated. *aurantius*,[*] *rufigularis*.[†]

b. Middle toe *shorter* than tarsus, the latter closely feathered on upper portion; first quill shorter than third.

3. (Subgenus *Hierofalco*, Cuvier.) Outer webs of second, third and fourth quills sinuated (the last only perceptibly;) inner web of first emarginated,—of second sinuated. More than the upper *half* of tarsus feathered, the feathering interrupted behind only by a narrow (almost concealed) strip from the knee downward. *candicans*,[‡] *islandicus*,[§] *sacer*,[‖] *labradorus*.[¶]

4. (Subgenus *Gennaia*, Kaup.) Outer webs of second and third quills sinuated; inner web of first emarginated, of second sinuated. Only the upper *third* of the tarsus feathered; its posterior face and the whole knee bare..*mexicanus*.[**]

B. Front of Tarsus with a double series of transverse scutellæ, these alternately joining; second and third quills equal and longest—or, third longest; first and second with inner webs emarginated. Tarsus scarcely feathered below the knee.

a. (Subgenus *Hypotriorchis*, Boie.) Basal joint of toes with irregular scales.

5. Third quill longest; second and third with outer webs sinuated. *columbarius*[††], *richardsonii*.[‡‡]

b. Basal joint of toes with transverse scutellæ.

6. Third quill longest; second, third and fourth with outer webs sinuated; scutellæ of tarsus and toes large and well defined, uninterrupted from knees to claws.......................................*femoralis*.[§§]

7. (Subgenus *Tinnunculus*, Vieill.) Second and third quills equal and longest; second and third with outer webs sinuated. *sparverius*,[‖‖] (with all its varieties); *sparveroides*,[¶¶] *leucophrys*.(1)

B. *Nostril not circular, and without bony tubercle.* Bill variable in form, but its breadth never equal to its height at the base; gonys only moderately convex. No "tooth" on the commissure, but, in its stead, a more or less prominent "lobe" or "festoon;" lower mandible neither truncated nor notched. Nostril variable in form, but never circular, and never with a central bony tubercle; though there is sometimes a cartilaginous projection, to be distinguished by its different appearance and situation. Tarsus, *when bare*, with a frontal and posterior series of transverse scutellæ.

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[*] *Falco aurantius*, Gmel., Syst. Nat., 1789, 283. *Falco deiroleucus*, Temm., Pl. Col. 348, 1836.

[†] *Falco rufigularis*, Daud., Tr. Orn. ii. 131, 1800. (*F. aurantius*, Temm., Pl. Col., and Cassin, B. N. Am.)

[‡] *F. candicans*, Gmel., Syst. Nat., 1789, 275.

[§] *F. islandicus*, Sab., Linn., Trans. xii., 1818, 528.

[‖] *F. sacer*, Forster, Phil. Trans. lxii., 1772, 383 and 427; Baird Trans. Chicago Ac. Nat. Sc., I. ii. 271. (*Hab.*—Interior regions of Arctic America.)

[¶] *F. labradora*, Aud. B. Am., pl. 161, 1831. (*Hab.*—Littoral regions of Arctic America.

All races of one species.

[**] *F. mexicanus*, "Licht. Mus. Berol," Schleg. Abh. Geb. Zool. Vergl., 1841, p. 15 = *F. polyagrus*, Cassin, B. Cal. and Tex., 1853, 88; B. N. Am., 1858, 12.

[††] *F. columbarius*, Linn., Syst. Nat., 1766, 128; *Hypotriorchis columbarius*, Gray, List., 1844, 55; Cass. B. N. Am., 1858, 9:

[‡‡] *Hypotriorchis richardsonii*, nobis. See page 145. (*Hab.*—Interior of Arctic Am.; U. S. between Rocky Mts. and Mississippi River.)

[§§] *F. femoralis*, Temm., Pl. Col. 121, 1834, 343. *Hypotriorchis femoralis*, Gray Gen. B.

[‖‖] *F. sparverius*, Linn, Syst. Nat. p. 128, 1766. *Tinnunculus sparverius*, Vieill. Ois. Am. Sept.

[¶¶] *F. sparveroides*, Vigors, Zool. Journ. III. 436, 1827. *Tinnunculus sparveroides*, Gray, Gen. B. (*Hab.*—Cuba.)

(1) *Tinnunculus leucophrys*, nobis. See page 147. (*Hab.*—Cuba and Hayti.)

Subfamily *CIRCINÆ*.

A ruff of short, stiff, close feathers around the face, as in the owls. (*Strigidæ.*)

Genus CIRCUS, Lacépede.

Fine bristly feathers of the lores extending upwards above the cere. Bill rather weak, much compressed; upper outline of the cere forming an ascending plane, somewhat arched at posterior end. Nostril oval, horizontal; superciliary shield inconspicuous, though prominent. Tarsus more than twice the length of middle toe; very slender, the scutellæ distinct. Wing long.

1. Third and fourth quill equal and longest; second equals fifth; first shorter than sixth; second, third, fourth and fifth sinuated on outer webs; inner webs of outer four emarginated.
C. hudsonicus, (Linn.,) Vieill.

Subfamily *ACCIPITRINÆ*.

No ruff.

A. *Accipitres.* Bill much as in last; but less compressed and higher through the base; *height at base exceeding chord of the culmen, the cere on top much ascending basally;* commissure anterior to the festoon deeply scolloped. Nostril broadly ovate, obliquely horizontal. Toes very long. Wing short; fourth quill longest; second shorter than sixth; first equal to or shorter than the tenth; outer quill bowed; second to sixth (inclusive) sinuated on outer webs; inner webs of outer five emarginated. Tail long, but not equal to wing.

a. *Astur*, Lacépede. Upper half of tarsus feathered, the feathering scarcely interrupted behind, where the bare space is covered with small circular scales; base of toes and lower part of tarsus with only irregular small scales...*A. atricapillus*, (Wils.,) Bonap.

b. *Accipiter*, Brisson. Less than one-third of the tarsus feathered below the knee; transverse scutellæ continuous all along the toes, and tarsus in front.

1. Middle toe longer than bare portion of tarsus in front; scutellæ of tarsus very distinct.................................... *A. Cooperi*, (Bonap.,) Gray.
2. Middle toe shorter than bare portion of tarsus in front; in adult birds, scutellæ of tarsus fused into an apparently-continuous plate, but in the young distinct..*A. fuscus*, (Gmel.,) Bonap.

§ Bill stouter and less compressed than in preceding; feet robust; third to fourth quill longest.

A. *Tarsus closely feathered to the toes.*

a. *Aquilæ.* Toes (except terminal joint) with only small scales.

Genus AQUILA, Moehring.

Feathering of tarsus not interrupted behind; middle toe more than half as long as tarsus. Upper outline of cere parallel with lower. Nostrils narrow, oval, obliquely vertical; fourth quill longest; first shorter than seventh or eighth; five to seven quills sinuated on outer webs; five or six emarginated on inner. Feathers of the occiput and nape lanceolate.*

Genus ARCHIBUTEO, Brehm.

Feathering of the tarsus interrupted behind by a narrow bare strip, exposing the knee; middle toe less than half as long as the tarsus. Upper outline of cere ascending basally. Nostril broadly oval, obliquely horizontal; fourth, or third and fourth quills longest; first shorter than seventh; second to sixth (inclusive) quills sinuated on outer webs; four or five emarginated on inner webs. Feathers of occiput and nape normal. Chin with a slight tuft of bristly feathers projecting forward.

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* Including all the European, as well as the American species.

1. Five primaries emarginated on inner webs. Bill small, compressed.
A. sanctijohannis,[*] (Penn.,) Gray.
2. Four primaries emarginated on inner webs. Bill more robust, very broad at base.......................................*A. ferrugineus*, (Licht.,) Gray.

B. Tarsus naked, with an anterior and posterior series of transverse scutellæ; feathered only on the upper portion in front.

a. *Buteones*. (Genus *Buteo*, Cuvier.) Only four outer primaries emarginated on inner webs; 3d or 4th longest, 1st equal 7th to 9th. Wing long, primaries pointed. Outstretched feet falling far short of end of tail.

1. Four outer quills emarginated on inner webs.
Cooperi, Cass., *harlani*,[†] *borealis*, (Gmel.) Vieill., *lineatus*, (Gmel.) Jard., *zonocercus* [‡]
2. Three outer quills emarginated on inner webs.
Swainsoni,[§] *fuliginosus*,[‖] *albifrons*,[¶] *pennsylvanicus*, (Wils.) Bonap.[**]

b. *Urubitingæ*. Generally five quills emarginated on inner webs; 3d and 4th, 4th, or 4th and 5th quills longest. Wing short, primaries obtuse. Outstretched feet reaching to or beyond end of tail.

§. *Feet buteonine*, but tarsus more robust compared with the toes than in that group. Bill very strong, the tip well developed and rather abruptly hooked; lobe on the commissure very conspicuous, cere ascending basally, arched.

Genus CRAXIREX, Gould.

Nostril horizontal, oval, *with a cartilaginous* (*not* central) *tubercle*. Five outer primaries, emarginated on inner webs[††]................................*C. harrisii*.[‡‡]

Genus ASTURINA, Vieillot.

Nostril horizontal, upper outline straight, the lower semicircular; *without tubercle*. Four outer primaries emarginated on inner webs. *A. plagiata*.[§§](‖‖)

§. *Feet almost milvine*, the tarsus slender, the claws very long and sharp. Bill small, hardly at all compressed, the tip rather obtuse; cere ascending basally, very broad and full on top.

Genus ONYCHOTES, Ridgway.[¶¶]

Nostril nearly circular, with a conspicuous (not central) *tubercle*. Tarsus very long and slender; toes moderate; claws very long, strong and sharp, but only slightly curved. *Tibial feathers short, close, not reaching below the joint*. Wing very short, much rounded and very concave beneath; 4th quill longest, 1st shorter than 9th. Tail moderate, rounded.............................*O. gruberi*.[¶¶]

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[*] *A. sanctijohannis*, is the name for all the N. Am. specimens, whether light or dark; there is but one American species or race; the very black-birds being merely melanistic individuals. The difference between the American and European forms is hardly enough to separate them as species, but sufficient to warrant our calling the former *A. lagopus* var. *sanctijohannis*.

[†] *Falco harlani*, Aud., B. Am. pl. 36, 1831. *Buteo harlani*, (Bonap.) Cassin, B. N. Am.

[‡] *Buteo zonocercus*, Sclater, Trans. Zool. Soc. IV, ii, 263, 1858.

[§] *B. swainsonii*, Bonap., Leish, 3, 1848. Cassin, B. N. Am. ***B. insignatus***, Cassin (*melanistic*), *B. bairdii* (Hoy), Cassin (*juvenilus*).

[‖] *B. fuliginosus*, Sclater, Pr. Zool. Soc. 1858, p. 356. (*Hab.*, Mexico.)

[¶] *Astur albifrons*, Kaup, Isis, 1847. *!!* *Buteo brachyura*, Vieill., Nouv. Dict. Hist. Nat. IV, 477, 1816.

[**] Also *polyosoma*, and *erythronotus* of S. Am.

[††] *Urubitinga zonura*, Shaw, *U. anthracina*, Leicht, *U. schistacea*, Sund.; *Buteogallus nigricollis*, Lath, and "*Buteo*" *gheisbreghtii*, Dub. South Am. species belonging to this section of the Buteones, also have, each, five primaries sinuated on inner webs; *Spizigeranus meridionalis*, Lath, has six; while "*Leucopternis*" *semiplumbeus*, Lawr., has only four. The last is, in every respect, almost a typical example of the *Urubitingeæ*.

[‡‡] *Falco harrisii*, Aud., B. Am. pl. 392, 1831. *Craxirex unicinctus*, var. *harrisii*, Ridgway.

[§§] *A. ruficauda*, Scl. and Salv. (and the allied S. Am. species), have the five outer primaries emarginated.

[‖‖] *Asturina plagiata*, Schlegel, Mus. Pays-Bas, Sept., 1862, p. 1.

[¶¶] *Onychotes*, Ridgway, Nov. Gen. (Type *O. gruberi*, see page 149).

Subfamily *HALIÆETINÆ.*

No membrane between the toes, which are instead cleft to the base.

Genus HALIÆETUS, Savigny.

Bill very large, *inflated; chord of the culmen more than twice the length of the cere on top:* commissure only slightly sinuated. Nostril elongate-oval, obliquely vertical. Toes and posterior face of tarsus with transverse scutellæ; posterior face of tarsus with circular plates. 1st quill shorter than 7th; 2d to 6th (inclusive) sinuated on outer webs; inner webs of outer six deeply emarginated.

1. 4th quill longest; tail slightly rounded.
H. leucocephalus, (Briss.) Savig.

2. 3d quill longest; tail very much graduated, or cuneate.
*H. pelagicus.**

II. *No bare, projecting, superciliary shield.*

Middle toe longer than naked portion of tarsus in front.

Subfamily *MILVINÆ.*

Closely feathered above, and generally all round, the eye. Feet very robust and strong; tarsus usually short; the naked portion in front less than length of the middle toe; toes cleft to the base, or else the membrane between outer and middle toe not well developed. Wing very long. Tail variable, being slightly rounded, square, emarginated or excessively forked. Bill black or dusky.†

A. *Tarsus without transverse scutellæ.*

a. *Claws not grooved beneath*, the lower surface being rounded, or just perceptibly flattened.

Genus PANDION, Savigny.

Bill inflated, the cere depressed below the arched culmen; end of bill much developed, forming a strong, pendant hook. *Anterior edge of nostril touching edge of the cere.* Whole of tarsus and toes (except terminal joint) covered with rough, somewhat imbricated, projecting scales *Outer toe versatile; all the claws of equal length;*‡ in their shape also they are peculiar; they contract in thickness to their lower side, where they are much narrower than on top, as well as perfectly smooth and rounded; the middle claw has the usual sharp lateral ridge, but it is not very distinct. All the toes perfectly free. Tibia not plumed, but covered compactly with short feathers, these reaching down the front of the tarsus below the knee, and terminating in an angle. *Primary coverts hard, stiff and acuminate,* almost as much so as the quills themselves; 3d quill longest; 1st longer than 5th; 2d, 3d and 4th sinuated on outer webs; outer three deeply emarginated, the fourth sinuated, on inner webs.

P. haliaëtus, (Linn.) Less., and *P. Carolinensis*, (Gmel) Bonap. (= *haliaetus* var. *carolinensis*).

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* *Aquila pelagica*, Pallas, Zoog. Ross. As. I, 343. 1811. *Haliætus pelagicus*, Zeit., Ueb. Falk. Mus. Senck. 261. (Does not belong to North American fauna.)

† The light greenish or yellowish bill in all the *Polyborinæ*, induces me to use this apparently trivial character, as a diagnostic one. The distinction between "*Milvinæ*" and "*Polyborinæ*" is by no means well marked, and there are intermediate forms (as *Milvago* and *Ibycter*) which almost induce me to designate them as sections of one subfamily. I find it difficult, if possible, to diagnose them separately by anything more than merely comparative characters.

‡ No other Raptorial bird that I have seen shares with *Pandion* in this curious feature. Indeed, most of the characters of this genus are so unique, that it is almost entitled to the rank of a separate subfamily.

Genus ELANUS, Savigny.

Bill rather small and narrow, the tip normal; commissure moderately sinuated; upper outline of lower mandible greatly arched, the height at base less than half that through middle; gonys almost straight, declining downward toward tip. Nostril circular, in middle of cere. Tarsus and toes (except terminal joint) covered with small roundish scales; *under surface of claws just perceptibly flattened*; sharp lateral ridge on middle claw very prominent; a very slight membrane between outer and middle toes. 2d quill longest, 3d very slightly shorter; 1st just exceeding 4th; 2d and 3d with outer webs slightly sinuated; inner web of 1st emarginated, of 2d sinuated. Tail peculiar—emarginated—but the lateral feather much shorter than the middle, the one next to it being the longest.......... ....*E. leucurus*, (Vieill.) Bonap.

b. *Claws flattened, or slightly grooved, beneath.*

Genus NAUCLERUS, Vigors.

Bill as in preceding, but less deep and less compressed; gonys straighter. Nostrils oval, obliquely vertical. Toes with transverse scutellæ to their base; scales of tarsus large; lower edges of claws sharp; middle claw bent laterally, the inner side much arched, the edge sharp; a just distinguishable membrane between outer and middle toes. 3d quill longest, 2d scarcely shorter; 1st slightly exceeding 4th; 2d and 3d with outer webs just perceptibly sinuated, the cuttings near the end. *Tail excessively forked*, the latter feather more than twice as long as the middle............................... *N. forficatus*,* (Linn.) Ridgw.

B. *Front of tarsus with transverse scutellæ.*

Genus ICTINIA, Vieillot.

Bill peculiar, being very short and deep, the commissure with a heavy festoon, behind and in front of which is a more or less perceptible indentation; gonys convex, *ascending* toward tip. Nostril very small, circular. Membrane between outer and middle toes well developed. Claws short, robust, flattened beneath, the edges sharp, particularly that on the inner side of the middle claw, which is somewhat bent. 3d quill longest.

1. 2d quill much longer than 4th; outer webs of quills not sinuated; inner web of 1st emarginated, of 2d sinuated.
I. mississippiensis, (Wils.) Gray.
2. 2d quill much shorter than 4th; outer web of 2d and 3d sinuated (near bases); inner web of outer three emarginated.
I. plumbea, (Gmel.) Vieill.

Genus ROSTRHAMUS, Lesson.

Bill very narrow, upper mandible much elongated and bent, the tip produced downward in a strong hook; lower mandible dropping terminally, the gonys perfectly straight, the upper outline much arched, to correspond with the convavity of the commissure. Nostril elongate-oval, horizontal. Membrane between outer and middle toes easily distinguishable. *Claws extremely long*, and very sharp, though but gently curved. 3d and 4th quills equal, and longest; 1st = 7th; 2d, 3d, 4th and 5th deeply sinuated on outer webs (near base); inner webs of outer five emarginated. Tail emarginated.
R. sociabilis, (Vieill.) D'Orb.

Middle toe shorter than bare portion of tarsus in front.

Subfamily (?) *POLYBORINÆ.*

Nostril with a bony tubercle, but of rather various form. Bill generally

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* *Falco forficatus*, Linn., Syst. Nat. I, 89, 1758. *Falco furcatus*, Linn., Syst. Nat. p. 129, 1766. *Nauclerus furcatus*, Vig., Zool. Journ. II, 387. Cassin, B. N. Am. 1858, 36, et Auct.

variable, but with the tip only slightly developed, and the commissure very regular. *Color of the bill greenish, or yellowish, white.* 3d or 3d and 4th quills longest; outer four to six sinuated on outer webs; inner webs of outer four or five sinuated.

Genus POLYBORUS, Vieillot.

Nostril in the upper anterior angle of the cere, *very small, linear, obliquely vertical, the posterior end being the upper one.* Cere very narrow, its anterior outline vertical and straight; commissure nearly straight; bill very high and much compressed. Occipital feathers elongated.

1. 3d quill longest; 1st shorter than 7th; outer webs of 2d to 5th (inclusive) emarginated at bases; inner webs of outer four emarginated.
P. auduboni, Cass., and *P. tharus*, Mol.*

FALCO (HYPOTRIORCHIS) RICHARDSONII.

Falco (*Hypotriorchis*) *richardsonii*, Ridgway.
Falco æsalon, Rich. and Swains., Faun. Bor. Am. ii, pl. 25, 1831. Coues, Prod. Orn. Ariz. Ter. (Pr. A. N. S. Phil.) 1866, p. 6 (in text).

Hab. Interior region of N. Am., from Arctic America southward, between Rocky Mts. and Mississippi valley, to Texas.

Adult Male. (Smithsonian No. 5171, Mouth of the Vermilion River, near the Missouri, Oct. 25th, 1856, Lt. G. K. Warren—Dr. F. V. Hayden). Upper plumage dull earth brown, each feather grayish umber centrally, and with a conspicuous black shaft line. Head above approaching ashy white anteriorly, the black shaft-streaks being very conspicuous. Secondaries, primary-coverts and primaries margined terminally with dull white; the primary-coverts with two transverse series of pale ochraceous spots; primaries with spots of the same, corresponding with those on the inner webs. Upper tail-coverts tipped, and spotted beneath the surface, with white. Tail clear drab, much lighter than the primaries, but growing darker terminally, having basally a slightly ashy cast; crossed with *six* sharply defined, perfectly continuous bands (the last terminal) of ashy white. Head, frontally, laterally and beneath—a collar around the nape (interrupting the brown above)—and the entire lower parts, white, somewhat ochraceous, this most perceptible on the tibia; cheeks and ear-coverts with sparse, fine hair-like streaks of black; nuchal collar, jugulum, breast, abdomen, sides and flanks with a medial linear stripe of clear ochre brown on each feather; these stripes broadest on the flanks; each stripe with a conspicuously black shaft-streak; tibia and lower tail-coverts with fine shaft-streaks of brown, like the broader stripes of the other portions. Chin and throat, only, immaculate. Lining of the wing spotted with ochraceous-white and brown, in about equal amount, the former in spots approaching the shaft. Inner webs of primaries with transverse broad bars of pale ochraceous—eight on the longest. Wing-formula, 2, 3—4, 1. Wing, 7·70; tail, 5·00; culmen, ·50; tarsus, 1·30; middle toe, 1·25; outer, ·85; inner, ·70; posterior, ·50.

Adult Female. (58983, Berthoud's Pass, Rocky Mts., Colorado Ter., Dr. F. V. Hayden—Jas. Stevenson.) Differing in coloration from the male only in the points of detail. Ground color of the upper parts clear grayish drab, the feathers with conspicuously black shafts; all the feathers with pairs of rather indistinct rounded ochraceous spots, these most conspicuous on the wings and scapulars. Secondaries crossed with three bands of deeper, more reddish ochraceous. Bands of the tail pure white. In other respects exactly as in the male.

Wing formula, 3, 2—4—1. Wing, 9·00; tail, 6·10; culmen, ·55; tarsus, 1·40; middle toe, 1·51.

Young Male. (40516, Fort Rice, Dacota, July 20, 1865, Brig.-Gen. Alfred

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* South Am. Analogue of *P. auduboni*.

Sully, U. S. A., S. M. Rothammer.) Differing from the adult only in degree. Upper surface with the rusty borders of the feathers more washed over the general surface; the rusty ochraceous forms the ground color of the head—paler anteriorly, where the black shaft-streaks are very conspicuous; spots on the primary coverts and primaries deep reddish ochraceous; tail bands broader than in the adult, and more reddish; the terminal one twice as broad as the rest (·40 of an inch) and almost cream color in tint.

Beneath, pale ochraceous, this deepest on the breast and sides; markings as in the adult, but anal region and lower tail-coverts immaculate; the shaft-streaks on the tibia, also, scarcely discernible. Wing, 7·00; tail, 4·60.

It is to this perfectly distinct species, that the various citations of "*œsalon*" from North America are to be referred. It is the bird noticed under that name in the "Fauna Boreali Americana," to the author of which (by whom its distinctness from *columbarius* was first recognized) we take pleasure in dedicating the species. This bird appears to inhabit exclusively the interior regions of North America, especially that portion between the Mississippi Valley and the Rocky Mountains; whether it extends into the Middle Province we cannot at present tell. Numerous specimens are in the collection from various points between Texas and the northern boundary of the U. S.—its habitat extending into the interior of British America, as we know from Richardson's account. The very numerous specimens of the *H. columbarius* from the same region as that inhabited by the present species, are of the usual style of that bird, and the slight degree of variation manifested in an exceedingly large series of the common species, as noted in its account,* will, we trust, illustrate the wide separation of the two species, even in the most similar stages of plumage.

Comparative Characters of HYPOTRIORCHIS COLUMBARIUS, (*Linn.*) *Gray*, ÆSALON, (*Gmel.*) *Gray*, and RICHARDSONII, *Ridgway*.

A. *Adult males ashy blue above.*

1. COLUMBARIUS. (*Hab.* Whole of N. Am.; West Indies.)

Male. Inner webs of primaries with *eight* transverse spots of white. Tail tipped with *white*, and with *three*, more or less continuous, black bands, anterior to the subterminal zone; lateral feather *approaching to white* on inner webs, on which there are altogether five sharply defined transverse spots of black, these crossing the shaft nearly to edge of outer web. Streaks on cheeks fine and sparse; pectoral markings *broad*, *clear brown*, with black shaft-lines. Beneath, only slightly tinged with ochraceous, except on the *tibia*, *which are deeply of this color*, and *streaked with dusky.*

Female. Above, *plumbeous-umber*, all the feathers with darker shaft-lines. Tail with *five* (one concealed), more or less continuous, narrow bands of whitish. Outer webs of primaries plain; inner web of longest with *eight* transverse spots of pale ochraceous. Streaks of cheeks uniformly distributed.

Measurements of ♀. Wing, 8·25; tail, 5·25; tarsus, 1·00; middle toe, 1·25. (1716, Carlisle, Penn.)

2. ÆSALON. (*Hab.* Europe.)

Male. Inner webs of primaries with *ten* spots. Tail tipped with *ash*, and with *six* transverse series (anterior to the subterminal zone) of concealed black spots, these only on inner webs, and *not* touching the shaft; lateral feather *uniformly ash*, with only small transversely oval black spots on inner webs, these not touching either the edge or shaft. Streaks on cheeks enlarged and blended, forming *a conspicuous* "*moustache*;" pectoral markings *linear*, *pure black;* those of sides and flanks broader and more brownish, but not connected in chain-like series as in *columbarius*. An *ochraceous* tinge *prevalent across the nape*, and all lower parts except the throat of this color, *deepest on breast and sides; tibia paler* and *scarcely streaked.*

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* See forthcoming Monograph.

Female. Above, *brownish plumbeous*, lighter and more bluish than in *columbarius*, feathers becoming *rusty toward margins*, and with more conspicuous black shaft-lines. Tail with *eight* narrow bands of fulvous-ashy, the first three concealed. Primaries with *ten* transverse oval spots of pinkish-ochre on inner webs, and indications of corresponding light spots on outer webs of inner quills. Conspicuous "moustache," as in the male.

Measurements of ♀. (Germany.) Wing, 9·00; tail, 5·70; tarsus, ·95; middle toe, 1·15.

B. *Adult male brown like the female.*

3. RICHARDSONII. (*Hab.* Interior of N. Am.

Male. Much lighter, more *earthy* brown than females of two preceding. Head very light colored, above, approaching white anteriorly; cheeks with the streaks exceedingly fine and scattered. Tail crossed with *six* sharply defined, perfectly continuous bands of ashy white. Inner webs of primaries with *eight* whitish spots. Pectoral markings broad, sharply defined, *clear light ochraceous-brown*, with black shaft-lines, stripes broadest on the flanks.

Female. Generally similar to the male. All the feathers above with pairs of rounded ochraceous spots on opposite webs; *secondaries crossed with three bands of ochraceous;* bands of the tail pure white, *six* in number.

Measurements of ♀. (58983, Colorado Ter.) Wing, 9·00; tail, 6·10; tarsus, 1·40; middle toe, 1·51.

FALCO (TINNUNCULUS) LEUCOPHRYS.

Tinnunculus leucophrys, Ridgway.

Tinnunculus sparveroides (not of Vigors!), Lawrence, Ann. Lyc. N. Y. 1860, p. 1. (In part; light individuals.)

Falco sparverius (not of Linn.!), D'Orb., R. Sagra, Hist. Nat. Cuba, p. 25 (probably). Vig., Zool. Journ. I, 339; III, 435.

Hab. Cuba and Santo Domingo.

Adult Male. (34244, Remedios Cuba, Dec. 14, 1863, N. H. Bishop.) Head above pure, fine bluish ash, becoming (broadly) white on forehead; the feathers with delicate shaft-lines of black. Nape, back, scapulars, rump, upper tail-coverts and tail rich purplish rufous (almost exactly as in *sparverius*); no bars on dorsal region, except a very few across ends of larger posterior scapulars. Terminal band of tail *light rufous*, ·30 in width; subterminal zone of black, very regular, ·55 in width; lateral feather, with outer web and end of inner, reddish white, the black subterminal band crossing the inner web only; inner web anterior to this, continuous rufous; shafts of tail feathers rufous.

Wings fine bluish ash, like the crown; middle and lower coverts with a very few elliptical, *longitudinal* specks or touches of black on the shafts; secondaries passing terminally into white, their exposed basal half pure black; primaries pure black, exposed edges of inner webs paler.

Whole under surface of wings immaculate pure white, with a faint delicate reddish tinge; inner webs of primaries serrated along the shaft with dusky.

Forehead and superciliary stripe (broadly and sharply defined against the bluish of the crown,) whole side of the head (including lores and ear-coverts) and entire lower parts, continuous, *immaculate*, pure white, with a delicate orange tinge, except anteriorly.

The "moustache" is but just indicated by some blackish touches, and in some individuals it is wanting entirely, while in all it is very restricted in width; the other black *picturæ* of the head are, however, as in *sparverius*.

Wing formula 2, 3—4, 1. Wing, 7·00; tail, 5·00; tarsus, 1·30; middle toe, ·90; culmen, ·46.

A specimen in Mr. Lawrence's collection, which with others he has kindly lent me for examination, is in beautifully high plumage. It differs from the type in having the white of the lower parts tinged, or rather *stained*, with a beautiful, delicate *rufous* or almost a *salmon-orange*. The terminal band of the tail also inclines decidedly to this color, while the white of the under surface of the wing (particularly towards ends of secondaries and primaries) is tinged with a more pinkish shade of the same.

Another of Mr. Lawrence's specimens differs in the clearer white beneath (that is, with less reddish tinge—the pureness and continuity does not vary)—which extends entirely around the neck, giving a sharper definition to the black *picturæ*. The "moustache," however, is almost entirely absent; the black transverse spots on larger posterior scapulars are rather more conspicuous, and the terminal band of the tail is more purely white.

Adult Female. (31984, Cuba, J. Ackhurst.) Generally similar to *sparverius*, but rufous brighter, the bars narrower and less numerous, the nape or upper part of back, and rump being almost immaculate. Tail with ten black bars, these scarcely touching the shaft; the last is about ·36 wide, the others about ·16; tip of tail scarcely paler than base; lateral feather with outer web edged broadly with paler or ochraceous white, rufous next the shaft; immaculate; inner web with only 3 or 4 very narrow bars on terminal half. Head as in the male, but vertex considerably tinged with rufous.

Whole lower parts, including frontal and lateral regions of the head, continuous, pure white; breast with a very faint yellowish tinge; side of the breast and sides with a few scattered minute elliptical, longitudinal flakes of rusty—more black on the shaft. Whole under surface of the wing white, as in the male.

Wing formula, 2, 3—4, 1. Wing, 7·00; tail, 4·70; tarsus, 1·40; middle toe, ·90; culmen, 51.

A Cuban female belonging to Mr. Lawrence is exactly similar. One in the S. I. Collection, from Hayti (42420, Port au Prince, June 5th, 1860, A. C. Younglove), differs only in less purely black bars, and in utter absence of the moustache. A male from the same locality (43418) is like it in the last respect.

After having carefully examined quite a large series of *Tinnuncules* from Cuba and San Domingo, I feel compelled to recognize two distinct species, of which the present is presented as new, although it has frequently been noticed; but only, however, in connection with the *sparveroides*, with which it has been confounded. The diagnosis will I hope sufficiently explain my reasons for separating these two birds.

Differential Characters of American Species of TINNUNCULUS.

A. Breast, sides and lining of the wing spotted with black; under surface of primaries transversely barred with white and dusky. No conspicuous white superciliary stripe. (1. *Sparverius.*)

a. Head above and wings fine bluish ash; one (outer) tail-feather only variegated.

1a. *Vertex with a conspicuous patch of rufous. Male.*—Black zone of tail one inch in width; breast strongly tinged with reddish ochraceous; spots of black on breast circular. *Female.*—Above, *fulvous*-rufous; whole breast and sides with longitudinal dashes of a lighter tint of the same. var. *sparverius.**

1b. *Vertex without* more than a trace of *rufous. Male.*—Black zone of tail ·60 of an inch in width; beneath, continuous dull white, with elliptical

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* *Falco sparverius*, Linn. Syst. Nat. 1766, 128. *Tinn. sparverius*, Vieill. *Tinnunculus phalæna*, Less., Mam. et d'Ois. 1847, 178. (*Hab.* Whole of N. America from Isthmus of Panama northward; not in W. Ind. nor S. Am.)

pure black spots on side. *Female.*—Rufous more *vinaceous* than in preceding; markings beneath deeper brown......................var. *australis*.[*]

b. Head above, and wings, dark bluish plumbeous; several outer tail-feathers variegated.

1^{c}. *Vertex without rufous. Male.*—Anterior portions beneath, deep, soft ochraceous; black spots very sparse; black zone of tail one inch wide; black bars above confined to larger scapulars. *Female.*—Black bars above broader, and purer black, than in either of preceding, upon a more *ferruginous* ground.................................var. *isabellinus*.[†]

1^{d}. *Vertex with a rufous patch. Male.*—Black spots beneath numerous, large, circular; black bars above covering whole rufous surface. Tail with indications or more or less complete narrow black bands nearly to the base. *Female.*—Similar to that of preceding, but markings beneath more numerous, and pure black instead of brownish.
var. *dominicensis*.[‡]

c. Head above dark slaty plumbeous; outer tail-feather unvariegated.

1^{e} ? (possibly 2). *No rufous on vertex. Male.—Tail continuous rufous to its extreme tip;* crossed with a broken *black zone narrower than the terminal rufous;* outer feathers without black..................var. ? *cinnamominus*.[§]

B. *Whole lower parts and under surface of wings continuous immaculate white;* inner webs of primaries with merely serrations of dusky along the shaft. A very sharply defined, broad, superciliary stripe of white.

2. *Male* resembling *sparverius*, except as above mentioned; "moustache" obsolete. *Female* differing from that of *sparverius* as does the male.
leucophrys.[||]

C. *Whole lower parts deep dark rufous;* inner webs of primaries slaty, with transverse dusky cloudings.

3. *Male.*—Whole upper surface plumbeous; tail deep chestnut, with a broad black subterminal, and narrower slate-colored terminal bar. *Female.*—The upper plumage considerably resembling that of the foregoing species, the lower parts, however, deep rusty rufous.
sparveroides.[¶]

ONYCHOTES GRUBERI, Ridgway.

Hab.—California ?

Sp. Ch. Immature? (41,703 "California," F. Gruber.) [**] Outstretched feet

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[*] *Falco gracilis* (not of Lesson !), Swains., An. Menag. p. 281, 1838. *Falco sparverius* (not of Linn.), Tschudi, Faun. Per. An. p. 110. *Tinn. sparv.* (not of Vieill.!), Darw., Zool. Beag. pt. 3, 29. *Bidens dominicensis* (not *F. dom.* of Gmel. !), Spix, Av. Bras. I, 16. *Tinn. dom.*, Strickl., Orn. Syn. I, 100 (in part). *Tinnunculus sparverius* var. *Australis*, Ridgway. (*Hab.* Whole of Continental South Am. except the north Atlantic coast, where replaced by the var. *isabellinus;* in Chili and western Brazil mixed with var. (?) *cinnamominus.*)

[†] *Falco isabellinus*, Swains. An. Menag. p. 281, 1853. *Tinnunculus dominicensis* (not of Gmel.!), Strikl., Orn. Syn. I, 100 (in part only). *Tinnunculus sparverius* var. *isabellinus*, Ridgway. (*Hab.* North Atlantic coast region of S. Am.; Caribbean and Gulf coasts of Middle Am., and Gulf coast of U. S. through Texas and Louisiana to Florida.)

[‡] *Accepiter æsalon dominicensis*, Briss., Orn I, 399, pl. 32, f. 2, 1760. *Falco 'dominicensis*, Gmelin, Syst. Nat. p. 285, 1789. *Tinn. dom.*, Strickl., Orn. Syn. I, 100, 1855 (in part only). *Tinnunculus sparverius* var. *dominicensis*, Ridgway. (*Hab.* Lesser Antilles, north to Porto Rico and St. Thomas.)

[§] *Falco cinnamominus*, Swains., An. Menag. p. 281, 1838. *Pæcilornis cinnam.*, Kaup, Monog, Falc. Cont. Orn. 1850, p. 53. *Tinnunculus cinnamomeus*, Gray, Gen. B. fol. sp. 11, 1844. List B. Brit Mus. p. 62. Bonap., Consp. Av. p. 27. Strickl., Orn. Syn. I, 100, 1855. (*Hab.* Chile and (western ?) Brazil.)

[||] *Tinnunculus leucophrys*, nobis, page 147. (*Hab.* Cuba and Hayti.)

[¶] *Falco sparveroides*, Vigors, Zool. Journ. III, 436, 1827. *Tinn. sparv.*, Lawrence, Ann. Lyc. N. Y. 1860, p. 1 (in part only; dark specimens). *Tinnunculus dominicensis* (not of Gmel.!), Gundlach, Rept. Cuba, I, 225, 1865. ? *Hypotriorchis ferrugineus*, Sauss., Rev. et Mag. Zool. 1859, p. 117, pl. 3. (*Hab.* Cuba—only ?)

[**] For generic characters, see page 142.

reaching beyond tail. General plumage dull dark bistre, darkest on the head above and back; the posterior lower parts paler and more reddish; throat and neck much tinged with pale rusty; this obsoletely bordering the feathers, which here have fine whitish filaments attached to the shafts; primaries uniform black. Tail like the rump, but with a more hoary tinge, (*not* paler at the tip,) and crossed with seven or eight very narrow obscure bars of darker, the last of which is distant an inch or more from the end. Lining of wing dark bistre, much tinged with rusty, this prevalent toward the edge; under surface of primaries white anterior to their emargination, beyond which they are ashy, approaching black at ends; ashy portion with distant, very obsolete dusky bars. No white anywhere about the head or neck.

Wing, 10.00; tail, 5.80; tarsus, 2.70; middle toe, 1.40; inner, 90; outer, 1.10; posterior, ·80; hind claw, 1·00 (chord); inner claw, ·91; on front of tarsus, 12 exposed, large transverse scutellæ; only 1·70 of the tarsus exposed.

This very peculiar hawk is, in all respects, utterly unlike any other American species. So much does it differ in structure, that we do not feel sure that it is not from some portion of the Old World, instead of from California.

However, we have searched in vain for descriptions which might apply to it, and have also examined, but without success, the large collection of exotic, as well as American, species in the museum of the Philadelphia Academy.

We take pleasure in dedicating this apparently-new species to Mr. Gruber, the collector and donor of the specimen, this gentleman, who is a zealous naturalist and accomplished taxidermist of San Francisco, having added much to our knowledge of the birds of California, through the frequent contribution of valuable specimens.

The following reports were read and referred to the Publication Committee:

LIBRARIAN'S REPORT.

The Librarian respectfully reports that the number of additions to the Library from Jan. to Dec. 1870, inclusive, amounts to 1225.

Of these 128 were volumes, 970 pamphlets and 127 newspapers, maps and photographs. They were derived from the following sources:

Societies, 497; Editors, 319; Wilson Fund, 122; Authors, 101; Norwegian Government, 19; Geological Survey of Sweden, 11; Chilian Government, 11; Publishers, 8; Elias Durand, 7; Geological Survey of India, 6; Thos. Meehan, 5; Minister of Public Works in France, 5; Geological Survey of Italy, 5; Publication Committee, 4; Messrs. Townsend & Adams, 4; Smithsonian Inst., 3; Wm. S. Vaux, 2; Col. Jas. Greer, 2; U. S. Coast Survey, 2; Treasury Department, 3; O. C. Marsh, 1; Jos. Leidy, 1; Chas. G. Atkins, 1; Jos. Jeanes, 1; D. F. Boyd, 1; Secretary of State for India, 1; 69 books and continuations were purchased, and a valuable suite of Blume's Botanical Works, comprising 14 volumes, was presented by the following gentlemen: Jos. Jeanes, A. J. Brasier, G. W. Tryon, Jr., J. H. Redfield, Isaac Lea, Wm. S. Vaux, Thos. Meehan, E. Durand and Chas. Schaffer, M. D.

These additions were distributed to the different departments of the Library as follows:

Journals, 948; Geology, 65; General Natural History, 48; History, 36; Conchology, 26; Botany, 24; Physical Science, 22; Ornithology, 18; Anatomy, 14; Entomology, 7; Bibliography, 4; Helminthology, 3; Herpetology, 3; Ichthyology, 2; Voyages and Travels, 2; Mineralogy, 2; Chemistry, 1.

In addition 3 volumes and 104 pamphlets were received through the Conchological Section.

During the year some of the duplicate books and pamphlets which had from time to time accumulated on our shelves were exchanged for a copy of

Elliott's Birds of North America, and the remainder were disposed of at auction in New York for $100.00.

I take this opportunity of again calling your attention to the expediency of selling the valuable Fine Art and literary works now in the Library. If this plan be adopted the means at the disposal of the Library Committee for procuring books absolutely necessary to the working members of the Academy will be greatly increased.

Blank forms, for the use of those wishing to apply for new books, have been prepared by order of the Council, and will be ready for use by the beginning of the year.

All of which is respectfully submitted,

EDWARD J. NOLAN, *Librarian.*

REPORT OF THE CURATORS.

The Museum of the Academy, in charge of the Curators, is in about the same condition that was indicated in the last annual report. The Conchological Section continues actively to arrange in order the large cabinet in its care. Other departments remain with but little progress towards arrangement.

The Curators regret to add that nothing further has been done, during the last year, towards completing the suggested plan of providing a new building for the accommodation of the Academy.

The Curators take pleasure in stating that the proposition, in their last annual report, to make a small charge of admission to the Museum, with the special view of moderating excessive crowds, having, with the authority of the Academy, been put into effect, has been found to meet all requirements. The charge of ten cents for each person, which was commenced the first of May, is so small as to be an inconvenience to no one really desirous of examining the Museum, while it is sufficient to prevent the crowds, which formerly were so great an annoyance. At the same time, the income derived from the fees is found to be sufficient to keep the Museum in a proper condition of cleanliness and repair.

The donations during the year to the different departments of the Museum are as follows :

Mammals.—A mounted specimen of the Grizzly Bear, one of the Fisher, of California, and one of the Howling Monkey, from Honduras, presented by Dr. George Hewston, of San Francisco, Cal. Skin and skeleton of the Sea Lion, (*Eumetopias Stelleri*) from Cape Arenas, Cal., and several skins of smaller mammals from Alaska, presented by Dr. Geo. Davidson, U. S. Coast Survey.

Birds.—One hundred and fifty bird-skins from the West Indies, being types of the principal birds of the Antilles ; and nineteen other skins, presented by the Smithsonian Institution. A collection of bird skins from California and Alaska, presented by Dr. George Davidson.

Reptiles and Fishes.—A small collection of lizards and serpents from near Pensacola and Perdido R., presented by Dr. John M. Kollock. A collection of reptiles and fishes from California and Alaska, presented by Dr. George Davidson. A serpent from Kansas, presented by S. R. Roberts. A Trigonocephalus half swallowed by Oxyrrhopus plumbeus, from St. Lucia, W. I., presented by Mrs. Capt. James S. Endicott, of Somer's Point, N. J. A small collection of reptiles, presented by A. C. Craig.

Mollusks.—For donations see Conservator's Report of the Conchological Section.

Articulates.—A collection of Myriapods from Missouri, presented by Charles Veatch ; of Spiders in alcohol, by A. C. Craig ; a Centiped, from the Apure

R., S. A., by Crawford Coates; and nests of the Trap-Door Spider, by Dr. George Davidson.

Fossils.—A choice collection of fossils, consisting of cetacean vertebræ, shark teeth, &c., from the Ashley River deposit, S. C., presented by Philip Wineman, through Messrs. Powers & Weightman. Two cetacean vertebræ and several shark teeth and a vertebra, from the same locality, presented by Col. D. W. Hagler, U. S. Arsenal, Georgia. A metacarpal of Megalonyx and a tooth of an extinct Ox, from Illinois, presented by Henry Greene and Dr. E. D. Kittoe. Two fossil bones from Kansas, presented by Dr. W. F. McAllister; fragments of a fossil reptile bone, from Clarksville, N. J., by S. R. Roberts; and a large log of silicified wood, from Greenwich, N. J., presented by Dr. Geoge B. Wood. A collection of fossil plants was also received from France, in exchange.

Comparative Anatomy.—Cranium of an Indian, from Greenwich, N. J., presented by Dr. George B. Wood; another specimen from near Woodbury, N. J., presented by George M. Tatum. Skull of a rat with distorted growth of an incisor tooth, presented by Richard L. Nicholson. Tusk of a Walrus, from Sitka, presented by Capt. George Wright, U. S. A.

Botany.—The herbarium of the late Thomas G. Lea, of Cincinnati, Ohio, presented by James M. Lea, with the condition that it shall be preserved separately as the "*Lea Herbarium.*" A collection of upwards of one hundred species of plants from Alameda, Cal., presented by Dr. W. P. Gibbons. A collection of cones of forty-four species of coniferæ, presented by Josiah Hoopes, Thomas Meehan and I. M. Thorburn. Six species of ferns, from Venezuela, presented by Thomas Guckert. A small collection of marine algæ, from Washington Ter., presented by Mrs. Samuel Stork, and another, from Ceylon, presented by Dr. A. C. Hamlin.

Minerals.—Two remarkably fine crystallized specimens of Epidote, from Untersulzbach, Tyrol, presented by Wm. P. Wilstach; a large crystal of Beryl, from Chester Co., Pa., presented by W. S. Vaux; and a fine mass of Graphite, from Ceylon, presented by T. Guilford Smith. The following specimens were also presented:—Calamine, Sussex Co., N. J., by Thomas S. Wiegand; Magnetic Iron, Essex Co., N. Y., by J. Blodget Britton; Margarite, Emery and Diaspore, Chester, Mass., by J. B. Taft; Zincite and Jeffersonite, Sussex Co., N. J., by Garret Kemble; Corundum in Lesleyite, Tourmaline, Muscovite and Oligocluse, Chester Co., and Phlogopite, Burgess, Canada, by Dr. Isaac Lea; Gold in slate, Montgomery, N. C., by Dr. F. A. Genth; Graphic Granite, Del. Co., Pa., by Joseph Wilcox and Dr. S. B. Howell; Kieserite, Stassfurth, Magdeburg, by E. Goldsmith; Galena, Crawford Co., Ill., by John Levering; Apatite, Burgess, Canada, by Clarence L. Bement. A number of minerals were also received in exchange.

Miscellaneous.—A collection of Indian stone relics, from Catawba R., N. C., presented by Adm. Charles Wilkes, U. S. N.; and another small collection of Indian relics from Manatee R., Florida, presented by Dr. C. J. Clebourne, U. S. N.

Respectfully submitted by JOSEPH LEIDY,
Chairman of the Curators.

REPORT OF THE BOTANICAL COMMITTEE.

To the President and Members of the Academy:

The Botanical Committee of the Academy respectfully reports that during the past year the collections made during the war by Dr. Hayden in South Carolina, and in 1869 in Western Nebraska by the same gentleman, have been named. Almost all of the species were already in the Academy, but many of them were in other conditions than those which we already have, and have been added to the collection.

A collection from California, presented by Dr. Gibbons, has also been named, and added to the collection. Many of these we did not possess before.

The collection of Australian plants presented by Dr. Mueller a few years ago, besides scattering collections from Alaska and other parts, have been all gathered together in their respective natural orders. The cases containing the *general Herbarium* of the Academy are full, and numbered consecutively. No additions can be made until the whole is re-arranged. The collections above referred to are, therefore, for the present preserved separate, as a supplemental herbarium.

In the beginning of the year it was found that the plants in the magnificent Shortian Herbarium were being badly injured by insects. By authority of the Curators, Mr. Burk was engaged to poison them. He has since been steadily engaged on the work, which is about two-thirds completed.

All the plants in the collections before alluded to were poisoned before putting away by the labors of Mr. Burk. THOMAS MEEHAN,

For Committee.

REPORT OF THE RECORDING SECRETARY.

The Recording Secretary would respectfully report that, during the year ending November 30th, 1870, there have been elected thirty-seven members and five correspondents.

The death of the following members has been announced, namely:

Benj. D. Walsh, Mrs. E. H. Vaux, Caleb S. Hallowell, Wm. P. Wilstach, Richard Wood.

Four members have resigned.

The number of papers contributed and ordered to be printed in the Proceedings of the Academy and Medical Journals during the year has been nineteen, as follows:

Elliott Coues, M. D.	1	Prof. Cyrus Thomas	1
C. F. Austin	1	T. Hale Streets	2
F. B. Meek & A. H. Worthen	2	Theodore Gill	1
Prof. C. Johnson	1	E. D. Cope	1
Thomas Meehan	5	H. M. Bannister	1
F. B. Meek	1		

In the Medical Journals two, namely:

S. W. Mitchell, M. D.	1	James Tyson	1

All of which is respectfully submitted,

S. B. HOWELL, *Recording Secretary.*

The Treasurer's report was read and referred to the Committee on Finance.

The Report of the Recorder of the Microscopical and Biological Section was received and referred to the Publication Committee.

The following is an extract from the same:

The great event in our history as an association, during the year which has just elapsed, was unquestionably the first Annual *Conversazione* held in the Hall of the College of Physicians, on the 12th of May, with a degree of success and satisfaction, not only to ourselves, as hosts, but also to our invited guests, that has rarely, if ever, been equaled by any similar scientific reunion before held in this city.

It was followed early in June by an exhibition of microscopes and microscopical apparatus, given to the members of the State Medical Society, with almost equal *eclat*, and which probably aided largely to diffuse among the rural practitioners of our State an accurate knowledge of the immense strides made during the past few years in the various departments of Microscopical Science.

The new plan of constituting every alternate meeting a conversational one, determined upon in accordance with suggestions contained in the resolutions brought forward by Dr. R. S. Kenderdine, in June last, has now been on trial for about three months, and, although its practical operation does not yet prove entirely without difficulties, it is to be hoped that greater care and further experience will enable us to derive from this novel feature the marked advantages which it seems capable of affording us.

Before concluding my report I may advert to the new and agreeable field of usefulness, which has been opened to us through the relations of our parent Academy, with the Smithsonian Institution, at Washington, to wit : the reference of subjects requiring microscopical investigation to our department for examination and report ; indeed, it appears to me that few opportunities of conducing towards a wide spread, enduring reputation, usefulness and influence for the Biological and Microscopical Section of the Academy, are more promising than those which invite our researches to matters of national interest and importance, such, for example, as the dust showers which occasionally visit our country. In fact, although in one respect, that of electing honorary and corresponding members, we may labor under certain restrictions on account of our connection with the Academy, so great and counterbalancing advantages are derived from this association that, to quote the words of our late Recorder, Dr. Tyson, in his last annual report, " We believe that any attempt to weigh them would result decidedly in favor of such union."

All of which is respectfully submitted,

Jos. G. Richardson, *Recorder.*

REPORTS OF THE CONCHOLOGICAL SECTION.

RECORDER'S REPORT.

Hall of the Academy, *December* 1*st*, 1870.

The Recorder would report that, during the year ending this date, there have been accepted, for publication in the Journal, thirty-three papers by the following authors :—

Wm. H. Dall,	5	T. A. Conrad,	4
Geo. W. Tryon, Jr.,	7	Jno. H. Redfield,	2
Prof. A. Brot,	1	Theo. Gill, M. D.,	1
James Lewis, M. D.,	2	W. H. Pease,	2
Binney and Bland,	1	J. G. Cooper, M. D.,	4
John Wolf,	1	Wm. G. Binney	1
R. J. L. Guppy,	1	W. D. Hartman,	1

One member has resigned, and one has died.

He regrets to report that no members or correspondents have been elected during the year.

Respectfully submitted,

S. R. Roberts, *Recorder.*

CORRESPONDING SECRETARY'S REPORT.

To the Conchological Section of the Academy of Natural Sciences, Philadelphia:

The Corresponding Secretary would respectfully report that letters have been written as follows, viz.:

Jan. 10.—To Prof. A. E. Verrill, Yale College, New Haven.
Feb. 4.—To Dr. P. P. Carpenter, Montreal, C. W.
Dec. 1.—To Dr. Frederick Stoliczka, Calcutta.
Ralph Tate, London.
Albany Hancock, Newcastle-upon-Tyne.
Dr. Jno. Römer, Marbourg, Hesse.
Prof. Wm. H. Dall, Smithsonian.

The following letters have been received:

Feb. 3.—From Prof. H. Cross, Paris.
Dr. P. P. Carpenter, Montreal, C. W.
Dec. 1.—Jules Collieau, Brussels.

Respectfully submitted,

E. R. Beadle, *Corres. Sec'y.*

LIBRARIAN'S REPORT.

The Librarian respectfully reports that there have been presented, during the past year, to the library of the Conchological Sectian, 104 pamphlets, 3 volumes and an almost complete suite of the publications of the Academy. Of these, 27 were received from Societies, 32 from Editors, 32 from Authors, 6 from Publication Committee, 6 from Geo. W. Tryon, Jr., 2 from Isaac Lea, 1 from Prof. Marsh, and 1 from P. P. Carpenter.

The Proceedings and Journal of the Academy were received from J. S. Phillips.

In addition, 26 pamphlets and continuations of Conchological works have been received through the Academy.

The work of transcribing the revised Catalogue of the Library has been carried on during the year as rapidly as circumstances would permit.

All of which is respectfully submitted.

Edward J. Nolan, *Librarian.*

CONSERVATOR'S REPORT.

The Conservator of the Conchological Section respectfully reports that the donations to the Cabinet, during the year, have been as follows:

From Rev. E. R. Beadle. Ten species of Mollusca, principally from St. Martin's, W. I.

H. F. Carpenter. *Limnea columella*, Say, from Providence, R. I.

J. C. Cox. One hundred and thirty-four species of Australian and Polynesian land, fresh-water and marine shells.

A. O. Currier. A collection of land and fresh-water shells from Nicaragua, including types of several new species forming part of the collections of the MacNiel Expedition to Central America. A collection of *Limnæidæ* and *Viviparidæ* from Kent County, Mich.

W. H. Dall. Two species of *Physa* from Arizona and Nicaragua. *Gadinia reticulata*, Say, from Monterey, Cal., and one unknown species of *Gadinia.*

H. A. Gilliat. Fifty-seven species of Australian marine shells.

F. A. Hassler, M. D. Model of animal of *Strombus gigas*, Linn. Suite of specimens of *Helix sphracita*, Hartm., from Syria.

F. V. Hayden, M. D. Six species of fresh-water shells, from Ancient Lake margins, Salt Lake, Utah.

G. A. Lathrop. Five species of *Helices* from Tennessee.

Isaac Lea. Types of *Physa Carltoni* and eight species of *Unio* from Big Black River, Mis.

M. L. Leach. *Pomatiopsis lapidaria*, Say, from St. Louis, Mich.

J. A. McNeil. *Unio Macneilii* and a species of *Melania*.

M. McDonald. *Leucocheila fallax*, Say, and *Triodopsis introferens*, Bland, from Lexington.

F. B. Meek. *Tiara humerosa*, Meek, from Utah—fossil.

C. W. Peale. Specimens of *Glandina*.

W. H. Pease. *Melania Kanaiensis*, *Limnea rubella*, Lea, *L. turgidula*, *L. ambigua*, and *L. compacta*.

J. S. Phillips. Two species of *Marginella; Aricia Scottii*, Brod.; *Porcellana erythræensis*, Beck.

J. H. Redfield. *Cyclophorus Nilagiricus*, Benson; fourteen species of *Auriculidæ*, eight species of *Ringicula*, and nine species of *Cylindrella*.

S. R. Roberts. *Helix alternata*, Say, from Niagara Falls.

Rev. J. Rowell. *Goniobasis circumliniata*, Tryon, and a species of *Physa*.

W. S. W. Ruschenberger. Two specimens of *Spondylus Delessertii*, Chemn., from Navigator's Island.

Mrs. Lucy W. Say. A unique rayed specimen of *Unio cylindricus*, Say, from the Wabash river.

John Wolf. *Pleurocera Lewisii*, and *P. subulare*, Lea, from Illinois River, Canton, Ill.; two species of *Physa;* two species of *Limneidæ; Amnicola parva*, Lea, *A. rustica*, Say, and *A. decisa*, Hald., from Illinois; eleven species of *Unionidæ* and one of *Sphærium* from Canton, Ill.

The following were purchased with funds received from the sale of duplicates: *Cataulus hæmastoma*, from India; *Helix Skinneri*, Reeve, from Ceylon; twenty-eight species operculate land shells from West Indies, new to collection, named by Thos. Bland, and six species of *Cylindrella*.

A collection of one hundred and fifty-two species was sent to Sylvanus Hanley for shells received from him in 1869. A similar collection was sent in exchange to Dr. J. C. Cox, of Sydney, N. S. W.

Selections from the publications of the Section were sent in exchange to E. A. Bielz, of Hermannstadt, F. de Malzine, of Bruxelles, E. von Martens, of Berlin, M. Petit de la Saussaye, of Paris, W. H. Pease, of Honolulu, Paul Terver, of Lyons, and Ralph Tate.

In consequence of the comparative completeness of our collection in many of the families, we have been forced to decline exchanging with foreign naturalists, except when they are able to furnish us with specified desiderata.

Through the liberality of Messrs. Jos. Jeanes, J. H. Redfield, Wm. L. Mactier and W. S. Vaux, we have been enabled to place sixty-four drawers under the horizontal cases. These drawers afford accommodations for the arrangement of the following families: the *Porcellanidæ*, *Cylindrellidæ*, *Cyclostomacea*, *Auriculacea*, the *Helices*, except the North American species, the *Slugs*, *Vitrinæ*, *Succineæ*, and part of the *Corbiculidæ*.

During the year, 10,060 shells have been cleansed, oiled, labelled and placed in 3771 trays. Fifty beautiful sections, illustrating the genera arranged, have been prepared by Dr. F. A. Hassler.

Your Committee on the Arrangement of the Collection have met frequently and devoted much time to the performance of the duty assigned them. They have reason to refer with satisfaction to the above summary of the results of their labors.

All of which is respectfully submitted,

Edward J. Nolan, *Conservator.*

The election of Officers for the ensuing year was held, in accordance with the By-Laws, with the following result:

President, ...	W. S. W. Ruschenberger, M. D.
Vice Presidents, . . .	Wm. S, Vaux, Jos. Carson, M. D.
Recording Secretary, . .	Samuel B. Howell, M. D.
Corresponding Secretary, .	Edward D. Cope.
Librarian, ...	Edw. J. Nolan, M. D.
Treasurer, ...	Wm. C. Henszey.
Curators, ...	Joseph Leidy, M. D., William S. Vaux, Geo. W. Tryon, Jr., Edw. D. Cope.
Council, ...	Isaac Lea, Robert Bridges, M. D., Edw. S. Whelen, Isaac Hays, M. D.
Publication Committee, . .	Jos. Leidy, M. D. Robert Bridges, M. D., Wm. S. Vaux, Geo. W. Tryon, Jr., Edw. J. Nolan, M. D.
Committee on Finance, . .	Wm. S. Vaux, Aubrey H. Smith, Robert Bridges, M. D.

ELECTIONS FOR 1870.

Members and Correspondents of the Academy of Natural Sciences have been elected as follows for the year 1870:

MEMBERS.

Jan. 25.—Charles T. Hunter, M. D.

Feb. 22.—Theodore L. Harrison, Jas. S. Martin, Chas. D. Reed.

March 29.—Geo. Hewston, of San Francisco, Cal., Alfred Tucker, W. Harrison Eisenbrey.

April 26.—John T. Morris, Dwight D. Willard, Daniel B. Smith.

May 31.—Thos. H. Speakman, H. St. G. Elliott, M. D., George Rice, Wm. H. Gumbes, Walter B. Comegys, Miss Grace Anna Lewis, Miss Hannah T. Smallwood, Miss Ella Hornor.

Sept. 27.—Wm. B. Rogers, Jr., Wm. H. Pancoast, M. D., Green Smith, of Cornell University, Thos. G. Gentry, Thos. Stewardson, H. Wier Workman.

Oct. 25.—J. Blodget Britton, J. Solis Cohen, M. D., Bushrod W. James, M.D., Chas. K. Mills, M. D.

Nov. 29.—J. Ewing Mears, M. D., Chas. Shaffner, M. D., E. Wildman, M. D., David L. Collier, Wm. H. Dougherty, W. H. Wahl, M. D.

CORRESPONDENTS.

April 26.—Prof. Frank H. Bradley, Knoxville, Tenn.

May 31.—Prof. Carl Wilhelm Boeck, of Christiania, Norway, Col. R. L. Playfair, of Algiers.

Sept. 27.—John Jas. Stevenson, of Morgantown, W. Va., Prof. Igino Cocchi, of Florence, Italy.

CORRESPONDENCE OF THE ACADEMY,

For 1870.

January.—Madame Charlotte Erdmann, announcing the death of Axel Joachim Erdmann.

Antonio Stoppani, announcing the death of Giuseppe Stabile.

J. F. Peck, in regard to white fish.

F. W. Putnam, in regard to the McNiel collection of reptiles.

P. E. Gibbons, in regard to a snake sent.

Geo. Davidson, with specimens sent.

H. E. van Rijgersma, in regard to specimens sent.

J. Hauxwell, in regard to arrival of boxes sent by the Academy.

Geo. Davidson, in regard to specimens sent.

Smithsonian Institution;
Kaiserliche Akademie der Wissenschaften in Wien; each acknowledging receipt of Journal.

Linnean Society;
British Museum;
Athenæum, Pall Mall;
Nassauischen Vereins für Naturkunde;
Naturforschende Gesellschaft des Osterlandes zu Altenburg; severally acknowledging receipt of Proceedings.

Königlich Bayerische Akademie der Wissenschaften;
Academie Royale des Sciences à Amsterdam;
Det Kongelige Danske Videnskabernes Selskab i Kjobenhavn;
Geological Museum of Calcutta; severally acknowledging receipt of Journ. and Proceedings.

Senckenbergische Naturforschende Gesellschaft in Frankfurt-am-Main; acknowledging receipt of Jour. and Proc. and sending Pub. in return.

Kaiserliche Akademie der Wissenschaften zu Wien;
Académie Royale à Amsterdam;
Société des Sciences de Finlande;
Universidad de Chile;
Naturforschende Gesellschaft in Emden;
Mannheimer Verein für Naturkunde;
Naturforschende Gesellschaft in Frankfurt-am-Main;
Société des Sciences Naturelles;
Aerztlichen Vereins in Frankfurt-am-Main;
Museets Naturhistoriske Afdeling Bergen, Norway;
Observatoire Physique Central; severally with publications.

February.—Daniel Turner, announcing the death of Dr. T. H. Turner.

Smithsonian Institution; acknowledging receipt of parcels for distribution.

James Orton, in regard to the purchase of books.

Wm. Smith, offering to collect for Academy.

W. E. Webb, in regard to footprints.

Smithsonian Institution, with birds from Henry Bryant's collection.

Wm. Smith, in regard to a snake.

J. E. Carey, in regard to a whale ashore.

Dr. W. Dunker, acknowledging receipt of books.

Legation Impériale de Russie aux Estats Unis, with Geological map.

Academy of Sciences of Chicago;
Essex Inst.;
N. Y. State Library; severally acknowledging receipt of Proceedings.
Essex Inst.;
Smithsonian Inst.;
American Antiquarian Society;
Lyceum of Natural History;
N. Y. State Library; severally acknowledging receipt of Journal.
Library of Congress, acknowledging receipt of Jour. and Proc.
K. K. Zoologisch-botanische Gesellschaft in Wien;
Kaiserliche Akademie der Wissenschaften in Wien;
Société Hollandaise à Harlem; severally with publication.

March.—Smithsonian Inst., with rules for sending packages.
James M. Lea, presenting the herbarium of Thomas G. Lea.
Chas. F. Hall, in regard to Arctic voyage.
Naturforschende Verein in Brünn;
Academy of Sciences of Chicago;
Smithsonian Inst.; severally acknowledging receipt of Proc.
Smithsonian Inst; acknowledging receipt of Journal.
American Antiquarian Society, acknowledging receipt of Jour. and Proc.
Akademie der Wissenschaften München;
Société Royale Hongroise des Sciences Naturelles;
Institution Royale Meteorologique Pays-Bas; severally with publications.

April.—Smithsonian Inst.;
Lyceum of Natural History; each acknowledging receipt of Proc.
British Museum, acknowledging receipt of Jour. and Proc.
Geological Museum of Calcutta;
Société Entomologique de France;
Naturwissenschaftliche Verein zu Bremen; severally with publications.

May.—Smithsonian Inst., presenting birds.
R. Instituto di Scienze Lettere ed Arti in Venezia, acknowledging receipt of Proceedings.
Gesellschaft der Wissenschaften Prag, acknowledging receipt of Journal.
Zoological Society of London;
Royal Society of London; each acknowledging receipt of Jour. and Proc.
Société Royale de Zoologie à Amsterdam;
Société des Sciences Naturelles de Milan;
Bureau de la Recherche Geologique de la Suède;
Academie Royale de Belgique; severally with publications.

June.—Frank H. Bradley, acknowledging election as Correspondent.
Essex Institution;
Academy of Sciences of Chicago; each acknowledging receipt of Proc.
Natürwissenschaftliche Verein für das Fürstenthum Luneburg;
Museo Püblico de Buenos Aires;
Royal Geological Society of London; severally with publications.

July.—R. L. Playfair, acknowledging election as Correspondent.
Smithsonian Inst., acknowledging receipt of Proc.
Acadèmie Royale de Belgique, acknowledging receipt of Journal.
Linnean Society, acknowledging receipt of Jour. and Proc., and sending publications.
Société Hollandaise des Sciences à Harlem, with publications.

August.—R. Rawson, acknowledging election as Correspondent.
Geo. Davidson, in regard to sea-lion sent.
W. A. Gordon, in regard to exchange of fossils.
Königlich Sachsische Gesellschaft der Wissenschaften zu Leipzig, with publications.

September.—W. Webster Butterfield, M. D., asking for copies of By-laws and list of Members.

Magyar Tudományos Akademia Pest, acknowledging receipt of Proc.

October.—H. Weir Workman ;
Wm. B. Rogers, Jr. ;
Greene Smith ; severally acknowledging election as members of the A. N. S.
A. E. Buck, in regard to a lamprey eel.
Smithsonian Inst., acknowledging receipt of box.
American Geographical and Statistical Society ;
Museum at Bergen, Norway ;
California Academy of Sciences ;
Athenaeum Pall Mall ;
Lyceum Natural History ; severally acknowledging receipt of Proceedings.
Naturforschende Gesellschaft in Emden, with publications.

November.—Temple C. Harrison, asking for copy of By-laws.
British Museum ;
Anthropological Society of London ; each acknowledging receipt of Proc.
Koninklijke Natuurkundige Vereeniging in Nederlandsch-Indie à Batavia ;
Det Kongelige Danske Videnskabernes Selskab Copenhague ; each with publications.

Number of letters received 1870, 127.
" " " written " 65.
Number of members elected, 37.
" " correspondents, 5.

EDWARD D. COPE
Corresponding Secretary.

DONATIONS TO THE LIBRARY.

1870.

JOURNALS AND PERIODICALS.

SWEDEN.

Christiania. Forhandlingar i Videnskabs-Selskabet i Christiania. Aar, 1868. From the Society.

Forhandlingar ved de Skandinaviske Naturforskeres Tiende Möde i Christiania fra den 4de til den 10de Juli, 1868. From the Society.

Det K. Norske Frederiks Universitets Aarsberetning for Aaret, 1868. From the Society.

Nyt Magazin for Naturvidenskabernes udgives af den physiographiske Forening i Christiania. 6de Binds, 1, 2, 3 and 4 Hefte. From the Society.

Norske Meteorologisk Aarbog for 1868. 2den Aargang. From the Observatory.

DENMARK.

Copenhagen. Mémoires de la Société Royale des Antiquaires du Nord. Nouvelle Série. 1868 and 1869. From the Society.

Oversigt over det K. danske Videnskabernes Selskabs. 1868, Nos. 5 and 6; 1869, Nos. 2, 3 and 4; 1870, No. 1. From the Society.

Tillæg til Aarboger for Nordisk Oldkyndighed og Historie. Aargang, 1869. Udgivet af det K. Nordiske Oldskrift-Selskab, 1870. From the Society.

Videnskabelige Meddelelser fra den naturhistoriske Forening i Kjöbenhavn for Aarets, 1868—1870. From the Society.

Videnskabernes Selskabs-Skrifter VII Band, 6 and 7; VIII Band, 1. 1870. From the Copenhagen Academy.

Drontheim. Det K. Norske Videnskabernes-Selskabs Skrifter i det 19de Aarhundrede. Femte Band, 1ste and 2e Heft. 1868. From the Society.

RUSSIA.

Dorpat. Archiv für die Naturkunde Liv-Ehst und Kurlands. Herausgegeben von der Dorpater Naturforscher-Gesellschaft. Ist Serie. 4er Band. 1868. From the Society.

Helsingfors. Ofversigt af Finska Vetenskaps-Societeten Forhandlingar. XII. 1869—1870. From the Society.

Bidrag till kännedom af Finlands Natur och Folk, utgifna af Finska Vetenskaps Societeten. Femtonde und Sextonde Häftet. 1870. From the Society.

Moscow. Bulletin de la Soc. Imp. des Naturalistes de Moscou. Année, 1868, No. 4, to 1870, No. 1. From the Society.

St. Petersburg. Horæ Societatis Entomologicæ Rossicæ. Tome VI. 1868. From the Society.

Annales de l'Observatoire Physique Central de Russie publiées par H. Wild. Année, 1865. From the author.

Jahresbericht des Physikalische Central-Observatoriums für 1869. Von H. Wild, 1870. From the Editor.

Mémoires de l'Academie Imperiale des Sciences. 7e Série. Tome XIII, No. 8, to Tome XV, No. 8. From the Society.

Bulletin de l'Académie Impériale des Sciences. Tome XIV, No. 1, to Tome XV, No. 2. From the Society.

HOLLAND.

Amsterdam. Jaarboek van de K. Akademie van Wetenschappen, gevestigd te Amsterdam. 1868. From the Society.

Hague. Archives Néerlandaises des Sciences Exactes et Naturelles. Tome IV and Tome V, Nos. 1, 2 and 3. 1870. From the Publishing Society.

Utrecht. Nederlandsch Meteorologisch Jaarboek voor 1869. 21er Jahrg. 1ste Deel. 1869. From the Meteorological Institute.

GERMANY.

Altenburg. Mittheilungen aus dem Osterlande. 19er Band, 1es und 2es Heft 1869. From the Publishing Societies.

Berlin. Archiv für Naturgeschichte. 35er Jahrg., No. 2, to 36er Jahrg., No. 2. 1869. From the Editor.

Berliner Entomologische Zeitschrift. Herausgegeben von dem Entomologischer Vereine. 13er Jahrg., 1869, 3es and 4es Vierteljahresheft. 1870, 1es and 2es Heft. From the Society.

Monatsbericht der K. P. Akademie der Wissenschaften. Nov., 1869, to Juli, 1870. From the Society.

Zeitschrift der Deutschen Geologischen Gesellschaft. XXI Band, 4 Heft, to XXII Band, 3 Heft From the Society.

Zeitschrift für die Gesammten Naturwissenschaften. Herausgegeben von dem Naturw. Vereine für Sachsen und Thüringen in Halle. Jahrg., 1869. 33er und 34er Band. Neue Folge, 1870. Band 1. From the Society.

Sitzungs-Bericht der Gesellschaft Naturforschender Freunde. Jahre, 1869. From the Society.

Wochenschrift des Vereines zur Beförderung des Gartenbaues in den K. P. Staaten für Gartnerei und Pflanzenkunde. XII Jahrg., 1869. From the Editor.

Bonn. Verhandlungen des Naturhistorischen Vereines der Preussischen Rheinlande und Westphalens. 26er Jahrg., 3e Folge. 6 Jahrg., 1 and 2 Hafte. 1869. From the Society.

Braunschweig. Archiv für Anthropologie. 4er Band, 1870, 1es und 2es Vierteljahrsheft. From the Wilson Fund.

Bremen. Abhandlungen herausgegeben vom Naturwissenschaftlichen Vereine. 2 Bd., 2 Heft. 1870. From the Society.

Brünn. Verhandlungen des Naturforschenden Vereines in Brünn. VII Band. 1868. From the Society.

Cassel. Journal für Ornithologie. XVII Jahrg., Heft VI., XVIII Jahrg., Heft I, II and III. 1869—1870. Purchased.

Dresden. Sitzungsberichte der Naturwissenschaftlichen Gesellschaft Isis in Dresden. Jahrg., 1869, No. 7, to 1870, Juni. From the Society.

Emden. Vierundfünfzigster und 25er Jahresbericht der Naturforschenden Gesellschaft. 1868—1869. From the Society.

Frankfurt, A. M. Der Zoologische Garten. X Jahrg., 1869, No. 7, to XI Jahrg., 1870, No. 6. From the Editor.

Jahresbericht ueber die Verwalting des Medicinalwesens der Stadt Frankfurt, A. M. X Jahrg. 1866. From the Publishing Society.

Abhandlungen, herausgegeben der Senckenbergischen Naturforschenden Gesellschaft. 7en Bandes, 1es and 2es Heft. 1869. From the Society.

Berichte über die Senckenbergische Naturforschende Gesellschaft von Juni, 1868, bis Juni, 1869. From the Society.

Freiburg. Berichte über die Verhandlungen der Naturforschenden Gesellschaft. Band V, Heft II. 1869. From the Society.

Göttingen. Nachrichten von der K. Gesellschaft der Wissenschaften und der Georg-Augusts Universität aus dem Jahre, 1869. From the Society.

Astronomische Mittheilungen von K. Sternwarte zu Göttingen. Herausgegeben von der K. Gesellschaft der Wissenschaften zu Göttingen. 1er Theil. 1869. From the Society.

Güstrow. Archiv des Vereins der Freunde der Naturgeschichte in Meklenburg. 23 Jahr. From the Society.

Hannover. Achtzehnter und 19er Jahresbericht der Naturhistorischen Gesellschaft. 1869. From the Society.

Königsberg. Schriften der K. Physikalisch-Okonomischen Gesellschaft. 18er Jahrg., und 19er Jahrg., 1ste and 2e Abth., 1868. 20er Jahrg., 1 and 2 Abth. From the Society.

Leipzig. Bericht über die Verhandlungen der K. Sachsischen Gesellschaft der Wissenschaften zu Leipzig. Mathematisch-Physische Classe, 1867, III, IV; 1868, I, III; 1869, I. From the Society.

Abhandlungen of the same. IX, I, and II 1869. From the Society.

Zeitschrift für Wissenschaftliche Zoologie. 19er Band, 4es Heft, to 20er Band, 3es Heft. Purchased.

Jahrbücher für Wissenschaftlichen Botanik. 7er Band, 3es Heft. 1869. Purchased.

Lüneburg. Jahresbericht des Naturwissenschaftlichen Vereins für das Fürstenthum Lüneburg. III und IV. From the Society.

Mannheim. Funfunddreissigster Jahresbericht des Mannheimer Vereins für Naturkunde. 1869. From the Society.

Marburg. Sitzungsberichte der Gesellschaft zur Beförderung der gesammten Naturwissenschaften in Marburg. Jahrg. 1866—1867—1868. From the Society.

Schriften der Gesellschaft zur befœrderung der gesammten Naturwissenschaften zu Marburg. Supplement Heft, III, IV, und V. From the Society.

Munich. Annalen der K. Sternwarte bei München. XVII Band und IX Supplementband. 1869. From the Observatory.

Verzeichniss von 6323 telescopischen Sternen. VIII Supplementband. 1869. From the Munich Observatory.

Abhandlungen der K. B. Akademie der Wissenschaften. Philosophisch-Philologischen Classe. X Band, 3e Abth.; XI Bandes, 3e Abtheilung; XII Band, 1ste Abth. Historischen Classe. XI Bandes, 1ste Abth.; 10en Bandes, 2e Abth. München. 1868. From the Society.

Sitzungberichte der K. B. Akademie der Wissenschaften. 1869, I, Heft I, to 1870, I, Heft IV. From the Society.

Offenbach, A. M. Zehnter Bericht des Offenbacher Vereins für Naturkünde. 1868—1869. From the Society.

Passau. Siebenter und Achter Jahres-Bericht des Naturhistorischen Vereines in Passau. 1865 bis 1868. From the Society.

Pesth. A. Kiralyi Magyar Termeszettudomanyi Tarsulat Közlönye. 1865—1866—1867. From the Hungarian Academy of Sciences.

A. Kiralyi Magyar Termeszettudomanyi Tarsulat Története Alapittatasatol Fogva. Maig, 1868. From the same.

Termeszettudomanyi Közlöny. Elso Kotet, 1—9. Füzet. 1869. From the same.

Prag. Repertorium Sämmtlichen Schriften der K. Böhmischen Gesellschaft der Wissenschaften vom Jahre 1769 bis 1868. From the Society.

Sitzungsberichte of the same. 1869. From the Society.

Abhandlungen of the same. Sechste Folge, 3er Band. From the Society.

Regensburg. Correspondenz-Blatt des Zoologisch-Mineralogischen Vereines in Regensburg. 23er Jahrg. 1869. From the Society.

Flora oder Allgemeine Botanische Zeitung herausgegeben von der K. B. Botanischen Gesellschaft. Neue Reihe, XXVII, Jahrg. 1869. From the Society.

Stuttgart. Neues Jahrbuch für Mineralogie, Geologie und Palæontologie. Jahrgang, 1869, 6es Heft, to 1870, 5es Heft. From the Editor.

Vienna. Mittheilungen der Anthropologischen Gesellschaft in Wien. 1 Band, Probenummer, Nos. 2 and 3. From the Society.

Sitzungsberichte der K. Akademie der Wissenschaften. Mathematisch-Naturwissenschaftlichen Classe. 58 Band, 1st Abth., to 60er Band, 1, 2 Abth., I and II Heft. From the Society.

Denkschriften der K. Akademie der Wissenschaften. Math.-Naturw. Classe 29er Band. 1869. From the Society.

Verhandlungen der K. K. Geologischen Reichsanstalt. No. 10, 1869, to No. 9, 1870. From the Bureau.

Jahrbuch of the same. Jahrg., 1869, XIX Band, No. 3, to 1870, XX Band, No. 1. From the Bureau.

Verhandlungen der K. K. Zoologisch-Botanischen Gesellschaft in Wien. Jahrg., 1869. XIX Band. From the Society.

Schriften des Vereines zur Verbreitung Naturwissenschaftlichen Kenntnisse in Wien. Bands II—VIII. From the Society.

Würzburg. Verzeichniss der Bibliothek der Physikalisch-Medicinischen Gesellschaft. 1869. From the Society.

Verhandlungen of the same. Neue Folge, 1 Band, 4 Heft, 1869. From the Society.

SWITZERLAND.

Bern. Mittheilungen der Naturforschenden Gesellschaft aus dem Jahre. 1869. No. 684—711. 1870. From the Society.

Geneva. Bibliothèque Universelle et Revue Suisse. Archives des Sciences Physiques et Naturelles. Nouvelle Periode. Tome 36me, No. 143, to Tome 38, No. 152. From the Editor.

Lausanne. Bulletin de la Société Vaudoise des Sciences Naturelles. Vol. X, No. 62. 1869. From the Society.

Neuchatel. Bulletin de la Société des Sciences Naturelles de Neuchatel. Tome VIII, 2me Cahier. 1869. From the Society.

Solothurn. Verhandlungen der Schweizerischen Naturforschenden Gesellschaft. 53 Jahresversammlung. 1869. From the Society.

St. Gallen. Bericht über die Thätigkeit der St. Gallischen Naturwissenschaftlichen Gesellschaft während des Vereinsjahres 1867—1868. From the Society.

Zurich. Vierteljahresschrift der Naturforschenden Gesellschaft. 14er Jahrg., 1—4es Heft. 1869. From the Society.

BELGIUM.

Bruxelles. Annuaire de l' Academie Royale des Sciences, des Belles-Lettres et des Beaux-Arts de Belgique. 1870. 36me Année. From the Society.

Bulletin of the same. 38me Année, 2me Ser. Tomes 27 and 28, 1869. From the Society.

Memoires Couronnés of the same. Col. in 8vo Tome XXI, Col. in 4to Tome XXXIV. From the Society.

Louvain. Annuaire de l'Université Catholique. 1870. 34me Année. From the University.

Mons. Mémoires et Publications de la Société des Sciences, des Arts et des Lettres du Hainaut. 1869—1870. From the Society.

FRANCE.

Angers. Mémoires de la Société Academique de Maine et Loire. Tomes XXI—XXIV. From the Society.

Bordeaux. Société des Sciences Physiques et Naturelles de Bordeaux. Tomes V—VII. 1867—1869. Extrait des Procès-Verbaux des Séances, pp. 1—32. From the Society.

Actes de l'Academie Imperiale des Sciences, Belles-Lettres et Arts. 3e Série, 30e Année, 3me et 4me Trimestre, 1868. 31e Année, 1er Trimestre, 1869. From the Society.

Actes de la Société Linnéenne de Bourdeaux. Tome XXIV, 5e et 6e Livr. Tome XXVII, 1re Partie. 1870. From the Society.

Lyon. Mémoires de l'Academie Impériale des Sciences, Belles-Lettres et Arts. Classe des Sciences. Tome 17me. 1869—1870. From the Society.

Annales de la Société Linnéenne de Lyon. Année, 1869. Tome 17me. From the Society.

Metz. Bulletin de la Société d'Histoire Naturelle du Departement de la Moselle. 12me Cahier, 1870. From the Society.

Orleans. Mémoires de la Société d'Agriculture, Sciences, Belle-Lettres et Arts d'Orleans. Seconde Série. Tome VIII, Nos. 1 et 2. 1870. From the Society.

Cherbourg. Mémoires de la Société Impériale des Sciences Naturelles de Cherbourg. Tomes XIII et XIV. 1869. From the Society.

Paris. Annales de la Société Entomologique de France. 4me Serie. Tome 9me. 1869. From the Society.

Annales des Sciences Naturelles. Botanique, Tome X, Nos. 3—6; Tomes XI, XII, et XIII; Tome XIV, No. 1. Purchased.

Bulletin de la Société Botanique de France. Tome 16me. 1869. Comp. Rendu, 4—5. 1870. 1 Rev. Bibl. A—E. From the Society.

Bulletin Mensuel de la Société Impériale Zoologique d'Acclimatation. 2me Serie. Tome VII, Nos. 1—7. From the Society.

Annales des Mines. 6me Série. Tome XVI, 5e et 6e Livr.; Tome XVII, Livr. 1—3. From the Minister of Public Works in France.

Journal de Conchyliologie. 3e Serie. Tome IX, No. 4; Tome X, Nos. 2 et 3. Paris. 1869. From the Editors.

Nouvelles Archives du Museum d'histoire Naturelle de Paris. 1869. 3me et 4me Fasc. Purchased.

Nouvelles Météorologiques, publiées sous les auspices de la Société Météorologique de France. 1869, Nos. 11 et 12; 1870, Nos. 1 et 2. From the Society.

Revue et Magazin de Zoologie. 1869, No. 9, to 1870, No. 6. From the Editor.

Strasbourg. Mémoires de la Société des Sciences Naturelles de Strasbourg. Tome 6me, 2me Livr. 1870. From the Society.

Bulletin de la Société des Sciences Naturelles. No. 1, 1re Année, to No. 10, 2e Année. 1868—1869. From the Society.

Toulouse. Mémoires de l'Academie Impériale des Sciences, Inscriptions et Belles-Lettres de Toulouse. 7me Série. Tome I. 1869. From the Society.

ITALY.

Bologna. Rendiconto della Sessioni dell' Accademia delle Scienze dell' Istituto di Bologna. Anno 1868—1869. From the Society.

Memorie of the same. Serie II. Tome VIII. Fasc. 1, 2, 3 and 4. From the Society.

Cagnola. Atti della Fondazione Scientifica Cagnola. Vol. V, No. 1. From the Society.

Catania. Atti dell' Accademia Givenia di Scienze Naturali di Catania. Série Terza. Tomo II et Tomo XLIII. 1868—1869. From the Society.

Genoa. Effemeridi della Società di Letture e Conversazioni Scientifichi. Anno 1, Fasc. 1. 1870. From the Society.

Milan. Memorie del R. Istituto Lombardo di Scienze e Lettere. Classe di Scienze, Mathematiche e Naturali. Vol. X, Fasc. IV and V; Vol. XI, Fasc. I and II. From the Society.

Reale Istituto Lombardo di Scienze e Lettere. Rendiconti. Classe di Scienze, Mathematiche e Naturali. Vol. IV, Pts. II—X, Serie II; Vol. I and II, Nos. I—XVI. From the Society.

Programma del R. Istituto Technico Superiore in Milano per l'anno Scolastico 1864—1869. From the Institute.

Annuario del Reale Istituto Lombardo di Scienze e Lettere. 1868. From the Society.

Palermo. Giornale di Scienze Naturali et Economiche publicato per cura del Consiglio di Perfezionamento annesso al R. Istituto Technico di Palermo. Parte I. Scienze Naturali. 1869. From the Society.

Turin. Atti della R. Accademia delle Scienze di Torino. Vol. IV, Disp. 1—7. 1869. From the Society.

Sunti dei Lavori Scientifici Letti e Discussi di Scienze Morali, Storiche e Filologiche delle Reale Accademia delle Scienze di Torino dal 1859 al 1865. Torino. 1868. From the Society.

Venice. Atti del Reale Istituto Veneto di Scienze, Lettere ed Arti. Tomo 13o, Disp. 1—10; Tomo 14o, Disp. 1—6, 8 and 9. Venezia. 1867—1869. From the Society.

Memoria del Regio Istituto Veneto. di Scienze, Lettere ed Arti. Vol. XIV, Part II. From the Society.

GREAT BRITAIN AND IRELAND.

Dublin. The Journal of the Royal Dublin Society. Nos. 38 and 39. From the Society.

The Transactions of the Royal Irish Academy. Vol. XXIV. Polite Literature, Part IV; Antiquities, Part VIII; Science, Parts IX to XV. 1867. From the Society.

Edinburgh. Transactions of the Royal Society. Vol. XXV, Part 11. From the Society.

Proceedings of the same. Vol. VI, No. 77. From the Society.

Transactions of the Edinburgh Geological Society. Vol. I, Part II. 1870. From the Society.

Transactions and Proceedings of the Botanical Society. Vol. X, Part 1. 1869. From the Society.

Leeds. Philosophical and Literary Society. The Annual Report for 1869—70. From the Society.

Report of the Proceedings of the Geological and Polytechnic Society of the West Riding of Yorkshire, 1869. From the Society.

London. The Annals and Magazine of Natural History. 4th Series. Vol. 3, No. 18, to Vol. 4, No 34. From the Library Fund.

The Athenæum Journal, Nos. 2189 to 2235. From the Wilson Fund.

The London, Edinburgh and Dublin Philosophical Magazine and Journal of Science. Vol. 37, 4th Series, No. 251 to Vol. 39, Nos. 261 and 263 to 267. 1869. Purchased.

Proceedings of the Royal Institution of Great Britian. Vol. V, Parts 5, 6 and 7, Vol. VI, Parts 1 and 2. List of Members, etc. From the Society.

The Food Journal, Nos. 1—10, Vol. 1. 1870. From the Editor.

The Ibis. New Series. Vol. V, No. 20, to Vol. VI, No. 23. From the Wilson Fund.

Notes and Queries. Part XVII, 4th Series, to XXXIII. From the Editor.

The Journal of the Royal Asiatic Society of Great Britain and Ireland. New Series. Vol. IV, Part 2. 1870. From the Society.

Journal of the Statistical Society of London. Vol. XXXII, Part IV, Dec., 1869. From the Society.

The Quarterly Journal of the Geological Society. Vol. XXVI, Parts 1 and 2. From the Society.

The Journal of Anatomy and Physiology. 2d Series. Nos. 4, 5 and 6. Purchased.

Nature. Nos. 15, 22—25, 37, 40, 42—48 and 51. From the Editor.

The Journal of the Chemical Society. From July, 1869, to Oct., 1870. From the Society.

Trübner's American and Oriental Literary Record. Nos. 52—60. From the Publishers.

The Student and Intellectual Observer. No. 24, Jan., 1870, to No. 4, New Series. From the Editor.

English Mechanic and Mirror of Science. Vol. XI, Nos. 276—283. From the Editor.

Report of the thirty-ninth meeting of the British Association for the Advancement of Science. 1869. Purchased.

Palæontological Society's Publications. Vol. XXIII. Issued for 1869. From the Wilson Fund.

The Journal of the Society of Arts and of the Institution in Union. Vol. XXII, 1869. From the Society.

Proceedings of the Royal Society. Vol. XVII, No. 110, to Vol. XVIII, No. 118. From the Society.

Philosophical Transactions of the same, 1869. Vol. 159, Parts 1 and 2. From the Society.

Proceedings of the Royal Geographical Society. Vol. XIII, No. 1, to Vol. XIV, No. 1, 1868. From the Society.

Journal of the same. Vol. 39. From the Society.

Proceedings of the Zoological Society. 1865, Part III. 1867, Part I. 1869, Parts II and III. From the Society.

Transactions of the same. Vol. VII, Parts 1 and 2. From the Society.

Proceedings of the Linnean Society. Sessions 1868—69, 1869—70.

Journal of the same. Botany, Vol. X, No. 48; Vol. XI, Nos. 49—53, and Vol. XII. Zoology. Vol. X, Nos. 43—48, 1869.

The Transactions of the Linnean Society. Vol. XXV, Part 1, 1865. From Wm. S. Vaux.

The same. Vol. XXVI, Parts 2, 3 and 4, Vol. XXVII, Parts 1 and 2, 1868—69. From the Society.

New-Castle-upon-Tyne. Natural History Transactions of Northumberland and Durham. Vol. III, Part 2, 1870. From the Publishing Society.

UNITED STATES.

Albany. Manual of the Albany Institute, 1870. From the Society.

Transactions of the Albany Institute. Vol. VI. From the Society.

Forty-second Annual Report of the Trustees of the New York State Library, 1870. From the Trustees.

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Boston. Proceedings of the Boston Society of Natural History. Vol. XIII, Pp. 161—288. From the Society.

Seventeenth Annual Report of the Trustees of the Public Library, 1869. From the Trustees.

The Literary World. Vol. I, Nos. 1—7, 1870. From the Editor.

Cambridge. Bulletin of the Museum of Comparative Zoology at Harvard College. Nos. 8—15. Vol. II, No. 1. From the Director.

Proceedings of the American Academy of Arts and Sciences. Vol. VIII, Pp. 1—136, 1870. From the Society.

Chicago. The Pharmacist. Vol. III, Jan., 1870, Nos. 1—4 From the Editor.

The Arts. Vol. I, Nos. 1—3, 1870. From the Editor.

Transactions of the Chicago Academy of Sciences. Vol. I, Part 2, 1869. From the Society.

Indianapolis. The Indiana Journal of Medicine. Vol. I, No. 8. From the Editor.

Louisville. The Journal of Science, Nov., 1870. From the Editor.

New Haven. The American Journal of Science and Arts. 2d Series. Vol. 49, Nos. 145—150, 1870. From the Editor.

New York. New York Medical Journal. Vol. X, No. 4, to Vol. XII, No. 4. From the Editor.

The Medical Record. Nos. 92 and 93. From the Editor.

The Journal of Applied Science. No. 5, Vol. I, May, 1870. From the Editor.

The Chemical News and Journal of Physical Sciences. Vol. VI, Nos. 2—6, 1870. From Messrs. Townsend & Adams.

The American Chemist. Vol. I, Nos. 2—6, 1870. From the Editor.

Annals of the Lyceum of Natural History of New York. Vol. IX, No. 7—10, 1869. From the Society.

Proceedings of the Lyceum of Natural History in the City of New York. Vol. I, Pp. 1—44. From the Society.

First Annual Report of the American Museum of Natural History. From the Trustees.

The American Gas-Light Journal. Vol. XII, No. 7, to Vol. XIII, No. 10. From the Editor.

Bulletin of the Torrey Botanical Club. Nos. 1—10. From Thomas Meehan.

Philadelphia. American Journal of Pharmacy. Vol. 42, Nos. 1—6. 3d Series, Jan., 1870. From the Editor.

Proceedings of the American Pharmaceutical Association.

The Gardener's Monthly. Vol. XII, No 2. From the Editor.

The American Journal of Medical Sciences. Nos. 117—120. New Series, Jan., 1870. From the Editor.

The Medical News and Library. Vol. 28, Nos. 328—336. From the Editor.

The Dental Cosmos. New Series. Vol. XII, Nos. 1—12, 1870. From the Editors.

The Gardener's Monthly. Vol. XII, Nos. 1—12. From the Editor.

Proceedings of the Academy of Natural Sciences. No. 3, 1869, to No. 1, 1870. From the Publication Committee.

Scientific Journal. New Series. Vol. I, No. 1, to Vol. II, No. 3. From the Editor.

Proceedings of the American Philosophical Society. Vol. XI, Nos. 82—84, 1870. From the Society.

Transactions of the same. Vol. XIV. New Series, Part 2, 1870. From the Society.

The Penn Monthly Magazine. Nos. 4—12, 1870. From the Editor.

Salem. The American Naturalist. Vol. III, No. 11, to Vol. IV, No. 2. From the Library Fund.

Bulletin of the Essex Institute. Vol. I, No. 5, to Vol. II, No. 8. From the Society.

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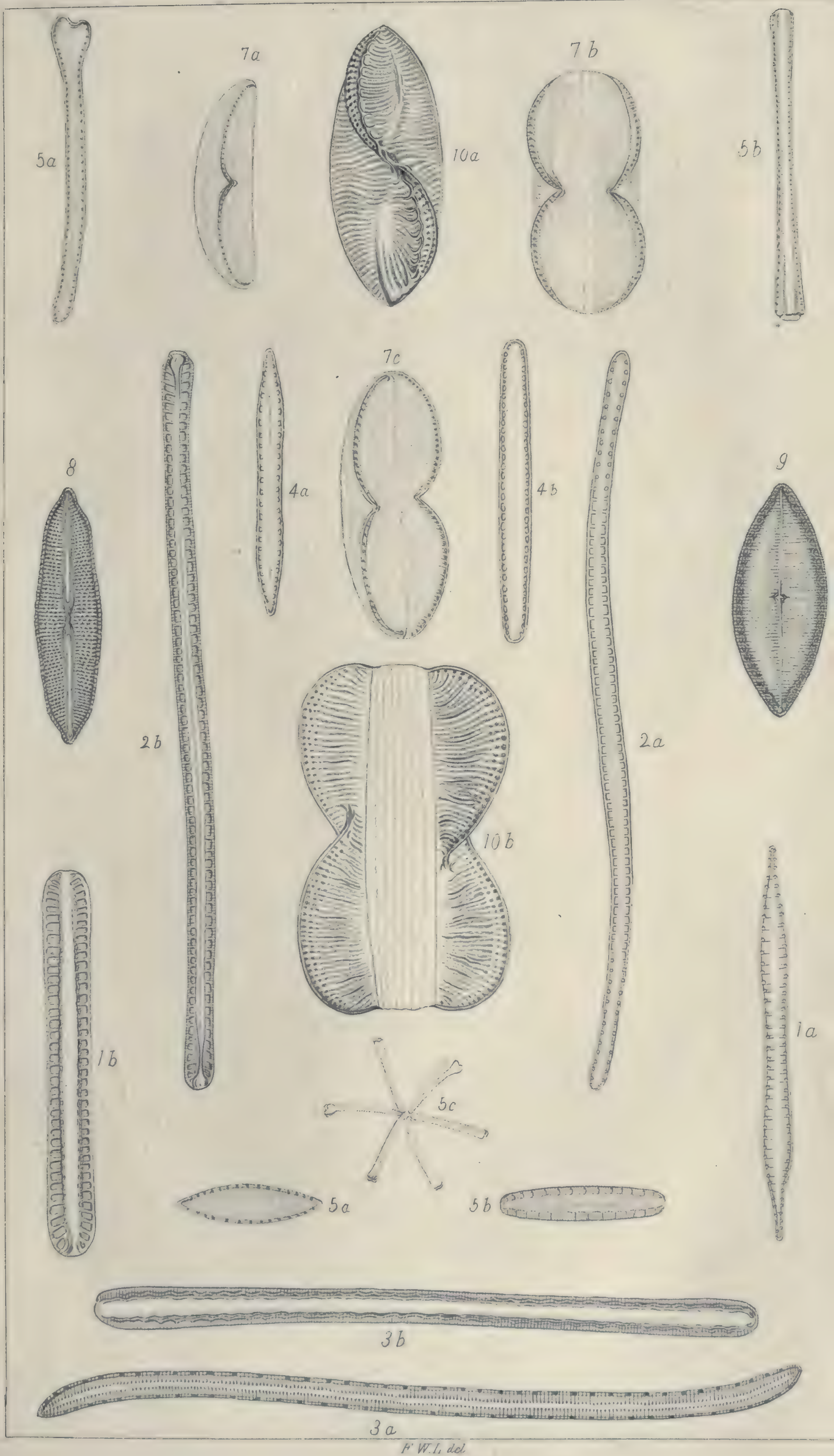
INDEX TO GENERA.

GENERAL INDEX.

ERRATA.

Page 25, fourteenth line from bottom, for "subrachial," read *subbrachial.*
" 31, fifteenth line from bottom, for "basas," read *basal;* and sixteenth line from bottom, for "basasal," read *basal.*
" 38, tenth line from bottom, insert *it* before "my;" and twenty-fifth line from bottom, for "this," read *their.*
" 45, twenty-first line from bottom, insert *section* after "Illinois."
" 46, fourteenth line from bottom, for "Jour.," read *Iowa.*
" 51, sixteenth line from bottom, for "isolated," read *involuted.*
" 56, twelfth and eighteenth lines from top, for "Clerence," read *Clarence;* and thirty-sixth line, for "is," read *are.*
" 59, second and twentieth lines from bottom, for "Vortifex," read *Vorticifex.*
" 60, erase the parenthetic marks in the fifteenth line from top.
" 74, twenty-fourth line from bottom, for "principle," read *principal.*
" 80, after "Œ. pruinosa, nov. sp.," insert = *Gr. trifasciatus,* (*Say*).
" 83, after "B. nigrum, nov. sp.," insert = *Gr. nubilus,* (*Say*).
" 130, for "B. H. BANNISTER," read H. M. BANNISTER; on twelfth line of article, for "recurved," read decurved.
" 131, "SCOPOLI" should be in small type, except the initial letter, so as to read as the authority for the generic name; on the last line, for "Lewast," read (Sewast). In the first line of the note at foot of page, for "*Brante,*" read *Branta.*

The authorities for all the specific names, except those for *Anser hyperboreus*, *A. rossii*, and *A. gambelli*, should be in brackets.



F. W. L. del

BIOLOGICAL AND MICROSCOPICAL DEPARTMENT

OF THE

ACADEMY OF NATURAL SCIENCES.

Jan. 3*d*, 1870.

Director S. W. Mitchell, M.D., in the Chair.

Eighteen members present.

Dr. McQuillen exhibited the skull of a hedge-hog, in which, owing to fracture of the left lower incisor, the superior incisor of that side, failing to meet with its antagonist, had formed a complete circle, the apex of the tooth penetrating the right upper maxilla just in front of the molars. The right upper incisor also had been fractured, and the inferior incisor of that side had grown to more than twice the usual length, and assumed the form of a tusk. The skull of a squirrel was also shown, in which, owing to a similar accident, the superior incisors had formed a complete circle and penetrated the upper maxilla.

Jan. 17*th.*

Director S. W. Mitchell, M.D., in the Chair.

Fourteen members present.

Dr. McQuillen exhibited the pulp of a lower molar, with the vessels naturally injected. The principal points of interest connected with the specimen were the dentinal fibrili, which were quite evident under the microscope, projecting from a fragment of dentine. In commenting on the specimen, the speaker stated that these fibrili, which are located in the dentinal tubuli, were first observed some eight or ten years ago in the human teeth by John Tomes, F.R.S., of London, who regards them as the continuation of the nerves of the dental pulp, and accounts for the exquisite sensibility of the dentine in excavating decay from the cavity of a tooth, by impressions made upon these filaments. The speaker would not pretend to assert that this was an untenable position, but he inclined to the opinion that the dentinal fibrili are to be regarded as post mortem results occurring after the extraction of a tooth, and due to the coagulation of the fibrine of the liquor sanguinis circulating in the dentinal tubuli during life. In the removal of pulps from the teeth when devitalized by arsenical application, or breaking up a tooth after extraction, he had found no difficulty in separating the pulp from the dentine, which would hardly be possible if the nerve fibres passed into the millions of tubuli in the dentine, or under such circumstances an attachment would be formed exceedingly difficult of separation.

A large plaster model of an incisor tooth, with a vertical section showing the arrangement of the enamel, cementum, dentine, pulp cavity and pulp, was used in illustration of the remarks.

Feb. 7th.

Vice-Director W. Pepper, M.D., in the Chair.

Fourteen members present.

Mr. W. H. Walmsley exhibited mounted sections of a testicle removed from a so-called hermaphrodite, who otherwise presented the external configuration of a woman. and who was looked upon in society as a female. The testicle exhibited tubular structure, and was removed at the patient's request.

Mr. T. W. Starr exhibited a slide showing malformation in a spider, which had eight legs and nine feet.

Feb. 24th.

Director S. W. Mitchell, M.D., in the Chair.

Eleven members present.

March 7th.

Vice-Director W. Pepper, M.D., in the Chair.

Six members present.

Dr. McQuillen stated that during certain experiments with the hydrate of chloral, he had reason to doubt the correctness of the view of Leibrech and B. W. Richardson, that it was decomposed in the blood and converted into chloroform.

March 21st.

Director S. W. Mitchell, M.D., in the Chair.

Thirteen members present.

Dr. Tyson read a paper on Class or Clinical Microscopes (see Dental Times for April, 1870).

Dr. Keen had had considerable experience with class-microscopes, and had used them with much satisfaction, even with higher powers than those named by Dr. Tyson. He had shown to his class the amœboid movements of the white blood corpuscle. He was disposed to look more hopefully than Dr. Tyson upon the results to be derived from the use of the gas-microscope in medical teaching.

Dr. McQuillen had also used the class microscope largely in teaching, and with satisfaction. He was disposed to think with Dr. Tyson, that the gas-microscope could never be substituted with advantage for the class-microscope in demonstrative teaching, but simply became a further aid, assuming the relation of the enlarged diagram, and this not always with satisfaction.

Mr. Walmsley exhibited a four-inch lens made by Tolles, which possessed a working distance of but two inches.

He also showed some brilliant fresh-water algæ, which had been mounted for a year in carbolic acid water, still retaining their color completely.

April 4*th.*

Director S. W. MITCHELL, M.D., in the Chair.

Eleven members present.

The Corresponding Secretary reported the presentation of a copy of Lieut.-Col. J. J. Woodward's Report on the Magnesium and Electric Lights as applied to Photo-Micrography; illustrated by a number of large photographs.

DR. S. W. MITCHELL exhibited a slide showing the ova of *Bilharzia hœmatobia,* believed to cause the intermittent Hœmaturia of the Cape of Good Hope and Natal, the specimen having been forwarded to him by his friend Dr. Harley, of London; and made some remarks upon the parasite.

Dr. James Tyson resigned the position of Recorder, and Dr. J. G. Richardson was elected to the vacancy.

April 18*th.*

J. GIBBONS HUNT, M.D., in the Chair.

Eighteen members present.

DR. WM. F. NORRIS made a verbal communication in regard to the use of weak solution of nitrate of silver and chloride of gold in the preparation of tissues for microscopic examination, which he illustrated by numerous mounted specimens, &c.

DR. HUNT inquired what strength of the solution of the nitrate of silver was employed.

DR. NORRIS replied that his ordinary solution was one-half of one per cent., and in answer to a question from Dr. Truman, stated that the chloride of gold liquid was of the same strength. Several members having mentioned that they met with nothing but failures in attempting to employ these processes, Dr. Norris remarked that he was at a loss to account for this want of success, and believed that if the half per cent. solutions were used in a dark room, and the specimens allowed to soak in glycerine slightly acidulated with acetic acid, afterwards exposing them to the light until sufficiently colored, no difficulty would be experienced.

DR. J. G. HUNT exhibited some mounted slides of *Saxafraga sarmentosa*, and observed that in regard to the stomata in plants the general rule is that they are distributed all over the under surface of the leaves. We find exceptions to this law, however, in some species of *Saxafraga*, and in *S. sarmentosa* the stomata are grouped in clusters only, and are not found in the cells between the clusters. In other species of the genus the same peculiarity occurs, but this arrangement of the stomata cannot be regarded as a generic feature, because some of the *Saxafrages* have these organs distributed all over the under surfaces of their leaves.

Dr. Hunt further remarked that the singular amœboid movement so often noticed in the white blood corpuscle seems to be a phenomenon not confined to the animal kingdom. A movement apparently similar may be distinctly observed in the nucleus of the cell of *Anacharis alsinastrum*, and in the plant the movement appears to be more active than that seen in the blood.

May 2*d*.

Director S. W. MITCHELL, M.D., in the Chair.

Thirteen members present.

May 16*th*.

Director S. W. MITCHELL, M.D., in the Chair.

Eighteen members present.

DR. J. GIBBONS HUNT exhibited a species of the frondose Hepaticæ,—the *Grimaldia barbifrons.* Its sporangia are borne on the ends of pedicels, and they contain spores and elaters of great beauty. The stomata in the heads of a plant open into chimney-like canals built up of cells, and these canals dip down into the tissues of the plant. This family of cryptogams offers to the microscopist many objects of beauty, as well as of physiological interest, when properly studied.

June 6*th*.

Director S. W. MITCHELL, M.D., in the Chair.

Sixteen members present.

PROF. J. H. MCQUILLEN, Corresponding Secretary, read a communication from the American Microscopical Society of New York City, requesting an interchange of specimens, and of published transactions as far as possible.

June 21*st*.

Director S. W. MITCHELL, M.D., in the Chair.

Ten members present.

A letter was read by the Secretary from Prof. Joseph Henry, of the Smithsonian Institution, Washington, submitting a specimen of the *Myiarchus cinerascens* with a remarkable fungous growth upon its feet, and requesting the opinion of the Department as to the nature of this abnormal formation, to investigate which Drs. Richardson, Allen, and Wood were appointed a committee.

In the subsequent session for private business, it was resolved, in accordance with resolutions offered in the report of a Committee on Modification of the By-Laws, R. S. Kenderdine, M.D., Chairman, and adopted after discussion, somewhat amended:

1*st*. That the second meeting in each month be purely conversational, without order of business.

2*d*. That the Director appoint a committee of five, who shall canvass and arrange the members, so as to bring to the Section at least three instruments at each conversational meeting, in addition to those belonging to the Section, with a few objects of interest for each microscope. They shall also canvass the members, and endeavor to have some subject presented at each meeting, in a short paper, relating to the construction or working of the instrument, or its use in scientific study.

3*d*. That the Janitor be requested to place the microscopes of the Section on the table at every meeting.

4*th*. That arrangements be made with the new Medical Journal to publish a synopsis of the proceedings, and, if possible, to announce the subject for discussion before the meetings.

The following paper was ordered to be published :

Is Atropia an antidote to Hydrocyanic Acid ?

BY DR. W. W. KEEN.

Having been recently called upon, as a member of a committee of the Pathological Society, to investigate the blood of Geo. S. Twitchell, Jr., the murderer (who poisoned himself by prussic acid), my attention was called to the lately asserted antidotal powers of atropia, and I made a number of experiments on the subject, the result of which I now report to the Department.

In the Glasgow Med. Jour., Nov., 1868, p. 70 et seq., will be found an extended analysis of Preyer's recent work on prussic acid (Die Blausaüre, Bonn, 1868), which I must quote as authority, as I had not access to the original work. The questions as to action of the poison on the spectrum analysis of the blood, on its coagulation, on the heart, &c., are foreign to my present purpose, and will be found discussed both in the paper just alluded to and in our report to the Pathological Society. (Amer. Jour. Med. Sci. vol. 58, p. 432.)

Preyer's conclusions, from numerous experiments, are that HCy kills by suffocation induced by three means:

1°, it stimulates or tetanizes the pulmonary branches of the vagus, so that the respiration ceases.

2°, it stimulates or tetanizes the cardiac branches of the vagus (and also the sympathetic ganglia of the heart in some cases), and thus arrests the circulation.

3°, it acts on the respiratory nervous centre, so that the breathing on being re-established is retarded more and more, till death follows.

Atropia, he states, has precisely an antagonistic action, and therefore should be and is an antidote. That atropia does have such an action as he has asserted on the circulation, is the conclusion to which Drs. Mitchell, Morehouse and myself came in studying the antagonism of opium and belladonna, and published in the Amer. Jour. Med. Sci., July, 1865; but that it affects the respiration is contrary to our experiments at that time, and that it acts as an antidote to prussic acid my present experiments, so far as they go, certainly disprove.

Preyer states that if the 0·015 of a grain—*i. e.*, one millegramme—of sulphate of atropia be injected under the skin of a rabbit, a lethal dose of HCy may be given without producing death ; or if the HCy be first administered, that then the atropia will arrest its poisonous action if it is given quickly enough.

Exp. I. May 12, 1869. Injected 0·017 gr. of sulph. atropia under the skin of the back of a rabbit, followed in half a minute by 3 ♏ of officinal dilute hydrocyanic acid.

In 1½ minutes after the last injection he fell over convulsed; opisthotonos.

In 2½ minutes pupils began to contract.

In 5½ minutes respiration had ceased; heart still beating.

In 6½ minutes, dead.

On the post mortem examination, made immediately, the heart was found to present the slight rythmical twitching usually noticed in the right auricle after poisoning by HCy, but here observed in the walls of all the cavities save the right ventricle.

Exp. II. Injected as before under the skin of a rabbit gr. 0·010 atrop. sulph., followed in half a minute by 2 ♏ HCy.

In 2¼ minutes respiration arrested.

In 3¼ minutes re-established, 16 in the minute; spasms; cry; heart beating.
In 4¼ minutes, respiration ceased.
In 5¾ minutes, pupils contracting.
In 7¼ minutes, heart ceased; dead.
Heart twitching as in Exp. I.

Exp. III. Injected as before 0·015 gr. atrop. sulph., followed in half a minute by 2 minims HCy.
In ½ minute, respiration rapid.
In 1 minute, pupil contracting.
In 1¼ minute, opisthotonos very severe.
In 2 minutes, respiration 32, and labored.
In 3 minutes, respiration stopped.
In 5 minutes, dead.

Exp. IV. Injected the HCy first, 3 minims.
In 1½ minutes fell over in convulsions.
In 2 minutes gave 0·015 gr. atrop. sulph.
In 2½ minutes, gasping very slowly.
In 3½ minutes, dead.

Besides these, I also performed four other experiments, in which larger doses were used with the like result, as follows:

Exp. V. Injected gr. 0·2 atrop. sulph., followed in half a minute by 10 minims HCy. Death in 4¼ minutes.

Exp. VI. Injected gr. 0·2 atrop. sulph., and in half a minute 5 minims HCy. Death in 4 minutes.

Exp. VII. Injected gr. 0·1 atrop. sulph., followed in half a minute by 2 minims HCy. Death in 6½ minutes.

Exp. VIII. Injected 0·063 gr. atrop. sulph., followed in half a minute by 1 minim HCy. Death in 10 minutes.

That the rabbits did not die as the result of atropia poisoning, I take for granted, inasmuch as very many experiments on all sides prove them to be unaffected by belladonna in any form, as much as 2 grains of atropia not having produced death. Their peculiar insusceptibility to atropia therefore eliminates a difficulty often felt in similar experiments,—viz., to test which of the poisons killed. It may be objected, then, that as atropia does not act on the rabbit, it cannot be expected to act as an antidote here. Preyer, however, asserts that it does act as an antidote in the case of rabbits, and if proven here, it must *a fortiori* hold good in other animals who are more susceptible to its influence. But in order to test this question, I performed the following experiments on dogs:

Exp. IX. Injected gr. 1-10 atrop. sulph. under the skin of a small dog, followed in half a minute by 10 minims HCy. In 2 minutes he fell over with marked opisthotonos, slow and labored respiration, and was dead in 8½ minutes.

Exp. X. Injected 1-10 gr. atrop. sulph. under the skin of another dog of the same size, followed in half a minute by 7½ minims HCy. Fell over with opisthotonos, as in the former experiment, in 3½ minutes, and was dead in half an hour.

Exp. XI. Injected 1-10 gr. atrop. sulph. under the skin of a similar-sized dog, followed in half a minute by 5 minims HCy. Death with the same symptoms in half an hour.

Exp. XII. 2.31½ P.M. Injected under skin of back of moderate-sized dog 1-20 gr. atropiæ sulphatis. 2.37½. No effect appearing, injected 1-10 gr. atrop. sulph. 2.40. Pupils dilated. 2.41. Injected minims v acid. hydrocyan. dil. (U.S.P.) 2.45. Seems uneasy; licks his chaps constantly from the dryness of the mouth. 2.46. Can scarcely stand. 2.47. Fell down; howls; bladder emptied; breathing laborious; opisthotonos. 2.48. General convulsions. 2.50. Breathing rapid and laborious. 3.40. Died.

That the dogs did not die from the atropia is evident, especially by reference to Dr. Harley's experiments (On the old Vegetable Neurotics, pp. 198—202), where as much as one-fourth of a grain was given without producing more than slight poisonous action.

I do not regard my experiments as sufficiently extended to be conclusive, but as disproving a positive assertion they are of a certain importance.

On favorable report of the Committee, the following paper was ordered to be published:

Case of Hypospadias—Male Hermaphrodism.

By Prof. CHRISTOPHER JOHNSTON, M.D., Baltimore.

"It is with Hermaphrodisms," says Isidore Geof. St. Hilaire, "as with all other anomalies: as we approach them the marvellous disappears; but their scientific interest increases, and all particular facts, bound together by theory, explained by simple considerations, present themselves to the observer as the diverse but concordant consequences of a small number of principles which govern the whole domain of teratology.

"Thus it is, whether we examine the reproductive apparatus of a male hermaphrodite, or consider the totality of his physical constitution, or study him in a moral point of view, we reach the same conclusion, namely, an analogy more or less apparent with the conditions of femininity, but at bottom an essentially masculine organization as well as tastes and proclivities."

These reflections serve very appropriately to introduce the short history of a case of so-called male hermaphrodism, in which, at the age of nineteen years, the subject of it, having been previously looked upon as a girl, was suddenly transformed into a boy by the decision of experts.

The case is as follows: X. Y., aged nineteen years, is of medium height, fair complexion, blue eyes, brown hair, face feminine, voice puerile and beard sprouting rather thickly for his age and slight figure. His general appearance indicates health. It may be added that his gait and deportment are decidedly girlish, for he drops his garments when stripping for examination; and he assures us that he assumed the position of the *Venus accroupie* when, as in Father Tom's case, "*vesica sua simul erat rumpere.*"

He gives of himself the history we reproduce, and which is corroborated by his mother and brother.

At birth he was looked upon as a girl normally developed, wherefore the age of seven years saw him still in frocks. At this period of his life he was struck by a piece of falling timber upon the abdomen, and, his body undergoing investigation in consequence, a peculiarity in the conformation of his outer genital parts was observed, but its nature was not ascertained nor, of course, understood. As he was but slightly injured no connection was alleged between the accident and the abnormal development; and as no importance was attached to his "peculiarity," he was recommitted to frocks and the matter forgotten. He continued to be regarded as a girl, wore the attire of a female, and associated very intimately with girls of the period. As a child he had a remarkably fine voice, a boy's soprano, and was accustomed to sing at public concerts; but at the age of fourteen his voice suddenly changed in quality, became piping, and lost much of its original compass.

A few months ago—as he tells us—his beard began to grow, and this circumstance occasioned him great annoyance, by reason of the remark it excited. Failing in his attempts to suppress the growth of hair upon his face, and stung by the ill-natured remarks its presence evoked, he lopped off his long braids, assumed the habiliments of a man, and fled from his maternal roof. It would also appear that this conclusion was assisted by the opinion of a medical gentleman, to whom, suspecting his proper sex, he had had recourse in order to satisfy his doubts as to his sexual status.

Far from his home, chance now led him to our door, and upon his request we made a satisfactory examination.

His framework is that of a male. The mammæ are undeveloped, the thorax and limbs quite hairy, and the pubis and genitals unusually hirsute. A median fissure separated two apparent labia, and, as hair conceals all else, the impression is decidedly womanly; nor is that impression altogether effaced by drawing apart the labia, for the cleft extends deeply, seems to merge into a small vagina, above which a mentus urinarius lies under the arch of the pubis. But higher up a penis appears, one inch and three quarters in length, by three-fourths in diameter, surrounded by an imperforate glans uncovered by prepuce. A groove extends along the under surface of the penis, and runs back to within one inch of the anus, being about three inches in length. This groove, lined by mucous membrane, is the roof of the urethra, which deepens posteriorly, and is finally concealed by overhanging scrotal pouches. Traction upon these shows its termination in a deeply imbedded meatus, which lies about half an inch anteriorly to a blind fossa about the size of a crow quill in capacity and half an inch in depth. The meatus and cul de sac are comprised in an oval space about an inch in length, bounded laterally by an elevated ridge of mucous membrane, and posteriorly limited by a fourchette.

The prepuce, dividing on the under surface of the penis, is continuous with bands of mucous membrane, which simulate the labia minora of the female, and are lost upon the inner sides of the scrota. The proximate surfaces of the scrotal pouches have the character of mucous membrane, are red, vascular and moist, and are traceable into the urethra and vaginoid cul de sac.

A careful examination with the finger in the rectum and a catheter in the bladder, recognizes no trace of uterus, and the blind fossa which simulates a rudimentary vagina appears to be independent of all other parts but the mucous membrane which forms its walls. The indications of the existence of a prostate are uncertain.

A small oval glandular body occupies each inguinal canal, has the form of a testicle, but is softer to the touch. These bodies, lying just within the external abdominal ring, are the testicles, which have not descended beyond that opening.

The sexual feeling is as feebly developed as the external parts of generation —indeed it is somewhat doubtful if that feeling exist at all, as the statements of X. Y. on this point are vague and unsatisfactory. He asserts that erection of the penis sometimes takes place, accompanied with pain, but the organ follows an unnatural bent—downwards.

We have evidently presented to us in this case an instance of arrest of development dating from an early period of fœtal life. The cleft is the original sexual fissure; the corpora cavernosa have united above, leaving the shallow groove beneath; the glans is imperforate, and the rest of the spongy body is wanting; and the bladder and rectum are partitioned off from the great inferior or genito-urinary and intestinal cloaca, the fundus of which puts on the appearance of a little vagina. The sex of the individual is manifestly masculine; but X. Y. must be regarded as a very imperfectly sketched male, and as affected with hypospadias of a remarkably decided as well as interesting character.

September 5th.

Vice-Director, Wm. Pepper, M.D., in the Chair.

Eleven members present.

October 3d, 1870.

Director S. W. MITCHELL, M. D., in the Chair.

Thirteen members present.

The report of the Committee upon the *Myiarchus cinerascens* was presented, as follows:

> The Committee to which was referred the specimen of *Myiarchus cinerascens* vel *Mexicanus*, with 'fungous growth of its feet,' forwarded for investigation from the Smithsonian Institution of Washington, report that, although the great changes which have taken place in the abnormal formation by drying render it impossible to determine with certainty its nature during the life of the bird, they have been able to recognize the following characteristics: Examined with a hand magnifying glass, the adventitious structure was found to be porous, and to present a cellular appearance closely resembling that of a section of mammalian lung which had been inflated and dried. A thin slice immersed in liquor potassa or glycerin and examined with a power of 200 diameters, was seen to be composed of bands of material resembling fibrous tissue, arranged so as to form alveoli, each about 1-150th of an inch in diameter with a wall of 1-600th of an inch in thickness. These alveoli frequently contained mycelial threads, apparently of some fungus of the Leptothrix type, and occasionally portions of *Acari*, resembling the *A. Scabæii*, with their ova and excrement. It seemed improbable that this pathological product was the result of the integument covering the legs and feet, and bearing even a fanciful analogy to the *Elephantiasis* of human beings; first, because a transverse section of one of the toes showed the black scaly skin apparently unaltered beneath the fungous growth, which was readily peeled off; second, because it covered the rather elongated claws of the bird with as thick and firm a coating as that found upon the adjacent portion of the toes supplied with its modified cuticle; and thirdly, from the absence of epithelial or other similar cells in the sections examined, even with a high power (1200 diam.) Any hypothesis of its being a malignant growth springing from the connective tissue beneath the integument was likewise deemed untenable, not only on account of the circumstances just enumerated, but also because the disease was so symmetrically developed upon both lower extremities; and your Committee was therefore, with some hesitation, led to assume that the growth was really of a fungous nature, and perhaps bore some slight resemblance to those comparatively rare affections of our race, *Favus* and *Tinea tonsurans* of the nails. The only fact which militated strongly against this view was that, on burning a small fragment of the abnormal structure in the flame of a spirit lamp, a decided animal odor was evolved, and a faint cloud of ammonic-nitrate appeared when the smoking particle was brought in contact with the vapor of nitric acid. Even this might be readily explained by the existence in the mass of the various animal excretions with which such a dense covering would probably be charged.
>
> All of which is respectfully submitted,
>
> (Signed) JOS. G. RICHARDSON,
> HARRISON ALLEN.
>
> *Sept.* 23*d*, 1870.

On motion, the report was accepted, the Committee discharged, and the Corresponding Secretary directed to transmit the document to the Smithsonian Institution.

A communication was presented from Prof. Baird, of the Smithsonian Institution, accompanied by a specimen of finely pulverized material stated to have fallen in a dust shower over portions of Vermont; to examine which Drs. J. G. Hunt and William Corbit were appointed.

Sundry photographs, specimens of skin and some animal organisms, dredged from the harbor of Newport, R. I., received from Mr. Powell for distribution among the members, was presented.

November 7th, 1870.

Vice-Director, WM PEPPER, M.D., in the Chair.

Nine members present.

Dr. J. G. Hunt presented the following report in regard to the dust shower, which was accepted, the Committee discharged, and the Corresponding Secretary requested to forward the same to the authorities at the Smithsonian Institution.

The Committee to whom the dust, sent by H. A. Cutting, and said to have fallen from the air in Vermont Feb. 12, 1870, was referred for examination, make the following report:

The dust effervesced under the action of an acid.

On microscopical examination we find as follows:

1st. Much granular amorphous matter.

2d. Many round or oval granules, perfectly transparent. These disappear when treated with nitric acid. It is probable that silica forms no part of their composition.

3d. Spores of fungi or gonidia of some lichen.

4th. Diatoms.

5th. Fragments of vegetable cells, too imperfect for identification.

6th. Cells of coniferous wood—the genus Pinus—having the peculiar deposit characteristic of these cells absent in spots.

7th. Other cells of coniferous wood with smaller markings than those of the pine; five dots in a row and two parallel rows in each cell, and the cells terminating transversely and not obliquely as in the pine.

8th. Many cells of an *Alga*, resembling red snow, or *Protococus nivalis*, or *Palmella cruenta*, or *Porphrydium*, as the unfortunate plant is now called. These cells were in the stage of binary subdivision, well known in that *Alga*.

We see no reason to doubt that this dust is the ashes of some burning forest, which has been sifting the higher regions of the atmosphere with its microscopical fingers, gathering in its transit some recognized organisms and many we could not identify. The distance it may have travelled we cannot measure, nor is it important.

To the action of the winds Linnæus ascribes the importation into Europe of the *Conyza cærulea* of Canada, which now infests the north of France.

Certain lichens from the mountains of Asia, taken up by whirlwinds, travel among the clouds and, imbibing watery vapor upon the journey, grow during their peregrinations, until they fall at vast distances from where they started. "This rain of plants sometimes forms on those places a layer five or six inches deep. Men feed upon them, and what they cannot consume is given to the cattle." We have been told by æronauts that they have seen thistle seeds floating above the clouds. If those heavier bodies have been carried vast distances, it is not improbable that this fine dust may have followed a devious and far distant path.

Your Committee would request Mr. Cutting to send to this Section a copy of his paper on Dust Storms, when completed.

All of which is respectfully submitted.

(Signed) DR. J. G. HUNT,
DR. WM. B. CORBIT.

Dr. Tyson inquired of Dr. Hunt whether the effervescence with acid did not indicate that the dust was composed of carbonates, to which question Dr. Hunt replied in the affirmative.

November 21*st*, 1870.

(Conversational Meeting.)

Director S. W. Mitchell, M. D., in the Chair.

Twelve members present.

Dr. Mitchell read an interesting account of a case of supposed Guinea worm in a patient from South Carolina, showing the worm itself, presumed to be allied to the *Dracunculus*, which he intended to present at the approaching business meeting, and make application for permission to publish the paper in the next number of the *American Journal of the Medical Sciences.*

In the course of the conversational discussion to which this gave rise, Dr. Mitchell stated that a similar case had occurred at the Wills' Hospital some years since.

Dr. Coates remarked that not very long ago a horse was on exhibition, and had been seen by many medical gentlemen, in which a worm was distinctly visible within the aqueous humor. He further inquired whether it was known what mode of travelling through the tissues was adopted by the ova in these cases.

Dr. Holt thought there was little doubt that they made their first entrance into the system in the water used for drinking.

Dr. Tyson considered that their mode of progress among the structures of the body might be somewhat analogous to the remarkable amœboid movements of the white blood corpuscles.

Dr. Mitchell mentioned in this connection a case where a piece of blunt-pointed iron wire was removed at the instep of a patient whose leg it had entered above the knee some time before.

Dr. Coates finally wished to know how the ovum of this parasite could have made its way through the patient's flesh, been swallowed in the water which she drank, or even existed at all in her neighborhood, when no other specimen of its kind had ever been known to occur in the State of South Carolina.

December 5*th*, 1870.

(Annual Meeting.)

Director S. W. Mitchell, M. D., in the Chair.

Fourteen members present.

Dr. Mitchell requested that the paper of Dr. Priolieu, read at the last conversational meeting, should be referred to a committee for publication, if approved. On motion of Dr. Kenderdine, it was voted that Dr. Leidy be appointed a Committee of one, to whom the specimen and communication be referred.

Reports of the Recorder, the Corresponding Secretary and the Treasurer, each giving abstracts of the affairs and transactions of the Section in their several departments during the year, were read and accepted.

Dr. Isaac Norris and Mr. Warner were appointed to examine the Treasurer's account, and, after investigation, reported that it was found to be correct.

The annual elections being next in order, Dr. J. H. McQuillen and Mr. T. W. Starr were requested to act as tellers, and the Department proceeded to elect officers for the ensuing year, as follows:

Director, . . .	S. W. Mitchell, M. D.
Vice-Director, . .	Wm. Pepper, M. D.
Recorder, . . .	Jos. G. Richardson, M. D.
Corresponding Secretary,	Prof. J. H. McQuillen, M. D.
Treasurer, . . .	L. S. Bolles, M. D.
Curator, . . .	W. H. Walmsley.

Publication Committee.

Recorder, *ex off.*, *Chairman*,
F. W. Lewis, M. D.,
W. Pepper, M. D.,
L. S. Bolles, M. D.,
M. W. McAllister,
J. G. Hunt, M. D.

Committee of Curators.

Wm. H. Walmsley, *ex off.*, *Chairman*,
T. W. Starr,
F. W. Lewis, M. D.,
Wm. F. Norris, M. D.,
J. G. Richardson, M. D.

Committee of Auditors.

H. M. Bellows, M. D.,
W. McFadden.
J. W. Queen,

December 19*th*, 1870.

(Conversational Meeting.)

Dr. J. G. Hunt in the Chair.

Seven members present.

Mr. T. W. Starr exhibited a slide containing a specimen of a species of *Chelifer*, a parasite of the common house fly, strongly resembling a scorpion, also one showing scales of the *Platessa plana* or Flounder, mounted in carbolic acid water.

In answer to a question from Dr. McQuillen, Mr. Starr stated that his experience in the use of glycerin jelly had been by no means satisfactory.

Prof. J. H. McQuillen exhibited a remarkable specimen of so-called exostosis at the root of an upper molar tooth from the human subject, the growth being more than an inch in diameter. Dr. McQuillen gave some account of this curious case, and also showed some specimens of teeth with calcified dentine, and under the microscope some thin sections of the same.

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