

Descriptions of three new species of Mollusca, of the genus *Sphærium*, by Temple Prime.

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Dec. 24th.

Mr. LEA, President, in the Chair.

Nineteen members present.

The following papers were presented for publication :

Description of a new Quadrumanous Mammal, of the genus *Midas*, by J. H. Slack, M. D.

Description of new Plants from Texas, by S. B. Buckley.

On the genera *Panolopus*, *Centropyx*, *Aristelliger* and *Sphærodactylus*, by E. D. Cope.

Descriptions of eleven new species of the genus *Unio* from the United States, by Isaac Lea.

Descriptions of seven new species of the genus *Io*, by Isaac Lea.

Monograph of the species of *Sphærium* of North and South America, by Temple Prime.

Synopsis of the recent species of *Gastrochænidæ*, by George W. Tryon.

Synopsis of the *Selaginoids*, by Theodore Gill.

Synopsis of the *Notothenioids*, by Theodore Gill.

Synopsis of the *Harpagiferoids*, by Theodore Gill.

Synopsis of the *Chænichthyoids*, by Theodore Gill.

Dr. Slack presented for examination a Guide to the Collection of the Academy, to be printed for sale at the door of the Academy.

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Dec. 31st.

Mr. LEA, President, in the Chair.

Thirty members present.

On report of the respective committees, the following papers were ordered to be printed in the Proceedings:—

**Descriptions of Eleven New Species of the genus UNIO from the United States.**

BY ISAAC LEA.

*UNIO SQUAMEUS*.—Testâ lævi, suboblongâ, valdè compressâ, inæquilaterali, posticè obtusè angulatâ, anticè rotundatâ; valvulis subcrassis, anticè paulisper crassioribus; natibus prominulis; epidermide vel rufo-fuscâ vel tenebrosos-fuscâ, striatâ, infernè squamosâ, obsoletè radiatâ; dentibus cardinalibus subgrandibus, compressis, striatis, in utroque valvulo subduplicibus; lateralibus prælongis, lamellatis, obliquis subrectisque; margaritâ albâ et valdè iridescente.

*Hab.*—North Carolina. J. G. Anthony.

*UNIO ROSTRUM*.—Testâ lævi, subtriangulari, ad latere planulatâ, valdè inæquilaterali, posticè subbiangulatâ, anticè rotundâ; valvulis crassiusculis, anticè paulisper crassioribus; natibus prominulis; epidermide tenebrosos-fuscâ, nigricante, eradiata; dentibus cardinalibus parvis, sulcatis, crenulatis, in utroque valvulo duplicibus; lateralibus longis, lamellatis subcurvisque; margaritâ albidâ et iridescente.

*Hab.*—Davidson County, North Carolina. F. A. Genth, M. D.

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**UNIO CONTIGUUS.**—Testâ lævi, latè ellipticâ, inflatâ, inæquilaterali, posticè obtusè angulatâ, anticè rotundatâ; valvulis subcrassis, anticè crassioribus; natibus subprominentibus; epidermide tenebroso-fuscâ, valdè radiatâ; dentibus cardinalibus subgrandibus, compressis, crenulatis; lateralibus longis, lamellatis subcurvisque; margaritâ salmonis colore tinctâ et valdè iridescente.

*Hab.*—Stewart's Mill Dam, Union County, North Carolina. F. A. Genth, M. D.

**UNIO RIDDELLII.**—Testâ lævi, subtriangulari, valdè inflatâ, ad umbones tumidâ, posticè obtusè angulatâ, anticè rotundâ, subæquilaterali; valvulis crassis, anticè paulisper crassioribus; natibus valdè prominentibus, incurvis, ad apices plicis parvis indutis; epidermide fusco-olivâ, obsoletè radiatâ; dentibus cardinalibus parviusculis, subpyramidatis corrugatisque; lateralibus crassis, corrugatis, curtis subcurvisque; margaritâ albâ et iridescente.

*Hab.*—Dallas, Texas. Prof. C. G. Forshey.

**UNIO CHUMI.**—Testâ lævi, triangulari, inflatâ, ad umbones subtumidâ, posticè obtusè angulatâ, anticè rotundâ, subequilaterali; valvulis subcrassis, anticè crassioribus; natibus subprominentibus, subincurvis, ad apices paulisper undulatis; epidermide rufo-fuscâ, obsoletè radiatâ; dentibus cardinalibus subgrandibus, subcompressis corrugatisque; lateralibus subcrassis, corrugatis, subcurtis subrectisque; margaritâ vel albâ vel roseâ vel salmoniâ et valdè iridescente.

*Hab.*—Dallas, Texas. Prof. C. G. Forshey.

**UNIO HEERMANNI.**—Testâ alata, lævi, ellipticâ, compressâ, valdè inæquilaterali, posticè obtusè biangulatâ, anticè rotundâ; valvulis subtenuibus, anticè irregulariter crassioribus; natibus prominulis, vix undulatis; epidermide luteo-fuscâ, micanti, eradiatâ; dentibus cardinalibus parvis, subconicis, crenulatis, in utroque valvulo duplicibus; lateralibus longis, lamellatis subrectisque; margaritâ pallido-salmonâ, purpurescente et intensè iridescente.

*Hab.*—Medina River, Texas. A. L. Heermann, M. D.

**UNIO TESSERULÆ.**—Testâ lævi, quadratâ, cuboideâ, valdè tumidâ, valdè inæquilaterali, posticè obtusè angulatâ, anticè truncatâ; valvulis crassis, ad apices rugoso-undulatis; epidermide melleâ, micanti, radiis interruptis indutis; dentibus cardinalibus parviusculis, subconicis corrugatisque; lateralibus curtis, obliquis rectisque; margaritâ argenteâ et valdè iridescente.

*Hab.*—Nolachucky River, Tenn. J. G. Anthony.

**UNIO NORTHAMPTONENSIS.**—Testâ lævi, oblongâ, valdè compressâ, ad latere planulatâ, posticè obtusè biangulari, anticè obliquè rotundatâ, valdè inæquilaterali; valvulis subcrassis, anticè crassioribus; natibus prominulis; epidermide vel ochraceâ vel luteo-fuscâ, obliquè radiatâ; dentibus cardinalibus crassis, striatis, in utroque valvulo duplicibus; lateralibus prælongis, validis, corrugatis, subrectis lamellatisque; margaritâ vel albâ vel purpurascete vel salmonis colore tinctâ et valdè iridescente.

*Hab.*—Connecticut River, at Northampton. At Springfield, by L. Shurtleff, M. D. Below Hartford, T. R. Ingalls, M. D. Neuse River, N. C., E. Emmons, M. D.

**UNIO WARDII.**—Testâ tuberculatâ, subtriangulari, compressâ, subæquilaterali, posticè et infernè emarginatâ, anticè rotundâ; valvulis crassiusculis, anticè crassioribus; natibus prominulis, ad apices rugosis; epidermide vel luteolâ vel luteo-virente, maculis triangularis indutis; dentibus cardinalibus subgrandibus, compressis sulcatisque; lateralibus sublongis, subcrassis, obliquis rectisque; margaritâ argenteâ, interdum roseâ et iridescente.

*Hab.*—Walhonding River, Ohio, J. C. Ward. Wassepinicon River, Iowa, Dr. Foreman. Coal River, Virginia, Dr. Hartman.

**UNIO SAMPSONII.**—Testâ lævi, oblongâ, inflatâ, ad umbones valdè tumidâ, posticè emarginatâ, anticè rotundâ, valdè inæquilaterali; valvulis crassis, an-

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tice paulisper crassioribus; natibus prominentibus, tumidis, incurvis, ad apices vix undulatis; epidermide luteolâ, radiis viridis vestitis; dentibus cardinalibus subgrandibus, erectis corrugatisque; lateralibus crassis, curtis, corrugatis subrectisque; margaritâ argenteâ et paulisper iridescente.

*Hab.*—Wabash River, New Harmony, Indiana. James Sampson.

**UNIO VESTITUS.**—Testâ lævi, ellipticâ, compressâ, inæquilaterali, posticè obtusè angulatâ, anticè rotundâ; valvulis subtenuibus, anticè paulisper crassioribus; natibus prominulis; epidermide vel luteâ vel luteo-fuscâ, politâ, radiis obliquis viridis vestitis; dentibus cardinalibus parvis, compressis, acuminatis, crenulatis, in utroque valvulo duplicibus; lateralibus sublongis, lamellatis, subobliquis corrugatisque; margaritâ albidâ et splendide iridescente.

*Hab.*—Ogeechee River, Georgia. Major Le Conte and J. G. Anthony.

### Descriptions of Seven New Species of the Genus IO.

BY ISAAC LEA.

When I proposed in 1831\* to form the new genus *Io* for Mr. Say's *Fusus fluviatilis*, there were no other allied species known to naturalists. I then proposed also to change the specific name to *fusififormis*, as being more appropriate, and I gave a figure under this name. At that time the canons of nomenclature were not so well understood nor so strict as they have since been; and it is only justice to Mr. Say to relinquish my specific name, and to replace his. Subsequently in 1834, I proposed a new species under the name of *Io spinosa*, (Trans. Am. Phil. Soc., vol. v. pl. 19, fig. 79.) More recently Mr. Anthony, in the Proceedings of the Academy, (1860,) proposed four new species; three of which I think belong to the two previously established species. Mr. Lovell Reeve, in his beautiful "Conchologia Iconica," has recently issued among his monographs one of the genus *Io* with numerous plates and full descriptions. In this he has introduced a number of species, most of which I think more appropriately belong to Prof. Haldeman's genus *Lithasia*—the species of which form a very excellent group, which he separated from *Melania* and *Anculosa*—but which Mr. Reeve does not seem to recognise. Of the true *Io* I also think he has considered several varieties as species.

**IO NODOSA.**—Testâ tuberculatâ, elevato-conicâ, virido-corneâ, vittatâ; spirâ regulariter conicâ; suturis valdè impressis; anfractibus instar denis, planulatis, medio tuberculatis, infrâ striatis; aperturâ parviusculâ, rhomboideâ, intus vittatâ; labro acuto et sigmoideo; columellâ albâ et valdè contortâ; canali breviusculâ.

*Hab.*—Tennessee River, Alabama? † Wm. Spillman, M. D.

**IO ROBUSTA.**—Testâ canaliculatâ, paulisper tuberculatâ, elevato-conicâ, pallido-corneâ, infrâ obsoletè vittatâ; spirâ regulariter conicâ; suturis valdè impressis; anfractibus instar denis, apud apicem planulatis, infrâ canaliculatâ; aperturâ parviusculâ, rhomboideâ, intus vittatâ; labro acuto et sigmoideo; columellâ pallido-salmonîâ; canali breviusculâ.

*Hab.*—Tennessee River, Alabama? Wm. Spillman, M. D.

**IO VARIABILIS.**—Testâ lævi, elevato-conoideâ, subfusiformi, vel vittatâ vel intense purpureâ vel virente; spirâ regulariter conoideâ; suturis leviter impressis; anfractibus instar novenis, planulatis, in medio angulatis; aperturâ elongato-rhomboideâ; labro acuto et sinuoso; columellâ vel albidâ vel purpureâ et valdè contortâ; canali attenuato-constrictâ.

*Hab.*—Tennessee River, Alabama? Wm. Spillman, M. D.

\* Trans. Amer. Phil. Soc., January, 1831.

† Dr. Spillman simply gave Tennessee River as the habitat of these species, but did not mention what part. They are probably from Alabama.

Io *MODESTA*.—Testâ lævi, conicâ, virido-corneâ; spirâ regulariter conicâ; suturis impressis; anfractibus novenis, planulatis, in medio angulatis; aperturâ parvâ, regulariter rhomboideâ; labro acuto et sinuoso; columellâ albâ et valdè contortâ; canali curtâ et effusâ.

*Hab.*—Tennessee River, Alabama. Wm. Spillman, M. D.

Io *SPILLMANII*.—Testâ lævi, attenuato-conicâ, pallido-corneâ; spirâ regulariter conicâ, supernè striatâ; suturis leviter impressis; anfractibus instar denis, planulatis, in medio obtusè angulatis; aperturâ parvâ, rhomboideâ; labro acuto et sinuoso; columellâ albâ et valdè contortâ; canali curtâ et subeffusâ.

*Hab.*—Tennessee River, Alabama? Wm. Spillman, M. D.

Io *GRACILIS*.—Testâ lævi, conicâ, pallido-purpureâ; spirâ regulariter conicâ; suturis regulariter impressis; anfractibus instar novenis, planulatis, in medio angulatis; aperturâ parviusculâ, rhomboideâ; labro acuto et sinuoso; columellâ pallido-purpureâ, valdè contortâ et deflectâ; canali curtâ et latè effusâ.

*Hab.*—Coosa River, Alabama. Wm. Spillman, M. D.

Io *VRIDULA*.—Testâ lævi, cylindrico-conoideâ, virente; spirâ subelevatâ; suturis parum impressis; anfractibus instar novenis, planulatis, in medio obtusè angulatis; aperturâ parviusculâ, rhomboideâ; labro acuto, sinuoso; columellâ ad basim purpureâ, parum contortâ; canali curtâ et dilatâ.

*Hab.*—Coosa River, Alabama. Wm. Spillman, M. D.

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**A Revision of the species of BACULITES, described in Dr. Morton's "Synopsis of the Cretaceous Group of the United States."**

BY W. M. GABB.

In the above mentioned work, Dr. Morton described six species of *Baculites*, two of which (*B. compressus* and *B. ovatus*) had been previously characterized and named by Say. All of these species were published with very short and meagre descriptions, although the illustrations were pretty accurate; the original specimens, however, are still preserved in the Museum of the Academy, and from them I have been enabled to arrive at tolerably satisfactory results, in the determination of the true relations of the several forms.

Mr. Say's species have been elaborately described and figured by Messrs. Hall and Meek in the Transactions of the American Academy of Arts and Sciences of Boston, vol. v. 2d series. I shall therefore not refer to them again, further than to say that they are very distinct from the species with which I am now occupied.

*Baculites labyrinthicus* Morton, Syn. p. 44, pl. 13, fig. 10.

This is probably the only form among those described by Dr. Morton which is entitled to rank as a valid species, unless *B. columna* should prove to be distinct from *B. carinatus* = *B. anceps*.

*Sp. char.* *B. testâ* compressiusculâ, tuberculis serie duplici positis, dorso subacuto, ventre plana, aperturâ incognitâ; septis lobatis.

Shell subcompressed, section rounded, pentagonal; dorsum acute; ventral side flattened, bounded by a row of subacute nodes on each side; midway between each of these nodes and the dorsum is another one of about the same size. Longitudinally between the nodes, the surface is slightly excavated; laterally, the excavation is almost invisible. Septum; dorsal lobe broader than the dorsal saddle, not so long as the superior lateral lobe, deeply excavated by a broad sinus in the middle, on each side of which extends a branch which is separated into one large and one small fork, the inner or largest one being trifurcate, above the outer one there is another smaller process, dorsal saddle divided for more than half its length by a long serrate process, each

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branch of the saddle being bilobate; superior lateral lobe one-fourth longer than the dorsal lobe; extremity divided into two very long slender parallel branches, the one on the dorsal side trifurcate, the other simply serrate and sometimes curved towards the other; above these on each side are two smaller processes, the upper one smallest, and those on the dorsal side somewhat larger; superior lateral saddle wider than the dorsal, of the same general form, except that the dorsal side is widest; lateral lobe about half as large as the superior lateral, bifurcate at the extremity and with one simple process above on each side; lateral saddle simple, divided at the extremity and not so large as the lobe; inferior lateral lobe about as large as the preceding saddle, serrate on the sides and bifurcate at the end; ventral saddle broader than the lateral, about as long and somewhat more profusely lobed, but not so distinctly; ventral lobe small, trifurcate at the end, and with two or three uniform processes at the sides.

Pl. iii. fig. 1 illustrates the septum and a section of this species taken from the specimen figured by Dr. Morton, loc. cit. Pl. 13, f. 10.

This species can be at once distinguished by its distinct pentagonal form and the two rows of tubercles, one at the edge of the ventral face, the other half way between these and the dorsum.

*Dimensions*.—Width, .7 in.; diameter in the middle, .5 in.; width across the nodes on the ventral side, .4 in.; width of same between the nodes, .3 in.; distance longitudinally between the nodes, .5 in. These measurements may vary slightly in different individuals, but are correct for Morton's original specimen.

*Baculites anceps* Lam., An. S. Vert. t. 7, p. 648, No. 2.

*B. vertebralis* Defr., D. Sc. Nat. t. 3, Sup. p. 160.

*B. dissimilis* Desm., Jour. de Phys. t. 85, p. 48, No. 3, pl. 2, f. 4—6.

*B. vertebralis* Blainv., Malac. pl. 12.

*B. Fayasii* Haan, Monog. Am. et Goni. p. 155, No. 2.

*B. dissimilis* Haan, *id.* 155, No. 3.

*B. anceps* d'Orb., Desh., Brown, Hisinger et auct.

*B. carinatus* Mort., Synopsis, p. 44, pl. 13, f. 1.

*B. asper* Mort., *id.* p. 43, pl. 1, f. 12, 13, and pl. 13, fig. 2.

*B. Tippaensis* Con. Jour. Acad. Nat. Sci., 2d ser., vol. iii. p. 334, pl. 35, fig. 27.

*B. Spillmannii* Con., *id.* p. 335, pl. 35, fig. 24.

*B. testâ compressiusculâ, lævi, transversim undatâ vel tuberculatâ, dorso subacuto vel obtuso, ventre crassiore obtuso; aperturâ obliquatâ, suprâ elongatâ, acutâ, lateribus sinuatâ; angulo, 6°; septis lobatis.*

Shell subcompressed, section variable, sometimes nearly circular or ovoid, at others strongly pyriform. Dorsum subacute, marked by a flattened angular ridge broadly rounded or undulated; ventrum always broad, regularly rounded. Sides smooth, marked by faint undulations, parallel with the border of the mouth or by large crescentic or triangular nodes, the apex always downwards. Septum: dorsal lobe about as wide as dorsal saddle, deeply emarginate in the middle, each branch with about three serrations internally and one or two externally; above the latter there are two or three processes; dorsal saddle divided in the middle, the process on the dorsal side, trilobate, the other bilobate; superior lateral lobe smaller than the dorsal, divided at the extremity into two compound processes, with two or three smaller ones above on the dorsal side, and one less on the ventral side; superior lateral saddle as wide or wider than the dorsal and marked in a similar manner; lateral lobe like the superior lateral but smaller; ventral saddle small, simple and trilobate; ventral lobe smaller than the corresponding saddle, trifurcate at the extremity and with two small processes above.

It will be seen that, notwithstanding the apparently great external differ-

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ence between the form described by DeFrance as *B. vertebralis*, and Dr. Morton's *B. asper* (or *B. Spillmannii* Con.), still there is no character by means of which we can satisfactorily separate them. Pl. iii. fig. 2 is from the European form; figure 3 is from a young individual of Morton's *carinatus*, which is the same as the variety figured by d'Orbigny; figure 4 is from one of Morton's original specimens of *B. asper*, which is characterized by a broad dorsum and large triangular nodes. *B. Spillmannii* Con. is a distinct link between the variety *asper* and the undulated form; the nodes on Mr. Conrad's specimen of that species being elongated into prominent crescents. Between that and the rougher forms of Morton's *carinatus*, (the typical variety of *B. anceps*), it is impossible to draw a dividing line. Again, some of Dr. Morton's specimens of this last named species are perfectly smooth, while others are so rough that when I thought that distinct from *B. asper*, I did not know to which species to refer them. Mr. Conrad's *Tippaensis* is the typical form of *B. carinatus* of Morton.

We have now but one other form left, and to ascertain positively its relations, will require a larger series of specimens than I have yet seen. I refer to *B. columna* Morton, Syn., p. 44, pl. 19, fig. 8. This species was described by Dr. Morton from half a dozen fragments of about an inch in length. I have been unable to discover any trace of a septum in any of them. They are elliptical to ovate, and marked rounded, sinuous ribs which cross the dorsum, pass downwards at a slight angle to about the middle of the side where they curve and then run transversely around the ventrum. The angle at which these ribs bend upwards from the middle to the dorsum is not more than half as much as in the preceding species, but in one or two specimens I have detected another series of lines which may be lines of growth, and which would give the mouth much the shape of that in *B. anceps*. Dr. Morton's illustration of this form is almost utterly worthless. He represents the ribs separated at too great distance, and much too distinct. This direction is also incorrect; they should bend twice as abruptly from the middle toward the widest end, on the side nearest the figure of *Rostellaria pennata*, which is the dorsal side, and should be less distinct towards the ventrum, since on that side they are sometimes almost obliterated. It is by no means improbable that this is merely the young of one of the many varieties of *B. anceps*. It is certainly not a *HAMIZ* as d'Orbigny suggested in his *Prodrome de Paléontologie Stratigraphique*.

#### On the Mollusca of Harper's Ferry, Virginia.

BY GEORGE W. TRYON, JR.

In the month of June, 1859, I was called by business to Harper's Ferry, and while there, having a very brief period of leisure at my disposal, I employed it in making a collection of the shells of the vicinity. I was struck at the time with the exceeding abundance of these, both in individuals and species, and also by the prevalence of certain external characters, much more prominently marked, than in the same shells from the vicinity of Philadelphia. These peculiarities, on a recent re-inspection of the shells, have appeared to me worthy of mention; and the subject of geographical distribution may receive some new light from the publication of a list of the Mollusca of the mountainous region of Virginia. The species collected are as follows:

#### GASTEROPODA.

##### MELANIADÆ.

These shells were numerous upon the rocks in the bed of the Potomac, just below the junction of the Shenandoah River, and at the U. S. Rifle Armory on the latter stream.

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*Melania Virginiaica*, *Gmelin*, sp.—The whorls well rounded, and entire to the apex. Frequently smooth, but the carinated varieties more abundant; (*M. multilineata* Say); on these, the carinæ, varying from three or four to eighteen on the body whorl, are raised and sharp, and on the more crowded ones, the interstices are densely striated by the longitudinal lines of growth. All the specimens are distinctly banded with brown. Length reaching 1.5 inches.

*Leptoxis isogona*, *Say*. Three specimens found.

*L. dentata*, *Couthouy*. Very numerous. Epidermis generally a rather brilliant green. Transverse brown bands, two near the base, and one near the suture.

*L. nigrescens*, *Conrad*. Numerous. Inhabiting with *L. dentata*.

*L. carinata*, *De Kay*. Very abundant. The carina is prominent and sharp, giving the shell a trochiform appearance. Color light horn, with faint revolving brown bands.

#### RISSOIDÆ.

*Amnicola limosa*, *Say*. Exceedingly abundant.

#### VIVIPARIDÆ.

*Vivipara decisa*, *Say*. Rare. Epidermis distinctly striate, with impressed spiral lines.

#### VALVATIDÆ.

*Valvata tricarinata*, *Say*. Very numerous, but not so much so as the variety *bicarinata*, *Lea*. A few specimens of the smooth variety *simplex* were gathered. None of the individuals collected had attained more than one-eighth inch diameter.

#### HELICIDÆ.

The towering wooded hills on the south side of the Potomac and Shenandoah, are thickly inhabited by Pulmonates. Every projecting rock which arrests the downward course of the mountain torrents, has gathered around its base numbers of dead shells, which are found in all stages of preservation. In some places, where well protected, these shells actually lay in heaps. In a decayed log by the water side, nearly one hundred specimens of *Helix* and *Pupa* were obtained. A close search on the hills on the north side of the Potomac failed to discover a single species of *Helix* or *Pupa*.

*Helix albolarbris*, *Say*. Diameter 1.25 inch. Spire rather depressed, and aperture sub-triangular. Reflected lip very broad and flat, with a tendency to form a tooth-like lamina near the umbilical region. Striæ coarse and crowded.

*H. thyroides*, *Say*. A few specimens obtained.

*H. monodon*, *Rackett*. This species appears to be rare at Harper's Ferry. I found but one individual.

*H. hirsuta*, *Say*. Common. All that were collected are entirely destitute of the hairy epidermis. There is considerable difference in the convexity of the upper surface, the spire being sometimes rather depressed.

*H. concava*, *Say*. Dr. Binney, in his "Terrestrial Mollusks," states that the upper and lower extremities of the lip are united in this species by a thin callus on the columella. In the single specimen found by me, the callus is very prominent.

*H. profunda*, *Say*. Numerous. Attaining quite a large size, and with close, narrow, raised striæ. But one brown revolving band is visible.

*H. pulchella*, *Müller*. Rare.

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*H. tridentata*, Say. In many of the specimens collected, the spire is scarcely at all elevated, and in one or two the upper surface is quite plane. Very common.

*H. labyrinthica*, Say.

*H. chersina*, Say. I discovered a very large number of *H. chersina* and *labyrinthica* in the old log previously alluded to.

*H. lineata*, Say.

*H. arborea*, Say.

*H. indentata*, Say.

*Pupa armifera*, Say. Exceedingly abundant.

*P. contracta*, Say. Three specimens obtained.

*Bulimus marginatus*, Say. Very numerous. The reflected lip is larger in proportion than in Philadelphia specimens.

No specimens of *Succinea* were obtained.

#### LIMNÆIDÆ.

*Limnæa decidiosa*, Say. I found some hundreds of this species on the rocks at the junction of the Potomac and Shenandoah Rivers.

*L. columella*, Say. Rather abundant. Specimens small size.

*L. catascopium*, Say. Rare. Three or four obtained.

*Physa heterostropha*, Say. One specimen.

*Planorbis lentus*, Say. One specimen found.

*P. trivolvis*, Say. Numerous, but not attaining a large size.

*P. bicarinatus*, Say. Very abundant; much more so than the preceding species. The carinæ, as in all the other fresh water mollusca from this locality, are very prominent and sharp.

*P. parvus*, Say. A few individuals were procured.

*P. exactus*, Say. Rare. Five or six only were found.

*Ancylus rivularis*, Say. One specimen only, obtained from *V. decisa*, to the body whorl of which it was attached.

#### CONCHIFERA.

##### CYRENIDÆ.

*Sphærium sulcatum*, Lam. A very few specimens were found; the rocky bed of the river being probably unfavorable to the multiplication of bivalve shells. Those obtained possessed the same rugose epidermis which seems to distinguish all the shells from this locality.

##### UNIONIDÆ.

*Unio cariosus*, Say. This species attains a large size in the Potomac River; the individuals are not numerous, however, at Harper's Ferry. The paucity of the Unionidæ is remarkable in a region where the Gasteropoda, both terrestrial and fluviatile, are so abundant.

*U. complanatus*, Solander, (species.) Valves very thin and shallow, with the epidermis growing beyond their margins. The surface brilliant green in the young shell, and brown in the adult. Not one specimen in ten exhibits any green rays, even in young specimens.

*U. Fisherianus*, Lea. Several good specimens taken.

*U. nasutus*, Say. This species, like *U. complanatus*, very seldom exhibits a rayed surface.

*U. ochraceus*, Say. A single individual obtained.

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*U. radiatus*, Lam. Beautiful specimens occur on the Potomac, with a light green polished epidermis, with broad dark rays, and frequently pencilled rays in the intermediate spaces.

*Margaritana undulata*, Say. (Sp.) Very rare. Nacre delicate pink, epidermis in adult shells jet black, much eroded at the beaks.

*M. marginata*, Say. (Sp.) I collected a number of specimens. They were all of small size. Epidermis in the young shells elegantly rayed.

*Anodonta fluviatilis*, Dillwyn. (Sp.) A few individuals were taken; their surface is almost a uniform dull brown, vastly inferior in beauty to those from the vicinity of Philadelphia.

*A. implicata*, Say. One specimen.

*A. edentula*, Say. One perfect young shell, and several larger odd valves were taken; they exhibit the same uniformity of color as *A. fluviatilis*.

The above shells were all collected within the space of two hours, such was their great abundance. A more prolonged search would doubtless add a few more species to the list, particularly among the smaller terrestrial shells. The Molluscous fauna of Harper's Ferry is distinguished for the development of heavy lines of growth and acute prominent carinæ on the shells of the species; and in the terrestrial shells, by the depression of the spire. It is strange that a climate which has evidently exercised some influence on the growth of the Mollusca, has still permitted a vast multiplication of individuals.

On *SQUALUS AMERICANUS*, Mitchell, referring it to the Genus  
*ODONTASPIS*, Agassiz.

BY CHAS. CONRAD ABBOTT.

In his "Report in part of the Fishes of New York," Dr. S. L. Mitchill makes mention of a species of shark, under the title of *Squalus Americanus*, with the suggestive note, "Caught almost every summer at the very wharves of New York, ten or more feet long."

Again, nearly a year afterwards, (Dec. 8th, 1814,) in the Trans. of the Lit. and Phil. Soc. of New York, vol. 1, p. 483, he mentions and partially describes, under the same name, this species, as follows:—

"*Squalus Americanus*. Long-toothed Shark. With oblong sharp teeth, each of which has a little one on each side, at its base.

This fish is occasionally taken at the very city of New York. He, when he comes, frequents a certain place near the great market, on account of the dead fish and offal thrown into the water there. When the people see one of these sharks prowling about, they bait a hook with a piece of meat or a fish, and not unfrequently catch him.

The teeth of this species are found abundantly in the alluvial country of North America. They are particularly met with in digging wells near the Potomac and James Rivers. On the former, they are found as high as Alexandria; and on the latter, in the city of Richmond itself. The long, sharp, narrow tooth, almost resembling a horse-shoe nail, with its two little auxiliaries is very plain and characteristic. This I know, by comparing the fossil Virginian species in my possession with those in the jaws of sharks taken at New York.

The mouth of one that was killed during the summer of 1813, was nearer the snout than in many other species. Both jaws had five rows of teeth in front. They were nearly an inch long and not jagged at the sides. Some of them have the rudiments of little teeth on each side, at the base."

For a third time, in the American Monthly Magazine, vol. 2, p. 328, Dr. Mitchill somewhat describes it, proposing for the species the specific appellation 1861.]

tion "*macrodus*" as a substitute for "*Americanus*;" but the former quoted description is sufficient to determine positively the intended species, and having three years priority, the specific name must be retained.

The article in the *American Monthly Magazine* we have not been able to examine.

In the Museum of the Academy, there is preserved a specimen, mounted, and somewhat distorted; and a set of jaws, belonging to the same species, which, if it were not for the descriptions of Mitchill, would be considered non-descript; as the specimens present certain characteristics of dentition not exhibited by any heretofore well defined species of our coast, although in perfect correspondence with the dentition of *Odontaspis taurus*, *O. ferox*, and *Lamna cornubica*; but as none of the above mentioned three sharks are known to be inhabitants of our coast, and as *Eugomphodus griseus*, to which the description of Mitchill might be possibly referred, differs in the dentition from *Odontaspis Americanus*, by the dentulures being vaguely defined prominences instead of sharply defined basal teeth, which is emphatically dwelt upon by Mitchill, it is evident that the *Squalus Americanus*, Mitchill, is the species that is described in detail in this paper, and which, belonging to the genus *Odontaspis*, Agassiz, will hereafter be so referred.

In the "*Recherches sur les Poissons fossiles*," tome 3d, p. 287, Professor Agassiz established a sub-genus from *Lamna*, Cuv., under the title *Odontaspis*, for the reception of two species, *Odontaspis taurus* and *O. ferox*. This sub-genus he characterized as follows:—

Les dents de *Lamna* sont plates et se rapprochent par leur forme des dents d'*Otodus*; dont elles different cependant par leur moindre largeur et par leurs cones lateraux beaucoup plus petites. Les dents d'*Odontaspis*, au contraire, sont plus cylindriques, plus tordues, et ont des cones lateraux plus long et plus pointus.

Müller and Henlé\* have raised the sub-genus, framed by Agassiz, to the rank of a genus, giving as its characters,

Ouvertures branchiales grandes, toutes situées en avant des pectorales. Eventes tres petites. Second dorsale et anale grandes. Lobe superior de la caudale allonge comme dans les carcharias. Fossette caudale indistinct ou manquent complètement. Les carenes de la queue des Lamnies manquent.†

The specimen in the Academy's Museum, to which we consider the descriptions of Mitchill applicable and belonging, is included in the scope of the above generic diagnoses; and the affinities of the specimen are as inclusively comprehended in the enumerations of the characters of *Odontaspis*, in this, the third species of the genus, as its specific variances are distinctly exhibited, from either *O. taurus* or *O. ferox*.

#### ODONTASPIS AMERICANUS, Abb.

*Squalus Americanus*, Mitch. Rep. in part of Fishes of New York, p. 27.

*Squalus Americanus*, Mitch. Trans. Phil. and Lit. Soc. of N. Y. p. 488.

*Squalus macrodus*, Mitch. Amer. Month. Mag. vol. 2, p. 328.

*Squalus Americanus*, De Kay, Fishes of New York, p. 366.

*Squalus Americanus*, Storer, Synop. Fishes of North America, p.

*Squalus Americanus*, Gill. Cat. Fishes of East Coast of N. Amer. in Proc. Acad. N. S., Philad. 1861, p. 60.

Head broader and blunter than in *Odontaspis taurus*. The extremity of the snout approximates to three times as far in advance of the anterior margin of the orbit, as the posterior margin of the orbit is anterior to the angle of the mouth. The nostrils are situated well forward and near the extremity of the

\* System. Besch. der Plagiostomen.

† Recher. sur les Pois. foss., tome 3, p. 287.—Foot note.

upper jaw. The margin of the upper jaw is somewhat distinctly defined, but not as prominently as in *Odontaspis taurus*, according to the figure given by Müller and Henle. The pointed, protruding snout resembles in outline, but is much less prominent than in *Eugomphodus griseus*, which is the nearest allied species found on our coast.

A ready point of difference with which to distinguish the *Odontaspis Americanus* from *Eugomphodus griseus*, is the position of the second dorsal, which in the former, is anterior to, and in the latter, posterior to the anal fin.

Teeth, with a single toothlet on either side, but one occasionally wanting.

The first tooth in the upper and lower jaws, smaller than the adjoining teeth; then follow, in the upper jaw, on each side, two very long teeth; at either side of these, another pair of somewhat smaller teeth; then two teeth increase somewhat in length, then the remainder gradually decrease.

In the under jaw from the first pair, the teeth decrease gradually.

The fins generally are similar to those of *Odontaspis taurus*, except the caudal fin, which is very much shorter and broader.

The posterior margin of the first dorsal in *Odontaspis taurus*, the nearest allied species, is posterior to the anterior margin of the ventrals, but in *Odontaspis Americanus*, the first dorsal is in advance of the ventrals, a distance equal to about half the length of the base of the first dorsal. The same difference exists with reference to the second dorsal and anal, with this species and *Odontaspis taurus*.

The head and body, the former especially, are somewhat shrunken and distorted by the mounting—but the measurements will be found nearly correct. Those measurements unattainable are marked *approximating*.

Total length.....	105 inches.
Tip of snout to nostril, approximating.....	5 “
Nostril to mouth, approximating.....	3½ “
Mouth to anus, approximating.....	60 “
Anus to anal fin, approximating.....	12 “
Base of anal fin.....	5½ “
Anterior margin of anal fin.....	5½ “
Anal to caudal fin.....	3¾ “
Length of caudal fin, ant. inser. to extremity.....	22 “
Anterior margin of under flap of caudal.....	8½ “
From pectoral to ventral.....	25¼ “
Post. bord. of pec. to ant. bord. of first dorsal.....	25 “
Base of first dorsal.....	7½ “
Anterior margin of first dorsal.....	8 “
Post. margin of first dorsal to ant. margin of ventrals.....	11¾ “
Base of second dorsal.....	5½ “
Anterior margin of second dorsal.....	7 “
Base of ventrals.....	8½ “
Anterior margin of ventrals.....	6¾ “
Distance between nostrils, approximating.....	3 “
Width of mouth, angle to angle.....	9¾ “
Margin of upper jaw.....	17¾ “
Margin of lower jaw.....	13 “

The specimen described was taken off “Beesley’s Point,” coast of New Jersey, by Messrs. R. Stites, S. Ashmead and Dr. Leidy.

According to Dr. Mitchill, this shark was at one time, one of the most abundant species, but at present, judging from the fact of the species remaining so long undetermined, it must be a rare representative of the *Squalidæ* on the Eastern Coast of North America.

Monograph of the Species of SPHÆRIUM of North and South America.

BY TEMPLE PRIME.

The genus Sphærium was characterized under its present name by Scopoli, in 1777; since that time, however, it has received various denominations, and the one under which it has been most generally known, that of *Cyclas*, was applied to it in 1792 by Bruguière. Mr. Gray revived the term of Sphærium in 1847, and his example has been followed by the conchologists of the continent of Europe. I was the first in this country to discard the name of *Cyclas* for that of Sphærium.

The species composing this genus are small bivalves inhabiting rivers, lakes, streams, and still waters; they are plentifully distributed all over the globe, but as far as present experience goes, seem to be more abundant on the northern portion of this hemisphere than elsewhere.

The shell is transversely oval, nearly equilateral, thin, fragile, sometimes translucent, with beaks more or less raised; its entire surface is transversely striated and covered with a light epidermis varying in color; the margins are rounded, obtuse or angular. The interior of the valves is smooth and varies in color; the muscular impressions are not very distinct; the posterior one is slightly the largest; the pallial impression is parallel with the basal margin; it is narrow and always simple. The hinge margin is very variable; it is usually composed of two small teeth in each valve; at times, however, they are single in one and double in the other, or else single in both valves; these teeth are occasionally rudimentary, or even nearly obsolete. The lateral teeth placed on each side of the cardinal teeth are double in the right valve and single in the left one; the anterior lateral tooth is usually the shorter. The ligament is external; it is short, not very conspicuous, and is always found on the longer portion of the shell.

The animal of Sphærium has a broad foot, capable of considerable extension; it uses it either to bore holes in the mud, in which it sinks the posterior portion of the shell, or as means of locomotion. The syphonal tube is double and very retractile; it is often white like the foot but at times it is colored.

The habits of these molluscs are very similar to those of *Pisidium*, with which they are often found living. The species of Sphærium are less abundant in individuals than those of *Pisidium*; they are also less generally distributed, and are more confined to certain localities than the latter.

Fam. CYCLADES Fer.

SPHÆRIUM Scopoli.

*Pectunculus*, Lister, 1685. *Musculus*, Gault, 1742. *Tellina*, Linn., 1758. *Sphærium*, Scop., 1777. *Cardium*, Da Costa, 1778. *Cyclas*, Brug., 1782. *Nux*, Humphr., 1797. *Musculium*, Link. 1807. *Cornea*, Pisum, Megerle, 1811. *Corneocyclas*, Fer., 1818. *Amesoda*, Rafin., 1820. *Pisidium*, Verany, 1846. *Cycladites*, Krug, 1848.

*Generic characters.* Animal oval, lobes of the mantle simple, united posteriorly, and terminating in two short syphons, joined at their base, without tentacles; mouth oval shaped, small; tentacles of the mouth short and narrow; gills rather broad, nearly equal, united behind the foot; foot narrow, elongated.

Shell oval, nearly equilateral; beaks somewhat inflated and prominent; hinge margin narrow, with two primary teeth in each valve; lateral teeth elongated; pallial impression simple; ligament external, narrow, situated on the longer portion of the shell.

[Dec.

*Description of species.\**

a.—Species with rounded but not protuberant beaks.

1. *Sph. sulcatum*, Lam.

*Cyclas sulcata*, Lam., An. s. vert. v. 560, 1818.

*C. Saratogea*, Lam., loc. sub. cit. v. 560, 1818.

*C. similis*, Say, Nich. Encycl. Amer. edit. ix. pl. 1, fig. 9, 1818.

*C. lasmampsis*, Rafin., Il. scie. Phys. ix. 319, pl. 82, f. 19, 20, 1820.

*C. solida*, DeKay, Rept. 220, pl. xxv. f. 265, 1842.

*C. gigantea*, Prime, Bost. Proc. iv. 157, 1851.

*C. ponderosa*, Prime, loc. sub. cit. iv. 157, 1851.

*C. striatina*, Lam., Fer. in Mag. Zool., 1835.

*C. rhomboidea*, Say, C. B. Adams, Vermont cat. 18, 1842.

Animal white, tubes a light orange color.

Shell transversely oval, nearly equilateral, light in texture for its size; posterior margin somewhat more pointed; anterior rounded, base slightly curved; valves convex; beaks full, raised above the outline of the shell; posterior portion a little longer; sulcations coarse, regular; epidermis dark chestnut brown; interior light blue; hinge margin narrow, nearly a straight line; cardinal teeth small, indistinct, situated somewhat towards the anterior side, double in both valves, and so placed as to assume the shape of the letter V reversed; lateral teeth on a line with the primary teeth, large, strong and prominent.

The young is more equilateral than the adult; more compressed; it presents the shape of a quadrilateral, it is of a light lemon color, the striations are as heavy as those of the mature shell.

Long. 11-16; lat. 71-61; diam. 5-16 inches.

*Hab.* North America, in the New England States, and in the States of New York, New Jersey, Pennsylvania, Ohio, Michigan, Wisconsin and Alabama.

(Cabinet Acad. of Nat. Sci. of Phila., Garden of Plants in Paris. Mus. Delessert, Jay, Prime and others.)

This, our most common and widely distributed species, living as it does in so many different sections of the country, presents at times great variations in size, color and general appearance. It can, however, be easily recognized by its very elongated and equilateral form, and by the beaks which are uniformly full and convex; they are often eroded. The young is often of an uniform light lemon color, which, as the shell matures, becomes gradually darker from the beaks downwards until the new shade covers the whole surface of shell; in certain intermediate stages of growth, the shell is marked with a zone of yellow on the inferior margin; the color of the adult varies from a greenish brown to a dark chestnut. The young shell has at times, owing to the variations which exist between it and the adult, been taken for a different species; by some it has been taken for the *Sph. rhomboideum*.

The hinge margin is generally straight. I have specimens, however, from Alabama, Pennsylvania and Rhode Island, in which it is slightly curved. One of the distinctive characters of this species is that the lateral teeth are never placed at an angle with the cardinal teeth; they are generally on a straight line with them.

The finest specimens I have seen of the *Sph. sulcatum* were sent to me by Mr. Ingalls, who had collected them in Washington Co., N. Y.; they were remarkably convex, and measured as much in length as 13-16ths of an inch; the beaks were very full, and much raised above the margin of the shell.

This species was first described in 1818, by Lamarck, under the names of Cy-

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\* I am preparing for publication, as a complement to this Monograph, an Atlas with colored figures of the different species described.

class *sulcata* and *Cyclas Saratoga*. Say, in 1819, ignorant that this shell was known to conchologists, described it as the *Cyclas similis*, under which name, until very recently, it has been most generally known. Say also figured this species, but his figure, I regret to say, is not correct, and would be more apt to give one the idea of a *Pisidium* than of a *Sphærium*. The description by Say of the *Cyclas similis* applies perfectly to the shell under consideration, of which Dr. Gould has given a very good figure in his Report on the Invertebrata of Massachusetts.

As related elsewhere,\* I had an opportunity, some years since, while in Paris, to see Lamarck's original specimens of the *Cyclas sulcata* and *Saratoga*, at the Garden of Plants, and at the Delessert Museum; and to convince myself by examination that they both belonged to one species, and were identical with Say's *Cyclas similis*.

2. *Sph. aureum*, Prime.

*Cyclas aurea*, Prime, Boston Proc. iv. 159, 1851.

Animal, not observed.

Shell transversely oval, slightly elongated, nearly equilateral, heavy, convex; beaks full, raised above the outline of the shell; anterior margin broad and rounded; posterior narrower and somewhat angular; inferior slightly curved; hinge margin somewhat broad, curved; cardinal teeth diminutive, double, so placed together as to represent the form of the letter V reversed, and rather wide-spread; lateral teeth situated each one at an angle with the cardinal teeth, strong and large; sulcations deep, not very regular; epidermis varying from a greenish yellow to a bright gold color, slightly lustrous; interior of the valves bluish white.

Long. 9-16; lat. 7-16; diam. 6-16 inches.

*Lab.* North America, from Lake Superior?  
(Cabinet. Agassiz and Prime.)

This is one of our most attractive species, but also one of the rarest. It is supposed to have been brought from Lake Superior by the expedition which visited that region under Professor Agassiz. In general outline it offers some similarities with the *Sph. sulcatum*; it is, however, a much more ponderous shell; it is less elongated, more convex, its sulcations are not so regular, its color is different, and lastly, its hinge margin is much more curved.

Compared to the *Sph. solidulum*, it is more convex, more elongated, its posterior margin is broader, the hinge margin is not so much curved, the beaks are fuller, and the sulcations are not quite so heavy; the color is also different.

3. *Sph. solidulum*, Prime.

*Cyclas solidula*, Prime, Bost. Proc. iv. 158, 1851.

*C. distorta*, Prime, loc. sub. cit. iv. 158, 1851.

Animal, not observed.

Shell transversely inequilateral, elongated, slightly convex; beaks full, not very prominent; anterior margin rounded; posterior drawn out to an angle; base slightly curved; epidermis variable, dark chestnut or brownish yellow, with sometimes a yellow zone on the basal margin; sulcations coarse, irregular; interior dark blue; hinge margin considerably curved; cardinal teeth double, in the shape of the letter V reversed; lateral teeth large; the anterior placed at an angle with the margin; the posterior more on a continuation of the curve.

Long. 9-16; lat. 7-16; diam. 5-16 inches.

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\* Notes on some American species of *Cyclas*, etc., by Temple Prime. The Hague, 1857. 8vo.

*Hab.* North America, in the States of New York, New Jersey, Ohio, Maryland, Virginia and Indiana.

(Cabinet Academy of Nat. Sci. of Phila., Jay et Prime.)

This species which is not uncommon was probably confounded by our early conchologists with the *Sph. sulcatum*, it differs from that shell, however, in being less elongated, more inequilateral, less convex, the hinge margin is more curved, and the shell is more solid.

4. *Sph. striatinum*, Lam.

*Cyclas striatina*, Lam., An. s. vert., v. 560, 1818.

*C. edentula*, Say, N. Harm. Dissem. 2, 1829.

*C. cornea*, Lam., C. B. Adam's Cat., 1847.

*C. albula*, Prime, Bost. Proc. iv. 155, 1851.

*C. tenuistriata*, " loc. sub. cit., iv. 156, 1851.

*C. acuminata*, " " " iv. 158, 1851.

*C. inornata*, " " " iv. 159, 1851.

*C. simplex*, " " " iv. 159, 1851.

*C. modesta*, " " " iv. 159, 1851.

Animal white, tubes light reddish yellow.

Shell slight, transversely elongated, somewhat compressed, inequilateral; anterior margin rounded, posterior distended, inferior rounded; beaks full, not much raised; sulcations irregular, at times so light as hardly to be seen with the naked eye, thus giving the shell a lustrous appearance; color varying from a light greenish yellow to a darker shade; valves slight; interior blue; hinge margin slightly curved; cardinal teeth double, very small, of the same size; lateral teeth larger, not very prominent.

Long. 7-16; lat. 5-16; diam. 4-46 inches.

*Hab.* North America, in the States of New York, Connecticut, Pennsylvania, Michigan, Illinois, Ohio, Alabama, Tennessee, and in the Hell Gate river, Washington Territory.

(Cabinet. Academy of Nat. Sci. Phila., Jay, Prime and others.)

As may be seen by the above synonymy, I have been induced to unite under this species several which I described as distinct in 1851. The differences existing between these shells are at times quite marked, but in general characters they agree, and I am inclined to believe that these differences owe their origin solely to local causes.

I had occasion some time since to convince myself of the identity of the *Sph. striatinum* with the *Cyclas edentula* of Say.\*

This species, which is not un plentiful in the localities where it is found, varies much in size, color and external appearance generally. The shell from Connecticut is so slight, that it is nearly translucent, and the striæ are so light as to impart to it a lustrous appearance; on the other hand, I have specimens from the Hoosack, which are quite heavy and coarsely striated; in the main, however, they all seem to tally. The variety from Alabama, described as the *Cyclas tenuistriata*, is less distended, is fuller, and the sulcations are hardly perceptible.

Compared to the *Sph. solidulum*, this species is smaller, more inequilateral, less tumid, more compressed, less solid, less heavily sulcated, and its posterior extremity is more distended.

5. *Sph. stamineum*, Conrad.

*Cyclas staminea*, Conrad, Amer. Journ. xxv. 342, pl. 1, f. v. 1834.

*C. fuscata*, Rafin., Prime in Bost. Proc. iv. 281, 1852.

*C. bulbosa*, Anthony, Prime in loc. sub. cit., iv. 283, 1852.

Animal, not observed.

\* Notes on some American species of *Cyclas*, etc., by Temple Prime. The Hague, 1857. 8vo.

Shell oval, somewhat full, inequilateral; anterior generally abrupt; posterior slightly distended; beaks very full and prominent, widely separate at the apex, often eroded; epidermis dark brownish yellow; striæ heavy; valves strong; interior blue; hinge margin curved; cardinal teeth double, nearly obsolete; lateral teeth distinct, strong.

Long. 9-16; lat. 6-16; diam. 5-16 inches.

*Hab.* North America in the States of New Jersey, Ohio, Illinois, Arkansas and Alabama.

(Cabinet. Academy of Nat. Sci. of Phila., Conrad, Jay and Prime.)

I have been induced to unite to this species the *Cyclas fusca*, Rafinesque, which I consider as nothing more than a large variety. The *Cyclas bulbosa*, Anthony, is a little more globose than Mr. Conrad's typical specimens, but presents no important characters of difference. The shells of this species found in New Jersey and in Illinois, are larger than those from Alabama.

This species differs from most of our North American ones by its full and very prominent beaks.

6. *Sph. rhomboideum*, Say.

*Cyclas rhomboidea*, Say, Acad. Nat. Sci. Phil., II. 2, 380, 1822.

*C. cornu*, var. 3, Lam., An. s. vert. v. 558, 1818.

*C. elegans*, C. B. Adams, Bost. II. 3, 330. pl. 3, f. 11, 1840.

Animal, syphons reddish yellow.

Shell subglobular, rhombic-orbicular, equilateral; anterior margin truncated; posterior slightly angular; basal nearly straight; beaks full, but not prominent; valves slight, convex towards the beaks, gradually decreasing in fulness towards the margins; interior blue; sulcations very delicate; epidermis olive green, with often a straw-colored zone on the margins; young shell more compressed than the adult; hinge margin nearly straight; cardinal teeth rudimentary; lateral teeth distinct, somewhat acute, not elongated.

Long. 8-16; lat. 6-16; diam. 5-16 inches.

*Hab.* North America, in the States of Vermont, Connecticut, Massachusetts, New York and Ohio.

(Cabinet. Academy of Nat. Sci. Phila., Jay, Prime, and others.)

This, the most attractive species of *Sphærium*, is not easily confounded with any other. Up to within a few years it was usually known among collectors under the name of *Cyclas elegans*, Adams. I have stated elsewhere\* my reasons for considering the *Cyclas elegans* as identical with Say's shell. Though no longer rare since 1851, when Mr. Whittemore found it in considerable abundance at one place near Cambridge, Mass., this species does not seem to be very widely distributed; it is confined to certain special localities.

7. *Sph. dentatum*, Hald.

*Cyclas dentata*, Hald., Acad. Nat. Sci. Phila. Proc. i. 100, 1841.

Animal, not observed.

Shell large, ventricose, somewhat equilateral, inferior and anterior margins rounded; posterior somewhat angular; beaks large, well rounded, distant, not very prominent; hinge margin nearly straight; cardinal teeth single, distinct; lateral teeth not prominent; sulcations slight; epidermis olive green, with a dark narrow zone at some distance above the basal margin.

Long. 1-2; lat. 2-5; diam. 3-8 inches.

*Hab.* North America, in Oregon.

(Cabinet. Academy of Nat. Sci. Phila.)

The young shell is more elongated and more heavily sulcated than the

\* Annals of the N. Y. Lyceum, vol. vi. p. 66, 1833.



adult; the beaks are less large and less tumid. This is a well marked species: compared to the *Sph. patella*, Gould, from the same section of the country, it is found to be larger, more ventricose, the beaks are more inflated, and the color of the epidermis is different.

The only two specimens I have seen of the *Sph. detrunctum* were those from which Mr. Haldeman described the species, an adult and a young one, which he was kind enough to lend me for study; they are now deposited in the collection of the Academy of Nat. Sci. of Philadelphia.

8. *Sph. fabalis*, Prime.

*Cyclas fabalis*, Prime, Bost. Proc. iv. 159, 1851.

*C. castanea*, Prime, loc. sub. cit., iv. 160, 1851.

*C. sulculosa*, DeCharpentier, Mss. 1851.

Animal, syphons crimson.

Shell transversely oval, compressed, nearly equilateral; anterior and basal margins rounded; posterior margin slightly abrupt; beaks not full, very much depressed; sulcations moderately heavy, very regular, quite distinct; epidermis light green, it is, however, sometimes quite dark; in the young it is often straw color; valves slight, interior blue; hinge margin very slightly curved; cardinal teeth small, assuming the shape of the letter V reversed; lateral teeth slight; anterior tooth somewhat more elevated, both placed very nearly on a line with the cardinal teeth.

Long. 9-16; lat. 7-16; diam. 4-16 inches.

*Hab.* North America, in the States of New York, Ohio, Illinois, Tennessee, Georgia and Virginia.

(Cabinet. Jay and Prime.)

This is a very distinct species; I know of no other to which it bears any resemblance; it is remarkable for its compressed appearance, and for the depression of its beaks. Though pretty widely distributed, it does not seem to be found any where in much abundance.

The epidermis of the shell is at times so entirely stained with a darkish substance, that it is with difficulty that its color can be detected.

9. *Sph. occidentale*, Prime.

*Cyclas ovalis*, (preoc.,) Prime, Bost. Proc., iv. 276, 1852.

*Sph. ovale*, Stimps. Adams, rec. gen. 2, 450, 1858.

*Sph. occidentale*, Prime, Ac. N. S. Phila., Proc., 295, 1860.

Animal not observed.

Shell oval, small, pellucid, fragile, equilateral, margins rounded; valves slight, rather convex; beaks full, rounded, not much raised; sulcations very fine, hardly visible; epidermis horn color; cardinal teeth very diminutive; lateral teeth more distinct.

Long. 5-16; lat. 4-16; diam. 3-16 inches.

*Hab.* N. America, in the States of New York, Vermont, Ohio, Wisconsin, Georgia and in the Hell Gate River, Washington Territory.

(Cabinets Academy N. S. of Phila., Jay and Prime)

This species is remarkable for its completely oval shape, which renders it quite distinct from all others. It is found not uncommonly. Compared to the *Sph. partium*, under which name it has at times been sent to me, it is much smaller, the margins are more rounded, and the beaks are not so much raised.

10. *Sph. nobile*, Gould.

*Cyclas nobilis*, Gould, Bost. Proc., v. 229, 1855. Atlas of U. S. Explor.

Expedit., pl. 36.

Animal not observed.

1861.]

Shell rhombic-ovate, inequilateral, moderately compressed; anterior margin truncated, posterior more distended, basal curved; beaks rounded, inclined towards the front, slightly tumid, separate at apex; sulcations coarse; epidermis delicate, light brown; valves strong, interior white; hinge margin nearly straight, moderately broad; cardinal teeth single, distinct; lateral teeth moderately developed.

Long. 8-16; lat. 6-16; diam. 4-16 inches.

*Hab.* N. America, at San Pedro in the State of California.

(Cabinet. Gould and Prime.)

Compared to the *Sph. sulcatum* it is slighter, less sulcated, more compressed and less tumid. This species is rare, the only specimens I have seen were kindly presented to me by Dr. Gould.

11. *Sph. patella*, Gould.

*Cyclas patella*, Gould, Bost. Proc., iii. 292, 1850. Atlas U. S. Explor. Expedit., pl. 36.

Animal not observed.

Shell rounded oval, lenticular, compressed, equilateral; margins generally rounded; beaks central, small, hardly raised; valves slight, interior white; sulcations extremely fine; epidermis light, of a yellowish brown color; cardinal teeth very diminutive, so placed as to assume the shape of the letter V reversed; lateral teeth not prominent, elongated.

Long. 7-16; lat. 5-16; diam. 3-16 inches.

*Hab.* N. America, in Oregon.

(Cabinet. Gould and Prime.)

This species is peculiar, owing to its compressed oval shape and rounded beaks; compared to the *Sph. flavum* it is more oval, more equilateral, and its beaks are less tumid. The specimens in my cabinet came from Dr. Gould.

12. *Sph. Vermontanum*, Prime.

Proc. Ac. N. S. Phil. 128, 1861.

Animal not observed.

Shell very oblique, tumid, inequilateral, full; anterior margin abrupt, posterior drawn out to an angle, basal slightly curved; beaks large, full, prominent, placed very much towards the anterior, in which direction they are slightly inclined; sulcations coarse, moderately regular; epidermis light green; ligament conspicuous; valves solid, interior light blue; hinge margin much curved, broad; cardinal teeth strong, representing the letter V reversed; lateral teeth elongated, strong.

Long. 9-16; lat. 6-16; diam. 4-16 inches.

*Hab.* N. America, in Lakes Champlain and Memphramagog, Vermont.

(Cabinet. Prime.)

Remarkable for its very oblique and tumid shape, and for the abruptness of its anterior margin. Compared to the *Sph. stamineum*, it is more tumid and less heavily sulcated; it is less elongated and more tumid than the *Sph. striatinum*. Quite rare. I have never seen but a few specimens of this species, which were received from the late Prof. Adams, of Amherst.

13. *Sph. emarginatum*, Prime.

*Cyclas emarginata*, Prime, Bost. Proc. iv. 156, 1851.

Animal not observed.

Shell triangular, nearly equilateral, convex, tumid, anterior and posterior margins abrupt, posterior slightly more distended, basal margin curved; valves solid, interior white; beaks very full, prominent, nearly central; ligament distinct; sulcations regular, not heavy; epidermis brown, with several narrow transverse zones of a dark color at regular intervals; hinge margin

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curved ; cardinal teeth single, quite distinct ; lateral teeth not much elongated, strong.

Long. 6-16 ; lat. 6-16 ; diam. 4-16 inches.

*Hab.* N. America, in the region of Lake Superior.

(Cabinet. Agassiz and Prime.)

The triangular and very tumid form of this species is quite singular ; it differs from the *Sph. Vermontanum* in being more tumid, fuller, in having larger beaks and in being much less broad at the base. The young shell is more elongated and less tumid than the adult. A rare species.

14. *Sph. flavum*, Prime.

*Cyclas flava*, Prime, Bost. Proc., iv. 155, 1851.

Animal not observed.

Shell transversely rounded, compressed, equilateral, delicate, margins generally rounded, the posterior a little distended ; beaks central, not full, more or less depressed ; valves very slight, interior whitish ; sulcations pretty deep, regular ; epidermis light, of a greenish yellow color ; cardinal teeth small, in the shape of the letter V reversed ; lateral teeth elongated.

Long. 7-16 ; lat. 5-16 ; diam. 3-16 inches.

*Hab.* N. America, at the Sault St. Marie, Lake Superior.

(Cabinet. Agassiz, Jay and Prime.)

This is a very slight and delicate species, quite distinct from any others but the *Sph. patella*, to which it bears some general resemblance from its shape ; it is, however, more compressed, less high, and the exterior of the valves is very different, as they are nearly smooth in Dr. Gould's shell. Found not un plentifully in the one locality.

(To be continued.)

Descriptions of New Palaeozoic Fossils from Kentucky and Indiana.

BY SIDNEY S. LYON.

ECHINODERMATA.

CRINOIDEA.

Genus CYATHOCRINUS Miller, 1821.

CYATHOCRINUS LEVICULUS, n. s. Plate iv., fig. 1.

Calyx subconical, truncate at its junction with the column, from which it expands upward. The pieces composing the calyx are smooth, united in a distinct groove. Basal pieces 5, pentangular, equal in size, slightly concave at the junction with the column. Subradials 5, four of which are of the same size, hexagonal in form, the fifth is a little larger than the others ; it is truncated at its summit, thus receiving an additional side. Radial pieces 5, similar in form, septagonal, grooved on their upper margin at their junction with the second primary radial pieces. These being absent in our specimen, their form is unknown. One anal piece is present, it is small, resting upon the right oblique upper margin of the largest piece forming the first circle above the basal pieces. One or more have fallen out, the space is quadrangular, a little higher than wide, having the same width and placed immediately above the truncated summit of the largest piece forming the subradial circle. Columnar facet large, opening large and nearly round.

*Dimensions.*

Height of calyx, from column to summit of first radials, .19-100 inch.

Diameter of base at its junction with column..... .16-100 "

Diameter of calyx at summit of first radials ..... .20-100 "

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*Locality and geological position.* Collected by Dr. J. Knapp, from the crinoid bed, lying between the Hydraulic limestone and the Black-slate, Beargrass quarries, Jefferson county, Kentucky.

I am indebted to Dr. J. Knapp, of Louisville, Kentucky, for the use of this and several other species from the same localities.

Our species is evidently not an adult; no analogous adult form has been collected from these beds.

CYATHOCRINUS WORTHENI, n. s. Plate iv., fig. 2.

The fragmentary condition of our specimen prevents a complete description.

Calyx subconical, about as wide as high, expanding upward, composed of pieces ornamented by carina intersecting each other at the centre of the pieces; dividing the surface into triangular spaces deeply depressed at the centre of each, except the basal pieces; upon these the carina passes from the centre of the subradials downward and along the lateral margins and base of the basal pieces at the line of their union with the column. Basal pieces nearly as high as wide, pentangular, the lateral margins half as high as the width of the base of the pieces. Subradials septagonal, nearly the same size, alternating with the basal pieces. Radial pieces considerably less than the subradials. A fragment of one of second primary radials is present; it is somewhat oval, the inner side is grooved by a deep furrow; the body of the piece is perforated by a round opening. The column is composed of thin pieces having ten prominent thickened projections, making when joined a circular column deeply indented by ten longitudinal grooves, one under the centre and one under the lateral union of the basal pieces. Columnar opening obscurely pentapetalous.

*Dimensions.*

Height to summit of first primary radials.....	·52-100 inch.
Diameter of base at column.....	·28-100 “
Diameter at summit of first radials .....	·65-100 “

Our example is slightly crushed.

*Geological position and locality.* Collected by Dr. J. Knapp, from the same locality and same beds as the preceding species; like that species, it is rare.

Genus ACTINOCRINUS Miller, 1821.

ACTINOCRINUS CASSEDAYI, n. s. Plate iv., fig. 3-3a.

Calyx basin-shaped, twice as wide as high, composed of thick costate pieces, the costa being partially or entirely interrupted at the sutures, marking the union of the pieces. The basal pieces are low, widely expanded beyond the column and body, deeply concave below, the outer margin of the pieces alternately raised and depressed, presents a waving line. The summit is low, covered by small prominent pieces, the central pieces being the largest; a double row of pieces not quite so large as the central ones, radiate from the central pieces to the centre of each group of arms; the spaces between these rows are deeply depressed, and are covered by very small pieces. All the pieces covering the summit are irregularly and prominently granulated. The central pieces are absent. It is probable the summit was surmounted by a proboscis, which is subcentral. Near the proboscis (?) are two lip-shaped pieces slightly parted, leaving an opening into the calyx. The interspaces between the costa on the radial and interradial pieces are remarkably deep and irregular in form. The radial pieces rise directly on the basal pieces. The interradial pieces appear to be three in each space. Anal pieces, from eight to ten. Column round and small, being less than half the diameter of

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the basal pieces. Opening small and irregularly circular. The arms appear to consist of groups of four each; the postero-lateral groups are not seen; their number is unknown.

*Dimensions.*

Height from base to arms.....	.....	·22-100 inch.
Height from base to summit.....	.....	·35-100 “
Greatest diameter.....	.....	·75-100 “
Least diameter.....	.....	·50-100 “
Diameter of base.....	.....	·35-100 “
Height of base.....	.....	·05-100 “

*Geological position and locality.* Collected by Dr. J. Knapp, in the same beds as the preceding species.

I have dedicated this elegant crinoid to the memory of one who loved and cultivated geology, my lamented friend, the late S. A. Casseday, of Louisville, Kentucky.

ACTINOCRINUS MEEKI\* n. s. Plate iv., 4 a-b.

Calyx uniform, symmetrical, a little wider than high; a prominent ridge rises at its junction with the column, slight at first, gradually increasing in size as it passes over the body along the line of the centre of the rays to the summit of the third radial pieces, the whole surface of the body is elaborately ornamented by fine raised ridges slightly waving; sometimes two are found uniting together, especially at the external corners of the triangular figures which they form; the centre of the triangle resting on the angular notch marking the union of any three adjacent pieces, the external points of the triangles terminating at the centre of the pieces, except in the basal pieces, when the lower point of the triangular figure terminates near the base of the pieces at the column. Basal pieces three, forming a broad deep pentagonal cup, the upper margins of which are slightly concave. First primary radials very large, hexagonal; the upper margin divided into three nearly equal sides, the centre of which supports a small quadrangular second primary radial, the centre line of which is rendered very prominent by the carina marking the line of the rays; this bears a nonagonal axillary third radial, still more prominent than those below. A single complete interradial field is exhibited in our specimen; it consists of one large octagonal piece, supporting two small parallellogramic pieces; the lateral oblique margins of the third primary radials also rest upon it. The form of the arms are unknown; they appear to start in groups of two each, ten in all. Column very small, round, arrangement unknown. Columnar facet concave, crenulations not visible, perforation very small and round.

*Dimensions.*

Height of calyx.....	.....	·33-100 inch.
Height of first primary radial.....	.....	·37-100 “
Whole height from base to summit of third radials.....	.....	·85-100 “
Diameter at centre of first radials.....	.....	·80-100 “
Diameter at summit of third radials.....	.....	1·00-100 “

*Geological position and locality.* Collected by Dr. J. Knapp, in beds from 70 to 75 feet below the black slate, Jefferson county, Kentucky, where it is found associated with Caryocrinus, Eucalectocrinus, Melocrinitis, &c. The beds for several feet above and below are barren of fossils. Pentamerus oblongus are quite abundant in beds from twenty to twenty-five feet above.

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\* I take pleasure in specifically designating this new and elegant crinoid by the name of Meeki, in honor of F. B. Meek of the Geological Survey of Illinois. 1861.]

## Genus RHODOCRINUS Miller, 1821.

RHODOCRINUS HALLI, n. s. Plate iv., fig. 5 a-b.

Body vasiform, one-third wider than high, composed of slightly convex and plane pieces, connected by distinct depressed sutures. The lines of the rays are prominent, while the interradial fields between them are nearly level, giving the calyx a pentagonal figure at the summit of the second radials. Columnar facet large, covering nearly the whole of the basal pieces, the angular points alone project beyond the column. Basal pieces five, short, lanceolate, crenulated and concave at their union with the column. Subradial pieces five, convex, three are pentagonal, the summits of the other two are truncated and hexagonal; one truncated piece supports the anal field, the other being the second to the left of the anal piece. A slight elevation rises at the lower side of the subradials, runs to the centre of them, when it branches; a branch from the subradials on either side uniting at the centre of the first radial piece. The first primary radials two, one septagonal, two hexagonal, the second to the left of anal field being pentagonal; they alternate with the subradials, rising from the angular notch between them, and with the first anal piece form a closed circle around the calyx. The second primary radials are quite small when compared with those below; they differ in size and are all hexagonal. The third primary are axillary, pentagonal, less than the second series; they each support one brachial piece on either of their oblique upper margins; from this last piece appears to rise the free arms. Interradials—the first are large pentagonal, each supporting two smaller pieces; these again support three; the fourth series appears to consist of four pieces. Our specimen does not show the upper part of any interradial field perfectly. The first anal piece is hexagonal; it supports three pieces, the central one pentagonal, the other two hexagonal, these support five (?). Arms ten, column round, perforation small, (obscure on our specimen,) it is nearly round, or slightly pentelobate.

*Dimensions.*

Height of specimen .....	.....	85-100 inch.
Greatest diameter (specimen slightly crushed).....	.....	1.80-108 “
Diameter of base.....	.....	40-100 “

*Geological position and locality.* Collected by Dr. J. Knapp, in the same beds as specimens described in this paper under Nos. 43, 44 and 49. Named in honor of James Hall, Esq., of Albany, N. Y.

## Genus MAGESTOCRINUS Owen &amp; Shumard, 1848.

MAGESTOCRINUS KNAPPII, n. s. Plate iv., fig. 6 a-b.

Calyx subglobose, base broad, nearly flat to the end of the second primary radials, slightly depressed at the basal pieces. Base composed of three pieces, nearly equal in size, together they present an oblong hexagonal disk. First primary radials hexagonal, nearly equal in size, about as wide as high, upper margins straight and parallel to the base of the pieces, the base a little wider than the summit of the pieces. Second primary radials hexagonal, less than the first radials, each surmounted by a short thick spine, the base of which covers the surface of the piece. Third radials axillary, less than the second, each surmounted by a spine like the second radials; the spines on the different third radials vary in size; they taper more rapidly than the spines on the second radials. Each third radial supports on its upper oblique upper margins two secondary radials, each of which is surmounted by a short obtuse spine, more or less prominent; two or three oblong non-spinous pieces are supported by these, which reach to the free arms. Interradial pieces: the first

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is large, hexagonal resting in the angular notch between the first radials, it supports two pieces of the second series, these again three pieces. All the pieces from the base to the summit of the second radials are well defined by a deep groove at the base of their junction with each other; above this the pieces rise upon a surface quite smooth, and are more readily distinguished by the spine marking the centre of each piece, than by the line of their union with each other. The first anal piece is like the first radial pieces, it supports one hexagonal piece on its centre, and a pentagonal piece on each of its oblique upper sides; this group of four pieces are nearly of the same size and are slightly convex; they support about six rows of pieces one above the other, each row diminishing in size and number of each row, in all about twenty-five pieces, each piece having a central spine or tubercle. The summit is low, deeply depressed between the groups of arms, surmounted by a subcentral proboscis, covered by numerous polygonal pieces nearly of the same size, separated by well defined grooves. The arms appear to be ten in number, the postero-lateral rays are not seen; it is possible they may bear three each; should this be the case, the whole number of arms would be twelve. The arm facets are large and prominent; a small portion of one of the arms remaining on the specimen, shows them to be composed of a double row of thin pieces.

*Dimensions.*

Height to free arms.....	48-100 inch.
Height to base of proboscis .....	85-100 “
Diameter below arms.....	95-100 “

*Geological position and locality.* Collected by Dr. J. Knapp, from the crinoid bed immediately below the hydraulic limestone, Clark county, Indiana.

I take pleasure in dedicating this species to a cultivator of Geology, my friend, Dr. J. Knapp of Louisville, Ky.

MAGESTOCRINUS SPINOSULUS, n. s. Plate iv., fig. 7 a-b.

Body subcylindrical, expanding slightly from the middle of the third primary radial to the summit of the third secondary radials. The first three or four axillary pieces lying nearly horizontal, expand the body at the insertion of the arms. The base is nearly level to the end of the spines on the third primary radial, concave from the middle of the second radial to the centre of the basal pieces; the summit is low, arched, surmounted by a proboscis placed quite near the side of the summit above the anal side. Basal pieces: together they form nearly a circle, slightly indented at the sutures at which they are united, crenulated on the outer margin of the columnar facet, forming a thin disk, implanted upon the second circle of pieces, a little larger when joined to the body than at the union with the column. The pieces appear to be joined to the second circle by lapping, and not at the edges of the pieces. First primary radials five, hexagonal, nearly equal in size, differing slightly in form, summits nearly parallel to the base of the pieces, curving outward and downward at the outer extremity of each. Second primary radials hexagonal, the centre of each having a mammillary tubercle more or less prominent. Third radials larger than the second, pentagonal, differing considerably in size and form; the centre of each piece is surmounted by a short mammillary or spinous tubercle, the base of which covers nearly or the entire surface of the pieces, on the upper oblique margins of each rests two hexagonal or septagonal pieces; each of which bears like the third radials a spine or tubercle, which are rather smaller than those on the radial below them, on which they rest. These last pieces are also axillary, and support each two smaller pieces more or less spinous, the last two pieces nearest each other (or in the centre of the several rays,) are also axillary and support each two small pieces, one above the other, the outer pieces supporting three similar pieces, all of which 1861.]

bear near the centre a small tubercle. The brachial pieces appear to rest upon the last of the preceding series. Interradials: the interrarial fields are filled with from seven to nine pieces, the first are of the same size and form as the second radials; they rise from the angular notch between the first radials, and support on their upper margins two spinous pieces like the third radials, with which they form a circle around the base of the vertical sides of the body; in an angular notch between the second range of interradials rests one large spinous piece, this supports two or three nearly smooth pieces one above the other. Interaxillary: rising between two of the first secondary radials are two small pentagonal pieces, one above the other, completely enclosed by the pieces of the secondary radials. Anal pieces: these are about twenty in number, rising in ranges one above the other; these ranges are not quite regular, but are thrust into and interlock each other; the pieces are similar in form and size to the other pieces of the same height composing the calyx. They diminish in size and number in the ranges until the field is terminated by a single piece immediately below the circle of the arms. The arms are thirty in number, in groups of six each; they form a closed circle around the calyx and support the vault. They appear to have been nearly circular, formed of two rows of thin pieces; the opening through the arm facets is circular and covered by the pieces of the summit. The summit is covered by numerous small polygonal pieces differing greatly in size. Near to the margin and immediately above the centre of each group of arms is placed a larger piece which is surmounted by a short spine; all the pieces are well defined by a deep groove at the line of the union of the pieces. The proboscis appears, (judging from two circles of pieces which are attached to our specimen), to have been composed of stout small pieces similar to those forming the summit. The surface markings are nearly all removed from our specimen; one or two pieces of the summit are finely granulose. The epidermis bearing the granula, is about one-thirtieth of an inch thick.

*Dimensions.*

Height from base to free arms .....	.55-100 inch.
Height from base to proboscis .....	1.00-100 "
Greatest diameter of calyx below arms .....	1.25-100 "
Greatest diameter of summit .....	1.60-100 "
Diameter of basal pieces .....	.25-100 "

*Geological position and locality.* Collected from a bed about six feet below the hydraulic limestone, Falls of Ohio, Clark county, Indiana. It is associated with the preceding species. My cabinet and that of Dr. J. Knapp, Louisville, Ky.

**Descriptions of three new species of Mollusca of the genus SPHÆRIUM.**

BY TEMPLE PRIME.

1. *Sphærium meridionale*, Prime.—S. testa ovato-oblonga, compressa. tenui, inæquilaterali, tenui, transversim elegantissime striata; intus carneorubra maculata; umbonibus parum prominentibus, natibus acutis, antice approximatis, inclinatis; epidermide fusco-luteolo, nigro-maculata; latere antico brevi, valde declivi, obtuso, postico subangulato, margine inferiore parum arcuato; dente cardinali minimo, dentibus lateralibus valde compressis, elongatis. antico majore.

Long.  $\frac{1}{4}$ ; lat. 1-5th; diam.  $\frac{1}{4}$  poll.

*Hab.* Panama; (Collect. Prime.)

Compared to the *Sphærium maculatum*, Morelet, of Yucatan, this species differs in having a less abrupt posterior margin, its lateral teeth are larger and more developed, and the shell is generally less inflated.

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2. *Sphærium Barbadosense*, Prime.—S. testa ovato-oblonga, ventricosa, inæquilaterali, tenui, transversim striata, intus carneo-rubra maculata, umbonibus prominentibus, natibus acutissimis, inclinatis, erosis; latere antico rotundato, postico latiore, obtuso; epidermide fusco-luteolo; dentibus cardinalibus inconspicuis, lateralibus parvis, subæqualibus, antico paulo majore.

Long.  $\frac{1}{2}$ ; lat. 1-5th; diam.  $\frac{1}{8}$  poll.

*Hab.* Barbadoes; (Collect. Prime.)

This insular species is very similar to the *Sphærium Bahiense*, Spix, of Brazil; it is, however, much larger and somewhat more inflated.

3. *Sphærium Portoricense*, Prime.—S. testa elongato-transversa, rhomboidea, æquilaterali, tenui, cornea, transversim fortiter striata; valvis crassiusculis, nigro irregulariter maculatis; extremitatibus obtusa, utroque latere æqualiter declivi; dentibus cardinalibus inconspicuis, lateralibus subæqualibus, antico majore.

Long.  $\frac{1}{2}$ ; lat. 1-5th; diam.  $\frac{1}{8}$  poll.

*Hab.* Portorico; (Collect. Swift et Prime.)

Very similar in shape to the young of *Sphærium sulcatum*, Lam. This species differs from the generality of West Indian and South American *Sphæria* by its sulcations, which are quite heavy for its size.

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**Descriptions of new Lower Silurian, (Primordial), Jurassic, Cretaceous, and Tertiary Fossils, collected in Nebraska, by the Exploring Expedition under the command of Capt. Wm. F. Reynolds, U. S. Top. Engrs.; with some remarks on the rocks from which they were obtained.**

BY F. B. MEEK AND F. V. HAYDEN.

The geological collections brought in by Captain Reynolds' expedition, although, as might be expected, not containing so large a number of new species, as those of some earlier explorers of the north-west, afford several very interesting new forms, and furnish much important information in regard to the geographical distribution of previously known species. They also afford us much valuable information respecting the extent and range of the various groups of rocks, so widely distributed throughout the great area of his explorations.

In the present paper we give descriptions only, of the new species contained in these collections. We have, however, in course of preparation for Capt. Reynolds' final Report, full illustrations, with more extended descriptions of these, together with complete catalogues of all the previously known forms. Before commencing these preliminary descriptions, it may not be out of place to make some remarks on the formations from which they were obtained. This we now propose to do in the order of their succession in time, commencing with the oldest.

#### LOWER SILURIAN (PRIMORDIAL) ROCKS.

In March, 1858, we announced in a paper read before the Academy, that we had identified fossils of the age of the Potsdam Sandstone amongst the collections brought by Lieut. Warren's expeditions from the Black Hills, Nebraska. Previous to that time, no organic remains of that age had been recognized either from there or from the Rocky Mountain ranges farther west. The specimens

[NOTE.—We take pleasure in acknowledging here our renewed obligations to Prof. Henry, for the free use of the extensive collection of works on geology, palæontology, &c., in the library of the Smithsonian Institution, and for other facilities of great value to us in the prosecution of these investigations ]

1861.]

then identified by us were collected by one of the writers, (Dr. H.,) who acted as geologist of Lieut. Warren's expedition. They consist of *Lingula prima*, *L. antiqua*, and an *Obolella*, with fragments of a *Trilobite* of Primordial type, similar to some of those occurring in rocks of that age in Wisconsin.

In the following pages of this paper we give descriptions of apparently the same *Trilobite* mentioned above, and of a small *Pteropod*? of the genus *Pugiunculus*, from the Primordial or Potsdam Sandstone at a locality near the head of Powder River, on Big Horn Mountains, a part of the Rocky Mountain range, near 43° 30' N. lat. long. 108° W. These fossils were collected by one of the writers, (Dr. Hayden, who acted as geologist of Capt. Reynolds' expedition,) from a brownish somewhat laminated sandstone, also containing a *Lingula* apparently identical with *L. antiqua*, but smaller than the average size of that shell. At this and other localities along the Rocky Mountains, west of the Black Hills, as well as at the latter, this rock was seen resting either directly upon granitic masses, or ancient upheaved metamorphic slates. At the Black Hills, it is usually only from 50 to 80 feet in thickness, but in the Big Horn Mountains, it sometimes attains a thickness of two hundred feet.

Up to this time, we have no positive evidence of the existence of any of the usually succeeding Silurian and Devonian rocks, throughout all this region, north of the South Pass, lat. 42° 31' N. long. 109° W. From the latter locality, we have identified specimens of *Halysites catenulata* and a few other fossils probably of upper Silurian age.\* North of this, however, so far as we know, the Primordial Sandstones, are directly succeeded by heavy deposits of Carboniferous age, of arenaceous and more or less pure limestones. Surmounting the latter there were also seen occasional local beds of magnesian limestones of the same age, and containing some of the same fossils as those referred by us and others in eastern Kansas, to the Permian epoch. As it is our purpose, however, to confine our remarks more particularly to the strata from which the fossils described in this paper were obtained, we pass on to the

#### JURASSIC ROCKS.

In a paper already referred to, (published by us in the March number of the Proceedings for 1858), we announced that we had identified Jurassic types of fossils among the collections brought in from the Black Hills, by Lieut. Warren's expedition. So far as we know, these were the first true Jurassic fossils ever identified from the region of the Rocky Mountains. In April, 1860, one of the writers, (F. B. M.,) and Mr. Henry Engelmann, recognized some of the same species along with a few new forms, in the collections brought by Capt. Simpson's expedition, from equivalent beds at Red Buttes on the north Platte, and from near Uintah and Weber River, in Utah.†

The specimens of this age collected during Capt. Reynolds' expeditions are in part from near the head of Wind River Valley, in the Rocky Mountains, lat. 43°, 30' N., long. 110° W., and from Big Horn Mountains, lat. 43° 30' N., long. 108° W. At both of these localities, at the Black Hills, and at the Red Buttes on the north Platte, as well as at the other localities already mentioned in Utah, the rocks containing these Jurassic fossils consist of a series of grayish, ash-colored, and red argillo-calcareous, more or less gritty strata, with beds of soft dark brown, and reddish sandstones. These beds preserve a remarkable uniformity of characters, taken as a group, wherever they have been seen, and need never be confounded with the Cretaceous or Tertiary rocks so widely distributed over the north-western Territories, even where no fossils are to be found. They are usually only seen as we approach the mountains, near which they rise from beneath the Cretaceous strata.

The organic remains found in this series present, both individually and as a group, very close affinities to those of the Jurassic epoch in the old world; so close indeed, that in some instances, after the most careful comparisons with

\* Transac. American Philosophical Society, March 4, 1859, page 137.

† See Proceedings of the Academy, April, 1860, p. 129.

figures and descriptions, we are left in doubt whether they should be regarded as distinct species, or as varieties of well known European Jurassic forms. Among those so very closely allied to foreign Jurassic species, may be mentioned an *Ammonite*, we have described under the name of *A. cordiformis*, which we now regard as probably identical with *A. cordatus* of Sowerby,—a *Gryphæa* we have only been able to distinguish as a variety, from *G. calceola*, Quenstedt,—a *Pecten* scarcely, distinguishable from *P. lens*, Sowerby,—a *Modiola* very closely allied to *M. cancellata* of Goldfuss,—a *Belemnite*, agreeing very nearly with *B. excentricus*, Blainville, &c. &c.

At the same time that the fossils of this group of strata are generally so closely analogous to known Jurassic species of the old world, they are all clearly distinct from any of those found in our Cretaceous rocks above. In short, their Jurassic age is as susceptible of demonstration, both upon stratigraphical and palæontological evidence, as that the succeeding rocks above them, or any part of the Green sands of New Jersey, belong to the Cretaceous epoch. The facts likewise, nearly all, as we have mentioned on former occasions, point to the conclusion that they hold a rather low position in the Jurassic system.

At nearly all the localities already mentioned, where these well marked Jurassic rocks occur, there is at their base a more or less extensive series of brick red strata, composed of fine grained, arenaceous material, with local intercalated beds of gypsum. These red strata seem to be nearly always destitute of organic remains, but from their position we have been inclined to regard them as probably of Triassic age. During Capt. Reynolds' expedition, however, some fossiliferous seams were found near their base, probably 300 feet below the horizon of the beds containing so many Jurassic fossils. Amongst these we recognize our *Lingula brevirostra*, and *Monotis curta*, Hall, sp., both of which are common in the beds containing the Jurassic fossils at the Black Hills. From this fact we are inclined to think that at least a large part of the red gypsum-bearing strata of this region, should also be included in the Jurassic system.

These red beds augment greatly in thickness as we go southward; and as Dr. Newberry and others have shown, similar, if not equivalent strata, are developed on a grand scale in New Mexico. Whether this vast series of red beds in the south-west belongs to the Jurassic or Triassic epoch, or whether they represent both in part, are questions it would be wandering from our subject to attempt to discuss here.

## CRETACEOUS ROCKS.

### LOWER SERIES.

In our paper of March 1858, already cited, we mentioned having recognized fresh or brackish-water shells in Lieut. Warren's collections from the south-west base of the Black Hills, obtained apparently from the base of the Cretaceous series, of that region. These fossils consist of a *Unio*, a small *Planorbis*, and fragments of some small univalves like *Paludina*, all of which were found associated with imperfect specimens of *Ostrea*. The beds containing these fossils present a somewhat mixed character, being composed, in part, of light gray clays, and purple argillo-calcareous seams. The fresh-water shells were found in the latter hard seams, which sometimes assume nearly the aspect and composition of a true limestone. This formation rests directly upon the Jurassic strata, and seems to pass beneath the older Cretaceous beds.\*

\* At the time we published these facts, we were led by the discovery here of fresh-water shells, in such a position, to think that some estuary deposits of doubtful age, near the mouth of Judith River, on the Missouri, from which Dr. Leidy had described some Saurian remains resembling Wealden types, might be older than Tertiary. Later examinations, however, have demonstrated, that the Judith beds contain an entirely different group of fossils from those found in the rock under consideration, and that they are really of Tertiary age, and hold a position at the base of the Great Lignite series of the north-west.

Amongst Capt. Reynolds' collections now before us, from the head of Wind River Valley, we also recognize, from a precisely similar bed, fragments of a *Unio*, with great numbers of a *Melania*, and a beautiful little *Neritella*, which, although completely mineralized, retains its original zig-zag bands of dark and light colors.\* The bed containing these fossils, here, like that at the Black Hills, rests directly upon the Jurassic strata, and appears to dip beneath the Cretaceous, while its fossils are in exactly the same state of preservation as those collected at the Black Hills. As it differs at both these localities in its lithological characters from all of the well-defined Tertiary beds of the northwest; and its fossils are not only clearly distinct from the known Tertiary forms of that region, but all present a more ancient aspect, we are still inclined to think it really holds a position near the lower part of the Cretaceous series of that region.

Until this can be determined, however, upon stratigraphical evidence, we do not feel warranted in assigning this formation a place in the general section of the Cretaceous rocks of the northwest, since it may prove to be of Tertiary, or even possibly of Jurassic age. For, as all palæontologists are aware, the remains of fresh-water mollusca cannot be relied upon in determining the age of strata, excepting where they happen to be specifically identical with forms known to occur elsewhere in well established horizons. This arises from the fact that they are very similar in rocks of all ages in which they are known to occur, or at least that they do not present peculiar distinctive features in different formations, in so marked a degree as marine shells.

Since the first publication of a general section of Nebraska Cretaceous Rocks, based upon observations made by us in 1853, while on an expedition for Prof. Hall, and subsequently published by him and one of the writers, (F. B. M.), in the Memoirs of the American Academy of Arts and Sciences,† our knowledge of the range and thickness of these rocks, as well as of their relations to each other, and to Cretaceous beds elsewhere, has been much extended. We have also been able, from the collections subsequently brought in by various expeditions from localities scattered over wide areas, not merely to add largely to the number of species previously known to be embraced in the Cretaceous fauna of this region, but we have also extended our knowledge of their geographical distribution and vertical range. Consequently we have now the means of constructing a section of these rocks that will give a more clear and accurate idea of the relative importance and thickness of the subdivisions, as well of their relations to each other and of each to the whole.

Hitherto in all the sections of these rocks published, the subdivisions have been designated merely by the numbers 1, 2, 3, 4 and 5. Experience has taught us that inconvenience and confusion are apt to arise from the use of this kind of a nomenclature, because these larger groups are constantly liable to be confounded with unimportant subdivisions of local sections, to which it is almost indispensably necessary to apply numbers. This being the case, we propose to designate each of these formations by a distinct name, retaining, however, opposite each name the same number formerly used for each group. In selecting names, we have preferred those derived from localities to such as might be suggested by the lithological or palæontological characters of the different rocks; because, however appropriate such a name as "Inoceramus Bed" or "Silicious Group" may be for a formation at a given locality, it will generally be found inapplicable if we attempt to trace the rock over areas of any great extent. Our names have also been selected from localities where the particular formation named is known to be well developed, and readily recognizable. In accordance with these views, we present the following section:—

\* Descriptions of the latter two fossils are given in another part of this paper.

† Mem. Am. Acad. Arts and Sci., Boston, vol. v. N. S., p. 381.

General Section of the Cretaceous Rocks of Nebraska.

DIVISIONS AND SUBDIVISIONS.		LOCALITIES.	Estimated thickness.	Eq. Upper or White Chalk and Maestricht beds. (Senonian, D'Orbigny.)
<p><b>UPPER SERIES.</b></p> <p><b>Fox Hills beds.</b> Formation No. 5.</p> <p>Gray, ferruginous and yellowish sandstone and arenaceous clays, containing <i>Belemnitella bulbosa</i>, <i>Nautilus Dekayi</i>, <i>Ammonites placenta</i>, <i>A. lobatus</i>, <i>Scaphites Conradi</i>, <i>S. Nicolletti</i>, <i>Baculites grandis</i>, <i>Busycon Burdi</i>, <i>Fusus Culbertsoni</i>, <i>F. Newberryi</i>, <i>Aporrhais Americana</i>, <i>Pseudo-buccinum Nebraskaensis</i>, <i>Mastra Warrenana</i>, <i>Cardium subquadratum</i>, and a great number of other molluscous fossils, together with bones of <i>Mosasaurus Missouriensis</i>, &amp;c.</p>		<p>Fox Hills, near Moreau River, — near Long Lake above Fort Pierre. Along base Big Horn Mountains, and on North and South Platte Rivers.</p>	500 feet.	
<p><b>Fort Pierre Group.</b> Formation No. 4.</p> <p>Dark gray and bluish plastic clays, containing near the upper part, <i>Nautilus Dekayi</i>, <i>Ammonites placenta</i>, <i>Baculites ovatus</i>, <i>B. compressus</i>, <i>Scaphites nodosus</i>, <i>Dentalium gracile</i>, <i>Crassutella Evansi</i>, <i>Cucullia Nebraskaensis</i>, <i>Inoceramus Sagensis</i>, <i>I. Nebraskaensis</i>, <i>I. Vanuxemi</i>, Bones of <i>Mosasaurus Missouriensis</i>, &amp;c., &amp;c., &amp;c.</p> <p>Middle zone nearly barren of fossils.</p> <p>Lower fossiliferous zone, containing <i>Ammonites complexus</i>, <i>Baculites ovatus</i>, <i>B. compressus</i>, <i>Helicoceras Mortoni</i>, <i>H. toium</i>, <i>H. umbilicatum</i>, <i>H. cochleatum</i>, <i>Helicoceras Mortoni</i>, <i>Fusus vinculum</i>, <i>Anisomyon borealis</i>, <i>Amauropsis paludiformis</i>, <i>Inoceramus sublaevis</i>, <i>I. tenuilineatus</i>, bones of <i>Mosasaurus Missouriensis</i>, &amp;c.</p> <p>Dark bed of very fine unctuous clay, containing much carbonaceous matter, with veins and seams of gypsum, masses sulphuret iron and numerous small scales fishes. Local; filling depressions in the bed below.</p>		<p>Sage Creek, Cheyenne River and on White River above the Mauvaises Terres.</p> <p>Fort Pierre and out to Bad Lands,—down the Missouri on the high country to Great Bend.</p> <p>Great Bend of the Missouri, below Fort Pierre.</p> <p>Near Bijou Hill, on the Missouri.</p>	700 feet.	
<p><b>LOWER SERIES.</b></p> <p><b>Niobrara Division.</b> Formation No. 3.</p> <p>Lead gray calcareous marl, weathering to a yellowish or whitish chalky appearance above. Containing large scales and other remains of fishes, and numerous species of <i>Ostrea congesta</i> attached to fragments of <i>Inoceramus</i>. Passing down into light, yellowish and whitish limestone, containing great numbers of <i>Inoceramus problematicus</i>, <i>I. pseudo-mytiloides</i>, <i>I. aviculoides</i> and <i>Ostrea congesta</i>, fish scales, &amp;c.</p>		<p>Bluffs along the Missouri below the Great Bend, to the vicinity of Big Sioux River; also below there on the tops of the hills.</p>	200 feet.	
<p><b>Fort Benton Group.</b> Formation No. 2.</p> <p>Dark gray laminated clays, sometimes alternating near the upper part with seams and layers of soft gray and light-colored limestone. <i>Inoceramus problematicus</i>, <i>I. tenuirostratus</i>, <i>I. latus?</i> <i>I. fragilis</i>, <i>Ostrea congesta</i>, <i>Venilia Mortoni</i>, <i>Pholadomya papyracea</i>, <i>Ammonites Mullani</i>, <i>A. percarinatus</i>, <i>A. vespertinus?</i> <i>Scaphites Warreni</i>, <i>S. larviformis</i>, <i>S. ventricosus</i>, <i>S. vermiformis</i>, <i>Nautilus elegans?</i> &amp;c.</p>		<p>Extensively developed near Fort Denton on the Upper Missouri; also along the latter, from ten miles above James River to Big Sioux River, and along the eastern slope of the Rocky Mountains, as well as at the Black Hills.</p>	800 feet.	
<p><b>Dakota Group.</b> Formation No. 1.</p> <p>Yellowish, reddish and occasionally white sandstone, with at places, alternations of various colored clays and beds and seams of impure lignite. Also silicified wood, and great numbers of leaves of the higher types of dicotyledonous trees; with casts of <i>Pharilla? Dakotensis</i>, <i>Azinnaea Siouxensis</i>, and <i>Cyprina arenarea</i>.</p>		<p>Hills back of the town of Dakota; also extensively developed in the surrounding country in Dakota County below the mouth of Big Sioux River,—thence extending southward into Northeastern Kansas and beyond.</p>	400 feet.	

\* This is *A. Texanus* of Roemer. It is on the authority of Mr. Gabb that it is here regarded as identical with *A. vespertinus* of Morton. We should never have suspected this from Dr. Morton's figure, but Mr. Gabb assures us that after a careful comparison of Dr. Morton's specimen, he can see no difference.

Geologists will understand that we do not regard the several rocks to which we have applied the names "Dakota Group, Fort Benton Group," &c., as being always separately and individually recognizable at widely distant parts of the world, nor even in all cases throughout North America. They are, merely, convenient subdivisions, presenting more or less marked lithological and palæontological peculiarities, due to physical agencies that were probably, in some instances, comparatively local in their action; though in other cases we have been able to identify the equivalents of some of them, as we have shown on former occasions, in New Jersey, Alabama and New Mexico.\* When we wish to draw parallels between these rocks and those of the Cretaceous System of the Old World, however, we find it necessary to group them together, so far as our present knowledge extends, into two, or at any rate, not more than three principal series.

DAKOTA GROUP.—Although we still retain this as a distinct rock, our present impression is, that it is probably only a subdivision or member of the Fort Benton Group. Still, until more fossils can be obtained from it in the region of the typical localities, the question whether or not it should rank as a distinct formation must remain an open one. That it is at least as old as the Fort Benton Group, however, is clearly demonstrated by its position beneath some two hundred feet of that rock near the mouth of Big Sioux River, where the latter formation is seen to pass beneath the Niobrara Division. This order of superposition is also known to prevail throughout a considerable area in north-eastern Kansas, and south eastern Nebraska, as may be seen at hundreds of localities where all the strata lie in a nearly horizontal position.

That this rock cannot be referred to any older epoch than the Cretaceous, is also equally clear from the modern affinities of numerous fossil leaves embedded in it. Amongst these remains Dr. Newberry and Prof. Heer, have identified the genera *Populus*, *Salix*, *Alnus*, *Platanus*, *Liriodendron*, &c., &c.† The few animal remains yet found in it are merely casts of shells referable to the genera *Pharella*, *Azinaea*, *Maetra* and *Cyprina*.

Along the Missouri, in the region of the mouth of Big Sioux River, and below, this rock consists mainly of yellowish and reddish sandstones, in rather thick beds, interstratified, however, at places, with beds of yellow and ash-colored clays, and impure lignite. In this region it is generally quite distinct from the Fort Pierre Group above, but farther south, in Kansas, the two rocks seem to be less distinct, while at the Black Hills and along the Rocky Mountains west of there, the whole appears to be represented at places by a series of alternating sandstones and clays.

Below the mouth of Big Sioux River, this formation is seen at some localities resting directly upon the limestones of the Coal Measures; but in north-eastern Kansas it usually reposes on a series of reddish and various colored clays, probably of Jurassic age. Near the Black Hills, and along the Rocky Mountains west of there, apparently representative beds were usually seen to be immediately underlaid by well marked Jurassic strata, excepting at the localities where the brackish-water deposits already mentioned, appear to intervene between them and the Jurassic.‡

This rock has not yet been satisfactorily recognized on the upper Missouri, though there is a similar formation near the mouth of Judith River and below there, which we have sometimes thought may possibly represent it. Until we can know more, however, in regard to the relations of the Judith River bed to the other rocks of the series in that region, and have an opportunity to examine more of its fossils, it would be unsafe to refer it to the Dakota Group. The

\* See Proceed Acad. Nat. Sci., Phila., Nov., 1856, p. 267, and May, 1857.

† Proceed. Acad., Dec., 1858; Am. Journ. Sci., New Ser., vol. xvii, 1859; also March, 1860.

‡ This brackish-water bed we think probably belongs to the formation under consideration.

fossils collected from the sandstone here alluded to, near the Judith River, belong to the genus *Inoceramus*, *Tancredia*, *Maetra*, *Baculites*, &c.; all of which are distinct from the species yet obtained from any of the known horizons elsewhere.

In our paper of May, 1857, we pointed out that the Dakota Group, (which we then designated as formation No. 1,) is represented in New Jersey and Alabama, by a series of more or less arenaceous clays and sandstones, with lignite and leaves of dicotyledonous trees.\* Since that time Dr. Newberry has traced it from near the Arkansas River, in Kansas Territory, by the remains of its characteristic flora, far into New Mexico, where he found it surmounted by a great thickness of well marked Cretaceous rocks.† Dr. Shumard also thinks he can recognize it in Texas at the base of the Cretaceous series of that state.‡

FORT BENTON GROUP.—This formation usually consists of dark grey laminated clays, with thin lighter colored arenaceous partings, and layers and beds of sandstone. Towards the upper part, near its connection with the Niobrara Division above, it sometimes includes intercalated layers of grey limestone in all respects similar to the lower portion of the overlying rock; while at some other places its upper portion passes into a dark shale. It seems to attain its greatest thickness in the vicinity of Fort Benton, where the entire hills eight or nine hundred feet in height appear to be composed of it. Until we can have more exact information, however, in regard to the range of the organic remains, through this great thickness of strata, we must have some doubts in regard to whether there may not also be some representation here of the Dakota Group.

This seems to be the more probable, when we bear in mind that the rock under consideration, becomes, as already stated, blended with the latter formation further south at the Black Hills, and along the Rocky Mountains west of them.

The Fort Benton Group has a wide geographical extension in the country west of the Mississippi,—though neither it nor the succeeding rock above, appears to have any well defined representatives as a distinct formation in Alabama, New Jersey and other states east of the Mississippi, as was pointed out by us in May, 1857.§ The highest northern locality at which we have any knowledge of its existence is on the north branch of the Saskatchewan, some thirty or forty miles west of Fort *la Corne*, near lat. 54 north, where Prof. Hinde discovered specimens which were referred by one of us, (F. B. M.,) to this horizon.|| We had also previously referred to the same position some specimens discovered by Prof. S. I. Dawson at a locality 250 miles west of Fort Garry, on the Assiniboine River.¶

It is known to occur in north-eastern Kansas, as well as in Arkansas, and in 1857 we pointed out that it is probably represented by one of the beds in Mr. Marcou's section of Pyramid Mountain, in the far south-west. Dr. Newberry's investigations, in connection with Lieut. Ives' Expedition, seem to show that it

\* Proc. Acad. Nat. Sci., Philad., Mar., 1857, p. 117; also, see page 426, of this paper.

† American Journal Sci. Ser. vol. xxix, p. 208, March, 1856.

‡ See an important paper on the Geology of Texas, by Dr. B. F. Shumard, in Trans. St. Louis Acad. Sci., Vol. i. p. 582. It is a source of much regret to those interested in the progress of geological science in this country, that circumstances have prevented this able geologist from completing the survey of Texas.

§ We have sometimes suspected that the bed in New Jersey containing *Venilia Conradi*, *Scaphites hippocrepis*, and *Pholadomya occidentalis*, Morton, might belong to this horizon, from the analogy of these species to some of our far western Fort Benton Group forms, but we have been assured that they occur in New Jersey, mingled with other species only found in our upper Cretaceous beds of Nebraska.

|| See Prof. Hind's Report on Saskatchewan and Assiniboine, Expl. Exp. p. 179. Toronto, 1859.

¶ See Prof. Dawson's Report on Explorations of the country between Lake Superior and the Red River Settlements, p. 18. Toronto, 1859.

is extensively developed in New Mexico; though it appears there to be generally inseparably blended with the Niobrara Division, the two forming together the middle division of his section of the Cretaceous of New Mexico, which attains a thickness of from twelve to fifteen hundred feet. Dr. Shumard has also identified it in Texas, where it is apparently quite thin.\*

All the facts show that this rock thins out, both in the south, and at the north, in an easterly direction, its greatest thickness being at Fort Benton, and along the mountains south of there, and in New Mexico; while on the Missouri, between James and Big Sioux Rivers, it is only about one hundred feet in thickness, and Dr. Shumard gives fifty feet as its thickness in his Texas section.

This formation contains a number of interesting organic remains, some of which are known to have a wide geographical range, and, as may be seen by the foregoing section, also pass up into the succeeding rock above. We also have reason to believe that several of them likewise occur further south, in the formation below, thus apparently linking together, as already suggested, these three rocks as subordinate members of one great series. At any rate, the fossils described by Dr. Shumard from the "Marly Clay, or Red River Group" of his Texas section, which we think he has correctly placed on a parallel with our Dakota Group (=No. 1 of former sections), are both individually, and as a group, apparently very closely allied to forms occurring in the formation under consideration, in Nebraska. For instance, his *Inoceramus capulus* is scarcely distinguishable, as he has suggested, from our *I. umbonatus*; and we think it probable his *Ammonites Graysonensis* is not distinct from *A. percarinatus*, Hall & Meek. Again, his *Scaphites vermiculus* is allied to our *S. larvæformis*.

**NIORRARA DIVISION.**—The typical localities of this rock are along the Missouri, near the mouth of Niobrara river, where it forms perpendicular cliffs from ninety to one hundred feet in height. In this region it consists mainly of lead gray richly calcareous marl, which, where long exposed, assumes a light buff or whitish color, and presents much the appearance of true chalk. Below, it passes into more compact beds of soft bluish gray limestone. It is first seen in descending the Missouri, a short distance below the Great Bend, where it rises by a gentle dip from beneath the succeeding formation (the Fort Pierre Group). Further down the river it is seen to rise higher and higher, and gradually assumes the character of a surface rock, not far below the mouth of Niobrara river. When much exposed to the action of the weather, here and on Little Blue river, near the northern boundary of Kansas, it becomes a rather hard whitish limestone.

This formation can be traced by exposures in north-eastern Kansas, near Little Blue and Smoky Hill rivers, through Arkansas into Texas and New Mexico. In 1837 we pointed out that it is represented by the upper beds of Mr. Marcou's Pyramid Mountain Section; and Dr. Shumard has placed the "Washita Limestone," and "Indurated Gray Marl" of his Texas section, on a parallel with it and two of the same beds in Mr. Marcou's section.

At the Black Hills this rock sometimes presents its normal appearance, but generally there, as well as along the Rocky Mountains further west, it is scarcely distinguishable lithologically from the formation below. The fossils hitherto found in it in Nebraska, are *Ostrea congesta*, *Inoceramus problematicus*, *I. aviculoides*, and a small *Baculite*, together with large scales of fishes. All excepting the fish scales being identical with species found in the strata beneath. *Inoceramus problematicus*, or at least a form scarcely distinguishable from that species, and *Ostrea congesta*, occur in it almost every where that it has been met with.

In Texas, Dr. Shumard found in the bed he places on a parallel with this formation, *Holaster simplex*, *Epiaster elegans*, *Cidaris hemigranosus*, *Gryphæa Pitcheri* (common variety and *G. Tucumcorii*) *G. sinuata*, Marcou (not Sowerby),

\* Transactions St. Louis Academy Sciences, vol. 1, p. 583.



*Ostrea subovata* (= *O. Marshii*, Marcou), *O. carinata*, *O. quadriplicata*, *Janira Texana*, *J. Wrightii*, *Inoceramus problematicus*, *Pachymya Austinensis*, *Lima crenulicosta*, *Terebratula Wacoensis*, *Turritiles Brazoensis*, *Ammonites Texanus*, *A. Brazoensis*, *Hamites Fremonti*, and *Nautilus Texanus*.

RELATIONS OF THE LOWER CRETACEOUS SERIES OF NEBRASKA TO SUBDIVISIONS AT FOREIGN LOCALITIES.—Having now considered, in the order of their succession, the several rocks embraced in the Lower Series of the Nebraska Cretaceous deposits, and endeavored as far as our present means of investigating the subject enables us to do, to trace out their relations to the Cretaceous beds of other parts of this country, it will be interesting to see how nearly their synchronism with known horizons in the Cretaceous system of the old world can be traced out. With this view we have carefully compared with European forms all the fossils in the several Nebraska collections from these rocks, including those most recently obtained, to which the new species described in this paper belong. These comparisons have satisfied us that the formations under consideration,—that is, the Niobrara Division, Fort Benton Group, and the Dakota Group, represent together the Lower or Gray Chalk, and probably the Upper Green Sand of British geologists (= *Turonien* and *Cenomanien*, of D’Orbigny.) We had in 1856, identified the Gray Chalk species *Inoceramus problematicus* in the Niobrara Division (No. 3 of former sections), and suggested that this rock probably holds a position at about the horizon of the Lower Chalk of the old world.\* More recently we had likewise mentioned that we regarded *Ammonites percarinatus*, Hall & Meek, as being probably identical with the well known Lower Chalk species *A. Woolgari* of Mantell.† These facts, however, had not so forcibly attracted our attention until we commenced the investigation of the collections containing the new species described in this paper.

The evidence upon which we have placed these rocks on a parallel with the Lower or Gray Chalk of British geologists, will be more clearly understood by consulting the following list of species from them, which are either identical with, or so closely allied to, species found in that position in the old world, as to be safely regarded we think, as contemporaneous representative forms:—

Found in the Lower Series of Nebraska.	European Lower Chalk species.
<i>Ammonites vespertinus</i> Mort.,	represents <i>A. Rhotomagensis</i> Defr., & other L. Chk. sp.
<i>A. percarinatus</i> H. & M.,	.....probably ident. with <i>A. Woolgari</i> of Mantell.
<i>Scaphites Warreni</i> M. & H.,	.....scarcely distinct from <i>S. aequalis</i> Sowerby.
<i>S. larvaformis</i> M. & H.,	.....same type as “ “ “
<i>Nautilus elegans</i> var.,	.....can scarcely be distinct from <i>N. elegans</i> Sowerby.
<i>Inoceramus latus</i> ?	.....appears to be the same as <i>I. latus</i> of Mantell.
<i>Inoceramus problematicus</i> †	.....can not be distinguished from <i>I. problematicus</i> , [Schlot. sp.]

*Inoceramus problematicus* is most frequently met with in the Niobrara division, but is also sometimes found in the Fort Benton Group: all the others are generally peculiar to the latter rock in Nebraska. *Inoceramus latus*, *Ammonites vespertinus*, and a species very closely allied to *Nautilus elegans*, are found in Texas in beds apparently representing the Niobrara division. Other species from our Lower series of Nebraska similar to Lower Chalk forms of the old world, might be mentioned, but the foregoing list includes the most striking examples.

We may, however, state that, with a few doubtful exceptions, nearly all the other species yet known in the lower series of Nebraska Cretaceous rocks, present much nearer affinities to Lower Chalk forms than to species holding a

\* Proceed. Acad. Nat. Sci. Phila. Nov. 1856, p. 267.

† Proceed. Acad. Nat. Sci. Phila. October, 1860, p. 419. Mr. Gabb has also suggested in a note to p. 129, of his Synopsis of Cret. Foss. that the rocks under consideration may represent the Lower Chalk of England.

‡ This species is said to also occur in the Upper Green Sand of Europe.

higher position in the Cretaceous of the Old World. The most important exception to this rule we have met with is *Inoceramus umbonatus*, which is evidently closely allied to *I. involutus* of Sowerby, from the Upper or White Chalk. There still remains, however, some doubts in regard to the position of this fossil in the Nebraska formations, no specimens of it having yet been collected *in situ* by any person familiar with the order of succession of the Nebraska rocks.

#### UPPER CRETACEOUS SERIES OF NEBRASKA.

FORT PIERRE GROUP.—In the foregoing review of the Lower Series of Nebraska Cretaceous rocks, it has been shown that the subdivisions often shade into each other lithologically, and that at least the upper two members, are so intimately related by the range and affinities of their organic remains as to indicate that they are merely subordinate formations of one great series, or primary division of the Cretaceous system. There seems to be no horizon at which we can, upon palæontological principles, draw a sharp line separating the beds below from those above, until we ascend to the top of the Niobrara Division. In crossing this line, however, we not only generally observe a marked lithological change, but, so far as our present knowledge extends, we meet with the remains of an entirely different group of animals. It is true, nearly or quite all the genera seen in the beds below, are still observed, along with many others in the strata above this horizon; but the species yet found in these upper formations, in Nebraska at least, are all distinct from those hitherto found in the lower series.

We are aware that further investigations may possibly show closer relations between the organic remains of the upper and lower series of these rocks in this region than have been hitherto discovered. Yet, when it is borne in mind that our conclusions are based upon a careful study and comparison of extensive collections from numerous localities, scattered over a great area of country, it will be readily understood how very improbable it is that future explorations will materially modify these results.

At the base of the Fort Pierre group,—the inferior member of the upper series of Nebraska Cretaceous rocks,—there is, at some localities along the Missouri below the Great Bend, a local bed ten to thirty feet in thickness, composed of very dark unctuous clay, containing great numbers of small scales of fishes, much iron pyrites and carbonaceous matter, with crystals, veins and seams of sulphate of lime. This bed usually occupies depressions in the previously eroded upper surface of the formation beneath.

With the exception of the local deposit just mentioned, the Fort Pierre Group consists of a vast accumulation of fine gray and dark colored clays in moderately distinct layers, but never presents a laminated or slaty structure like the Fort Benton Group. When wet, these clays are soft and plastic, but in drying they often crack and crumble so as to obliterate the marks of deposition in vertical exposures.

This formation composes all the hills on both sides of the Missouri at Fort Pierre, and much of the country between there and the Bad Lands. It also forms the bluffs along the river below Fort Pierre to the Great Bend, just below which the Niobrara Division rises above the level of the Missouri. From the Great Bend down to the mouth of Niobrara River, the country is made up of these two formations, which rise with the general inclination of all the rocks in this region, so that the Fort Pierre Group finally runs out in the form of outliers on the tops of the hills below the mouth of Niobrara River. Above Fort Pierre, it gradually sinks beneath the Fox Hills Group in the region of Cheyenne and Moreau Rivers, but continues to be seen in the bluffs of the Missouri and other streams for some distance beyond.

On the Upper Missouri, this formation comes to the surface again, and forms much of the country in the region of Milk and Muscle Shell Rivers. It is also known to extend far up into the British possessions,—some of its fossils having

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been discovered on the Saskatchewan by an expedition sent out by the Canadian Government in 1858, under the direction of Prof. S. J. Dawson.\*

Several of the characteristic fossils of this formation were also discovered, in 1858, on the South Branch of the Saskatchewan, as well as on the Assiniboine and Little Souris Rivers, by another Canadian Government expedition, under the charge of Prof. Henry Y. Hind.†

This formation is also known to be well developed at the Black Hills and along the Rocky Mountains west of there in Nebraska, and extends southward at least as far as the region of Pike's Peak. It also exists in Texas, though it probably only occurs as thin local patches in the country between the Rocky Mountains and the Mississippi south of Nebraska. We had pointed out its probable existence in Texas in 1856;‡ and Dr. Shumard has, as we think, correctly placed on a parallel with it the "Austin Limestone" and "Fish-bed" of his section of the Texas Cretaceous rocks.§

The Fort Pierre Group is also known to be represented on the western borders of North America, or more properly, on Vancouver Island, as well as on Suvia Islands in the Gulf of Georgia.||

Coming eastward we find it again represented in New Jersey, and extending thence through into Alabama and other Southern States. As long back as 1834, Dr. Morton had suggested in his Synopsis of Organic Remains, p. 25, that the beds at the Great Bend of the Missouri, are probably on a parallel with the Green Sand of New Jersey. The identity of a few of the Nebraska Cretaceous fossils with New Jersey species, was also pointed out by Prof. Hall, and one of the writers (F. B. M.) in a paper published in the Memoirs of the American Academy of Arts and Sciences, vol. 5, N. S., p. 406, 1854; though too little was then known in regard to the range of the fossils in the Nebraska beds, to warrant any attempt at drawing parallels between subdivisions.

In Nov., 1856, after we had ascertained with some degree of accuracy the position and range of particular species in the Nebraska series, and had learned from the New Jersey Reports and from Prof. Cook, the range of the same forms in New Jersey, we remarked that "the occurrence of several of the more common and characteristic fossils of the upper two Nebraska formations, [Fort Pierre Group and Fox Hill Beds,] such as *Ammonites placenta*, *Scaphites Conradi*, *Baculites ovalis*, *Nautilus Dekayi*," &c., in the first and second Green Sand beds, and the intervening ferruginous stratum in New Jersey, as well as in the "Rotten Limestone" of Alabama, clearly indicates the synchronism of these deposits, notwithstanding their widely separated geographical positions.¶

In May, 1857, we also submitted to the Academy another paper in which we discussed more at length the relations of the Nebraska Cretaceous rocks to those of New Jersey and other States, giving at the same time for comparison a section of the Cretaceous strata of Alabama, furnished by Prof. Winchell, another of those in Northeastern Kansas, by Mr. Hawn, and a third of the same in New Jersey, compiled from the Reports of Prof. Ketchell and Prof. Cook.\*\*

\* See Report Exploration of the Country between Lake Superior and the Red River Settlement. Toronto, 1859, page 18.

† For figures and descriptions of these fossils, see a paper by one of the writers in Professor Hind's Report of the Saskatchewan and Assiniboine Expedition, page 182. Toronto, 1859.

‡ See note appended to the extra copies distributed by us, of a paper read before the Academy, in Nov., 1856.

§ Observations upon the Cretaceous Strata of Texas, by F. B. Shumard, M. D., State Geologist. Trans. St. Louis Acad. Sci., vol. 1, page 583.

|| See paper by F. B. Meek, describing Cretaceous fossils from Vancouver Island, in Trans. Albany Institute, read Dec., 1856. Also another paper by same, in Proceed. Acad. Nat. Sci. Phila., for Oct., 1861. On the Collections of N. W. Boundary Survey.

¶ Proceed. Acad. Nat. Sci. Phila., November, 1856, p. 267.

\*\* Proceed. Acad. Nat. Sci. Phila., May, 1857, p. 117.

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As the last mentioned section of the New Jersey rocks will aid in the clear understanding of remarks and comparisons in other portions of this paper, we reproduce it below as originally published by us in the paper last above cited. The reader will understand that by formations No. 1, No. 4 and No. 5 of Nebraska, in the right-hand column, we referred to the Dakota Group, the Fort Pierre Group and the Fox Hills Beds of this paper;—the intermediate No. 2 and No. 3, (Fort Benton Group and Niobrara Division,) being probably wanting in New Jersey.

*New Jersey Section Compiled from the Reports of that State.*

a.	3d bed. G. Sand.	Green Sand.	60 ft.	Tertiary.
		"The sand between the second and third beds has usually been con-founded with beach sand, which it closely resembles."		
		45 or 50 ft.		
b.	2d bed. G. Sand.	Yellow limestone.		No. 5. Nebraska.
		Green Sand, <i>Scaphites Conradi</i> , <i>Baculites ovatus</i> , <i>Ammonites placenta</i> .	45 or 50 ft.	
c.		Sand "much colored with oxyd of iron, and when sufficiently firm is found almost full of the impression of shells." <i>Belemnites mucronatus</i> .*		Represents No. 4, Nebraska.
			65 or 70 ft.	
d.	1st bed. G. Sand.	Green Sand, <i>Nautilus Dekayi</i> , <i>Baculites ovatus</i> , <i>Belemnites mucro-natus</i> ,* and bones of <i>Mosasaurus</i> .		Represents No. 1 of Nebraska section.
			50 ft.	
e.		Dark clays with "occasional streaks and irregular spots of green sand." <i>Ammonites placenta</i> , <i>Baculites ovatus</i> , &c. &c.		
			130 ft.	
f.		Dark blue, ash colored, and whitish clays, and micaceous sand, with thin seams of coal. Great quantities of sulphuret of iron. "Fossil wood is found in some of the layers in large quantities, and some very distinct impressions of net-veined leaves were examined in the clay at French's landing."		
			130 ft. or more.	

In an able and lucid article by Prof. Hall, on the distribution of the Cretaceous rocks of America, and their relations at distantly separated localities, published in the American Journal of Science, July, 1857, it will be seen he has arrived at nearly the same conclusions in regard to the Nebraska and N. Jersey beds. He likewise draws the same parallels in an elaborate article in the first vol. of the Report on the U. S. and Mexican Boundary Survey, published during the summer of 1858.†

The Fort Pierre Group generally abounds in fossils in Nebraska, though they are not equally distributed through the whole formation, there being an upper and a lower fossiliferous zone, while a considerable thickness of the middle beds usually contains few organic remains. Its fossils are generally found in a

\* *Belemnitella mucronata*.

† This volume of the Mexican Boundary Report bears the date of 1857 on the title-page, but it was not actually published until the summer of 1858. See American Journal of Science and Arts for July, 1859, p. 149.

fine state of preservation,—the nacre of many of the shells being as brilliant as when the animals were living. In this latter respect they present a marked contrast with the dull appearance of those from the formations below. In most cases they are found enveloped in very hard, dark argillo-calcareous concretions, from a few inches to several feet in diameter. Those occurring in the lower fossiliferous zone, at the base, are, *Mosasaurus Missouriensis*, *Callianassa Danaë*, *Ammonites complexus*, *Baculites ovatus* and *B. compressus*, *Helicoceras Mortoni*, *H. cochleatum*, *H. tortum*, *H. umbilicatum*, *Fusus viniculum*, *F. Shumardi*, *Buccinum constrictum*, *Amauropsis paludinaeformis*, *Anisomyon borealis*, *Inoceramus sublævis*, *I. incurvus*, &c. &c.

In the upper fossiliferous zone, organic remains are more abundant than in the lower; the following list contains the names of many of those usually found at this horizon, viz.,—bones of *Mosasaurus Missouriensis*, with *Nautilus Dekayi*, *Ammonites placenta*, *Scaphites nodosus*, *S. Nicolleii*, *Baculites ovatus*, *B. compressus*, *Aptychus Cheyennensis*, *Fusus subtrirritus*, *F. ? tenuilineatus*, *Gladius ? Cheyennensis*, *Margarita Nebrascensis*, *Dentalium gracile*, *Tectura occidentalis*, *Anisomyon patelliformis*, *A. alveolus*, *Bulla Nebrascensis*, † *Xylophaga elegantula*, *Corbulamella gregaria*, *Cardium rarum*, *Lucina occidentalis*, *Crassatella Evansi*, *Modiola Meekii*, *Inoceramus convexus*, *I. Mortoni*, *I. Nebrascensis*, *I. Sagensis*, *I. Vanuzemi*, &c. &c. Several of these fossils pass up into the formation above.

FOX HILLS BEDS.—This formation is generally more arenaceous than the Fort Pierre Group, and also differs in presenting a more yellowish or ferruginous tinge. Towards the base it consists of sandy clays, but as we ascend to the higher beds, we find the arenaceous matter increasing, so that at some places the whole passes into a sandstone. It is not separated by any strongly defined line of demarcation from the formation below, the change from the fine clays of the latter to the more sandy material above, being usually very gradual. Nor are these two formations distinguished by any abrupt change in the organic remains, since several of the fossils occurring in the upper beds of the Fort Pierre Group pass up into the Fox Hills Beds, while at some localities we find a complete mingling in the same bed of the forms usually found at these two horizons. Indeed, we might with almost equal propriety, on palæontological principles, carry the line separating these two formations down so as to include the upper fossiliferous zone of the Fort Pierre Group, as we have defined it, in the formation above. All the facts, however, so far as our present information goes,—taking into consideration the change in the sediments at or near where we have placed the line between these two rocks,—seem to mark this as about the horizon where we find evidences of the greatest break in the continuity of physical conditions.

The formation under consideration is most distinctly marked at Fox Hills, between Cheyenne and Moreau Rivers, above Fort Pierre; and it also extends across upon the opposite side of the Missouri, in the region of Long Lake. It likewise immediately underlies the Tertiary bone beds of the *Mauvaisés Terres* at Sage Creek and other places in the vicinity of White River, but is not very fossiliferous, so far as known, in that region. At a single locality on the Yellow Stone River, about one hundred and fifty miles from its mouth, there is a low exposure having the lithological characters of the Fort Pierre Group, but containing a complete mingling of the fossils usually found in the upper part of that rock, with those generally occurring in this.

On the Upper Missouri, in the region of Mussel Shell and Milk Rivers, the Fox Hills Beds do not seem to be very well defined as a distinct rock. A few specimens, however, apparently from this horizon, were collected by Prof.

† This species we had named *B. occidentalis*, in our paper of March, 1856. As that name had previously been used for a recent species of this genus by A. Adams, it becomes necessary to give our shell another name, and we now propose to call it *B. Nebrascensis*.

Hind's Exploring Expedition in the British Possessions, on the South Branch of the Saskatchewan; and, what is a little remarkable, they occur in a green sand matrix, much like that in New Jersey, excepting that it is more indurated.

At the Black Hills, and along the Rocky Mountains west of there, the Fox Hills Beds are generally well developed. They also occur at Deer Creek on the North Platte, and along the mountains southward at least to the region of Pike's Peak. South of this they have not yet been certainly identified as a distinct rock.

As already stated, we had pointed out, in Nov., 1856, and in May, 1857, that this rock is represented by the upper portion of the Cretaceous beds in New Jersey, (the beds b, c, d and e of the section on page 426 of this paper,) and by the Rotten Limestone of Alabama.

The intimate relations between the Fox Hills Beds and the Fort Pierre Group, already mentioned, make it necessary, when we undertake to trace out the relations between our Cretaceous rocks and those of the Old World, to view these two formations together as one series. Their synchronism with particular portions of the Cretaceous system, at British and other foreign localities, will also be more clearly understood by keeping in view, as a half-way ground, their representative beds in New Jersey, which certainly contain a few foreign species. The evidence of the equivalence of our Upper Cretaceous Series of Nebraska with the upper four divisions of the Cretaceous in New Jersey,—b, c, d and e of the section on page 426 of this paper,—(which we must also take collectively, when we wish to compare them with particular horizons of the Cretaceous abroad), will be more clearly understood by consulting the following list of species common to the New Jersey and Nebraska Upper Cretaceous Series:—

New Jersey Species.	Position in Nebraska Upper Series.
<i>Mosasaurus Missouriensis</i> .....	Ranges through the whole Upper Series.
<i>Nautilus Dekayi</i> .....	Upper zone Ft. P. G. and in F. H. Beds.
<i>Scaphites Conradi</i> .....	Fox Hills Beds.
<i>Ammonites placenta</i> .....	Upper zone Ft. P. G. and F. H. Beds.
<i>A. complexus</i> .....	Lower zone Ft. Pierre Group.
<i>A. lobatus</i> .....	Fox Hills Beds.
<i>Baculites ovatus</i> .....	Ranges all through Ft. P. Group.
<i>Amauropsis paludinaeformis</i> *.....	Lower zone Ft. P. Group.

We have reason to believe several other species are common to the Upper Series in Nebraska and New Jersey, but we only include in this list those about which there can be no doubt. A list of the closely allied representative species at these distant localities, would, if accompanied by figures, still more clearly illustrate the synchronism of the rocks under consideration.

#### RELATIONS OF THE UPPER CRETACEOUS SERIES OF NEBRASKA TO EUROPEAN DIVISIONS.

Before expressing any opinion in regard to the parallelism of our Upper Cretaceous Series of Nebraska, with particular portions of the Cretaceous of the old world, it is proper that we should give a brief statement of the views of others on this point, as well as in relation to the age of equivalent beds in New Jersey, and in the States farther south.

As is now well known, the Cretaceous strata of New Jersey were first referred to that epoch by the lamented Prof. Lardner Vanuxem; who did not, however, attempt to trace out close parallels between particular beds of the New Jersey strata, and their exact equivalents in the old world. Dr. Morton, to whom we are indebted for figures and descriptions of a large number of the New Jersey fossils, regarded these rocks and their equivalents in Nebraska and the South-

\* This species has been identified in New Jersey by Dr. Isaac Lea.

orn States, as mainly representatives of the Upper Green Sand, or Chalk Marl of Europe. It should not be forgotten, however, that he considered what he had previously called the "Middle Division," that is, the upper calcareous stratum in New Jersey, "contemporaneous with the European White Chalk."\*

Sir Charles Lyell expresses the opinion that the fossils of the New Jersey Cretaceous beds, "on the whole agree most nearly with those of the upper European series from the Maestricht beds to the Gault inclusive." †

Prof. Henry D. Rogers, with his usual sagacity in such matters, remarks in his able Report on the Geology of New Jersey, that he does not regard the Green Sands of that State, "in the strict sense of the word, as the equivalents of the Green Sand formation, so called, of Europe." ‡

In his *Cours Elementaire de Paleontologie*, Alcide D'Orbigny refers the fossiliferous Cretaceous beds in New Jersey, and those in Nebraska, Arkansas, Texas, Alabama, &c., all to his *Senonien*, the equivalent of the White or Upper Chalk, and Maestricht beds. §

Prof. F. J. Pictet, in his "*Traite de Paleontologie*," also refers most, if not all, of the New Jersey Cretaceous species, to the age of the White Chalk of Europe.

In an interesting paper read by Dr. Isaac Lea before the Academy, in December, 1858, he likewise seems to favor the conclusion that the Cretaceous Green Sands of New Jersey represent the *Senonien* of D'Orbigny, but suggests some reasons for thinking that they may possibly belong a little lower in the Series. ||

From a careful review of the whole subject, and an attentive study of extensive collections from the various formations of Nebraska, we are led to adopt D'Orbigny's views, so far as regards our Upper Cretaceous Series of that region, and their equivalents in New Jersey and the States farther south. That is to say, we regard these rocks as synchronous with the Upper or White Chalk, and Maestricht beds of Europe, (= *Senonien* of D'Orbigny.) We differ with him, however, in regard to the parallelism of our Lower Series of Nebraska; or, more properly, we differ with him in referring equivalent beds in Arkansas and farther south to his *Senonien*, for it is probable he had never seen any fossils from this Lower Series in Nebraska.

The evidence in favor of the conclusion we have adopted in regard to the synchronism of our Upper Series of Cretaceous rocks in Nebraska, with the White Chalk and Maestricht beds of Europe, is both of a stratigraphical and paleontological nature. The stratigraphical evidence is, that it holds, west of the Mississippi, a position above an older series, containing, as we have shown, a group of organic remains corresponding in their affinities, and in several instances, as we think, agreeing specifically with Lower Chalk forms in the old world. The paleontological evidence is, first, that many of its fossils belong to genera, which, according to Pictet, D'Orbigny, and others, are not known in Europe below the White Chalk, nor even, in some instances, below the oldest Tertiary. Secondly, that several of the forms occurring in these beds in Nebraska are also found in equivalent beds in New Jersey, and farther south, associated with well known European Upper Chalk and Maestricht bed species; while they are all specifically distinct, so far as known, from those found in the Lower Series in Nebraska.

The following is a list of the genera found in the Upper Series in Nebraska, and equivalent strata in New Jersey, Alabama, and some other States in the South; which, according to trustworthy authorities, are not known to range below the horizon of the White Chalk, and a few of them not even below the oldest Tertiary at foreign localities. ¶

\* Jour. Acad. Nat. Sci., vol. iii., New Series, p. 217.—1841.

† Manual, p. 224.

‡ Report on the Geology of New Jersey, page 178.—1845.

§ Cours Elemt. de Paleontologie, pages 671 and 672, vol. ii.—1852.

¶ Proceed. Acad. Nat. Sci., Phila., Dec., 1858.

¶ A few other genera might probably be added to this list, but we have given what we consider the best authenticated examples.

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Names of Genera.	Position in Nebraska.	Localities in the States.	Position in Europe.
Mosasaurus.	Ft. P. G. & Fox H. Bds.	N. Jersey and Alab.	Wh. Chk. & Maest. B.
Saurocephalus.		New Jersey.	White Chalk.
Callianassa.	Base Ft. Pierre Gr.	" "	" "
Pleurotoma.	Ft. P. G. Up. pt. & Fox H. B.		Wh. Chk. & Maest. B.
Busycon.	Fox Hills Bds.		
Pseudobuccinum.	" " "		
Fasciolaria.	" " "	Tennessee.	Maestr. Bds.
Cypræa.		Alabama.	White Chalk.
Xylophaga.	Fox Hills Bds.		
Pulvenites.		Mississippi.	" "
Cassidulus.		Alab. and Miss.	" "

Of this list of eleven genera, the following three, viz.—*Busycon*, *Pseudobuccinum* and *Xylophaga*, have not yet, we believe, been found in the old world so low as the Cretaceous; while the genus *Fasciolaria* is there said to extend no lower than the very latest member of the Cretaceous, (the *Danien* of D'Orbigny,) above the Maëstricht beds. The following seven of these genera, viz.—*Callianassa*, *Busycon*, *Pleurotoma*, *Fasciolaria*, *Cypræa*, *Xylophaga*, and *Cassidulus*, pass into the Tertiary, and are represented in our present seas; while the genus *Pseudobuccinum* will probably be also found in the Tertiary, since we know at least one species of it still living.\*

At the same time that we are already aware of the occurrence of eleven or more genera, in our Upper Series of American Cretaceous rocks, not known to have been found below the horizon of the Upper Chalk in Europe, we can remember only three that have been identified in this Upper Series, which are supposed not to range above the Lower Chalk of the old world. These are *Caprinella*, *Goniatomya*, and *Macrabacia*.† Of each of the latter two genera we certainly know one species in our Fox Hills beds; but the occurrence of the first in our Upper Series is very doubtful, since it has only been identified from a single imperfect specimen, that will probably be found to belong to some other group.

In addition to the general upward tendency, so to speak, of the genera in this Upper Series, both in Nebraska and farther eastward, we would also remark that a few of the forms found in our Fox Hills beds, particularly of the *Gasteropoda*, present such close specific affinities to Tertiary shells, that we would have doubted the propriety of referring them to the Cretaceous epoch, were it not for the fact that we find them associated in the same bed with *Baculites*, *Ammonites*, *Scaphites*, and other Cretaceous genera and species.

Although we have not been fully able to satisfy ourselves that any of the species yet known from the Upper Cretaceous Series of Nebraska are certainly identical with Upper Chalk forms in the old world, many of them are undoubtedly closely allied representatives, and we think the following will probably prove to be common to this horizon in Nebraska and Europe, viz.—*Nautilus Dekayi*, *Scaphites Conradi*, *Baculites anceps*, and *Gryphæa vesicularis*. At any rate *Nautilus Dekayi* is closely related to some foreign forms, and is supposed by D'Orbigny to occur in the Upper Chalk of Europe. *Scaphites Conradi*, also, seems scarcely distinguishable from an Upper Chalk form found in Germany, described by Roemer under the name of *S. pulcherrimus*; and we find in our Fox Hills beds a *Baculite* we cannot distinguish from a Texas shell referred by Dr. F. Roemer to *B. anceps* of Lamarck. We would remark, however, that if D'Orbigny's figures of Lamarck's species represent the sutures accurately, the Ame-

\* *P. ampullaceum*, (= *Bullia ampullacea* of Middendorff,) from the Great Schantar Island.

† We are aware the genus *Belemnites* is not known to extend up into the Upper Chalk in Europe, and that Dr. Morton described a *B. ambiguus* from New Jersey. Dr. Leidy, however, has decided that it is a spine of a Fish.



rican form will probably prove to be only an allied representative species. In addition to the above, we likewise find a *Gryphæa* in our Fort Pierre Group, which presents close relations to *G. vesicularis*, if it is not indeed that species.

When we come to the equivalent rocks further eastward, however, in New Jersey, and at localities in Alabama and other Southern States, we are no longer compelled, as previously stated, to rely upon doubtfully identical, or closely allied representative species, for we there find a number of our Nebraska forms associated with some seven or eight well known European Upper Chalk species.

So far as we have been able to ascertain, the list given below embraces the species known to be common to the New Jersey and Alabama rocks alluded to, and the Upper Chalk and Maestricht beds of the Old World :

Names.	American Localities.	Foreign localities and position.
<i>Saurocephalus lanciformis</i> ,	New Jersey.	England, White Chalk.
<i>Lamna acuminata</i> ,	New Jersey.	England, White Chalk.
<i>Belemnitella mucronata</i> ,	New Jersey, Ala., &c.	Eng., Fr., &c., Wh. Ck. & Maest. B.
<i>Neithea Mortoni</i> ,	New Jersey, Ala., &c.	France, White Chalk.
<i>Ostrea larva</i> ,	N. J., Tenn., Ala., &c.	Eng., France, &c., Wh. Ck. & Maest. B.
<i>Gryphæa vesicularis</i> ,*	N. J., Tenn., Ala., &c.	Eng., France, &c., Wh. Ck. & Maest. B.
<i>Nucleolites crucifer</i> ,	New Jersey.	France, White Chalk.

It is true we have in this upper series in Nebraska and further east, a few forms allied to Lower Chalk and Upper Green Sand species, and we have regarded two of these, at least, as probably identical with foreign species of that age. That is, we had supposed our *Cucullæa Shumardi* probably identical with the Green Sand species, *C. fibrosa* of Sowerby, and a small *Micrabacia* from our Fox Hills beds, probably identical with *M. coronula* Goldfuss sp., from the same horizon. Later comparisons, however, have led us to regard the latter as a distinct species; and although we have not yet been able to find characters by which our *Cucullæa Shumardi* can be distinguished from the figures and descriptions of Sowerby's species we have seen, it is quite probable that a careful comparison of a series of good specimens would bring to light constant differences of specific importance. Should these, however, and several others we have from time to time compared with Green Sand and Lower Chalk species, really prove to be undistinguishable from them, still the weight of evidence would, on the whole, be strongly in favor of the conclusion that these rocks are certainly of the age of the Upper Chalk and Maestricht beds.

From all the foregoing facts it may be seen, first, that the only strongly marked palæontological break in the Nebraska Cretaceous Section, so far as we now know, is that dividing the Niobrara Division from the Fort Pierre Group.

Secondly, That all the Nebraska Cretaceous beds below this line, included in our section, as well as the bed f. of the New Jersey Section, on page 426 of this paper, represent the Lower or Gray Chalk, are probably the Upper Green Sand of the Old World.†

Thirdly, That all the Nebraska beds between this strongly marked line, near the middle of the section, and the Tertiary, as well as the beds b, c, d,

\* This species is supposed by some to occur also in the Upper Green Sand, and the Lower or Gray Chalk, but the form occurring in these lower positions is regarded by other authorities as a distinct species.

† By this remark we do not mean to express the opinion that Cretaceous strata older than the Upper Green Sand of Europe may not exist, and yet be discovered in Nebraska and New Jersey.

and e, of the New Jersey Section, belong to the horizon of the Upper or White Chalk and Maestricht Beds of Europe.

#### TERTIARY ROCKS.

It would extend these remarks beyond the limits assigned them, to attempt any detailed account of the Tertiary rocks of Nebraska, or to discuss at length the questions respecting their relations to those of the Atlantic coast, or of the Old World. We must therefore limit ourselves here to a few brief statements of leading facts, and leave all details for another occasion.

In the first place, we would remark, that no strictly marine Tertiary deposits have yet been discovered in all the Rocky Mountain region of Nebraska, nor, so far as we know, in any other portion of Nebraska, Kansas or Utah. Throughout all this great central area of the Continent, wherever the oldest Tertiary deposits have been seen, they give evidence of fresh and brackish water origin; and where observed resting upon the most recent Cretaceous beds, the two have been found conformable, and sometimes blended together, so as to render it difficult to draw a line between them, in the absence of organic remains.

All the facts indicate a gradual change from the marine conditions of the Cretaceous—at first to brackish, and then to the fresh water conditions of the Tertiary. The predominance of *Gasteropoda* and *Lamellibranchiata*, and the comparative paucity of types usually considered characteristic of deeper water deposits, as well as the coarser nature of the sediments, near the end of the Cretaceous epoch in this region, indicate that the waters were growing more shallow as the land on the east encroached on the sea, and islands were rising where the Rocky Mountains now stand; while the close of the Cretaceous period seems to have been attended by the gradual elevation of large areas of country here above the ocean level. This and other contemporaneous changes of physical conditions, caused the total destruction of the whole Cretaceous fauna.

After this, extensive tracts of country in the region of the Rocky Mountains, and east of there in Nebraska, and other North-western Territories, were occupied by Bays, Inlets, Estuaries, &c., of brackish water, inhabited by mollusca of the genera *Ostrea*, *Unio*, *Pisidium*, *Corbicula*, *Potamomya*, *Melania*, *Melampus*, *Vivipara*, &c. &c., all of Tertiary types. As the gradual elevation of the country continued, the salt and brackish waters receded, and gave place to Lakes and other bodies of fresh water, in which most of the Tertiary rocks of the North-west were deposited; so that in all, excepting the earliest Tertiary beds of this region, we find only the remains of strictly fresh water and terrestrial animals.

The passage from the brackish to the fresh water beds in the oldest member of the Tertiary of this region, seems not to be marked by any material alteration in the nature of the sediments. Nor have we, so far as is yet known, any reasons for believing that any climatic or other important physical changes beyond the slow rising of the land, and the consequent recession of the salt and brackish water, took place during the deposition of the whole of the oldest member of the Tertiary here; since we find a considerable proportion of the species of fresh water mollusca ranging through this whole lower member. The principal difference between the fossils of its upper and lower beds, consists in the gradual disappearance of strictly brackish water types, as we ascend from the inferior strata.

The entire series of Nebraska Tertiary rocks consists of three or four groups, three of which at least, (and probably four), evidently belong to separate and distinct epochs. They usually occur in isolated basins, but have with one exception, all been seen in such connection as to leave no doubts in regard to their order of superposition. Their prevailing lithological characters, estimated maximum thickness, and order of succession, will be seen in the section given below.

[Dec.

General Section of the Tertiary rocks of Nebraska.

Names.	SUBDIVISIONS.	Thick-ness.	LOCALITIES.	Foreign Equiva-lents.
Loup River beds.	Fine loose sand, with some layers of limestone,—contains bones of <i>Canis</i> , <i>Felis</i> , <i>Castor</i> , <i>Equus</i> , <i>Mastodon</i> , <i>Testudo</i> , &c., some of which are scarcely distinguishable from living species. Also <i>Helix</i> , <i>Physa succinea</i> , probably of recent species. All fresh water and land types.	300 to 400 feet.	On Loup fork of Platte River; extending north to Niobrara River, and south to an unknown distance beyond the Platte.	Pliocene.
White River Group.	White and light drab clays, with some beds sandstone, and local layers limestone. Fossils, <i>Oreodon</i> , <i>Titanotherium</i> , <i>Cheropotamus</i> , <i>Rhinoceras</i> , <i>Anchitherium</i> , <i>Hyaenodon</i> , <i>Machairodus</i> , <i>Trionyx</i> , <i>Testudo</i> , <i>Helix</i> , <i>Planorbis</i> , <i>Limnaea</i> , Petrified wood, &c. &c. All extinct. No brackish water or marine remains.	1000 feet or more.	Bad Lands of White River; under the Loup River beds, on Niobrara, and across the country to the Platte.	Miocene.
Wind River Deposits.	Light gray and ash colored sandstones, with more or less argillaceous layers. Fossils,—fragments of <i>Trionyx</i> , <i>Testudo</i> , with large <i>Helix</i> , <i>Vivipara</i> , Petrified wood, &c. No marine or brackish water types.	1500 to 2000 feet.	Wind River valley. Also west of Wind River Mountains.	?
Fort Union or Great Lignite Group.	Beds of clay and sand, with round ferruginous concretions, and numerous beds, seams and local deposits of Lignite; great numbers of dicotyledonous leaves, stems, &c. of the genera <i>Platanus</i> , <i>Acer</i> , <i>Ulmus</i> , <i>Populus</i> , &c., with very large leaves of true fan Palms. Also, <i>Helix</i> , <i>Melania</i> , <i>Vivipara</i> , <i>Corbicula</i> , <i>Unio</i> , <i>Ostrea</i> , <i>Potamomya</i> , and scales <i>Lepidotus</i> , with bones of <i>Trionyx</i> , <i>Emys</i> , <i>Compsemys</i> , <i>Crocodylus</i> , &c.	2000 feet or more.	Occupies the whole country around Fort Union, — extending north into the British possessions, to unknown distances; also southward to Fort Clark. Seen under the White River Group on North Platte River above Fort Laramie. Also on west side Wind River Mountains.	Eocene?

THE FORT UNION, OR GREAT LIGNITE GROUP, occupies extensive areas of country in Nebraska, and has been seen beneath the White River Group at several distant localities. It was evidently deposited in large bodies of water, which were at first brackish, and then gradually became fresh. The great numbers of fossil leaves, and numerous beds of lignite contained in it, clearly show that the shores of these ancient estuaries, lakes, &c., in which this formation was deposited, supported dense forests of large trees, and a growth of other vegetation, far exceeding in luxuriance anything now met with in these latitudes. Indeed, the presence of true Fan Palms, of large size, and 1861.]

the remains of the genus *Crocodylus*, as well as the affinities of the mollusca found in these beds to southern forms, all point rather to the existence here of a tropical than a temperate climate during their deposition.

In regard to the relations of this formation to known horizons in the Tertiary of the Old World, we scarcely feel prepared to express a very decided opinion. The difficulty in the way of drawing inferences bearing on this point, from the remains of mollusca found in these beds, is, that they, being fresh and brackish-water types, bear little or no analogy to those of the Tertiaries of the States bordering on the Atlantic; nor are any of them, so far as known, specifically identical with foreign forms.

When we bear in mind, however, the fact, that wherever this formation has been seen in contact with the latest Cretaceous beds, the two have been found to be conformable, however great the upheavals and distortions may be, while at the junction there seems to be a complete mingling of sediments, one is strongly impressed with the probability that no important member of either system is wanting between them. This view is also rendered more probable by the fact that the formation under consideration is known to hold a position beneath the White River Group; which is characterized by the remains of an entirely different fauna, clearly of Miocene age.

Again, the occurrence in this lower group of remains of the genus *Lepidotus*, which is, we believe, in Europe unknown above the Eocene; while the other vertebrate remains found associated with it have been compared by the distinguished Comparative Anatomist, Prof. Leidy, with types even older than the Tertiary, are facts strengthening the impression that this Fort Union Lignite Group probably represents the Eocene of Europe.

It should not be forgotten, however, that an extensive and beautiful series of fossil plants from this formation, although not yet thoroughly investigated, have been thought by Dr. Newberry to be most analogous to Miocene types. Yet even if this formation should prove to be of Eocene age, this would only be in accordance with what is now known in regard to the earlier introduction of particular types of plants in the Cretaceous System of this country, than in that of the Old World.

As the WIND RIVER DEPOSITS have not yet been seen in contact with any well marked beds of the other Tertiary formations of this region, and few fossils have yet been found in them, their position in the series remains doubtful. It is therefore only provisionally that we have placed this formation between the Fort Union and White River Groups in the foregoing section. It may possibly belong to the horizon of one of these rocks, or even represent them both in part, or, what is more probable, it may occupy an intermediate chronological position.

The only fossils yet found in this formation are fragments of *Trionyx*, and *Testudo*, together with the shells of two species of *Helix* and a cast of a *Vivipara*. One of these *Helices* is more like *H. Leidyi*, from the White River Group than any of the other species yet known from any of these rocks, while the other is a very large depressed species of southern type, quite unlike any of those hitherto found in any of the other Nebraska rocks. The *Vivipara* seems to be undistinguishable from our *V. trochiformis*, from the Fort Benton Group; though, as it is a mere cast, it cannot be identified with positive certainty with that shell. No marine or brackish water fossils have been found in these beds.

THE WHITE RIVER GROUP is the formation that has furnished the extensive and interesting collections of vertebrate remains, which have been so ably investigated by Prof. Leidy. It occupies a considerable area in the region of White River, and is seen beneath the succeeding formation on the Niobrara and Platte Rivers. Its position above the Fort Union, or Great Lignite Group, has also been clearly and satisfactorily determined.

This formation is mainly composed of a series of whitish indurated clays, which have been worn and cut by the streams, rains, and other atmospheric

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agencies, into numerous deep valleys and ravines, so as to leave various peaks, isolated columns, towers, &c., presenting, as seen from a distance, exactly the appearance of the ruins of an ancient city. The difficulty the traveler meets with in finding his way through this interminable labyrinth, had caused the Indians to call it in their own language, the Bad Grounds, hence the French name *Mauvaises Terres*, applied by the Canadian Voyageurs in the employ of the Fur Companies.

The vertebrate remains found in these beds belong to the genera *Oreodon*, *Agriochærus*, *Pæbrotherium*, *Leptomeryx*, *Leptauchenia*, *Protomeryx*, *Merycodus*, *Titanotherium*, *Leptochoerus*, *Hyracodon*, *Entelodon*, *Palæochoerus*, *Rhinoceros*, *Steneo fiber*, *Machairodus*, *Anchitherium*, *Hypotamias*, *Hyænodon*, *Ischyromys*, *Palæolagus*, and *Eumys*, *Testudo*, &c., &c. The affinities of these fossils, as has been shown by Prof. Leidy, clearly establish the Miocene age of this formation.

Comparatively few invertebrate remains have yet been found in the White River Group. They consist of one species of *Helix*, one or two of *Limnæa*, a small *Physa*, two or three small species of *Planorbis*, &c. No fossil leaves, nor beds of Lignite, have been met within it; and all the animal remains, as may be seen from the foregoing list, are terrestrial and fresh water types.

The LOUP RIVER BEDS consist mainly of incoherent materials, and were evidently deposited after the upper surface of the White River Group had been worn into ravines and other depressions. It occupies much of the surface of the country in the region of the Loup Fork of Platte River, and extending far south of the latter stream. The vertebrate remains described by Prof. Leidy from it, belong to the genera *Megalomeryx*, *Procamelus*, *Cervus*, *Rhinoceros*, *Mastodon*, *Elephas*, *Hipparion*, *Merychippus*, *Equus*, *Castor*, *Felis*, *Canis*, *Testudo*, &c., many of which are very closely allied to recent species. A few shells of the genera *Helix*, *Physa*, &c., apparently identical with living species, have also been found in these beds. All the species of vertebrate and other remains yet found in them, are distinct from those occurring in the White River Group and beds below, and they have not yet afforded any brackish or marine types of any kind.

When we take into consideration the position of this formation above the well marked Miocene White River Group, and the relations of its organic remains to Pliocene and recent species, there is little room for doubting the correctness of its reference to the horizon of the Pliocene of Europe.

## SILURIAN (PRIMORDIAL) FOSSILS.

### BRACHIOPODA.

#### Genus OBOLELLA, Billings.

##### OBOLELLA NANA.

Shell very small, subcircular, or transversely suboval, moderately convex, rather thick; front broadly rounded; sides more narrowly rounded. Beak of dorsal valve short and obtuse. Ventral valve proportionally a little longer than the other, about as long as wide, and having a slightly more prominent beak; without a distinct mesial ridge within; scars of adductor muscles? located behind the middle and diverging towards the front. Surface marked by a few concentric furrows; exfoliated specimens showing small, obscure, regularly disposed radiating striæ on the inner laminae.

Length of dorsal valve, 0.15 inch; breadth of do., 0.17 inch; convexity, 0.15 inch. Length and breadth of ventral valve of a smaller specimen, each 0.14 inch.

In first sending on to the Academy a description of this little shell, we had referred it with doubt to the genus *Obolus*, stating, at the same time, that its muscular scars, so far as they could be made out from the only specimen we 1861.]

had seen showing the interior, seemed to present differences from the type of Echwald's genus. Since seeing Mr. Billings's figures of his genus *Obolella*, recently published, we are fully satisfied that he is right in separating these shells from the genus *Obolus*.

Our species is so closely allied to *Obolella chromatica* of Billings, the type of the genus, (see "New species of Lower Silurian Fossils," page 7,) that we were inclined to regard it as specifically identical, until we had an opportunity to compare it with specimens of Mr. Billings' species, kindly sent us by him. On comparing it with these, we find it is more convex, and proportionally broader, while its concentric markings are stronger. The substance of its shell is also thicker, and differs in showing radiating striæ on the inner laminae of exfoliated specimens.

*Locality and position.* Central portions of the Black Hills, from the Primordial or Potsdam Sandstone.

#### PTEROPODA?

Genus THECA, Morris.

THECA (PUGIUNCULUS) GREGAREA.

Shell small, straight, acutely conical; dorsal side compressed or nearly flat; ventral side regularly rounded; lateral margins obtusely subangular, and converging regularly, at an angle of about  $18^\circ$  to the pointed lower extremity; aperture nearly semicircular, or forming rather more than half a circle; surface smooth.

Length, 0.45 inch; breadth, 0.15 inch; convexity, 0.10 inch at the aperture. This frail little shell must have existed in vast numbers, since on a single slab not more than six by eight inches across, we have counted near two hundred individuals. It resembles in form *Pugiunculus striatatus*, of Barrande, (Neues Jah. p. 554, pl. 9, fig. 2,) but differs in being very much smaller, and much more convex and straighter on the ventral side; as well as in being destitute of striæ. It agrees more nearly in size, and the smoothness of its surface, with *P. simplex*, of the same author, but is smaller, and differs in having its lateral margins straight instead of concave in outline. Its ventral side is also much more convex, and more rounded.

In size and form it is much more nearly like *Salterella obtusa*, of Billings, (New sp. Lower Sil. Foss., p. 18;) but it seems to differ in not being composed of successive layers, as in that species and genus. We only place it provisionally in the genus *Theca*.

*Locality and position.*—Near the head of Powder River, in Big Horn Mountains. From Primordial or Potsdam Sandstone.

#### TRILOBITES.

Genus ARIONELLUS, Barrande.

ARIONELLUS (CREFICEPALUS) OWENI.

Head forming more than a semicircle, or nearly semielliptic in outline, its length equalling about two-thirds its breadth, rather distinctly convex; posterior border more or less concave in outline, and provided with a deep rounded marginal groove along each lateral slope. Glabella rather gibbous, elevated above the cheeks, oblong-subovate, its lateral margins converging with a slight convexity towards the front, which is rounded; greatest convexity near the middle and posteriorly, separated from the cheeks on each side and in front, by a distinct sulcus; neck furrow passing entirely across, but slightly deeper on each side than at the middle; lateral grooves three, very short, obscure, or (in casts) nearly obsolete, not oblique. Cervical segment somewhat

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rounded, a little convex on its posterior outline; less elevated than the glabella. Anterior slope in advance of the glabella, less than half as wide as the length of the latter, and provided with a distinct, rounded transverse furrow, which passes around slightly in front of the middle of this space parallel to the anterior and lateral margins. Cheeks convex, and sloping towards the lateral and antero-lateral border. Surface and facial sutures unknown.

Length, measuring from the posterior side of the neck segment to the front margin, 0.57 inch; greatest breadth measuring across at the posterior extremities of the cheeks, 0.87 inch; height, 0.31 inch. Length of glabella, including the neck segment, 0.40 inch; breadth of glabella, 0.35 inch.

The only specimen of this species we have seen is a cast, retaining none of the shell, and of course giving no idea of the nature of the external markings, if there were any. Nor is it in a condition to enable us to determine whether or not the posterior lateral extremities of the buckler are pointed, though they appear to be. At a point nearly opposite the middle of the glabella, there is on each cheek less than half way down the slope, from the furrow between the cheeks and the glabella, what appears to be some remains of a small eye, though the specimen being unfortunately a little defective here on both sides, the exact nature of these prominences cannot be clearly made out.

We sent drawings of this species to Dr. Shumard and Mr. Billings, both of whom write that it is specifically distinct from any of the forms described by them from rocks of the same age in Canada and Texas. We had been inclined to refer it to Mr. Billings' genus *Bathyurus*, but have concluded to place it provisionally in Barrande's genus, *Arionellus*, until better specimens can be obtained, showing more satisfactorily its generic characters. We have been led to do this, by the proportionally small size of some imperfect caudal shields, probably of the same species, embedded in the same slab; in which respect it would seem to agree more nearly with Barrande's genus, than with *Bathyurus*, the type of which, Mr. Billings writes, has a caudal shield nearly one-third as large as the entire animal.

Both of these genera seem to be very closely allied to *Crepicepalus* of Owen, but as that genus is not very clearly defined, and was based upon specimens probably belonging to more than one group, it will perhaps not be generally adopted. Our species is certainly quite closely allied to some of the specimens figured by Dr. Owen under that name.

*Locality and position.*—Same as last.

## JURASSIC SPECIES.

### LAMELLIBRANCHIATA.

Genus GRYPHÆA, Lamarck.

GRYPHÆA CALCEOLA, var. NEBASCENSIS.

*Gryphæa calceola*, Quenstedt, Handb. Petref. tab. 40, fig. 29–31.

*Gryphæa calceola*, Quenstedt, Der Jura, tab. 48, fig. 1–3.

*Gryphæa calceola*? Meek, Capt. Simpson's Rept. Utah Expedition.

Amongst the collections brought in by Capt. Simpson's Expedition, from the Jurassic beds at the Red Buttes, on the North Branch of the Platte River, there are specimens of a small irregular oyster-like *Gryphæa*, which were referred with doubt by one of the authors to *Gryphæa calceola*, of Quenstedt. These specimens generally have the whole umbo completely truncated by the scar of attainment, so as to present none of the characteristic features of the genus *Gryphæa*. Some of them, however, have the beak less distinctly truncated, and a few have it nearly entire, pointed, and incurved as in the true *Gryphæas*. Still none of these specimens are one-fourth as large, nor have any of 1861.]

them the beak anything like near so strongly incurved as Quenstedt's fig. 1, tab. 48, of his *Der Jura*.

Amongst the specimens now under consideration, belonging to Capt. Reynolds' collections, from the Jurassic beds at Big Horn, Mountain Lat.  $43^{\circ} 30' N.$ , Long. 108 West, we have a large series agreeing in nearly all respects with the forms brought in by Capt. Simpson. Most of them would be called true oysters, were it not for the fact that we find them occasionally shading into *Gryphaea*-like forms.

From another locality at the base of the mountains near the head of Wind River Valley, a large number of specimens were obtained by Capt. Reynolds' expedition, from the same horizon as those mentioned above, (and associated with the same group of fossils,) nearly all of which present the form, and all the characters of true *Gryphaeas*, and appear to agree very closely with Quenstedt's fig. 1, on the plate above cited. Whether or not all these Nebraska forms should be included in one species, as Quenstedt has done with the German specimens, is an exceedingly difficult question to decide; nor can we determine very satisfactorily without authentic European specimens for comparison, whether or not our group of forms are really in all respects identical with those figured by Quenstedt. Until these questions can be determined from more satisfactory data than we now have at our command, we would propose to designate the narrow shells with a distinctly incurved umbo from Wind River Valley, as *Gryphaea calceola*, var. *Nebrascensis*, since they may possibly be distinct from Quenstedt's species.

These latter may be described as follows:—lower valve very narrow, elongate, arcuate, in old individuals thickened near the umbo, and provided with an obscure sulcus from near the beak along near the anterior side to the ventral margin; beak slender, distinctly incurved, and directed a little obliquely towards the front, often rather pointed, but sometimes slightly truncated at the apex; area triangular, arcuate, extending close up under the curve of the beak, and provided with a shallow mesial depression; muscular scar small, shallow, oval, and located near the left or anterior side, surface ornamented on the gibbous back of the umbo by distinct, irregular, radiating striæ, usually extending to near the middle, on mature specimens, while the space between this and the ventral margin is marked only by moderately distinct concentric striæ, and stronger ridges of growth.

Upper or smaller valve ovate, nearly flat on the outside, or a little convex at the beak, and more or less concave near the middle, usually concave within towards the cardinal extremity, which is truncated and thickened; surface ornamented with rather distinct marks of growth.

Length from the most prominent part of the umbo, to the ventral extremity, 2.70 inches; breadth at the extremity opposite the beak, about 1.20 inch; convexity, 0.73 inch.

The most marked features of this shell of which we have before us more than one hundred specimens, are its slender form, and the distinctly striated character of the umbonal region of its lower valve. Its greatest breadth is at the ventral extremity, from which it narrows gradually towards the beak, the anterior side being a little more expanded than the other, and in the lower valve somewhat lobed in front of the sulcus extending from near the beak to the ventral margin. The radiating striæ on the umbonal region of the under valve seem to have commenced almost with the growth of the shell, and continued until it had obtained nearly half its full size, after which only concentric markings were developed.

No one could for a moment confound any of the forms we have been describing with *G. Pitcheri*, (= *G. dilatata* of Marcon, not of Sowerby), even after merely glancing at the specimens. None of those having the beak pointed and incurved are ever one-half as broad, or deep in proportion to their length as that shell, while they differ entirely in their surface striæ. In short, they all differ as widely from that shell as any two species of the genus can perhaps

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differ from each other. In addition to this, they hold a widely different geological position, and are associated with an entirely different group of fossils, all of which are clearly Jurassic forms. We mention these facts because Mr. Marcou has expressed the opinion that the specimens in Capt. Simpson's collections, referred by one of the authors with doubt to *G. calceola*, are nothing more than the form he has referred to *G. dilatata*, an opinion he would not have for a moment maintained, if he had seen the specimens alluded to.

*Locality and position.* Head Wind River Valley, at base of the mountains. Jurassic.

Genus MODIOLA Lamarck.\*

MODIOLA (PERNA) FORMOSA.

Shell narrow, subelliptical, moderately arcuate, gibbous along the umbonal slopes, the greatest convexity being near the middle of the valves; anterior end rather narrowly rounded; base sinuous near the middle, or a little behind it, and rounding up rather abruptly in front; dorsal margin a little arching back to near the middle of the shell, thence becoming obtusely carinate, and declining with a long gentle curve to the posterior extremity which is very narrowly rounded; beaks small, compressed, obtuse, and located directly over the anterior margin, beyond the rounded outline of which they scarcely project; umbonal slopes prominently rounded, and extending from the beaks obliquely backwards to the posterior extremity. Surface ornamented by small concentric striæ, and a few stronger marks of growth, which are crossed on the dorsal half of the valves by about forty or fifty regular, closely arranged, and generally simple radiating lines, extending from the beaks to the postero-dorsal and anal margins; faint traces of another system of extremely fine striæ may also be seen, by the aid of a magnifier, crossing the somewhat compressed ventral half of the valves, from the umbonal ridge to the basal margin.

Length, 2.05 inches; diameter from the ventral to the dorsal margins, at right angles to the length, near the middle of the shell, 0.84 inch; greatest convexity at the same point, 0.80 inch.

This shell is very closely allied to the European Jurassic, *Modiola cancellata*, (= *Mytilus cancellatus* of Goldfuss.—Petrefact. Germ., Tome ii. pl. 131, fig. 2), and may possibly prove to be identical, when we can have the means of making direct comparisons with authentic specimens of the latter. The five Nebraska specimens, however, now before us, all present the following differences from Goldfuss' figure. In the first place, they are narrower across from the dorsal to the ventral side, more narrowly rounded at the posterior extremity, and have slightly more prominent beaks, while their antero-ventral margin is a little more convex, and their base rather more arcuate. Their surface markings are very similar to those of Goldfuss' species, though his enlarged figure represents the concentric striæ crossing the radiating lines, as being more distinct and regular than on our shell. He also neither figures nor mentions in his description the fine obscure transverse striæ seen on the ventral half of the Nebraska shell, though these are so indistinct that they might be easily overlooked; indeed they seem rather to be in some way dependent upon the structure of the shell rather than really surface markings.

M. Alcide D'Orbigny cites *Modiola cancellata* of Rømer, and his own *M. Strajeskiana* from the Jura of Russia, as synonymous with *M. cancellata* of Goldfuss. Without expressing a positive opinion on this point, we would remark, that this seems very improbable to us, unless Goldfuss' species is exceedingly variable. At any rate, Rømer's and D'Orbigny's figures are very unlike our Nebraska shell, which is remarkably uniform in its characters.

*Locality and position.* Big Horn Mountains. Jurassic.

\*The name *Modiola*, Lamarck, will probably have to give way to *Perna*, Adanson (non Bruguiere), or *Volsella scopoli*.

## CRETACEOUS SPECIES.

## LAMELLIBRANCHIATA.

## Genus OSTREA Linnæus.

## OSTREA GABBANA.

Shell rather small, thin and longitudinally elliptical or ovate; cardinal margin narrowly rounded, or subangular at the beaks; opposite extremity rounded; anterior and posterior sides forming regular elliptic curves; surface of both valves smooth, excepting obscure marks of growth. Lower valve rounded below, and rather deeply concave within; beak small, not very prominent; area small, wider than long. Upper valve perfectly flat, nearly smooth, and presenting the same outline as the other, excepting that its beak is rather less prominent; area short and a little thickened.

Length from beaks to the opposite extremity, 1.36 inches; diameter from the anterior to the posterior side, 1 inch; convexity or depth of the lower valve, 0.30 inch.

This shell presents an unusual regularity of form for an oyster, and is not liable to be confounded with any other species with which we are acquainted. The regular elliptic outline and uniform convexity of the lower valve, with its small beak, ranging exactly in a line with its longer central axis, give it, as seen from below, much the appearance of some smooth species of *Terebratula*, such as the *T. Harlani* of Morton. The specimens vary little in form, the only difference being the rather less elongate outline of young individuals.

Named in honor of Mr. Wm. M. Gabb, of Philadelphia.

*Locality and position.* Head Gros-ventres River, from a gray sandstone containing *Cardium curtum* (of this paper), a large nearly circular *Inoceramus*, and an *Oyster* of undetermined species. The age of this rock is not very clearly determined but is most probably Cretaceous.

## Genus LEDA Schumacher.

## LEDA BISULCATA.

Shell small, transversely subovate; gibbous in the central region; anterior side narrowly rounded; base semi-elliptical, with a slight sinuosity near the posterior extremity; anal end narrow and subangular in outline; dorsal border sloping from the beaks at an angle of about 135°; beaks rather obtuse, nearly central, or located slightly in advance of the middle; posterior umbonal slopes distinctly angular, the angles extending back to the anal extremity, where they terminate in a small obscure fold; escutcheon lanceolate, concave along the middle, and strongly defined by the umbonal angles, just within which there is on each side a narrow well defined sulcus, extending from the beaks to the posterior end of the shell; lunule not defined; surface ornamented by small, rather distinctly elevated, regularly arranged concentric striæ.

Length, 0.31 inch; height, 0.16 inch; convexity, 0.13 inch.

At a first glance, this little shell might be mistaken for our *Leda*, (*Yoldia*), *scitula* (= *Nacula scitula* Ap. 1856, Proceed. Acad. Nat. Sci., Phila., p. 84); but on a closer examination, it will be at once distinguished by its angular posterior umbonal slopes and distinctly defined escutcheon, as well as by its stronger concentric striæ. It is also a little less gibbous and slightly more depressed.

*Locality and position.* Deer Creek, near North branch Platte River, in lower part Fox Hills beds, or the upper beds of Fort Pierre Group of the Nebraska Cretaceous Section.

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## Genus GERVILLIA, DeFrance.

## GERVILLIA RECTA.

Shell small, rather thin, obliquely elongate-oblong; antero-basal margin nearly straight, or slightly convex in outline; postero-dorsal border parallel to the under margin; anal extremity rounded or subtruncate; hinge comparatively short, terminating in an acute angle in front, and ranging at an angle of thirty to thirty-five degrees above the oblique longitudinal axis of the shell; cardinal area scarcely gaping, provided with three small cartilage pits; beaks small, very oblique, placed about half way between the middle and the anterior extremity of the hinge; surface smooth, or only marked with fine obscure striæ of growth. Left valve convex, but flattened along the middle, so as to give the shell a cuneate appearance posteriorly, and produce an obscure ridge along the upper and lower margins of the flattened portion; above the upper of these ridges, the posterior portion of the hinge is strongly compress or subalate. Right valve flat.

Length, measuring from the posterior extremity obliquely forward to the anterior end of the hinge, 2 inches; breadth, at right angles to the length, 0.66 inch; convexity, 0.30 inch; length of hinge, 0.81 inch.

This little shell is closely allied to a lower green sand species described by Prof. Forbes under the name of *Gervilia linguloides*, (Qr. Jour. Geol. Soc. Lon., vol. 1, pl. 3, fig. 9.) So close indeed is the resemblance, that were it not for the fact that our shell holds a position near the upper part of the Cretaceous system, and comes from so widely distant a locality, we should scarcely venture to regard it as a new species. The most important difference between it and Forbes' species is in the position of its beaks, those of *G. linguloides* being described as terminal, while in our shell they are placed about half way between the middle and the anterior extremity of the hinge. It is true, D'Orbigny refers to *G. linguloides*, (Pal. Fr. Ter. Cret., Tome 3, pl. 396,) a form which has its beaks not quite terminal, though they are distinctly nearer so than those of our species. In other respects D'Orbigny's figures agree almost exactly with the specimens before us, excepting that they represent the shell as being laterally arcuate, while ours is invariably straight. His figures, as well as Prof. Forbes', are also more narrowly rounded at the postero-basal extremity than any of the specimens of the form under consideration. All our specimens are proportionably narrower, and more elongate than Prof. Forbes' figures, though not more so than D'Orbigny's.

*Locality and position.*—Same as last. Very numerous.

## Genus CRENELLA, Brown.

## CRENELLA ELEGANTULA.

Shell small, very thin and pearly, obliquely ovato-cordate, ventricose; postero-basal and basal margins rounded; dorsal border sloping posteriorly with an arcuate outline, and rounding into the anal margin behind; anterior border rounding obliquely backwards into the base; umbonal region of both valves very gibbous; beaks prominent, terminal, pointed, distinctly incurved and directed obliquely forward at the extremities; hinge margin smooth; free border minutely crenulated. Surface (as seen by the aid of a magnifier) beautifully ornamented by extremely fine, regular, closely-arranged, radiating striæ, which increase chiefly by bifurcation, and continue of uniform size on all parts of the shell; crossing these are numerous equally fine, but much less distinct, concentric lines, and occasional stronger marks of growth.

Length, measuring obliquely forward and upward from the base to the beaks, 0.55 inch; diameter, from base to hinge, measuring at right angles to the greatest length, 0.40 inch; convexity, 0.37 inch.

1861.]

This beautiful little shell is very closely allied to *C. sericea* of Conrad, (Jour. Acad. Nat. Sci., Phila., New Series, vol. 4, page 281, pl. 46,) but differs in being uniformly more broadly ovate in form, and in having less elevated and less distinctly incurved beaks, while its concentric markings are not near so strongly defined.

*Locality and Position.*—Same as last. We also have a fragment of apparently the same species from the Yellow Stone river, in upper part Fort Pierre Group.

Genus *CARDIUM*, Linnæus.

*CARDIUM* (*HEMICARDIUM*?) *CURTUM*.

Shell trigonal, gibbous, closed; anterior side more or less rounded; posterior side distinctly truncated and transversely flattened; base forming an elliptic curve; postero-basal extremity angular; hinge very short; beaks elevated, pointed, distinctly incurved, and a little oblique at the immediate points; posterior umbonal slopes prominent and angular from the beaks to the base. Surface ornamented by about forty five regular, distinct radiating costæ, usually a little wider than the deep grooves between, and always simple on the gibbous posterior side. (Hinge teeth unknown.)

Height, 1.74 inch; breadth, 1.80 inch; convexity, 1.30 inch.

This is a peculiar shell, not liable to be confounded with any other species with which we are acquainted. It seems to form a connecting link between the singular group *Hemicardium* and the true typical *Cardiurums*; being one of the many instances met with in the study of fossil species of a form connecting groups which in our existing fauna appear to be separated by rather marked differences.

*Locality and position.*—Head Gros Ventres River, where it occurs with a large *Inoceramus* in a gray sandstone, probably of Cretaceous age. Fragments of apparently the same *Cardium* were brought by Capt. Simpson's Expedition from a yellow sandstone near Bear River, Utah.

*CARDIUM PERTENUE*.

Shell rather small and very thin, broad ovate in form, its height being greater than its length, very ventricose; anterior and basal margins regularly rounded; posterior side subtruncate; hinge margin short; beaks elevated, gibbous, distinctly incurved, and very nearly central; posterior umbonal slopes prominently rounded. Surface ornamented by fine lines of growth and a few concentric wrinkles near the free border; on the posterior half of the valves there are also some fifteen to twenty nearly obsolete radiating costæ, which impart to the posterior and postero-basal margins a distinctly crenulated outline.

Height, 0.64 inch; diameter, from the anterior to the posterior margin, 0.59 inch; convexity, 0.50 inch.

This species is of the same type as *Cardium subquadratum* and *C. rarum* of Evans and Shumard, (Trans. Acad. Sci., St. Louis, vol. 1, p. 39); from both of which it may be at once distinguished by its much more elevated beaks and greater height in proportion to its length. These three species belong to a small group having close relations to *Protocardium*, being concentrically striated or nearly smooth on the anterior half of the shell, with faint indications of radiating costæ behind. These markings, however, are not so distinct and regular as on the typical species of *Protocardium*; the concentric striae being merely very fine, obscure lines of growth, and the plications often almost entirely obsolete.

*Locality and position.*—Deer Creek, near the North Branch of Platte River, from the upper part of the Fort Pierre Group, or the lower part of the Fox Hills Beds.

[Dec.

## Genus CALLISTA, Poli.

## CALLISTA DEWEYI.

*Cytherea Deweyi*, M. and H., 1856, *Proceed. Acad. Nat. Sci., Phila.*, p. 83.

*Meretrix Deweyi*, M. and H., 1860, " " " " " p. 185.

We have recently had an opportunity to examine some specimens of this species, exhibiting the hinge and other internal characters which we had not previously seen. These show that it cannot properly go into the genus *Meretrix*, (*Cytherea*), as that group is now restricted by those conchologists who take as its type such forms as *M. impudica*, but that it possesses the characters of *Callista*, Poli, (*Dione*, Gray,) to which we now remove it.\*

The collections recently brought in from a locality on Deer Creek, a tributary of the North Branch of Platte River, contain a large number of specimens apparently of the above species, in a fine state of preservation. Many of these are much larger than the original typical specimens from the Yellow Stone and Moreau Rivers, and they all likewise differ in being a little less convex and in having a somewhat narrower and deeper pallial sinus. It is possible these Deer Creek specimens may belong to a distinct species, but they agree in so many respects with *C. Deweyi* that we do not feel quite warranted in separating them specifically. If they should prove distinct, however, we would propose to designate them by the name *C. robusta*.†

## Genus TELLINA, Linnæus.

## TELLINA NITIDULA.

Shell transversely ovate, thin, rather short and convex for a species of this genus; anterior side regularly rounded; base semi-ovate, the most prominent part being in advance of the middle: posterior side narrower than the other, rounding down from above with a graceful, oblique curve; postero-basal extremity rather narrowly rounded and slightly bent to the right; dorsal outline sloping from the beaks at an angle of about  $1:30^\circ$ ; beaks moderately prominent, approximate, located a little in advance of the middle; posterior umbonal slopes prominent from the beaks to the postero-basal extremity, but not forming a distinct fold. Surface with fine concentric striæ, and a few stronger marks of growth. Sinus of pallial line of moderate length, and directed somewhat obliquely downwards; posterior muscular impression broad ovate. (Hinge unknown.)

Length, (of a specimen a little under medium size,) 1.10 inches; height, 0.82 inch; convexity, 0.40 inch.

Not having seen the hinge of this species, we cannot determine with positive certainty its generic characters, though it has the habit and general aspect of a *Tellina*. It is worthy of note, however, that the sinus of its pallial line seems to be rather short for a species of that genus. In form it resembles somewhat closely our *Tellina? Cheyennensis*, (*Proceed. Acad. Nat. Sci., Phila.*, Apr., 1856, p. 82,) but is a thicker shell, with more pointed beaks, while its concentric striæ are not near so regularly arranged.

*Locality and position.*—Same as preceding.

## Genus LINGULA, Bruguiere.

## LINGULA NITIDA.

Shell small, extremely thin, narrow subelliptical in outline, the greatest breadth being near the middle; front very narrowly rounded; sides forming

\* Our *Cytherea Owenana*, (*Proceed. Acad. Nat. Sci.*, November, 1856,) and *C. orbiculata*, Hall and Meek, should probably also be removed to the same group.

† Since this was in type, farther comparisons have satisfied us that this is distinct from *C. Deweyi*, and we now adopt for it the name *Callista robusta*.

so gentle a curve as to appear nearly parallel; beaks rather obtuse, that of the ventral valve being a little more prominent than the other; valves nearly equally convex, their greatest convexity being along the middle; surface polished, and only marked by fine lines of growth, which are obsolete on the more convex part of the valves, but become rather distinct on each side.

Length, 0.36 inch; breadth, 0.16 inch; convexity of the two valves about 0.10 inch.

This species differs from *L. subspatulata*, Hall and Meek, (Mem. Am. Acad. Boston, vol. 5, p. 380, pl. 1, fig. 2, a, b,) in being always much smaller, proportionally narrower and more convex, as well as in having its front very narrowly rounded instead of subtruncate. It never attains one-fifth the size of *L. Rouliniana* of D'Orbigny, (Pal. Fr. Ter. Cret. Brach., p. 10, pl. 490, fig. 1,) and has a much less pointed beak, as well as a more narrowly rounded front.

It is often very difficult to distinguish the fossil species of this genus, those coming from very widely different horizons being sometimes very nearly alike, when we know from the vast extent of time that must have elapsed between the periods of their existence, that it is scarcely possible they can be identical.

*Locality and position.*—Mouth Big Horn River, from near the horizon of the base of the Fox Hills Beds of Nebraska Cretaceous series.

#### GASTEROPODA.

Genus NERITELLA, Humphrey.

##### NERITELLA NEBRASCENSIS.

Shell small, obliquely oval; volutions three to three and a half, increasing rapidly in size, the last one composing more than nine-tenths of the entire shell, all convex; suture well defined; aperture broad ovate, the inner side being nearly straight; columella of moderate length, flattened, smooth, somewhat arched, and usually having a distinct opercular impression; surface smooth, or only having fine obscure marks of growth, and beautifully ornamented by alternate dark and light-colored, zigzag transverse bands.

Height, 0.40 inch; greatest transverse diameter, measuring from the outer side of the aperture, obliquely upwards to the most prominent part of the body whorl on the other side, 0.50 inch; height of aperture, 0.35 inch; breadth of do., 0.25 inch.

*Locality and position.* Head Wind River, from a bed apparently holding a position at the base of the Cretaceous.

Genus MELANIA, Lamarck.

##### MELANIA (POTODOMA) VETERNA.

Shell conical-subovate; spire moderately elevated, rather pointed at the immediate apex; volutions six, very convex, rounded in the middle, and sometimes slightly compressed above; suture deep; aperture obliquely oval, narrowly rounded below, and obtusely subangular above, much more prominent on the outer than the inner side; inner lip a little thickened, somewhat arched, and often slightly disconnected from the body whorl below, so as to leave a small umbilical impression; outer lip thin, inversely sigmoid, or broadly sinuous above the middle and at the base of the aperture; surface marked by strong flexuous striæ of growth, crossed by more or less distinct thread-like revolving lines, which are much more closely arranged on the lower half of the body whorl than above.

Length, 0.77 inch, breadth, 0.50 inch; apical angle very convex, divergence about 47°.

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A marked feature of this species is the ventricose character of its whorls, which will alone distinguish it from all the others yet known in the Nebraska rocks. As is usual with species marked like this, its revolving lines vary much in their distinctness on different individuals. On some specimens they are well defined, while on others they are nearly or quite obsolete. Usually three or four of those around the middle and upper part of the whorls are larger, and separated by much wider spaces, than those on the under half of the body volution.

*Locality and position*, same as last.

#### CEPHALOPODA.

Genus BACULITES, Lamarck.

#### BACULITES BACULUS.

Shell slender, straight, and gradually tapering; transverse section broad oval, the larger diameter being to the smaller, as 112 to 90; surface of septate portion having a few distant, broad, undefined lateral undulations.

Septa rather distant. Dorsal lobe nearly one-third wider than high, provided with two short, widely separated terminal branches, each of which is ornamented by about four short, digitate branchlets; above these terminal divisions there are on each side two very small lateral branchlets, the upper of which are much smaller than the others, and nearly or quite simple, while the other two are distinctly digitate. Dorsal saddle as long as the dorsal lobe, but scarcely more than half as wide,—rather deeply divided at the extremity into two nearly equal irregularly tripartite branches, with short, variously digitate subdivisions. Superior lateral lobe as long as the dorsal saddle, but narrower, and ornamented at its extremity by four short, subequal, palmately spreading branches, each of which has four or five very small, short, unequal branchlets, and a few digitations; above these spreading branches the body of the lobe is comparatively narrow, and provided with a single small digitate lateral branch on each side. Lateral saddle of the same size as the dorsal saddle, and very similarly divided. Inferior lateral lobe broader than the superior, and provided with six short spreading unequal, digitate, terminal branches, of which the three on the dorsal side are a little smaller than the others. Ventral lobe comparatively large, about twice as long as wide, contracted near the middle, and ornamented at the extremity by seven or eight palmately spreading, nearly equal digitations.

Our specimen of this species is a septate fragment four inches in length. At its smaller end it measures 0.90 inch in its greater diameter, and 0.70 inch in its smaller do. Its greater diameter at larger end is 1.12 inch, and its smaller do. 0.90 inch.

This species will be at once distinguished from the Nebraska shell, referred by all authorities to *B. ovatus* of Say, by its much more rounded form; indeed, its two diameters are so usually nearly equal, and its dorsal and ventral sides so similar, that it appears almost entirely cylindrical at a first glance, though its section is a little oval. It has a proportionally larger ventral lobe than *B. ovatus*, while in all its other lobes and saddles it presents as great differences as are often seen between those of species of this genus.

In its nearly cylindrical form, it is more like *B. Spillmani* of Conrad (Jour. Acad. Nat. Sci., Phila., 2d ser., vol. iii., pl. 35, fig. 24) than any other species with which we are acquainted; though it is not flattened on the back, nor obtusely carinate on its front, (dorsal side,) as in that shell. As Mr. Conrad's specimen does not show the septa, we have no means of knowing whether these forms resemble in their internal characters or not.

*Locality and position.* Deer Creek, a tributary of the north branch of Platte River. Fox Hills Beds, upper part.

1861.]

## TERTIARY SPECIES.

## GASTEROPODA.

## Genus VIVIPARA Lamarck.

## VIVIPARA RAYNOLDSANA.

Shell, large, ovate; spire rather elevated, pointed at the apex; volution about six and a half; ventricose, increasing rather gradually in size, sometimes a little compressed around the middle, so as to present a slightly shouldered appearance above; last one often prominently rounded or faintly subangular a little below the middle; suture well defined; aperture broad subovate or subcircular; columella scarcely perforate. Surface of upper whorls usually smooth, or only marked by very obscure lines of growth, which generally become quite strong near the aperture, and on the under side of the body whorl. On the last two volutions of well preserved specimens, more or less distinct threadlike revolving striae are usually seen, which are rarely continued upon the succeeding turns above; generally two or three of the revolving lines on the middle of the whorls are larger than the others.

Length, 1.56 inches; breadth, 1.14 inches; apical angle convex; divergence  $60^{\circ}$  to  $65^{\circ}$ .

In size and general outline, this fine *Vivipara* resembles our *V. Leidyi*, (= *Paludina Leidyi*, Proceed. Acad. Nat. Sci. Phila., June, 1856, p. 123), but it differs in having much more convex whorls and a deeper suture. It also differs from that species in always having its revolving lines most strongly defined on the lower whorls, while those of *V. Leidyi* are entirely confined to the upper turns near the summit of the spire.

From our *V. Leai*, (= *Paludina Leai*, Proceed. Acad. Nat. Sci. Phila., June, 1856, p. 121), it will be readily distinguished by its larger size, proportionally more elevated spire, and more or less distinct revolving lines. It also differs in having its whorls usually a little compressed around the middle, so as to give them a slightly shouldered appearance above. This latter character and the revolving lines are not, it is true, always distinctly marked, but when they are not, its more attenuate spire and larger size, will alone always serve to distinguish it from *V. Leai*.

Amongst recent species it is represented by such forms as *V. Burroughiana* Lea, and *V. carinata* Val. It is longer, proportionally thicker, and has a more elevated spire, than the first; and differs from the latter not only in being much longer, but in always having less angular whorls. Its aperture is also rounder, and less extended below than in *V. carinata*.

Named in honor of Captain Wm. F. Reynolds, U. S. Topographical Engineers.

*Locality and position.* Lower fork of Powder River, Fort Union or Great Lignite Group. Tertiary.

## Genus HELIX Linnæus.

## HELIX SPATIOSA.

Shell large, rather thin, subdiscoidal, the spire being depressed, but not flat; umbilicus about half to two-thirds the breadth of the outer whorl at the aperture, deep, conical, and showing near one-fourth of each volution of the spire; whorls five and a half to six, increasing gradually in size, somewhat depressed and sloping outwards above, narrowly rounded, or (in young specimens) subangular around the periphery,—compressed convex below, and rounding abruptly into the umbilicus on the inner side; suture moderately distinct; aperture transversely suboval, being a little wider than high, and

[Dec.



rather deeply sinuous on the upper inner side, for the reception of the preceding whorl; lip oblique, produced above and retreating below, somewhat distinctly reflected, particularly on the under side; surface marked by well defined lines of growth, which cross the upper side of the whorls obliquely.

Height, 0.90 inch; greatest breadth, 1.83 inches; breadth of aperture, 0.74 inch; height of do., 0.72 inch. Apical angle convex, divergence about 120°.

This fine large *Helix* will be at once distinguished by its size and general form from any other species yet known in the Nebraska rocks. Some twelve specimens of it were obtained, all of which are in the condition of internal casts. One or two of them retain some fragments of the shell, which are marked by strong lines of growth; none of the specimens, however, are sufficiently well preserved to show whether or not there were any fine revolving striae. From impressions left on the matrix, the aperture seems to have been a little constricted on the under side, but none of the specimens are in a condition to show whether or not the lip was much thickened.

Amongst recent species it may be compared with the Chilian *H. laxata* of Furisac, from Coquimbo, with which it agrees in size and form, though its umbilicus is proportionally a little smaller, and it has about one whorl more. All its volutions are likewise less rounded on the under side, while its lines of growth are much stronger. The most nearly allied North American living species is *H. Newberryana* of W. G. Binney, a California species, from which it will be readily distinguished.

*Locality and position.* Wind River Valley. From Wind River Group. Tertiary.

#### HELIX VETERNA.

Shell of about medium size, obliquely oval and subrhombic in outline; volutions five and a half, increasing rather rapidly in size, those of the spire moderately convex; last one comprising about half the entire length, most convex below the middle, rounded on the under side, and somewhat obliquely produced below; umbilicus small or closed; suture distinct, but not very deep; aperture ovate, rather narrowly rounded below, and somewhat obtusely angular above, slightly modified on the inner side above, by the convexity of the preceding whorl; lip reflexed; surface marked by distinct, oblique, threadlike striae.

Height, 1.24 inches; breadth, 1.05 inches; height of aperture, 0.75 inch; breadth of do., 0.57 inch. Apical angle very convex, divergence, 85° to 90°.

This species is about the size, and presents much the appearance of *H. Leidyi* Hall & Meek, (Mem. Am. Acad. Arts and Sci. Boston, vol. v., n. s., p. 394, pl. 3, fig. 12 a b.) It is a more elongated shell, however, and its spire is a little more elevated, while its body whorl is more produced below. Its aperture is also quite different, not being near so oblique and more extended below.

*Locality and position.* Same as last.

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#### CORRECTION.

In printing our Catalogue of Nebraska Fossils, in the October number of the Proceedings for 1860, the family name ARCADÆ was inadvertently omitted on page 428, between the names *Inoceramus Balchii* and *Arca sulcata*, which makes it appear as though we were intending to place the genera *Arca*, *Cucullæa*, *Axinaea* and *Linopsis* in the family AVICULIDÆ.

1861.]

Description of **NEW PLANTS** from Texas,

BY S. B. BUCKLEY.

These plants were collected by the author while engaged in the State Geological Survey of Texas, during 1860 and '61. Specimens of them are in the herbarium of the Academy of Natural Sciences at Philadelphia, and also in the herbarium of Elias Durand, Esq.

## RANUNCULACEÆ.

*Clematis Texensis*, n. s.—Caule scandente, foliis pedunculatis, integris, lato-ovatis, acuminatis, mucronatis, breviter petiolatis, foliis caulinis imparipinnatis, longe petiolatis, foliolis pusillis 1-3 lobis, segmentis lanceolatis, acutis, pedunculis unifloris, sepalis coriaceis, apice parum reflexis; fructus?

On the Colorado River above Austin.

Leaves thin, not toriaceous. Whole plant smooth; peduncles 2-2½ inches long; flowers about an inch long, subconical, purple, floral leaves 2-4, near the junction of the peduncle with the stem large, crowded, and on petioles 2-3 lines long, at the base of which are 2-4 spatular bracts. The unequally pinnated stem leaflets small, 1-3 lobed, segments lanceolate and acute, part of these stem leaflets are on long tendril like petioles. Flowers in May.

*Clematis Coloradoensis*, n. s.—Caule scandente, ramis rotundis, parce pubescentibus, foliis petiolatis, integris, vel 2-3 lobis segmentis ovato-lanceolatis, acuminatis, utrinque glabris, pedunculis axillaris, nudis, unifloris, sepalis coriaceis apice reflexis, fructus?

North-western Texas near the Colorado River, May.

Leaves very thin and veins not prominent, mostly 3-lobed, sinuses of the lobes narrow, and extending from one-third to two-thirds of the leaf; lobes acute and mucronate, the middle one largest. Some of the leaf bearing branches twisted, and tendril-like; peduncles leafless, axillary 3 inches long and one-flowered, flowers ¾ inch long, leaflets 1-2 inches long and 1-1½ wide; foot stalks of leaflets ½ an inch in length. Stem, petioles and peduncles sparingly pubescent.

## CRUCIFERÆ.

*Streptanthus (Arabis) glabrifolius*, n. s.—Glaberimus, caule erecto, 3-4 pedali, parce ramoso, foliis oblongis, lineari-lanceolatis, basi attenuatis, breviter petiolatis, acutis, vel subobtusis, petalis spatulatis, (roseo-purpureis) unguibus calyce subdimidio excedentibus, siliquis immaturis teretiusculis, stylis brevissimo obtusis. Seminibus?

Sandy post oak woods north of Fort Belknap.

Stem erect, and sparingly branched, 3-4 feet high; flowers crowded near the top on pedicels about ¼ of an inch long; petals ⅞ lines long; leaves 3-5 inches long and about ¼ of an inch wide; petioles 2-4 lines long. Lower leaves sub-obtuse, upper leaves linear acute.

*Streptanthus (Arabis) Brazoensis*, s. nov. — Subglaucescens, foliis caulinis lanceolatis, radicalibus longe petiolaris, oblongo-ovatis ad basi parce lyrato sectis et repando dentatis, dentibus submucronatis; floribus pusillis, erectis; petalis oblongo spatulatis, albidis et purpureo-tinctis, calycem paulo excedentibus, filamentis liberis, paulo exsertibus, siliquis lato linearibus, in loculis circe 20 seminibus latissime alatis septo æqualibus.

On the Upper Brazos near Fort Belknap. May.

Plant 1-2 feet high; leaves 1½-2 inches long, the upper ones lanceolate, entire, acute and attenuate at the base into a petiole 4 lines long, with 1-2 linear bracts at its base. Radical leaves lyrate, petioled, subpubescent, petioles 2-3 inch long, flowers very small pedicels 4 lines long, seeds circular.

[Dec.

*Lepidium Texanum*, s. nov.—Annuum, glabrum vel parce pulverulentum, caulibus diffusis, racemosis; foliis superne integris anguste linearibus, basi attenuatis, radicalibus longe petiolatis, et pinnato-sectis, racemis densifloris, floribus minutissimis, petalis ovato-lanceolatis, acutis calyce paulo excedentibus, siliculis elliptico-ovatis apteris, valde emarginatis, glabris; stylo brevissimo.

Near Fort Mason. June.

1-2 feet high, divaricately branched, branches terminated by long racemes of minute flowers; silicles a line in length, strongly emarginated; the very short style included.

## CARYOPHYLLACEÆ.

*Arenaria (Alsine) monticola*, s. nov.—Annuum, pumilla, parce pubescenti-glandulosa, caulibus diffusis, foliis pumilis, obovatis, acutis, basi attenuatis, subpetiolatis, petalis obovatis, acutis, calyce fere duplo brevioribus, sepalis ovato-lanceolatis, acuminatisque scariosis; floribus longe pedicellatis.

Limestone, mountain tops middle and northern Texas. May.

Glabrous or sparingly pulverulent pubescent; 6-10 inches high, diffusely branched from the base; leaves 3-4 lines long.

## MALVACEÆ.

*Sida Sabeanana*, s. nov.—Caule erecto, 3-4 pedali tereti. Foliis ovato-lanceolatis petiolatis, inequaliter dentatis, dentibus acutis, vel subobtusis caulibus, petiolisque et pedicellis pulverulentis, floribus pumilis pedicellatis subpaniculatis, petalis oblongo-obovatis, sepalis ovato-lanceolatis, acuminatis.

Prairies San Saba County. June.

Divaricately and sparingly branched; leaves 1-1½ inches long; petioles 4 lines in length; flowers yellow and crowded or solitary on short pedicels, axillary, or at the extremity of the branches.

*Callirhœ palmata*, s. nov.—Caule prostrata, parce strigosa, foliis longe petiolatis, reniformisque palmato 3-5 sectis, laciniis 3-5 fidis subobtusis acutis, pedunculis erectis, axillaribus, solitariis, unifloris folio longioribus; calycis hirsutis, lanceolatis, acuminatis, petalis obovato-rotundatis, albis, vel parum cæruleis, calyce duplo longioribus; floret June.

Common on Brady's Creek north of Fort Mason. Stems from a small, long, tap root, creeping in different directions to the distance of 1-2 feet; leafy, radical and cauline leaves, similar, flowers, 1-1½ inches in diameter, generally white, rarely of a pale purple; peduncles 2½-3 inches long; petioles ½-2 inches long.

*Sidalcea Atacosa*, s. nov.—Tota planta hirsuta, caule erecta, ramis numerosis foliis ovatis, plurime, et irregulariter sectis laciniis acutis; multifloris, floribus axillaribus et capitatis, pedicellis calyce brevioribus, pedicellis bracteosis, valde hirsutis, coccis hirsutis, rugosis, subreniformis.

On the Atacosa River in Western Texas. May. Stems about a foot high; lobes of the unequally divided leaves gash-toothed. Our specimens are in fruit only.

*Malvastrum linearifolium*, s. nov.—Ramis, et foliis parce pilosis. Involucellum nullum, vel caducum, humile, foliis petiolatis, lineari-lanceolatis, ad apice dentatis, bracteolis ad basi calycis numerosis, lineari-elongatis, valde pilosis calyce longioribus; segmentis calycis ovatis, acutis, floribus glomeratis, axillaribus, seu capitatis, carpellis muticis.

Northern Texas. May.

Stems branching 6-10 inches high; leaves about ¾ of an inch long and 2-3 lines wide; petioles 6-8 lines long; flowers small, shortly pedicellate; at the 1861.]

base of the pedicels are numerous long linear bracts or stipules, some of which are also at the foot stalks of the leaves, and coated with long stellate hairs. Stipules about  $\frac{1}{2}$  an inch long.

ELIDURANDIA, Gen. nov. MALVACEARUM.

Involucellum polyphyllum, persistens; stigmata 5-capitata; capsula 5-loculare; carpellis unilocularis verticellater 2-spermis.

Calyx five-parted involuclate, with 8-10 long spathulate and persistent bracts; petalis 5 obovate, hypogynous, convolute in æstivation; stamens numerous, monadelphous at the summit of an urceolate column; filaments short; anthers reniform, ovules ascending peritropous, micropyles inferior. Fruit an oblong, depressed capsule, subobtusely pointed, and included in the involucre; valves alternate with the sepals; dissepiments attached to the middle of the valves; seeds 2 in each cell, ascending, united and truncate at points of union; subovate; testa coriaceous, rough and woolly; embryo small; incurved in the fleshy albumen; radicle inferior.

Elidurandia Texana.—Herbaceous, foliis ovatis, petiolatis, integris, repando-dentatis; dentibus mucronatis; floribus longe pedunculatis; corolla ampla coccinea.

Plant one to two feet high, branching from the root; outer branches procumbent; leaves 1-1 $\frac{1}{2}$  inches long; petioles  $\frac{1}{2}$  inch long, and peduncles 1-3 inches in length, one-flowered.

On the banks of the Colorado River, above Austin. Flowers May and June.

In honor of the well known botanist, Elias Durand, author of several papers on American botany.

LINACEÆ.

Linum (Linopsis) San-Sabaenum, s. nov.—Annum, humile. Ramis numerosis gracilibus, teretis, foliis parvis, linearibus, calycis 2-4 stipularibus, linearibus; ramis, foliisque calycis, canescenti-pilosis; floribus parvis, plurimis, pedicellatis, capsulæ parvæ, depresso-globosæ, semiseptis.

Prairies San Saba County.

6-8 inches high, with many slender branches from near the root. Leaves  $\frac{1}{2}$  an inch long and scarce a line wide, not subulate or rigid, pedicels 4 lines long.

RUTACEÆ.

Zanthoxylum hirsutum, s. nov.—Arbor. Ramis junioribus et petiolis, armatisque valde hirsutis, foliis pinnatis 2-3 jugis, foliolis ovato-lanceolatis, crenatis, obtusis, floribus breviter paniculatis axillaribus, seu terminalibus, carpellis subcordatis, 1-2 spermis, spermi subovatis.

Near Corpus Christi.

Tree about 25 feet high and 8-12 inches in diameter. Branches armed with stout recurved prickles. Leaflets opposite or subalternate. Trunk and old branches gray and smooth.

VITACEÆ.

Ampelopsis (Cissus) heptaphylla, s. n.—Foliis petiolatis, palmato 7-foliatis; foliolis pumilis ovato-lanceolatis sessilibus vel breviter petiolatis, apice mucronato-dentatis, acuminatis, paniculis ramis dichotomo-divaricatis, longe pedunculatis; floribus parvis, petalis distinctis, oblongo-lanceolatis, subobtusis, staminibus exsertis. Stylo longissimo, baccis rotundis 3-4 spermis.

Common on the mountains in Burnet and San Saba Counties, climbing sometimes to the height of 25-30 feet.

Vitis monticola, s. nov.—Ramis decumbentibus 4-6 pedali. Foliis

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parvis, cordatis, dentatis aut crenatis, dentibus inequalibus basi sinuatis; sinu profundo et angusto, vel lato-repando; glabriusculis, junioribus subpubescentibus; ramis, petiolis, nervisque foliorum arachnoideo-pubescentibus. Racemis valde compositis; baccis confertis, albis ambreisve, gustu suavi et inter uvas Americanas gratissime. Crescit in Texas.

Leaves  $1\frac{1}{2}$ -2 inches long, and nearly of the same width; petioles about an inch and a half in length. Fruit ripe in July and August,  $\frac{3}{4}$  of an inch in diameter, skin thin. Grows in the mountainous districts of Burnet, Bell and Hays Counties.

*Vitis Linsecornii*, s. n.—Ramis decumbentibus 4-6 pedali. Foliis magnis reniformi-cordatis integris, vel 5-lobatis; totis obtusis, crenato-dentatis; dentibus submucronatis, superne glabriusculis; subtus dense rufo-arachnoideo-tomentosisque et petiolis et junioribus ramis; racemis compositis, foliis brevioribus; baccis purpureis; gustu acido grato. Crescit in Texas et Louisiana.

This grape has larger leaves than any other American species; 6-10 inches wide and of nearly the same length. Its fruit ripens the first of July; skin thin, and berry  $\frac{3}{4}$  in. diameter, juicy and of a pleasant acid taste.

*Vitis mustangensis*, s. n.—Foliis cordatis, integris non nunquam 3-5 lobatis, parum ad basi sinuatis; superne viridissimus, glabris, infra pedunculisque et ramis junioribus dense albo-floccoso-tomentosis; racemis compositis, foliis brevioribus, baccis magnis, confertis, atro-cæruleis, subpellico saccum rubricundum acridissime-ferventum continentibus; palpa vera non ingrato gusto, nec noscia.

This is called the Mustang grape in Texas, where it is very common. It makes an excellent wine; but is little esteemed for eating on account of an acrid juice beneath the skin, which, if swallowed, gives a burning pain in the throat. It climbs high, bears abundantly and has large fruit, which is sometimes nearly an inch in diameter. Its leaves are neither toothed or mucronate.

A more detailed account of these new species of *Vitis* is given by the author in an article on North American Grapes, in the Patent Office Report, (Agricultural,) 1861.

#### LEGUMINOSÆ.

*Psoralea palmata*, s. nov.—Caule erecto 2-3 pedali, simplo, vel parce ramoso, parum canescenti-villoso, foliis 5-foliat, petiolatis, foliolis lanceolatis, submucronatis, subtus canescenti-pilosis, supra rugosis, floribus longe pedunculatis, subcapitatis, bracteatibus, bracteisque calycibus villosis, ovato-lanceolatis, acuminatis.

South of Fort Belknap.

Stem simple, with few leaves; 2-3 feet high; petioles 1-2 inches long. Leaflets  $1\frac{1}{2}$ -2 inches long. Flowers axillary and terminal, on peduncles 3-5 inches long; 8-10-flowered in a loose head.

*Indigofera cinerea*, s. nov.—Annuæ, cinerea, decumbens, caule tereti, ramoso, foliis impari pinnatis 2-5-jugis, foliolis spatulatis acutis ad basi attenuatis, subpetiolatis stipulis parvis subulatis, pedunculis parvi-floris, folio multo longioribus, calycis lineari-subulatis corolla brevioribus, leguminibus rectis, reflexis, teretibus, acutis, 4-6 spermis.

Washington County, Texas. Miss Sallie Linsecorn.

Whole plant covered with white appressed hairs. Leaves, including the petioles, 1-1 $\frac{1}{2}$  inches long; leaflets  $\frac{1}{2}$  in. in length; peduncles 3-7 inches, axillary and capitate, few-flowered; flowers large in proportion, white tinged with red.

*Indigofera Texana*, s. nov.—Tota planta canescenti-pilosa, suffruticosa erecta vel decumbens, caule tereti, foliis subsessilibus, foliolis cuneati-obovatis 1861.]

breviter petiolatis, 2—3-jugis cum impari sen oppositæ folioli, submucronatis; pedunculis elongatis parvifloris, calycis longe lineari-acuminatis hirsutis, stipulis parvis subulatis, leguminibus reflexis, valde quadrangulatis, rectis, acutis, 8—10-spermis.

Near Fort Mason, Texas. June.

12—18 inches high, with many stems from the same root. Leaflets  $\frac{1}{2}$  an inch long, leaves 1— $1\frac{1}{2}$  inch long; pods 1— $1\frac{1}{2}$  inch in length; spikes 3—4 inches.

*Amorpha Texana*, s. nov.—Fruticosa, foliis magnis, foliolis 4—6-jugis, elliptico-oblongatis emarginatis mucronatis basi obtusis, breve petiolatis, subtus glanduloso-pubescentibus supra glabris, spicis axillaribus vel capitatis glanduloso-tomentosis, folio parum longioribus, sublaxifloris, floribus breve pedicellatis, calycis dentibus, subæqualibus, ovatis, acutis, stylo exserto villosa, leguminibus subobovatis, arcuatis, acutis.

On the Pierdenalis River. June.

Shrub 4—5 feet high. Racemes and flowers brownish-red; filaments and style long, exserted; leaflets 1—2 inches long and  $\frac{3}{4}$ — $1\frac{1}{4}$  wide, the pairs at intervals of about an inch from each other; corolla more than twice the length of the calyx; flowers large in comparison with the other species.

*Astragalus Brazoensis*, s. nov.—Erectus, glabriusculis, subsessilifolius; stipulis triangulari-ovatis, acutis; foliolis obovatis, 5—7-jugis, pedunculis folio parum longioribus; floribus capitatis, ocreoleucis; calycis dentibus parvis acuminatis, parce canescenti-pilosis; leguminibus membranaceis, glabris, didymis; loculis monospermis; seminibus reniformis glabris.

Western Texas. June.

6—8 inches high; smooth or with a very few short, appressed white hairs; leaflets 3 lines long, the lowest pair near the stem. Legumes double the size of those on *Astragalus didymocarpus*, Hook.

*Phaca (Astragalus) cretacea*, s. nov.—Tota parce canescenti-pilosa, subacaulis diffusis; foliis longe petiolatis; foliolis 6—8-jugis, ovato-lanceolatis, submucronatis; scapo foliis parum longiori; floribus capitatis ocreoleucis; bracteis oblongo-linearis; calycis dense pilosis, dentibus longe attenuatis, leguminibus ovato-lanceolatis, acuminatis, coreaceo-membranaceis, incanis, lato-falcatis, aut rectis.

Cretaceous rocks, Northern Texas. May.

Plant 4—6 inches high. Many leaves and scapes from a stem  $\frac{1}{2}$ —1 inch high. Scapes and leaves nearly equal. Legumes 1— $1\frac{1}{2}$  inches long. Leaflets 4 lines long and 2—3 lines wide.

*Baptisia Texana*, s. nov.—Glabra, caule erecto ramoso; foliis palmato-trifoliatis, breviter petiolatis; foliolis ovato-lanceolatis, acutis; stipulis ovato-lanceolatis, acuminatis, foliolis, triplo brevioribus, bracteis minutis, ovatis, caducis; racemis erectis brevibus; pedicellis calycem æquantibus; dentibus calycibus lato-ovatis, acutis, floribus magnis breve pedicellatis; legumine immaturæ lineari-lanceolati, stipati.

Northern Texas. May.

Plant  $1\frac{1}{2}$ —2 feet high; petioles 2 lines long; pedicels 3—4 lines in length; leaflets  $\frac{3}{4}$ —1 inch long; stipules  $\frac{1}{4}$ — $\frac{1}{2}$  in. in length; flowers few, and not crowded.

*Cassia Texana*, s. nov.—Suffruticosa; ramis et foliis glanduloso-pubescentibus, foliolis 14—18-jugis, lineari-oblongis, subfalcatis, 2—3 nervis margine; ciliatis; stipulis ovatis, acuminatis; racemis 1—2 floris folio subæquantibus; legumine lato lineari acuminato, 6—10 spermis.

Sandy soil, Bastrop County.

Stem diffusely branched and 6—10 inches high; lowest pair of leaflets near the stem, and each succeeding pair shorter to the apex, giving an ovate form to the leaf. Flowers yellow and large; legume 1—2 inches long.

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## Nov. Gen. CESALPINÆ.

*Hoopesia*.—Calyx ebracteatus, profunde quinquefidus vel quinquepartitus; laciniis lanceolatis, subinæqualibus, lineari-acutis, corolla petalis 5 subpapilionaceis, longe unguiculatis; staminibus 10 libera, filamentis ad basi lanuginosis, ovarium stipatum pluriovulatum; stylus basi dilatatus, filiformis, filamentis parum longior; stigma parva, legumen longe stipatum, lato-lanceolatum parce compressum, obtusum, 8—10 spermis, tardi dehiscens, semen reniformis.

*Hoopesia arborea*.—Arbor, ramis spinosis, foliis bipinatis, 1—3-jugis, foliis oppositis, obovatis obtusis, 3—6-jugis, floribus axillaribus, subsolitariis, breviter pedunculatis.

Near Corpus Christi. May.

Tree 20—25 feet high and 8—12 inches in diameter; bark of trunk and branches smooth, and of a pale green; branches numerous, forming a dense shade; legume 4 inches long, 10 lines wide and 8 lines thick. Seeds large, divided by septa; spines axillary, double, stipular, subulate and small; flowers yellow, with reddish-brown lines near the base of the limb of the petals. Insects have destroyed the embryo in our fruiting specimens.

Dedicated to Joshua Hoopes, of Westchester, Pennsylvania, a zealous botanist, who has long studied and admired trees;

*Acacia Sabeana*, s. nov.—Fruticosa; ramis teretibus, junioribusque petiolis glanduloso-pubescentibus; foliis bipinatis, pinatis 2—4-jugis, pinnulis 4—6-jugis, ovatisve rhombo-ovatis, submucronatis, utrinque glabris; stipulis ovatis, longe acuminatis; floribus magnis, longe-pedunculatis, monocephalis, erectis, capitulis multifloris, filamentis longe exsertis, legumine immaturæ lato lineari tomentose, falcata acuminata, longe stipata.

Banks of the San Sab River. June.

Shrub 6—10 feet high, branching from near the ground. Leaves, including the petiole, 4—5 inches long, leaflets inequilateral and  $\frac{3}{4}$  of an inch long and  $\frac{1}{2}$  an inch wide; flowers numerous, bright yellow, in solitary heads on peduncles 2—3 inches long; heads round, an inch in diameter.

*Acacia Durandiana*, s. nov.—Fruticosa, glabriusculis alternatis recurvis; pinnis 2—3-jugis; foliolis 3—4-jugis, obovatis mucronatis, spicis elongatis, multifloris, foliolis multo longioribus, floribus brevissime pedicellatis, legumine glabro, lato-lineari obtusove acuto margine undulato.

Near Fort Belknap.

Shrub 3—4 feet high, diffusely branched from the base, and armed with rather slender, recurved prickles. Flowers yellow and numerous, spikes 2—3 inches long. Leaflets 2—3 lines long, inequilateral and mucronate, subglandular and slightly pubescent; pod 2—3 inches long and of unequal width, from  $\frac{1}{2}$ — $\frac{3}{4}$  of an inch, the apex often rounded or retuse and rarely acute.

*Acacia Nueciana*, s. nov.—Fruticosa; ramis junioribus, foliisque et spicis glanduloso-pubescentibus; foliis 3—5-jugis foliolis 7—10-jugis, lineari-lanceolatis inequilateralis acutis, breviter petiolatis spinis stipularibus rectis parvis subulatis; pedunculis solitariis elongatis, floribus capitatis 10—14-meris, calycis campanulatis breviter dentatis, petalis calyce triplo longioribus acutis.

Near the Nueces River.

Shrub 4—6 feet high, the stipular prickles 2—3 lines long, and in divergent pairs; flowering peduncles 1—1 $\frac{1}{2}$  in. long; florets capitate shortly pedicellate, corolla  $\frac{1}{2}$  of an inch long; filaments long, exserted; heads of flowers  $\frac{3}{4}$  of an inch in diameter; leaves 2—3 inches long; leaflets 3—4 lines in length and 2 lines wide.

*Mimosa calcarea*, s. nov.—Humilis, fruticosa; 8—12 polycaris, valde aromatis; spinis rectis duplis longissimis, pinnis unijugis; foliolis 6—10-jugis, 1861.]

obovatis, obtusis, puberulis, capitatis; capitibus, lanoso-tomentosis; floribus albis leguminibus?

Limestone hills near Live Oak in South-western Texas.

Plant about a foot in height, branching from the root, very thorny; spines axillary, slender, about an inch in length. Leaves small, an inch long. Leaflets dense, 2—3 lines long; peduncles  $\frac{3}{4}$  of an inch long; heads globose and solitary.

*Desmanthus pedunculatus*, s. nov.—Suffruticosa, caule tereti, pinnis 6—8-jugis, pilosis; stipulis setaceis, foliolis 12—16-jugis, elliptico-oblongis, submucronatis, pedunculis teretibus, folium subæquantibus, capitulis globosis, leguminibus umbellatis, rectis, linearis, compressis, acuminatis, glabris, 12—22 spermis, seminibus subreniformis.

Northern Texas. May.

Plant 2—3 feet high, sparingly branched, the whole, excepting the pods, covered with a white, glandular pubescence. Leaves, including the petioles, 2—5 inches long; peduncles 2 $\frac{1}{2}$ —3 inches long; legumes 2—3 in. in length.

*Desmanthus rhombifolius*, s. nov.—Suffruticosa, caulisque pedunculis angulatis, subglandulosis, stipulis parvis, subulatis; foliis 3—5-jugis; foliolis 6—8-jugis, rhomboideo-ovatis, ad basi inequalibus, brevissime pedicellatis, inequilateralibus, obtusisve submucronatis, pedunculis folium longioribus, capitulis globosis, leguminibus umbellatis, falcatis, rostratis, compressis 8—12-spermis, seminibus ellipsoideis.

Buchanan County. June.

Subdecumbent. It has several stems about a foot long from the root. Stems and peduncles glandular pubescent. Leaves, including the petioles, about an inch and a half long; peduncles 3—4 inches long; legumes 1 $\frac{1}{2}$ —2 inches long; leaflets very inequilateral, hairy on the margins, 2—3 lines long, 1 $\frac{1}{2}$ —2 lines wide.

#### ROSACEÆ.

*Cratægus Texana*, s. nov.—Arbor 20—25-pedalis; inermis; foliis lato-ovatis ad basi cuneatis, inequaliter dentatis; dentibus acutis; subtus junioribusque et petiolis pubescentibus; peduncles, pedicellisque calycis dense lanoso-tomentosis; petalis obovatis, calyce longioribus; calycis lacinis lanceolatis, acuminatis; fructu coccinei, ellipsoidea calyce coronati.

Common along the Brazos and Colorado Rivers.

Bark of trunk and branches dark gray, furrowed and rough, resembling that of the dogwood, (*Cornus florida*.) Leaves large, incised and doubly toothed, nearly as broad as long; petioles not margined, about an inch in length; old leaves arachnoid, tomentose beneath, smooth above; fruit large, red and edible; ripe last of October; trunk 6—10 inches in diameter.

#### ONAGRACEÆ.

*Gaura triangularis*, s. nov.—Suffruticosus, ramosissimus, ramulisque foliis parce canescenti-pilosis, floribus parvis, foliis sessilibus, lineari-lanceolatis, acutis, rare dentatis, ramis floriferis nudis, parum elongatis; bracteis minutis, subulatis; fructibus glabris valde triangularibus, basi obtusis, subsessilibus apice breviter subacutis.

Prairies northern Texas. May.

Plant a foot high. Leaves  $\frac{3}{4}$ —1 inch long, 2—3 lines wide, crowded; fruit 5 lines long and 3 lines wide, angles acute.

*Eriogonum (Salpigia) Lampasana*, s. nov.—Caule subprostrata, glanduloso-pilosa; foliis numerosis, ovato-lanceolatis, integris subsessilibus, acutis, glanduloso-pubescentibus, calycis tubo longissimo; petalis lato-obovatis, eroso-crenulatis, stamina longioribus; stigmati lato-discoideo, capsulis cylindraceis, sessilibus, valde pilosis.

Prairies, Lampasas County.

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Stems 1—2 feet long, with many branches; leaves of the branches  $\frac{1}{2}$  an inch long, terminating rather abruptly at both ends; flowers nearly 2 inches long, and the diameter of the expanded petals  $1\frac{1}{2}$  inches.

(*Enothera* (*Onagra*) *Leona*, s. nov.—*Parum pulverulenta-pilosa*; foliis ovato-lanceolatis; longe acuminatis, sessilibus, parce dentatis, dentibus minutis, floribus magnis, plurimis; spicis striatis, elongatis; bracteis lanceolatis, acuminatis; calyce tubo lineari-elongata, petalis ovato-lanceolatis, acutis, capsulis elongatis, subquadrangulatis, hirsutis, arcuatis.

Near Leon River. June.

Stems simple,  $1\frac{1}{2}$ —2 feet high; capsules sessile,  $\frac{1}{2}$  an inch long; upper leaves somewhat clasping, those near the root attenuate almost to a petiole; stems and leaves subpilose, with short white, appressed hairs; leaves  $1\frac{1}{2}$ — $2\frac{1}{2}$  inches long; flowers nearly 2 inches long and  $1\frac{1}{2}$  broad.

#### LOASACEÆ.

*Mentzelia* (*Ementzelia*) *petiolata*, s. nov.—*Caule decumbente, ramosissime, foliis ovatis, parce grandi-dentatis, acutis, ad basi subcuneatis, longe petiolatis; segmentis calycis subulatis, corolla parum longior, petalis subovatis, acutis; capsulis breviter clavatis, canescenti-hirsutissimis.*

Llano County. June.

Stems 2— $2\frac{1}{2}$  feet long; petioles 1— $1\frac{1}{2}$  inches long; capsules  $\frac{1}{2}$  an inch in length. Whole plant rough-pubescent, with the adherent stems and leaves peculiar to the genus.

#### SAXIFRAGACEÆ.

*Saxifraga* (*Micranthis*) *Texana*, s. nov.—*Foliis omnibus radicalibus, glanduloso-pubescentibus, obovatis, integris, breviter lato-petiolatis; caule simplice, parce pubescenti; bracteis linearis, vel subspathulatis; floribus paniculato-cymosis, sepalis ovatis, subacutis, petalis spathulato-obovatis; calyce parum longioribus.*

Prairies Northeastern Texas. March.

4—6 inches high. Leaves nearly sessile, and, including petiole,  $\frac{3}{4}$ —1 inch long, obtuse and about an inch wide.

#### UMBELLIFERÆ.

*Cymopteris* (*Eucymopteris*) *macrorhizus*, s. nov.—*Glaucus; radix napiformis, caulis erectis; foliis pinnati-decompositis, divisionibus confluentibus; foliorum segmentis plurimis, ovatis, seu subovatis, obtusis, vel subacutis, involucellis 5—7-partitis, lobis lanceolatisve ovatis, membranaceis, laciniatis.*

Prairies north of Austin. Last of March.

6—8 inches high; root 1—2 inches in diameter; caudix 1—2 in. high; leaves long petioled, oblong ovate in outline, the somewhat winged petiole expanding into leaflets, which are 8—10 lobed; petioles of the outer leaves widening near the base, and clasping the stem; leaves 2—3 inches long; petioles 1—2 inches in length; fruit 3 lines long; wings wide and thin.

*Eurytenia* *macrophylla*, s. nov.—*Tota glabra; umbellis magnis, 10—14 longe radiatis; involucrem e foliolis parvis 3-sectis; segmentis longe linearis involucrem e foliolis numerosis, 3-fidis, laciniis, linearis, acutis, petalis albis, lato obovatis, emarginatis; foliis caulinis superiores pinnati sectis, segmentis elongato-linearis; inferiores pinnatis, 2—3-jugis; foliolis ovatis inæqualiter magna-dentatis, seu lanceolatis, dentibus mucronatis; foliis radicalibus petiolatis, 3—5 lobis segmentis ovatis.*

Washington County. Dr. Linsecm.

Lower cauline leaves 3—4 inches in length; leaflets sessile or clasping, about an inch and a half in length and an inch wide; petioles  $1\frac{1}{2}$ —2 inches long; rays of the umbel 2—3 inches.

1861.]

## COMPOSITÆ.

*Eupatorium Sabeanum*, n. s.—Suffruticosa, paullum pubescenti; ramis teretibus, erectis, plurimis; foliis oppositis, petiolatis, ovatis, acuminatis, ad basi subcuneatis; involucri squamis imbricatis, oblongo linearis, apice obtusis, vel submucronatis; achenia oblongæ et quinquecostata, glabra; costis albo-sericeis.

San Saba County. May.

This species belongs to the section *Cylindrocephala* of De Candolle. Its leaves are  $1\frac{1}{2}$ —2 inches long; petioles 4—6 lines in length, 2—4 stipules in the axils; stipules petiolate ovate lanceolate; leaves long acuminate, with margins entire; rarely some few leaves have distant coarse teeth.

*Bulbostylis (Brickellia) deltoidea*, s. nov.—Fruticosa, ramoso; ramis teretibus, junioribus pubescentibus; foliis utrinque glabris, oppositis, crenatodentatis, obtusis deltoideo-ovatis, petiolatis, trinervis; petiolis glanduloso-pubescentibus; floribus corymbosis axillaribus aut terminalibus; involucri squamis lineari-oblongis, laxè imbricatis: achenia tereti striato subpiloso.

Northern Texas. May.

A branching shrub, 3—4 feet high; flowers few, small and mostly terminal; petioles  $\frac{1}{2}$ —1 inch long; leaves  $1\frac{1}{2}$ —2 inches long and  $1\frac{1}{2}$  wide.

*Kuhnia macranthra*, s. nov.—Herbacea; caule 8—12 pollicaris, ramoso; foliis sessilibus ovato-lanceolatis, puberulo-pubescentibus; margine integris, vel interrupti-dentatis; floribus magnis, purpureis subcorymbosis.

Northern Texas. May.

Scales of the involucre loosely imbricated, linear-oblong, the longest nearly equal in length to the flowers of the disk; leaves about an inch long; flowering stems 1—2 inches below the flowers, destitute of leaves, but furnished with linear bracts about  $\frac{1}{2}$  an inch in length.

*Erigeron Brazosense*, s. nov.—Herbaceum, ramosum, pilosum; foliis numerosis, lato-spathulatis, submucronatis, caulinis sessilibus vel breve petiolatis, radicalibus petiolatis; ligulis albis, linearibus, acutis, confertissimis, subuniseriatis, involucri duplo excedentibus; involucri squamis, linearibus, acutis, discum æquantibus.

On the waters of the Upper Brazos. May.

Plant 8—10 inches high; leaves  $1\frac{1}{2}$ —2 inches long, and the largest about  $\frac{1}{2}$  an inch wide; radical leaves mostly petioled; petioles  $\frac{1}{2}$ — $1\frac{1}{2}$  inches long; whole plant sparingly coated with white hairs, not appressed; branches numerous and erect; coated thickly with leaves to the summit.

*Erigeron (Erigeron) nudiflorum*, s. n.—Hirsutum pumilum, ramosum; foliis lineari-oblongis, integris, acutis, confertissimis; ramis apice longe nudis, monocephalis; ligulis albis, plurimis, subuniseriatis, involucri duplo excedentibus, acheniis oblongis, glabris, vel parum pilosis; pappo radii et disci conformi, duplici; exteriore breve setacea.

Northern Texas. May.

Very much branched from the root. Stems erect, 4—6 inches high; leaves numerous near the root and upwards on the stems about 3 inches; the upper stems, two inches below the flowers, naked; whole plant strigose hirsute, the white hairs not appressed; flowers about  $\frac{1}{4}$  of an inch in diameter; leaves  $\frac{1}{2}$ —1 inch long and a little more than a line wide.

*Machæranthera (Dieteria) grandiflora*, s. nov.—Glabra, vel subpubescens; caule ramosissimo; foliis numerosis, superne lineari-lanceolatis, subamplexi-caulis, acutis; inferne pinnato sectis, segmentis plurimis, acutis; involucri squamis imbricatis 3—4 serialis, lineari-oblongis, abrupte acutis, disco brevioribus; pappo rufo setaceo; acheniis obovatis, sericeis striatis, receptaculum convexum, alveolatum, alveolæ margine laceraæ.

West of Fort Mason. June.

[Dec.

12—18 inches high; leaves alternate  $\frac{3}{4}$ —1 inch long; whole plant rigid; flowers  $\frac{3}{4}$  of an inch in diameter.

*Aplopappus linearifolius*, s. nov.—Tota glabra; caule diffuse ramosissimo, striato; foliis lineari-elongatis, sessilibusque acutis; involucri squamis, 3-serialis, lanceolatis acutis; pappo albo, setaceo, receptaculum, planum alveolatum; achenia cylindrica, striata, parum sericea.

Llano County. June.

Stems procumbent, and branches extending 1—2 feet; leaves about a line in width and an inch long, alternate and numerous; flowers few,  $\frac{1}{2}$  an inch in diameter; receptacle deeply alveolate, and margins of the cells chaffy.

*Parthenium lobatum*, s. nov.—Annua, canle herbaceo-ramoso, glanduloso; foliis sinuato-pinnatifidis, lobis obtusis et submucronatis foliis superne sessilibus; inferne petiolatis, utrinque pubescentibus, involucri squamis obtusissimis, margine valde, et minute lacineatis, acheniis sericeis, obovatis, pappo paleaceo breve aristato.

Western Texas. June.

About a foot high; flowers numerous, glomerated at the ends of the branches.

*Aphanostephus pilosus*, s. nov.—Humile, ramosissime, utrinque pilosa; foliis linearis, basi attenuatis, acutis; involucri squamis, lanceolatis, subulatis, margine membranaceis, ligulis albis, linearibus involucri duplo longioribus; acheniis teretibus, subarcuatis, striatis, pappo parvo duplo longioribus.

Prairies north of Fort Belknap. May.

3—6 inches high; leaves and flowers numerous, the flowering stems not naked or elongated, the whole plant covered with white hairs which are dilated at the base, and not appressed.

*Sericocarpus (Galatella) Woodhousei*, s. n.—Glabra, seu parum pubescens; foliis oblongo-linearis, mucronatis, subfasciculatis; receptaculum angustum, alveolatum; alveolorum marginibus lacineato-dentatis; corollæ disci, campanulato-tubulosæ, limbo profunde quinque-dentato; achenia dense strigoso-sericea, involucri squamis imbricatis, lineari-oblongis, disco brevioribus; floribus subcorymbosis numerosis.

New Mexico. Dr. Woodhouse.

Leaves somewhat fasciculated, varying in size from  $\frac{1}{2}$  an inch to 2 inches long and 1—3 lines in width, not rigid; stem about 2 feet high, with a few branches near the summit. Flowers in August.

*Lepachys serratus*, s. nov.—Valde pubescens; foliis interrupte pinnatisectis; segmentis ovatis aut lanceolatis, profunde serratis; superne sessilibus; inferne petiolatis et lyrato-sectis; involucri squamis 2-serialis longe linearis, hirsutis; discus elongatus, cylindricus, involucreo vel ligulæ longior; floribus raris, longe pedunculatis.

Near Camp Colorado. June.

Several erect root-stems, 2—3 feet high, with few branches; leaves 2—4 inches long, the three terminal segments large and ovate, with large serratures; radical petioles margined with a few small mucronate lobes. Whole plant hirsutely pubescent.

#### MARGACOLA. Gen. nov.

*Capitulum multiflorum* homogamum; ligulis nullis; flosculis hermaphroditis tubulosis, 5-dentatis luteis; involucreum campanulatum; squamis subæqualibus, 2—3 serialis, linearis, abrupte acutis disco brevioribus; receptaculum conicum, nudum, parvum; styli rami breve, apice pubescenti; antheræ inclusæ; achenia conformia; lineari-oblonga, subquadrangulata, glabra vel parum pilosa pappo minute setuloso, coronata; 4—6 setulis minutissimis.

*Margacola parvula*.—Annua, herbacea, glabra, humile 4—6 policar. valde 1861.]

ramoso foliis alternis, integris amplexicaulis ovatis, obtusis; floribus parvis, capitibus luteis.

Southern Texas. May.

Diffusely branching from the root; flowers on branches little elongated, on which are a few small lanceolate or ovate bracts.

Grows in a marly soil, hence the name from the Latin.

LINSECOMIA. Gen. nov. HELIANTHIDÆ.

Capitulum multiflorum heterogamum; floris radii ligulatis neutris, 1-serialis disci tubulosis hermaphroditis 5-dentatis; involucri squamis 3—4 serialis, imbricatis adpressis; exteriores ovalibus subacutis, interiores lanceolatis, acutis; receptaculum convexum subalveolatum; paleis semiamplectentibus, oblongis, apice ciliatis acutis; acheniis glabris, obovatis, compressis, subquadrangulatis, biaristatis; aristis subpaleaceis, caducis.

*Linsecomia glauca*.—Glabra, glauca; foliis caulinis oppositis; lanceolatis, longe acuminatis, integris, sessilibus; radicalibus, sessilibus, aut breviter petiolatis; caulis erectis, 10—12 pollicar. parum ramosis teretis.

Near the ruins of the old Spanish Fort San Saba. Flowers last of June.

Leaves  $1\frac{1}{2}$ —3 inches long; chaff of the disk nearly as long as the tube of the corolla, which, with the achenia, is nearly encircled by a single palea; anthers small, ovate and erect; rays slightly 2-cleft; flowers yellow.

In honor of Dr. Gideon Linsecom, a Texan botanist, to whom the Academy of Natural Sciences of Philadelphia is indebted for a fine collection of Texas plants.

*Halea repanda*, s. nov.—Annuæ; scabroso pubescenti; foliis radicalibus breviter petiolatis, ovatis repando-denticulatis, superioribus longe petiolatis ovatisve trilobatis petiolis subalatis, alis 2—3-dentatis; tubo corollæ glabro; involucri squamis lato-ovatis, acutis margine albo-pubescentibus, receptaculum conicum; palea lanceolatæ acutæ pappus paleaceus; paleis ovatis subobtusis.

Near Corpus Christi. May.

Plant 1—2 feet high; flowers  $1\frac{1}{2}$ —2 inches in diameter; achenia subquadrangular, crowned with a short scaly pappus; scales oval, distinct and obtuse; petioles 1— $1\frac{1}{2}$  inches long, and leaves of nearly the same length; rays about twice the length of the involucre; flowers yellow.

*Zexmenia (Lasianthea) hispida*, s. nov.—Strigoso-hispida; foliis ovatis, dentatis, petiolatis, stipulis ovatis vel lanceolatis, pedunculis axillaribus, solitariis vel ternis, nudis seu foliis summis capitulo longioribus; involucri squamis biserialis, subæquantibus, ovatis canescenti pilosis, acutis, ligulis aureis brevissimis, acheniis oblongo-obovatis, rugosis; aristis divaricatis elongatis.

Northern Texas. May.

Plant with slender, decumbent stems, few leaves and small flowers, almost concealed by leaves at the extremity of the branches; rays scarcely longer than the involucre; leaves all with petioles 4—8 lines long; whole plant sparingly coated with white appressed hairs; palea of the disk prominent, linear, acute and equal in length to the achenia; leaves 1— $1\frac{1}{2}$  inches long and  $\frac{1}{2}$ —1 inch wide, sharply serrate and subacute; flowers 3—4 lines in diameter; achenia 3 lines long.

*Verbesina Texana*, s. nov.—Herbacea, ramoso; ramis alis foliaceis auctis; foliis alternis, ovatis, subcrenatis; petiolatis, petiolis lato-alatis, pedunculis terminalibus, multifloris, nudis, vel parum alatis; involucri squamis linearis, obtusis, acheniis radii, discique biaristatis.

Northern Texas. May.

Stems 2—3 feet high, erect and with few branches; whole plant glandular

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pubescent; leaves obtuse or subacute, the margins entire or unequally crenate; leaves 3—5 inches long; petioles 1 inch long and broadly winged.

*Actinella lanuginosa*, s. nov.—Planta densissima villosa, caule simplo aphylo; foliis radicalibus numerosis, obovatis, seu lato-spathulatis, obtusis vel subacutis, basi cuneatis, sessilibus, aut breviter petiolatis, rarissime 3-lobatis, involucri squamis lanceolatis, acutis, biserialis, pappi squamellis ovatis, longe aristulatis.

Prairies, Burnet County. April. Common.

4—6 inches high. Leaves about an inch in length and 4—8 lines broad; stem one-flowered.

*Heterotheca latifolia*, s. nov.—Scabro-villoso; caule erecto, ramoso; foliis caulinis oblongo-cordatis, amplexicaulisve sessilibus, mucronatis, margine integris seu parce et grande dentatis; foliis radicalibus breviter petiolatis, ovatis; involucri squamis scariosis, linearibus, acutis.

Llano County. June.

1½—2 feet high; branches erect, and leaves numerous, mostly clasping and entire; flowering branches little elongated and leafy, or nearly naked; expanded flowers an inch in diameter; rays many and bright yellow, twice the length of the involucre; leaves 2—4 inches long and 1—2 wide, terminating abruptly.

*Gaillardia lobata*, s. nov.—Caule ramoso, glanduloso-pubescente, foliis lyrato-5—7-lobatis, segmentis ovatis vel lanceolatis, obtusis, vel acutis; foliis caulinis sessilibus, aut breviter petiolatis; radicalibus petiolatis; involucri squamis discum superantibus, utrinque scabroso-pilosis, lanceolatis acuminatis; corollæ hermaphroditæ dentibus magnis 3-nervis, subacutis, fimbriis receptaculi crebris, acicularibus basi dilatatis; pappo radii conformi.

Southern Texas. May.

Stems 8—12 inches high, branching from the root; rays numerous and crowded, flowers 1½ inches in diameter, dark red; corolla of the disk with broad fringed subulate teeth; subulate fimbriæ longer than the achenia; leaves 1—2 inches long, the lobe at the extremity twice the length of the lateral segments; floral stems naked above, petioles of radical leaves about ½ an inch long.

*Gaillardia scabrosa*, s. nov.—Ramisque foliis valde scabroso-pubescentibus; foliis longe lanceolatis, sessilibus, aut breviter petiolatis, acuminatis integris; involucri squamis discum excedentibus, lineari-lanceolatis, subulatis margine ciliatis, corollæ hermaphroditæ, dentibus lanceolatis, acutis; fimbriis receptaculi plurimis acicularibus, basi dilatatis, pappo radii conformi.

Western Texas. June.

Stems 12—18 inches long, and leafy to the summit terminated by flowers; leaves 1—1½ inches long, and 3—6 lines wide; corolla of the disk with glandular pubescent teeth; rays deeply 3-cleft, yellow with purple veins.

#### PHILEZERA. Gen. nov.

Capitulum multiflorum radiatum, heterogamum, involucri squamis biserialis, imbricatis; squamis ovatis, acutis disco brevioribus; receptaculum parvum, nudum conicum; styli rami breve pubescente; pappo duplo, ima setacea, supra paleacea; paliis 5 ovatis, aristatis; acheniis sericeis, obovatis; ligulis uniserialis.

*Philezera multiflora*.—Annuæ, herbacæ, ramosissima; foliis linearibus, 3—6 laciniatis; segmentis lineari-elongatis; floribus plurimis, parvis, luteis capitatis.

Prairies north of Fort Belknap. May.

Plant 4—6 inches high, with numerous erect flowering branches, which are 1861.]

destitute of leaves near the flowers; leaves about half a line wide, elongated, and 3—6-parted, with opposite or alternate segments; whole plant sparingly pubescent; flowers 3—4 lines in diameter; the lower pappus of many white hairs is at the base of, and about equal in length to the achenia; palea nearly as long as the achenia which they crown. The flowers have a resemblance to those of *Riddellia*. Name from the Greek, signifying its love of arid places.

*Heleneum* (*Tetrodus*) *Texanum*, s. nov.—Annua, glabra; caulibus erectis, 3—4 pedali, ramosissimis; ramis superioribus, alatis; foliis caulinis lanceolatis, integris, vel remote denticulatis, decurrentibus, capitulis parvis obovato-globosis, ligulis cuneatis trilobis parvis, disco, multum brevioribus, pappus paleaceus; paleis ovatis aristatis; involucri squamis linearis, acuminatis.

North of Fort Mason. June.

Radical leaves wanting in our specimens. Heads brownish yellow, 4 lines in diameter; rays yellow, scarcely 4 lines in length, 3-cleft, teeth acute; involucri longer than the rays; flowers many, and terminated in branches which are leafy to the summit; achenia villous.

*Cirsium Texanum*, s. nov.—Caule erecto, ramoso, 3—4 pedalis; foliis ovatis, integris; superiores amplexicaulis; radicalibus sessilibus vel breviter petiolatis; subtus dense canescenti-tomentosis, superne glabris, margine repando-dentatis, spinosis; involucri subglobosi squamis imbricatis, intimis lineari-lanceolatis, subulatis; exterioribus ovatis, lanceolatisque cuspidatis; flosculis purpureis.

Near Brady's Creek, north of Fort Mason. June.

Stems divaricately branched; flowers axillary or terminal; leaves none, or few, in the elongated flowering branches; stems tomentose, upper leaves 1—2 inches long; radical leaves 3—4 inches.

#### CAMPANULACEÆ.

*Specularia* (*Campanula*) *Linsecornia*, s. n.—Glabra; caule decumbente, parce ramoso; foliis sessilibus, lanceolatis apice attenuatis, acutis, bracteis longe linearibus; floribus axillaribus 2—5-glomeratis; calycis tubus elongata 3—5-lobis; segmentis linearis, acutis.

On Brady's Creek, north of Fort Mason. June.

Leaves alternate, 4—6 lines distant, in every axil of which flowers and bracts abound; capsules 6—8 lines long, 3-valved dehiscent on the sides; seeds smooth, elliptical. Whole plant smooth, excepting the margins of some of the leaves, which are minutely ciliate with white hairs, scarcely perceptible without the aid of a glass. Our specimens are in fruit only.

*Campanula Coloradoensis*, s. nov.—Glabriusculis; caule erecto, simplo, multifloro; foliis caulinis sessilibus, lanceolatis, margine integris aut interrupte dentatis, minute ciliatis; radicalibus petiolatis, subobtusis; floribus axillaribus vel terminalibus; simplicibus seu duplicibus; bracteis linearibus, acutis; tubo calycis elongato linearis acutis; corolla profunde 5-fida subæquantibus; capsula cylindracea, 3-valvis, lateraliter sitis dehiscens; semina ellipsoidea.

On the Upper Colorado of Texas. June.

Plant 1—2 feet high; leaves few and alternate; lower stem and leaves have a few white, erect hairs; style exserted; stigmas 4—5; leaves 1—1½ inches long and about 4 lines wide.

#### ERICACEÆ.

*Arbutus Texana*, s. nov.—Arborea 20—25 pedali, glaberrima; foliis ovatis, subacutis, parce serratis; floribus capitatis, subracemosis calycibus albis,

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corolla duplo brevioribus, pubescentibusque et pedicellis; calycis laciniis ovatis acutis; corollis oblongo-ovatis glabris; filamentis inclusis ad basi lanuginosis corolla triplo brevioribus; stylus longis cylindricus, bacca rotunda, rubra.

Hills, Hays County. Flowers in March.

Fruit ripe in November, of a deep scarlet or red color; trunk and branches very smooth, brownish-red, the outer bark peeling off like *Platanus*. Wood very brittle; trunk 8—12 inches in diameter; leaves evergreen,  $1\frac{1}{2}$ — $2\frac{1}{2}$  inches long; petioles 1 inch long.

*Comarostaphylus (Arctostaphylus) glauca*, s. nov.—Subarborea, ramis teretibus, junioribus subpubescentibus; foliis oblongo-ovatis, obtusis, acute, et minute serratis, petiolatis; subtus candido-pulverulentis, supra glaucis et glabris; floribus capitatis, racemosis, crebrique bracteatis, brevissime pedicellatis; calycibus que bracteis pubescentibus; bracteis lato-ovatis, obtusis vel subacutis; corollis albis, ovatis, calyce parum excedentibus; calycis laciniis ovatis, acutis; fructus?

Western Texas.

Small trees 15—20 feet high and 3—4 inches in diameter; leaves 2—4 inches long and  $1\frac{1}{4}$ —2 inches broad, obtuse at both ends; petioles 1— $1\frac{1}{2}$  inches long.

#### SAPOTACEA.

*Bumelia arborea*, s. nov.—Inermis; foliis obovatis, obtusis, ad basi cuneatis, breviter petiolatis; supra glabris, subtus glabris, vel parce pilosis, pedicellis axillaribus, numerosis, hirsutis, petiolum æquantibus; floribus minutis; calycis hirsutissimis sepalis, ovato, acutis, corolla parum brevioribus; corollæ 5-fidæ; drupa nigra, ellipsoidea.

Southern Texas.

Tree 40—50 feet high and 1—2 feet in diameter; leaves round, obtuse at the apex, 1—2 inches long and nearly an inch in breadth at the widest part; petioles 4—6 lines in length; leaves deep green on both sides, smooth and shining above, beneath a few white hairs on the mid rib and veins; fruit  $\frac{1}{2}$  an inch long, not healthy, and rarely tasted by any one the second time. It is called "Gum-elastic." Its wood is hard, close-grained, takes a fine polish, and is sometimes used for small articles of furniture. Flowers in May; fruit ripe in October.

#### SCROPHULARIACEÆ.

*Penstemon paniciflorus*, s. n.—Glanduloso-pubescentibus; foliis oppositis sessilibus, lineari-lanceolatis, margine integris, vel minute dentatis; floribus laxè paniculatis; pedunculis inequalibus, erecto-patentibus; calycis segmentis, lineari-subulatis, hirsutissimis; corollæ tubo elongato, superne constricto; filamentis sterili glabro, apice dilatato; antheris glabris.

Past oak woods south of Fort Belknap. May.

Stems, several from the same root, about a foot high, sparingly branched near the summit; 3—6 pairs of leaves on a stem, which are about an inch and a half long and 2—4 lines wide; corolla tube 6—10 lines long, and mouth constricted to scarce a line in width.

*Penstemon amplexicaule*, s. n.—Glaucus, erectus; foliis caulinis, lato-ovatis, vel cordatis, integris, acutis, late amplexicaulis; radicalibus, oblongo-ovatis, longe petiolatis; panicula elongata breve interrupte; cymis breviter pedunculatis, congestis; calycis segmentis ovatis, vel lanceolatis, acutis, margine submembranaceis; corollæ tubo parvo, superne parum dilatato; filamentis sterili glabro; antheris piloso-lanatis.

About 60 miles N. E. of Camp Colorado. June.

Stems mostly simple, 2—3 feet high; flower white, tinged with purple, 3—4 on each side, opposite, on pedicels 2—4 lines long. Cymes on the panicle 6—12 lines distant; tube of corolla about 6 lines long, and mouth 2—3 lines wide.

## ACANTHACEÆ.

*Drejera parviflora*, s. n.—Glabriusculus; ramis junioribus et calycibus glanduloso-pubescentibus; foliis oppositis, lanceolatis breviter petiolatis basi obtusis ad apicem attenuatis; spicis terminalibus, nudis; calyce profunde 5-fido; segmentis longe subulatis, corollæ tubo angusto calyce duplo longiore; floribus oppositis sessilibus breve interupte spicatis.

Western Texas. June.

Shrub 3—4 feet high, with slender branches; petioles about a line long; flowers 6—8 lines long; bracts lanceolate, shorter than the calyx.

## BORAGINACEÆ.

*Lithospermum prostratum*, s. n.—Prostrata vel parce ascendenti; caule longe ramoso; ramis paucis, scabroso-hirsutis; foliis obovatis, basi attenuatis, breviter petiolatis utrinque hirsutis et albo-punctatis; floribus axillaribus, solitariis vel duplicibus, breve pedicellatis; corolla calyce piloso longiore; nuculis albis lævissimis.

Falls of Fall River in Llano County.

Stems slender, 12—18 inches long. Whole plant sparingly coated with erect white hairs; leaves 1—3 inches long and 4—12 lines wide.

*Echinospermum pilosum*, s. n.—Caule erecto, incane-piloso, ramoso; foliis alternatis oblongo-spathulatis, obtusis, sessilibus; floribus solitariis, axillaribus, breviter pedicellatis, corolla tubo calyce brevioribus; nuculis rugosis; glochidiatis aculeis uniserialibus.

Hills Northern Texas. June.

Stems numerous from the root, leafy to the summit and 6—10 inches high; whole plant coated with suberect white hairs; leaves about an inch long and 3—4 lines wide.

*Echinospermum scabrosum*, s. n.—Tota planta scabroso-piloso; caule erecto, ramoso, floribus numerosis axillaribus breviter pedicellatis; foliis sessilibus breve lanceolatis superne linearibus; lobis calycinis linearibus acutis, corolla longioribus; nuculis ovatis, aculeis glochidiatis uniserialibus.

On the Upper Colorado of Texas. June.

Stems numerous from the base, 4—6 inches high, thickly clothed with white erect hairs; leaves alternate or opposite; radical leaves 8—12 lines long; stem leaves 4—6 lines in length and 1—4 lines wide; stems leafy to the summit and full of fruit, leaves and flowers from near the base to the top.

*Eritrichium (Rutydocaryum) hispidum*, s. n.—Caule ramosissimo dense canescenti-piloso; foliis linearibus, sessilibus, acutis; floribus axillaribus et terminalibus breviter pedicellatis; corolla calycem hispidissimum parum superante; nuculis ovatis acutiusculis rugosis vel glabriusculis.

On the Upper Colorado of Texas. June.

Plant 3—6 inches high, with many erect branches, which are densely covered from near the base to the top with leaves, fruit and flowers; leaves 4—8 lines long and 1—2 lines wide.

## HYDROPHYLLACEÆ.

*Nemophilla hirsuta*, s. n.—Canescenti-hirsuta, caule decumbente, foliis caulibus sessilibus, alternis, radicalibus breve petiolatis, subpalmatis, profunde 3—5 lobatis, segmentis ovatisve oblongis acutis, pedunculis axillari-

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busque terminalibus, folio longioribus, appendicibus calycinis lanceolatis, acutis, lobo duplo brevioribus.

Western Texas. May.

Stems 4—8 inches long; leaves about an inch in length and nearly of the same width; petioles of the radical leaves 2—4 lines long; peduncles about an inch long; flowers large, pale blue.

*Nemophilla pilosa*, s. n.—Canescenti-pilosiusculis, foliis alternatis, caulibus sessilibus, radicalibus breviter petiolatis et lyrato-pinnati-partitis, segmentis 5—15 ovatis vel lanceolatis, 2—5 acute-dentatis, racemis terminalibus laxifloris, calycinis sinibus appendicibus lanceolatis lobo triplo brevioribus, corolla profunde 5-fida rotata, calyce ciliata duplo longiore.

Austin. April.

Stems assurgent, 4—6 inches high, branching from the base; petioles of the radical leaves 4—12 lines long, and the leaves  $1\frac{1}{2}$ — $2\frac{1}{2}$  inches in length; peduncles 6—14 lines long; flowers purple.

*Phacelia (Cosmanthus) hispida*, n. s.—Hispida, foliis dentato-lobatis, sessilibus, segmentis lato-ovatis, obtusiusculis vel lanceolatisque acutis, racemis elongatis, terminalibus, lobis calycinis linearibus, corolla brevioribus, staminibus corollam subæquantibus.

Austin. April.

Stems ascending and branching, 6—8 inches high from the base; sinuses of the lobes extending scarcely half way to the midrib of the leaves; leaves 1— $1\frac{1}{2}$  inches long; flowers blue. This plant resembles *Phacelia Purshii*, but is different in its non-fimbriate corolla, its leaves all being sessile, with smaller and more obtuse lobes; and the whole plant is much more hispidly pilose.

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#### Description of a new QUADRUMANOUS MAMMAL, of the genus MIDAS.

BY J. H. SLACK, M. D.

*Midas elegantulus*.—M. capite, collo, cauda, pedibusque nigris; pilis dorso nigris, apicibus canis; abdomine rufescente; macula verticale aureo rufescente, labiis nasique apice albis.

*Hab.*—Amazon.

Head, throat, anterior limbs, tail and hands, deep, glossy black; hairs of back, sides, and posterior limbs black, throughout most of their length tipped with white, without regular annulations; belly, breast, and internal surface of limbs bright rust color, separated by a well defined line from the black of back and external surface of limbs. Upon the back of the head is a small patch of hairs, of similar coloration to those of the back; and upon the vertex a small triangular patch of golden yellow. The lips and tip of nose are white.

This species is nearest allied to the *M. mystax Geoff.*, having, like that, the bright rust colored belly, and black body and tail, but can readily be distinguished by the ashy tips of the hairs of the back and posterior limbs, and the triangular golden spot upon the vertex; the hairs of this spot are golden throughout their entire length, in this respect resembling the *M. chrysoleles Kuhl.*, and *M. pileatus Geoff.* and *Deville*, from both of which, however, it can readily be distinguished by the color of the belly. The typical specimen was procured by Lieut. Herndon, during his exploration of the Amazon river and its tributaries. Its precise locality unfortunately being unknown. The specimen is the skin of an adult male, and is the property of the Smithsonian Institution, by the Secretaries of which it was kindly loaned me for examination.

1861.]

*Measurements*.—Head and body 11.5 in.; anterior limbs 6 in.; posterior limb 7 in.; tail to end of hairs 12.8 in.; tail to end of vertebra 11.5 in.

The following is a synopsis of the genus:—

1. Species with long hairs upon the head.
 

Pelage golden yellow, long and silky,	<i>M. rosalia</i> Geoff.
Body black; head, anterior arms and line beneath the tail golden yellow	<i>M. chrysomelas</i> Kuhl.
General color brown; sides of head naked; hands white,	<i>M. oedipus</i> Geoff.
Black, back of neck maroon,	<i>M. geoffroii</i> Puch.
  
2. Species with short hairs on the back of the head.
  - α. Lips not white.
 

Head and anterior limbs white; body and posterior feet brown; tail and abdomen ferruginous,	<i>M. bicolor</i> Spix.
General color black; dashed with reddish brown,	<i>M. tamarin nobis</i> .
	<i>Cebus tamarin</i> Link.
Black; hands golden yellow,*	<i>M. ursula</i> Geoff.
	<i>M. lacepedii nobis</i> .
	<i>Sim. lacepedii</i> Fischer.
	<i>M. rufimanus</i> Geoff.
  
  - β. Lips white.
 

General color black; beneath reddish,	<i>M. labiatus</i> , Geoff.
Back varied black and grey; limbs and tail blackish; entire top of head golden yellow,	<i>M. pileatus</i> , Is. Geoff.
Head, shoulders and tail black; body brown, sometimes with white annulations,	<i>M. mystax</i> , Spix.
	<i>M. nigricollis</i> , “
	<i>M. ruficollis</i> , “
Pelage mostly black; thighs and base of tail bright maroon,	<i>M. nigrifrons</i> Is. Geoff.
	<i>M. devillii</i> , Is. Geoff.
Lips (not nose) white; top of head yellow; back yellow and black; thighs and base of tail reddish; hands black,	<i>M. weddelleri</i> , Deville.
	<i>M. flavifrons</i> , Is. Geoff.
Head black; back black, dashed with white; nape of neck, <i>external</i> and <i>internal</i> surface of limbs reddish; tail red at base and top, the intermediate portion black,	<i>M. illigeri</i> , Puch.
Back black, dashed with white, without regular annulations; head black, with a triangular golden spot upon the vertex; hands and tail black; belly and internal surface of limbs bright brick red,	<i>M. elegantulus</i> , Slack

\*This is the *Midas rufimanus* of Geoffroy St. Hilaire, Ann. du Mus., 1812, but had been described previously by G. Fischer, Bulletin de la Societe de Moscou, p. 23, 1806. It is curious that Isidore Geoffroy St. Hilaire, though crediting to Fischer the *Galago demidoffii*, (Catalogue des Primates, p. 81, 1853,) has utterly ignored the existence of this species, though described in the same paper, upon the preceding page. The following is Fischer's description, for the work containing which I am indebted to Mr. Hansen, the Librarian of the Museum of Comparative Zoology, Cambridge, Mass.:  
*S. Lacepedii*, nigra, pedibus rufis, auriculis vellere brevi, labio superiore non deviso.

**Synopsis of the Recent Species of GASTROCHÆNIDÆ, a Family of Acephalous Mollusca.**

BY GEORGE W. TRYON, JR.

Linnaeus included in the genera *Serpula*, *Teredo* and *Pholas*, the curious group of shells which form the subject of this memoir; and it is not surprising that he should have made such a distribution when we recollect, that until quite recently the animals of these shells were unknown, whilst an obvious external resemblance existed between the tubes of *Gastrochæna*, *Rocellaria*, etc., and those of *Serpula* and *Teredo*, and the valves exhibited a close affinity to those of *Pholas*. The earlier conchologists, misled by these resemblances, in several instances referred to different genera the shell and tube of one species. Lamarck assigned to these shells their true position in the system. His family TUBICOLA included the various species of *Aspergillum*, *Clavagella*, *Fistulana* and *Gastrochæna*, together with *Teredo* and *Teredina*, and excluded the *Serpulæ*. TUBICOLA was placed in close connection with the family Pholadaria, to which it is nearly allied not only by external characters, but also by anatomical resemblances and circumstance of habitation. The Lamarckian arrangement and his genera, were adhered to by the few writers who have taken up the study of the family until within the past few years.

Dr. John Edward Gray, in a paper published in the London Zool. Proc. for 1858, entitled, "On the Families *Aspergillidæ*, *Gastrochænidæ* and *Humphreyiadæ*," proposed the following classification:—

Family I. ASPERGILLIDÆ.

Animal living sunk in sand, or holes in rocks, or shells; enclosed in a shelly tube in which it resides, and emitting from the front of its mantle a number of tentacles, which are enclosed in tubuli radiating from the edge or disk of the base of the enclosing tube.

Subfamily 1. PENICILLINA.

Both the valves of the adult animal imbedded in and forming part of the shelly tubular sheath. The valves of the young animals are early united into one plate.

Genera. *Warnea*, *Aspergillum*, *Penicillus*, *Clepsydra*, *Arytene*, *Fægia*.

Subfamily 2. CLAVAGELLINA.

Only one valve of the adult animal imbedded in the shelly tubular sheath; the other free, and movable in the cavity of the tube.

Genera. *Clavagella* (fossil), *Bryopa*, *Dacosta*.

Family II. GASTROCHÆNIDÆ.

Living sunk in sand or holes in rocks and shells; enclosed in a shelly tube, in which are contained the free, movable valves. The front of the mantle not provided with any tentacles. The tube of the adult animal closed at the base, and destitute of any slit or perforations; its siphonal end not expanded.

Subfamily 1. CHÆNAINA.

The tube symmetrical, clavate, free. The animal living free, sunk in sand. Genus *Chæna*.

Subfamily 2. GASTROCHÆNAINA.

The tube irregular, attached. The animal living in holes in rocks, shells and other marine bodies.

Genus *Gastrochæna*.

Family III. HUMPHREYIADÆ.

The animal at first free and covered with two shelly valves, which become

united into a single plate, which expands on the sides and in front, forming a bag-like cavity, attached by its outer surface to shells or rocks, and, as the animal increases in size, it expands behind into a shelly tube with a circular aperture.

The front of the mantle is furnished with scattered tentacles, which are emitted through tubular pores on the upper part of the front of the tube, and round the circumference of the part by which it is attached.

The shells are attached to the surface of shells or rocks, and not sunk into their substance; nor do the animals live sunk in the sand like ASPERGILLIDÆ and GASTROCHÆNIDÆ.

Genus *Humphreyia*.

We have adopted several of the subfamilies and genera proposed by Dr. Gray, and have also used some of the genera as subgenera, but we do not consider the differences among these shells to be sufficient to warrant the creation of three families; nor are the genera so numerous as to require such a division for their proper study. The families proposed by Dr. Gray are not only discarded for the foregoing reasons, but also because their characters are very unequal in value. The *first*, comprising shells with both valves free, and those with but one valve free, the other attached, presents stronger differences within itself than those by which he has separated it from the *second* family; while the *third* (HUMPHREYIADÆ) is described as possessing a peculiar mode of growth, the tube being an enlargement or prolongation of the shelly valves. This may be true with regard to HUMPHREYIADÆ, but then it is also true of the genus *Brechites*, the depressions round the valves evidently marking the growth of the tube from them, as a nucleus.

Mr. Lovell Reeve, in his "Monograph of Aspergillum," says, in relation to *Humphreyia*:—

"If the animal of this interesting form of *Aspergillum* could speak, its remarks on Dr. Gray's ingenious description of its structure, habits and shell would probably resemble those of our great landscape painter Turner, on the criticisms of his pictures by Ruskin,—'Ah! he sees a great deal more in them than I can, or ever intended should be seen.'

"The peculiarities of *Aspergillum* (*Humphreyia*) *Strangei* are, that it is an adherent species; and, secondly, that it forms its sheath in a square. Like the shell of all other adherent species of a genus, compared with those that live free, the shell of *A. Strangei* has a very distorted growth, and the part of the attachment being the most delicate part of the shell is the part most distorted. One of the only two specimens known has, on ceasing its free habit, commenced to attach itself within the hinge portion of a muscle; the other has been attached to stone, in a manner obviously even less commodious to the symmetry of its growth; and many of the points seized by Dr. Gray as points of generic character are contortions arising out of these peculiar circumstances of habitation. The disk is smashed in as it were, and the frill is pushed out at the edge of the place of attachment, and both are an irregular heap of contortion."

The three groups or subfamilies into which we have divided the recent GASTROCHÆNIDÆ, following the arrangement given by H. and A. Adams, form very natural divisions of equal value; and the first three genera, also, are founded on constant and very distinct characters; but the division of the old genus *Aspergillum* must be regarded as a purely artificial arrangement of a large number of species into groups, in order to facilitate their study, which, in a genus so subject to distortion and abnormal mode of growth, had become very perplexing. These genera will probably undergo much modification when we have a better knowledge of their animals, which at present are almost unknown to us.

Naturalists are not all agreed as to the application of Guettard's name

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*Brechites* to *Aspergillum*. The description, it must be owned, is entirely inadequate; still, we have but little doubt that it was intended for this shell.

It is the aim of this paper to enumerate and define the various genera and species of GASTROCHENIDÆ, giving their synonymy in full, and also their distinctive characters. In the progress of the work, difficulties have been encountered that were scarcely imagined at the outset. The older writers have given us generally utterly inadequate descriptions, and have also in some cases confounded two or more species under one name and description,—e. g. in *Gastrochæna cuneiformis* and *Aspergillum Javanum*.

Then, again, many of the later species are founded on single or few specimens, and characterized principally by variations of surface and ornamentation, which *may* be found to be permanent when a larger number of specimens become known to us, but are most probably the result of accident, in a family acknowledged to be peculiarly subject to distortion from external causes. That a large number of these species could not be retained on present data, early became apparent; but the question with what forms they were to be united has sometimes proved a perplexing one. Where we have merged two or more species into one, our reasons are always stated; but they must be understood as mere opinions which future discoveries may very seriously modify.

Whilst the course we have thought proper to pursue may have resulted in the suppression of some good species, it offers us, in those which have been adopted as valid, objects distinguished from each other by well founded and permanent characters. Unusual care has been taken with the synonymy of the older species, the descriptions having been patiently studied out and compared, and it is probable that the most of them have been assigned to their true position; but for reasons already alluded to, there can be no certainty regarding this, and perhaps this paper should rather be regarded as a contribution of facts and authorities as *material* for the future monographer, than as an addition to positive knowledge.

It will be found by reference to the succeeding pages that we have placed in the synonymy of a number of genera and species many well known and generally received names. To explain our motive for so doing, we deem it important to enunciate the following general principle:

We hold that the oldest generic name, accompanied by a sufficiently accurate description for the purposes of identification, should always have priority; and the same rule applies to specific names; but in order to save naturalists from the labor of consulting the writings of the ancients and the danger of adopting a false application of their generally obscure descriptions, no pre-Linnæan names should be used.

The name of the naturalist who first describes a species of shell should forever remain attached to the specific name, of which, for all the purposes of memorizing or identification, it is properly a part; and should our better acquaintance with its structure and relations to other mollusca authorize its removal to another genus from that in which it was originally placed by its discoverer, then the latter's name should be followed by the word "Species," to indicate the fact.

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*Classification.*

CONCHIFERA.

PHOLADACEA.

(Family I. PHOLADIDÆ.)

Family II. GASTROCHÆNIDÆ.

*Shell.*—Valves thin, gaping, edentulous, or teeth rudimentary, ligament external, adductor impressions two, pallial line sinuated; contained within a shelly tube, both valves free, or one or both valves cemented to its walls.

*Animal.*—Symmetrical, elongated, anteriorly truncated; with two long contractile siphons posteriorly, united nearly to their extremities, which are fringed with ciliated orifices. Margins of the mantle anteriorly thickened and united, with a small pedal opening; foot cylindrical, small; gills, a pair on either side, prolonged into the branchial siphon.

Frequently gregarious; burrowing in wood, stone, sand, or mud at low water mark, and lining their burrows with a calcareous tube; the shape of which, together with the more or less cohesion of the valves to its sides, affords the generic characters.

Subfamily 1. GASTROCHÆNINÆ, Tryon, (not Gray.\*) 1861.

Shell with both valves free from the tube.

a. Inequivalve, edentulous; tube straight, striated transversely, and furnished, when complete, with a perforated septum behind the valves.

1. Genus GASTROCHÆNA, Spengler. 1780.

Gastrochæna, (including Rocellaria.)

Spengler, Nov. Act. Soc. Sc. Havn. ii. 1780.

Blainville, Malacologie, p. 574, 1825.

Rang, Tabl. Meth. p. 342, 1829.

Deshayes, Traite Elem. i. pt. 2, p. 26, 1843—'50.

Gastrochæna, (as at present restricted.)

Mörch, Catalogue, 1853.

H. and A. Adams, Genera, ii. p. 334, 1856.

Chæna, Retzius, Nov. Test. Gen. p. 19, 1788, (including Rocellaria.)

Schumacher, Essai d'un Nov. Syst. p. 94, 1817, (including Rocellaria.)

Gray, Zool. Proc. London, p. 189, 1847.

“ “ “ “ p. 315, 1858.

Deshayes, Zool. Proc. London, p. 330, 1854.

Woodward, Manual, p. 326, 1854, (as a subgenus of Gastrochæna, Rocellaria.)

Fistulana, Bruguiere, Encyc. Meth. Vers. 1789.

Cuvier, Regne Anim. Ed. primo, ii. p. 494, 1817.

Lamarck, Anim. Sans. Vert. v. p. 432, 1818.

“ (Deshayes' edit.) Anim. Sans. Vert. vi. p. 25, 1835.

\* Gray's subfamily GASTROCHÆNAINA is made to include only the species of *Rocellaria*, (by him wrongly named *Gastrochæna*.) while the genus *Gastrochæna* he has placed, under the name of *Chæna*, in another subfamily CHÆNAINA. I include the two genera in one subfamily. I also include a third genus, recently proposed by Dr. Gould.



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 Bosc, Hist. Nat. des Coquilles, ii. p. 205, 1824.  
 Deshayes, Encyc. Meth. ii. p. 139, 1830.  
 Wyatt, Conch. p. 24, 1838.  
 Hanley, Descriptive Catalogue, p. 3, 1842.  
 Reeve, Conch. Syst. 1843.  
 Catlow and Reeve, Conch. Nomenc. p. 2, 1845.  
 Jay. Catalogue, 4th edit. p. 8, 1850.

**Teredo, partim.**

Linnaeus, Gmelin, Dillwyn.

*Description.*—Valves irregular, unequal, widely gaping, hinge edentulous, ligament narrow; pallial sinus deep, posterior muscular impression nearly central, with a pedal scar in front. Tube straight, cylindrical, striated transversely, tapering upwards, closed at the lower end, with a perforated septum behind the valves.

A tropical genus, burrowing in sand or mud, at low water mark; with the upper part of the tube projecting but little above the surface.

- b. Equivalve, edentulous, but the hinge generally with a small spatulate lamina. Tube irregular.

2. Genus **ROCELLARIA**, Fleuriau de Bellevue. 1802.

Rupellaria, Fleuriau de Bellevue, Journ. de Physique, liv. 1802.

Roxellaria, Agassiz, Nomenclator Zoologicus.

Rocellaria, Mörch, Catalogue, 1853.

H. and A. Adams, Genera, ii. p. 335, 1856.

Gastrochæna, Cuvier, Regne Anim. Ed. primo, ii. p. 490, 1817.

Lamarck, Anim. Sans. Vert. v. p. 446, 1818.

“ (Desh. edit.) Anim. Sans. Vert. vi. p. 48, 1835.

Ferussac, Tabl. Syst. p. 45, 1822.

Turton, Conch. Dithyra Brit. p. 17, 1822.

Crouch, Introd. Lam. 1827.

Fleming, Brit. Anim. 1828.

Rang, Tabl. Meth. p. 342, 1829.

Boucharde-Charantreaux, Moll. Boulonnais, p. 8, 1829.

Della Chiaje, Anim. Senza Vert.

Collard de Cherres, Cat. Test. Mar. p. 9, 1830.

Lukis, Loudon's Mag. Nat. Hist. vi. p. 401, 1833.

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Hanley, Descriptive Catalogue, p. 10, 1842.

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Potiez et Michaud, Galerie des Moll. ii. p. 267, 1844.

Thorpe, Brit. Mar. Conch. p. 33, 1844.

Philippi, Enum. Moll. Sicil. ii. p. 3, 1844.

Catlow, Conch. Nomenc. p. 2, 1845.

Gray, Zool. Proc. p. 189, 1847.

“ “ “ p. 316, 1858.

D'Orbigny, Mollusks, Sagra's Cuba.

Requier, Cat. des Coq. de la Corse, p. 13, 1848.

Jay, Catalogue, 4th edit. p. 8, 1850.

Deshayes, Mollusques, Expl. Sci. de l'Algerie, p. 17.

“ Proc. Zool. Soc. London, p. 326, 1854.

Forbes and Hanley, Hist. Brit. Moll. i. p. 130, 1853.

Woodward, Manual, pt. 2, p. 325, 1854.

Carpenter, Mazatlan Shells, Brit. Mus. Cat. p. 14, 1857.

Beau, Cat. des Coq. Guadeloupe, 1858.

- Gastrochæna, (including both Gastrochæna and Rocellaria.)  
 Spengler, Nov. Act. Sc. Soc. Havn. ii. 1780.  
 Blainville, Malacol. i. p. 574, 1825.  
 Deshayes, Traite Elem. i. pt. 2, p. 26, 1843—'50.
- Chæna, (partim,) Retzius, Nov. Test. Gen. p. 19, 1788.  
 Gray, Figs. Moll. Anim. v. 1857.
- Mya, (partim,) Pennant, Brit. Zool. iv. 1777.  
 Donovan, Brit. Shells, iii. 1801.  
 Montagu, Test. Brit. i. 1803.  
 Maton & Rackett, Linn. Trans. viii. 1807.  
 Wood, Gen. Conch. edit. 1, 1815.  
 " Index Test, edit. 1, 1818; edit. 2, 1828.  
 De Gerville. Cat. des Coq. de la Manche, 1825.
- Chama, DaCosta, Brit. Conch. 1778.
- Pholas, (partim,) Chemnitz, Conch. Cab. x. 1788.  
 Gmelin, Syst. Nat. i. 1790.  
 Poli, Test. utr. Sicil. i. 1791.  
 Olivi, Adriatica, 1792.  
 Schreibers, Versuch nach Conchylieen, ii. 1793.  
 Pultney, Dorsetshire Catalogue, 1799.  
 Dillwyn, Descriptive Catalogue, i. 1817.  
 Wood, Gen. Conch. ed. 1, 1815.  
 " Index Test, edit. 1. 1818; edit. 2, 1828.
- Mytilus, (partim,) Dillwyn, Descriptive Catalogue. i. 1817.
- Fistulana, (partim,) Bosc, Hist. Nat. des Coq. ii. p. 205, 1824.  
 Deshayes, Encyc. Meth. Vers. ii. p. 139, 1830.  
 Philippi, Enum. Moll. Sicil. i. p. 2, 1836.

*Description*.—Shell regular, equivalve; valves ovate or cuneiform, widely gaping anteriorly, very inequilateral; umbones anterior, ligament long and narrow. Pallial line lightly impressed, sinuated, uniting the muscular impressions.

Tube claviform or irregular, often incomplete, perforating shells and limestone, to which its walls are sometimes adherent.

Subgenus SPENGLERIA, Tryon. 1861.

I propose to separate from Rocellaria those species which are elongate-cuneiform, truncated at the posterior end of the shell, and having a triangular space, radiating from the beaks posteriorly to the margin, elevated slightly above the general surface of the shell, and ornamented with transverse lamellæ.

3. Genus CUCURBITULA, Gould. 1861.

Cucurbitula, Gould, Proc. Bost. Soc. Nat. Hist. viii. p. 22, March, 1861.

Fistulana,  
 Gastrochæna, } Partim. of authors.  
 Chæna, &c. }

*Description*.—Shell regular, elongate, equivalve, gaping the whole length, anteriorly enveloped by the mantle of the animal.

Tube very short, ovate, or gourd-shaped, composed of successive calcareous layers or cups, involving bits of shell or sand. Attached by one side to shells, &c.

I quite agree with Dr. Gould in the propriety of erecting a new genus for the well known Gastrochæna lagena. The characters given above prove it to be quite distinct from Gastrochæna or Rocellaria.

Subfamily 2. BRYOPINÆ, Tryon. 1861.

Shell with the right valve only free, the left being imbedded in the tube.

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## 4. Genus BRYOPA, Gray. 1840.

- Bryopa, Gray, Syn. Brit. Mus. 1840.  
 " Proc. Zool. Soc. p. 314, 1858.  
 H. and A. Adams, Genera, ii. p. 649, 1858.  
 Clavagella,\* Lamarck, Anim. Sans. Vert. v. p. 430, 1818.  
 " (Desh. edit.) Anim. Sans. Vert. vi. p. 22, 1835.  
 Ferrussac, Tabl. Syst. p. 45, 1822.  
 Della Chiaje, Anim. Senza Vert.  
 Sowerby, Genera.  
 Blainville, Malacol. p. 575, 1825.  
 Crouch, Introd. Lam. p. 5, 1827.  
 Rang, Man. Moll. p. 338, 1829.  
 Broderip, Zool. Proc. London, p. 115, 1834.  
 " Zool. Trans. London, i. p. 261, 1835.  
 Owen, " " " i. p. 269, 1835. (Anatomy.)  
 Cuvier, Regne Anim. (Andouin's edit.) 1836.  
 Th. Müller, Syn. Test. Viv. 1836.  
 Philippi, Weigmann's Archiv. für Naturg. i. 1840.  
 " Enum. Moll. Sicil. i. p. 1, 1836; ii. p. 1, 1844.  
 Reeve, Conch. Syst. 1843.  
 Hanley, Descriptive Catalogue. p. 2, 1842.  
 Cailliaud, Guerin's Mag. Zool. 1842.  
 " Chenu's Illustrations Conch.  
 Forbes, Report on Ægean Invert., Brit. Assoc. p. 142, 1843.  
 Deshayes, Traite Elem. i. pt. 2, p. 16, 1843-'50.  
 " Expl. Sci. de l'Algerie, Mollusques, p. 1.  
 Catlow, Conch. Nomencl. p. 2, 1845.  
 Jay, Catalogue, 4th edit. p. 3, 1850.  
 H. and A. Adams, Genera, ii. p. 337, 1854.  
 Gray, Figs. of Moll. Anim. v. 1857.

Teredo, (partim,) Brocchi.

*Description*.—Valves flat, irregular, unequal, the right free, the left always imbedded when adult. Pallial sinus deep. Anterior muscular impression small, posterior one large.

Tube elongated, cylindrical, open at the posterior end, and furnished with siphonal fringes; the anterior or lower end compressed, clavate, simple, with a minute central fissure.

Subgenus DACOSTA, Gray. 1858.

Dacosta, Gray, Zool. Proc. London, p. 315, 1858.

H. and A. Adams, Genera, ii. p. 649, 1858.

Posterior or upper end of the tube destitute of siphonal fringes.

## Subfamily 3. CLAVAGELLINÆ, Gray. 1858.

Distinguished from Bryopinæ by the presence of radiated tubuli on the lower end of the tube, thus forming a connecting link between Bryopinæ and Penicillinæ.

(Contains the fossil genus Clavagella.)

## Subfamily 4. PENICILLINÆ, Gray. 1858.

Shell with both valves imbedded in the walls of the tube, with their umbones visible externally. Base of the tube ornamented with radiated tubuli, containing tentacular processes originating in the animal's mantle.

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\* The genus *Clavagella*, as characterized by Lamarck, includes those species (only known in a fossil state) in which the lower end of the tube is surrounded by hollow spinous processes. Lamarck included the recent species in his genus, under the impression, probably, that their tubes were incomplete.

5. Genus BRECHITES, Guettard. 1774.
- Brechites, Guettard, Mem. de l'Academie Paris, ii. p. 18, 1774.  
Mörch, Catalogue, 1853.  
H. and A. Adams, Genera, ii. p. 338, 1856.  
“ “ “ “ ii. p. 649, 1858.
- Phallus, (partim,) Lister, Historiæ Conchyliorum, 1685—'92.  
Rumphius, Amboinsche Rareit. 1705.  
Gualtieri, Test, 1742.
- Tubulus, (partim,) Bonanni, Recreatio Oculi, &c., 1684.  
Klein, Tab. Mar. Gen. 1734.  
Martini, Conch. i. 1769.
- Venus, (partim,) Rumphius, Amboinsche Rareit, 1705.
- Solen, (partim,) Klein, Ostracologica, p. 163, 1753.
- Arytæna, (partim,) D'Argenville, Conchyliologie, 2d ed. 1757.  
Favanne, Conch. 1780.  
Oken, Lehrbuch, p. 379, 1815.
- Penicillus, (partim,) Bruguière, Encyc. Meth. Vers. p. 126, 1789.  
Lamarck, 1801.  
Gray, Genera, Zool. Proc. p. 188, 1847.
- Clepsydra, (partim,) Meuschen.  
Schumacher, Essai d'un Nov. Syst. pp. 79 and 261, 1817.
- Serpula, (partim,) Linnæus.  
Schroeter, Einleit. Conch. ii. 1784.  
Gmelin, Syst. Nat. i. 1790.  
Born.  
Schreibers, Versuch nach Conchyl. ii. 1793.  
Dillwyn, Descriptive Catalogue, 1817.  
Wood, Index Test. edit. 1, 1818; edit. 2, 1828.  
Knorr, Vergnüg. iv. 1772.  
Martini, Conch. Cabinet, i. 1769.  
Shaw, Nat. Misc. vi.  
Brooke's Conchology, 1815.  
Mawe, Conch. 1823.  
Woodarch, Introd. 1831.
- Verpa, Bolten, Mus. Bolt. edit. 2, 1819.
- Aquaria, Perry, Conch. 1811.
- Adspergillum, Menke, Syn. Meth. Moll. 1830.
- Arrosoir, Favanne, 1780.  
D'Argenville, 1742.  
Bruguière, Encyc. Meth. p. 126, 1789.
- Aspergillum, (partim,) Bruguière, 1789.  
Lamarck, Anim. Sans Vert. v. p. 428, 1818.  
“ (Desh. ed.) Anim. Sans Vert. vi. p. 19, 1835.  
Ferussac, Tabl. Syst. p. 45, 1822.  
Blainville, Malacologie, p. 576, 1825.  
Sowerby, Genera.  
Crouch, Introd. Lamarck, p. 5, 1827.  
Chenu, Illust. Conch. Aspergillum.  
Rang, Hist. Nat. des Moll. p. 337, 1829.  
Wyatt, Conch. p. 23, 1838.  
Cuvier, Regne Anim. (Audouin's edit.)  
Anton, Verzeich der Conchyl. p. 122, 1839.  
Reichenbach, Conchylien, 1842.  
Hanley, Descriptive Catalogue, p. 1, 1842.  
Reeve, Conch. Syst. 1843.  
“ Conchologia Iconica, Monog. Aspergillum, 1860.  
Deshayes, Traite Elem. i. pt. 2, p. 8, 1843—'50.  
Potiez et Michaud, Galerie des Moll. ii. p. 273, 1844.

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- Aspergillum, (partim,) Savigny, Expl. Egypt. Moll.  
 Guerin, Iconog. du Règne Anim.  
 Philippi, Enum. Moll. Sicil. i. p. 2, 1836; ii. p. 2, 1844.  
 Catlow, Conch. Nomenc. p. 1, 1845.  
 Rüppell, Reise Nord Afric.  
 Jay, Catalogue, p. 8, 4th ed. 1850.  
 Woodward, Manual, pt. 2, p. 327, 1854.  
 Gray, Figs. Moll. Animals, v. 1857.  
 " Zool. Proc. p. 311, 1858.

*Description*.—Shell small, oval, equivalve, equilateral, imbedded in the wall of the tube, and visible externally.

Tube elongated, attenuated and open above, swelling, and closed below by a convex diaphragm, with numerous margined perforations and a narrow central fissure; the circumference ornamented with one or more fringes of tubuli. The upper or siphonal end of the tube plain.

Surface of the tube wavy, depressed around the small pair of open valves.

Inhabiting tropical countries, and living buried in sand or mud at low water mark.

Subgenus WARNEA, Gray. 1858.

Warnea, Gray, Zool. Proc. p. 309, 1858.

H. and A. Adams, Genera, ii. p. 649, 1858.

The siphonal end of the tube fringed with from one to several rows of ruffles.

6. Genus PENICILLUS, Gray, 1858, (not Bruguiere.)

Penicillus, Gray, Zool. Proc. 312, 1858.

H. and A. Adams, Genera, ii. p. 649, 1858.

Aspergillum (partim) of authors.

*Description*.—The valves not surrounded by wavy depressions on the surface of the tube. Disk surrounded by a single fringe of tubuli.

Subgenus CLEPSYDRA, Gray, 1858, (not Meuschen or Schumacher.)

Clepsydra, Gray, Zool. Proc. p. 312, 1858.

H. and A. Adams, Genera, ii. p. 649, 1858.

Fringe of the disk consisting of two or three series of tubes.

7. Genus FŒGIA, Gray. 1840.

Fœgia, Gray, Syn. Brit. Mus. 1840.

" Zool. Proc. p. 313, 1858.

H. and A. Adams, Genera, ii. p. 649, 1858.

Aspergillum (partim) of authors.

*Description*.—Valves not surrounded by wavy depressions; covered more or less by a sunken tubercle in front. Disk of the tube fringed.

Subgenus ARYTENE, Gray, 1858, (not Oken or Megerle.)

Arytene, Gray, Zool. Proc. p. 313, 1858.

H. & A. Adams, Genera, ii. 650, 1858.

Disk of the tube not fringed.

8. Genus HUMPHREYIA, Gray. 1858.

Humphreyia, Gray, Zool. Proc. London, p. 316, 1858, and Ann. and Mag. N. H. 3d ser. ii. p. 16, 1858.

H. and A. Adams, Genera, ii. p. 650, 1858.

Brechites, (Fœgia,) H. and A. Adams, Genera, ii. p. 339, 1856.

Aspergillum, A. Adams, Zool. Soc. Proc. p. 91, 1852.

Reeve, Monog. Asp. Conch. Iconica, 1860.

1861.]

*Description.*—The tube attached by its base to shells or stone, and much distorted in growth.

But two specimens are known, of the only species of this genus, and they are entirely too much distorted in appearance to furnish reliable characters. They exhibit, however, a close relationship to *Brechites*, etc., from which they may be distinguished by their adherence to foreign bodies. This character is sufficient to justify the separation made by Dr. Gray, under the name of *Humphreyia*; and, until we are better acquainted with these shells, it is as well to allow the genus to rest on it alone. Dr. Gray has attempted more, and incurred thereby the criticism in Reeve's Monograph, which we have already quoted.

*Species of Gastrochænidæ.\**

GASTROCHÆNA.

1. *G. agglutinans*, Deshayes, sp.

*Chæna agglutinans*, Deshayes, Proc. Zool. Soc. Lond. p. 330, 1854.

*Gastrochæna agglutinans*, H. and A. Adams, Genera, ii. p. 335, 1856.

*Description.*—"G. vaginâ minimâ, elongato-clavatâ, posticè valdè attenuatâ, corticè valdè et irregulariter transversim plicato, corporâ alienâ agglutinante. Testâ elongato-paulo latiore, extus ut in Solenibus bipartitâ, partè alterâ sub-planâ, arcuatim striatâ, alterâ longitudinaliter tenuissime striatâ; laterè antico brevissimo, abruptè truncato, cucullato, angulo acuto circumscripto, radiatim tenuè lirato, liris subgranosis; impressione musculari posticâ paulo post medianâ, minimâ; sinu pallii profundo, acutissimo."—*Deshayes*.

*Hab.*—Zebu, Philippines. Coll. Cuming.

*Remarks.*—This shell is distinguished from *G. mumia* by its agglutinated tube, the division of the surface of the valve into two parts, and their peculiar striation. *G. grandis* has, like this species, an agglutinated tube, but its valves are carinate and sulcate, and differently formed.

2. *G. grandis*, Deshayes, sp.

*Chæna grandis*, Deshayes, Proc. Zool. Soc. Lond. p. 330, 1854.

*Gastrochæna grandis*, H. and A. Adams, Genera, ii. p. 335, 1856.

*Description.*—"G. vaginâ elongato-clavatâ, regulari, rectâ, transversim rugatâ, posticè attenuatâ, sabuletis in corticè agglutinante. Testâ elongato-angustâ, hiantissimâ, posticè latiorè spathulatâ, ad latus anticum sensim attenuatâ; laterè antico brevissimo, subito truncato et angulo acuto distincto, in medio valdè carinato vel cristato, radiatim inæqualiter sulcato, sulcis inæqualibus novem ad decem, quinque majoribus denticulo acuto terminatis; cardine lineari, simplici; impressione musculari posticâ in medio longitudinis posita; sinu pallii profundo, acutissimo."—*Deshayes*.

*Hab.*—Zebu, Philippine Islands. Coll. Cuming.

3. *G. mumia*,\* Spengler.

*Gastrochæna mumia*, Spengler, Nov. Act. Sc. Soc. ii. p. 174, f. 1—7, 1783.

" Journ. Nat. Hist. Soc. Copenh. iii. p. 20,  
t. 2, f. 1, 1a.

Favanne, Conch. t. 5, f. k, 1780.

Deshayes, Traite Elem. p. 32, t. 2, 1843—'50.

Mörch, Catalogue, 1853.

H. and A. Adams, Genera, iii. t. xci. f. 1, 1a, 1855.

*Chæna mumia*, Retzius, Nov. Test. Gen. p. 19, 1788.

Schumacher, Essai d'un Nov. Syst. p. 94, 1817.

Woodward, Manual, t. 23, f. 16, 1854.

*Chæna tessellata*, Gray, Zool. Proc. p. 315, 1858.

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\* Those species marked with a star are contained in the collection of the Academy of Natural Sciences of Philadelphia.

- Fistulana mumia, Catlow, Conch. Nomenc. p. 2, 1845.  
 Jay, Catalogue, 4th ed. p. 8, 1850.
- Fistulana clava, Lamarck, Anim. Sans Vert. v. p. 435, 1818.  
 " (Desh. edit.) Anim. Sans. Vert. vi. p. 30, 1835.  
 Cuvier, Regne Anim. 1st edit. ii. p. 494, 1817.  
 " " " (Audouin's edit.) t. 116, f. 1, a, b, c.  
 Sowerby, Genera, No. 27, f. 1—5.  
 Bosc, Hist. Nat. des Coq. ii. p. 204, 1824.  
 Blainville, Malacol. t. 81, f. 3, 1825.  
 Deshayes, Encyc. Meth. Vers. ii. p. 140, 1830.  
 Wyatt, Conch. t. 33, f. 5, 1838.  
 Reeve, Conch. Syst. t. 19, 1843.  
 Hanley, Desc. Cat. p. 3, t. 11, f. 5, 1842.
- Teredo clava, Gmelin, 3748, 1790.  
 Dillwyn, Desc. Cat. ii. p. 1090, 1817.

*Description*.—"G. vaginâ tereti clavatâ, rectâ, tenuissimâ, fragili; testæ valvis elongatis, anticæ contortis, uncinatis, regulariter striato-plicatis."—*Deshayes*.

*Hab*.—India, Philippine Islands.

This is the well known type of the old genus *Fistulana*. Very excellent figures of it are given in the works of Deshayes, Cuvier, Blainville and Sowerby, quoted above.

G. (*Chæna*) *annulata*, Gray, B. M., *Hab*. Mozambique, Mauritius, is mentioned in the Zool. Proc. Lond. for 1858, but without description.

#### ROCELLARIA.

Considerable diversity of form exists among the species of this genus, and their separation into groups would probably facilitate their study; this we are unfortunately not able to do in a very perfect manner, in consequence of the extreme paucity of some of the descriptions. We have separated a subgenus *Spengleria*, and propose to divide the remaining species into two groups.

1st. Those whose shells are short and ovate. Ex *R. dubia*, *hians*, etc.

2d. Those possessing elongate-cuneiform shells. Ex *R. apertissima*, etc.

It has been proposed to create a separate genus or subgenus for those species possessing a large spathulate hinge lamina, and it is not at all improbable that future researches will show the necessity for such division. It will be seen that in a majority of the species the anterior hiatus is very long, equalling the entire, or nearly the whole length, of the shell. There are marked exceptions to this, however, in several species, the hiatus in *R. humilis*, for instance, scarcely reaching to the middle of the shell. The umbones are always placed near the anterior margin, and they are sometimes terminal. Differences also occur in the width, length, prominence and color of the ligament, in the contour of the margins, in the relative proportions of the sides anterior and posterior to the beaks, the form of the hiatus, character of the striation, the thickness of the valves, the size of the spathulate hinge lamina, (which is *generally* minute or obsolete,) and in the form of the interior impression.

#### a. Valves short, ovate.

1. *R. brevis*, Sowerby, sp.

*Gastrochæna brevis*, Sowerby, Zool. Proc. Lond. p. 21, 1834.

Th. Müller, Syn. Test. Viv. p. 335, 1836.

Hanley, Desc. Cat. p. 11, 1842.

Catlow, Conch. Nomenc. p. 2, 1845.

*Rocellaria brevis*, H. and A. Adams, Genera, ii. p. 336, 1856.

*Description*.—"R. testâ breviter ovatâ, tenui, pellucidâ, striatâ, striis exilissimis; longitudinè lateris anticæ octavum partim testæ æquante. Long. 0.8. lat. 0.5, alt. 0.5, poll."—*Sowerby*.

1861.]

*Hab.*—"Ad Insulas Gallapagos et apud Insulam Lord Hood's dictam. Found in pearl oysters, in from three to seven fathoms."—*Sowerby*.

2. *R. denticulata*, Deshayes, sp.

*Gastrochæna denticulata*, Deshayes, Zool. Proc. Lond. p. 327, 1854.

*Rocellaria denticulata*, H. and A. Adams, Genera, ii. p. 336, 1856.

*Description.*—"R. testâ ovato-ventricosâ, brevi, solidulâ, latâ, hiantissimâ, hiatus ovato, lato, infernè attenuato et tertiam partem posticam testæ attingente; valvis subtrapezoidalibus transversim striato-lamellosis, in laterè antico striis imbricatis, crispato-denticulatis, in laterè postico erectis, distantioribus; laterè antico satis elongato, recto, in suturâ cristato; umbonibus tumidulis, subumbilicatis; ligamento angusto, elongato, fulvo."—*Deshayes*.

*Hab.*—Columbia. Coll. Cuming.

This is a heavy shell, while *R. brevis* is thin and pellucid. It is also more prominently striated than that species, and differs from it in shape.

3. *R. dubia*,\* Pennant, sp.

*Mya dubia*, Pennant, Brit. Zool. iv. p. 82, t. 44, f. 19, 1777.

Donovan, British Shells, iii. t. 108, 1810.

Maton and Rackett, Linn. Trans. viii. p. 33, 1807.

Wood, Gen. Conch. p. 102, t. 25, f. 2, 3, 1815.

" Index Test, edit. 1, p. 11, 1818.

" " " edit. 2, t. 2, f. 23, 1828.

Gerville, Cat. des Coq. de la Manche, p. 10, 1825.

*Mya Pholadia*, Montagu, Test. Brit. i. p. 28 et 559, et supp. p. 20, 1803.

Fleming, Edinb. Encyc. ii. p. 87.

*Chama parva*, DaCosta, Brit. Conch. p. 234, 1778.

*Pholas faba*, Pultney, Dorsetshire Catalogue, p. 27, 1799.

*Pholas pusilla*, Poli, Test. utr. Sicil. i. p. 50, t. 7, f. 12, 13, 1791.

Olivi, Adrit. p. 93, 1792.

*Mytilus ambiguus*, Dillwyn, i. p. 304, 1817.

*Balano minimo*, Ginanni, Op. post. ii. p. 35, t. 23, f. 164, 1755—'57.

*Gastrochæna Pholadia*, Turton, Conch. Dithyra Brit. p. 18, t. 2, f. 8, 9, 1822.

Lukis, Loudon's Mag. Nat. Hist. vi. p. 404, f. 52, 1833.

Brown, Illust. Brit. Conch. 2d ed. p. 116, t. 48, f. 13, 14, 1844.

*Gastrochæna hians*, Fleming, Brit. Anim. p. 458, 1828.

*Gastrochæna cuneiformis*, Philippi, Enum. Moll. Sicil. i. p. 2, 1836.

*Gastrochæna Polii*, Philippi, Enum. Moll. Sicil. ii. p. 3, 1844.

Requier, Cat. des Coq. de la Corse, p. 13, 1848.

*Gastrochæna (Chæna) faba*, Gray, Figs. Moll. Anim. v. p. 28, t. 339, f. 2, 3, 4; t. 347, f. 6—8, 1857.

*Gastrochæna modiolina*, Lamarck, Anim. Sans Vert. v. p. 447, 1818.

" (Desh. edit.) Anim. Sans Vert. vi. p. 49, 1835.

Sowerby, Genera, f. 1, 2, 1820—'24.

" Conch. Manual, f. 52, 1842.

Crouch, Introd. Lamarck, t. 2, f. 12, a, b, 1827.

Boucharde-Chantreaux, Moll. Boulonnais, p. 8, 1829.

Collard de Cherrès, Cat. Test. Mar. p. 9, 1830.

Hanley, Desc. Cat. p. 10, 1842.

Cailliaud, Guerin's Mag. Zool. Moll. p. 2, t. 69, 70, 71, 1843.

Reeve, Conch. Syst. t. 50, f. 1, 2, 1843.

Potiez et Michaud, Galerie des Moll. ii. p. 268, 1844.

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*Gastrochæna modiolina*, Thorpe, Brit. Mar. Conch. p. 33, 1844.

Jay, Catalogue, 4th ed. p. 9, 1850.

Leach, Moll. Great Britain, p. 256, t. 3, f. 3, 1852.

Forbes and Hanley, Brit. Moll. i. p. 132, t. 2, f.

5—8, and t. F, f. 5, (animal,) 1853.

Woodward, Manual, pt. 2, t. 23, f. 15, 1854.

Gray, Proc. Zool. Soc. Lond. p. 316, 1858.

*Gastrochæna dubia*, Philippi, Wiegmann's Archiv. Natur. t. 7, f. 1, 1845.

Catlow, Conch. Nomenc. p. 2, 1845.

Deshayes. Expl. Sci. de l'Algerie, Moll. p. 34.

“ Traite Elem. i. pt. 2, p. 34, t. 2, f. 4, 5,  
1843—'50.

*Rocellaria dubia*, H. and A. Adams, Genera, iii. t. xci. f. 2, a, b, c, 1855.

*Description*.—“*R. vaginâ* pyriformi, contortâ, crassâ intus, ad aperturam bicarinatâ; testâ ovato-oblongâ, angustâ, transversim striatâ, anticè sinuatâ; natibus prominulis, laterè antico brevissimo.”—*Deshayes*.

*Hab.*—England, Mediterranean.

This species may be readily distinguished from the others by the slight truncation of the margin at the posterior end of the shell, by its short, wide hiatus, and its large laminar hinge-plate.

There are many excellent figures in the list of works quoted above, and a very full description is contained in the “British Mollusca” of Messrs. Forbes and Hanley.

4. *R. hians*,\* Chemnitz, sp.

*Pholas hians*, Chemnitz, x. p. 364, t. 172, f. 1678 and 1679, 1788.

Gmelin, Syst. Nat. 3217, 1790.

Schreibers, Versuch nach Conch. ii. p. 367, 1793.

Dillwyn, Desc. Cat. i. p. 39, 1817.

Wood, Gen. Conch. p. 85, 1815.

“ Index Test, 1st ed. p. 9, 1818.

“ “ “ 2d ed. t. 2, f. 11, 1828.

*Fistulana rupestris*, Bosc, Hist. Nat. des Coq. ii. p. 205, 1824.

*Chæna cuneiformis*, Retzius, Nov. Test. Gen. p. 19, 1788.

*Gastrochæna cuneiformis*, Spengler, Nov. Act. Sc. Soc. ii. p. 179, f. 8—11, 1783.

Lamarck, Anim. Sans Vert. v. p. 447, 1818.

“ (Desh edit.) Anim. Sans Vert. vi.  
p. 49, 1835.

Rang, Tabl. Meth.

Sowerby, Genera, f. 3, 4, 5, 1820—'24.

Blainville, Man. de Malacol. p. 574, t. 79, f.  
5, 1825.

Anton, Verzeich der Conchyl. p. 1, 1839.

Hanley, Desc. Cat. p. 10, 1842.

Reeve, Conch. Syst. t. 20, f. 4, 5, 1843.

Potiez et Michaud, Galerie des Moll. ii. p.  
267, 1844.

Catlow, Conch. Nomenc. p. 2, 1845.

Jay, Catalogue, 4th ed. p. 8, 1850.

D'Orbigny, Sagra's Hist. de l'Isle de Cuba,  
Moll. p. 228, 1853.

Beau, Cat. des Coq. Guadeloupe, p. 27, 1858.

*Gastrochæna hians*, Gray, Zool. Proc. Lond. p. 316, 1858.

*Rocellaria hians*, H. and A. Adams, Genera, ii. p. 336, 1856.

*Description*.—“*R. testâ* ovatâ, cuneiformi, tenui, albidâ, subpellucidâ, concentricè densè striatâ, laterè anali elongato, rotundato; laterè anali brevi, angustato, acuminato; laterè palleali hiante.”—*D'Orbigny*.

*Hab.*—West Indies.

1861.]

This species is represented by Chemnitz's figures, Nos. 1678 and 1679. Nos. 1680 and 1681 represent *R. rostrata*. Several writers have confounded the two under one description, although they are really very different. *R. hians* has also been frequently confounded with *R. dubia* of Europe.

5. *R. humilis*,\* Deshayes, sp.

*Gastrochæna humilis*, Deshayes, Proc. Zool. Soc. Lond. p. 327, 1854.

*Rocellaria humilis*, H. and A. Adams, Genera, ii. p. 336, 1856.

*Description*.—"R. testâ parvâ, elongato-ovatâ, tumidâ, tenui, albâ, hyalinâ, fragili, aperturâ anticâ ovato-acuminatâ, dimidiam partem testæ vix æquante, oblique sectâ et rectilineâ; valvis subtrapezoidalibus, regulariter striato-sublamellosis, striis continuis, antice approximatis, in medio paulo distantioribus et prominentioribus; umbonibus tumidulis, approximatis; laterè antico brevissimo, in suturâ cristatâ, parum obliquo; ligamento angusto, elongato, nigro."—*Deshayes*.

*Hab.*—Philippines, Zebu, (Cuming.) West Indies? Mus. Brit., Gray.

The hiatus in this species scarcely reaches to the middle of the shell, whilst it is not less than two-thirds the total length in any other species.

6. *R. hyalina*, Sowerby, sp.

*Gastrochæna hyalina*, Sowerby, Zool. Proc. p. 22, 1834.

Th. Müller, Syn. Test. Viv. p. 236, 1836.

Hanley, Desc. Cat. p. 11, 1842.

Catlow, Conch. Nomenc. p. 2, 1845.

*Rocellaria hyalina*, H. and A. Adams, Genera, ii. p. 336, 1856.

*Description*.—"R. testâ ovali, albidâ, hyalinâ, lævi, dorso longitudinaliter striato; laterè antico brevi; hiatu duos trientes testæ æquante. Long. 0·55, lat. 0·25, alt. 0·3 poll."—*Sowerby*.

*Hab.*—Lord Hood's Isle.

Sowerby's descriptions of species in this genus are entirely too short and indefinite for satisfactory recognition. Having no specimens, we are not able to give any opinion regarding the validity of his species, and therefore we are compelled to insert them with the original Latin descriptions.

7. *R. intersecta*, Deshayes, sp.

*Gastrochæna intersecta*, Deshayes, Zool. Proc. London, p. 327, 1854.

*Rocellaria intersecta*, H. and A. Adams, Genera, ii. p. 336, 1856.

*Description*.—"R. testâ ovato-oblongâ, brevi, cuneiformi, tenui, fragili, candidâ, oblique hiantè, hiatu ovato, acuminato, dimidiam partem testæ æquante, valvis subspathulatis, anticè angustis, posticè dilatatis, striatis, striis anticis regularibus extremitate detectis, æquidistantibus, arcuatis et in medio evanescentibus et medianis interpositis, striis medianis inæqualibus, majoribus distantibus; laterè antico brevissimo, fere nullo; umbonibus minimis, subterminalibus."—*Deshayes*.

*Hab.*——? Coll. Cuming.

8. *R. lævigata*, Deshayes, sp.

*Gastrochæna lævigata*, Deshayes, Zool. Proc. Lond. p. 326, 1854.

*Rocellaria lævigata*, H. and A. Adams, Genera, ii. p. 336, 1856.

*Description*.—"R. testâ ovato-cuneiformi, tenui, pellucidâ, fragili, candidissimâ, ventricosâ, latè hiantè, hiatu cordiformi, dimidiam partem testæ paulo superante; valvis lævigatis; laterè antico striis aliquibus regularibus, ad mediam partem arcuatis et evanescentibus; umbonibus minimis, obliquis, approximatis, laterè antico brevissimo, recto."—*Deshayes*.

*Hab.*——? Coll. Cuming.

9. *R. macroschisma*, Deshayes, sp.

*Gastrochæna macroschisma*, Deshayes, Proc. Zool. Soc. p. 326, 1854.

*Rocellaria macroschisma*, H. and A. Adams, Genera, ii. p. 336, 1856.

*Description*.—"R. testâ ovatâ, brevi, ventricosâ, tenui, fragili, candidâ,

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anticè hiantissimâ, hiatu subcordiformi, lato, obliquo, et fere totam altitudinem testæ æquante; valvis trapezoidalibus, tenuissime striatis, striis in laterè antico tenuissimus, appressis, in medio distantioribus, erectis, sublamellosis; laterè postico obtuso, supernè in suturâ cristato; umbonibus tumidis, posticè depressiusculis, laterè antico brevi, recto; sinu pallii parum profundo, apicè acuto, triangulari, subæquilaterali."—*Deshayes*.

*Hab.*——? Coll. Cuming.

10. *R. ovata*, \* Sowerby, sp.

*Gastrochæna ovata*, Sowerby, Zool. Proc. p. 21, 1834.

Th. Müller, Syn. Test. Viv. p. 235, 1836.

Hanley, Desc. Cat. p. 10, t. 9, f. 42, 1842.

Catlow, Conch. Nomenc. p. 2, 1845.

Jay, Catalogue, 4th edit. p. 9, 1850.

Carpenter, Mazatl. Shells, Brit. Mus. Cat. p. 15, 1857.

*Rocellaria ovata*, H. and A. Adams, Genera, ii. p. 336, 1856.

*Description.*—"R. testâ ovatâ, albicanâ, longitudinaliter striatâ, striis exilibus, lamellosis, formam marginis semper sequentibus; longitudinè lateris antici quintam partem testæ æquante. Long. 1·2, lat. 0·7, alt. 0·7 poll."—*Sowerby*.

*Hab.*—In Sinu Panamensi (Isle of Perico) et ad Insulam Platæ. Found in spondyli at the Isle of Perico, and in coral rocks, at a depth of seventeen fathoms, at the Island of Plata. Also inhabits St. Thomas Harbor, W. I., (Coll. A. N. S.) and Charleston Bay, S. Carolina! (Coll. Smithsonian Inst.)

The great difference in the relative length of the anterior and posterior sides will readily distinguish this species from *R. brevis*. *R. dubia* has a slight truncation of the posterior margin of the valves, while this species is always rounded posteriorly. The absence of the laminar hinge-plate and the length of the hiatus also separate this shell from both *R. dubia* and *R. hians*.

I have made a very close comparison between specimens from Panama and those from the West Indies and Charleston, without detecting the slightest difference between them. The Charleston specimens were collected by Dr. Wm. Stimpson.

11. *R. pupina*, *Deshayes*, sp.

*Gastrochæna pupina*, *Deshayes*, Proc. Zool. Soc. Lond. p. 326, 1854.

*Rocellaria pupina*, H. and A. Adams, Genera, ii. p. 336, 1856.

*Description.*—"R. vaginâ crassâ, brevi, clavatâ, transversim articulatâ, lævigatâ, nullâ corporâ alienâ agglutinante, in cavitate valvulæ affixa. Testâ minimâ, tenui, albâ, hyalinâ, hiantissimâ, hiatu amplissimo quasi testæ per mediam partem resecto, oblique inæqualiter bipartitâ, coarctatâ, extremitate posticâ clausâ, obtusâ, attenuatâ; laterè antico satis longo, incumbente, cucullato; umbonibus prominulis, oblique terminalibus; valvis lævigatis, posticè suturâ brevi, carinatâ; margine aperturæ dorsali, parallelo."—*Desh.*

*Hab.*—Morton Bay. Coll. Cuming.

12. *R. rugulosa*, Sowerby, sp.

*Gastrochæna rugulosa*, Sowerby, Zool. Proc. Lond. p. 22, 1834.

Th. Müller, Syn. Test. Viv. p. 235, 1836.

Hanley, Desc. Cat. p. 11, 1842.

Catlow, Conch. Nomenc. p. 2, 1845.

*Rocellaria rugulosa*, H. & A. Adams, Genera, ii. p. 336, 1856.

*Description.*—"R. testâ oblongâ, albidâ, striatâ, rugulosâ, striis anticis marginem hiantem confertis, acutis; hiatu longissimo. Long. 0·8, lat. 0·3, alt. 0·4 poll."—*Sowerby*.

*Hab.*—"Ad Insulas Gallapagos et apud Insulam Lord Hood's dictam."—*Sowerby*.

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## b. Valves elongate-cuneiform.

Hiatus, equalling the whole length of the shell, a pertissima, impressa, lamellosa, Ruppellii, spathulata, Stimpsonii, tenera.

“ nearly the entire length of the shell, cucullata, difficilis, interrupta.

“ about two-thirds the length of the shell, indistincta, Philippinensis.

13. *R. a pertissima*, Deshayes, sp.

*Gastrochæna apertissima*, Deshayes, Zool. Proc. p. 326, 1854.

*Rocellaria apertissima*, H. and A. Adams, Genera, ii. p. 336, 1856.

*Description*.—“*R. testâ elongatâ, cuneiformi, inflatâ, tenui, fragili, per totam altitudinem testâ antice inferneque hiantissimâ, albâ, tenui, pellucidâ, anticè brevissimâ, marginè inferiorè ferè recto, posteriorè obtuso, convexo, superiore paulo obliquo; valvis tenuissimè striatis, striis in laterè antico transversalibus, in medio secundum lineam obliquam fractis, in areâ superiorè armatis, pluribus majoribus, subæquidistantibus; ligamento angusto, elongato, nigrescente.*”—*Deshayes*.

*Hab.*—Philippines. Coll. Cuming.

14. *R. cucullata*, Deshayes, sp.

*Gastrochæna cucullata*, Deshayes, Zool. Proc. p. 329, 1854.

*Rocellaria cucullata*, H. and A. Adams, Genera, ii. p. 336, 1856.

*Description*.—“*R. testâ elongato-cuneiformi, tenui, albâ, fragili, subcretaceâ, extremitate anticâ brevissimâ, posticâ compressâ, dilatatâ, spathuliformi, antice inferneque oblique hiante, apertura lateraliter coarctatâ, ferè totam longitudinem testæ æquante, latere antico angusto, incumbente, cucullato; valvis extus in tres areas divisus, primâ anticâ obsolete striatâ, medianâ latiore, irregulariter arcuatim striato-rugosâ, tertiâ circâ ligamentum angustiorè, lævigatâ; umbonibus tumidulis, terminalibus; ligamento satis prominulo, elongato, fusco.*”—*Deshayes*.

*Hab.*—West Indies. Coll. Cuming.

15. *R. difficilis*, Deshayes, sp.

*Gastrochæna difficilis*, Deshayes, Zool. Proc. Lond. p. 328, 1854.

*Rocellaria difficilis*, H. and A. Adams, Genera, ii. p. 336, 1856.

*Description*.—“*R. testâ elongato-transversâ, ovatâ, cuneiformi, compressiusculâ, obliquè longè hiantè, hiatu ovato-oblongo, infernè attenuato, ferè totam longitudinem testæ æquante; valvis trapezoidalibus, tenuè striatis; striis tenuissimis, erectis, angustissimis, in laterè antico conertioribus; umbonibus minimis; laterè antico brevissimo, recto; ligamento elongato, rufo, angusto.*”—*Deshayes*.

*Hab.*—Western India. Coll. Cuming.

16. *R. impressa*, Deshayes, sp.

*Gastrochæna impressa*, Deshayes, Zool. Proc. p. 327, 1854.

*Rocellaria impressa*, H. and A. Adams, Genera, ii. p. 336, 1856.

*Description*.—“*R. testâ elongato-cuneiformi, subovatâ, inflatâ, antice inferneque amplissimè apertâ; hiatu totam longitudinem testæ æquante, margine lateraliter oblique arcuato, anticè angusto; valvis tenuibus, subtrapezoidalibus, in medio sulco vix impresso bipartitis, partè anticâ tenuè transversim striatâ, striis in sulco subfractis, partè posticâ arcuatim et irregulariter sulcato-striatâ, in laterè postico striis oblique ascendentibus; umbonibus tumidulis, posticè obtusè subangulatis, ferè terminalibus; ligamento angustissimo, elongato, partim immerso.*”—*Deshayes*.

*Hab.*—? Coll. Cuming.

17. *R. indistincta*, Deshayes, sp.

*Gastrochæna indistincta*, Deshayes, Zool. Proc. p. 328, 1854.

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*Rocellaria indistincta*, H. and A. Adams, Genera, ii. p. 336, 1856.

*Description*.—"R. testâ ovato-elongatâ, angustâ, cuneiformi, tenui, albâ, oblique truncatâ, elongato-hiantè, hiatu elongato, acuminato, anguscusculo, usque ad tertiam partem posticam testæ attingente, transversim striatâ, striis anticè tenuibus, regularibus, sublamellosis, erectis, in medio paulo distantioribus, et minus regularibus in areâ posticâ tenuissimis; areâ posticâ elongato-angustâ, angulo obtuso-distinctâ; laterè antico brevissimo, ligamento angustissimo, partim infosso, breviusculo."—*Deshayes*.

*Hab.*—Singapore. Coll. Cuming.

18. *R. interrupta*, Deshayes, sp.

*Gastrochæna interrupta*, Deshayes, Zool. Proc. p. 329, 1854.

*Rocellaria interrupta*, H. and A. Adams, Genera, ii. p. 336, 1856.

*Description*.—"R. testâ elongato-angustâ, convexiusculâ, extremitatibus ferè æqualiter latâ, per longitudinem quasi excisâ, latè apertâ; hiatu longissimo, ovato, oblongo, inferne vix acuto, et fere totam longitudinem testæ æquante; valvis oculo nudo lævigatis, sublentè argutissime striatis, striis obsoletis, distantibus, incrementi distantibus, subcontabulatis, interruptis; marginè inferiorè recto, superiorè fere parallelo, umbonibus minimis, subterminalibus; laterè antico brevi, inclinato; ligamento angustissimo, brevi."—*Deshayes*.

*Hab.*—Philippines. Coll. Cuming.

19. *R. lamellosa*, Deshayes, sp.

*Gastrochæna lamellosa*, Deshayes, Zool. Proc. p. 328, 1854.

*Rocellaria lamellosa*, H. and A. Adams, Genera, ii. p. 336, 1856.

*Description*.—"R. testâ elongato-angustâ, tenui, fragili, candidâ, hyalina, compressiusculâ, longè hiantè, margine anticæ paululum excavato, in medio convexo, hiatu longissimo, inferne valdè attenuata, ferè totam altitudinem testæ æquante; valvis anticè valdè attenuatis, rostratis, posticè obtusis, rotundatis, anticè tenuissimè striatis, striis erectis, appressis, in medio distantioribus, breviter lamellosis, eleganter armatis, regularibus; umbonibus minimis, approximatis, subumbilicatis; laterè antico brevissimo, subrostrato; ligamento angustissimo, nigro."—*Deshayes*.

*Hab.*—Philippines, Zebu. Coll. Cuming.

20. *R. Philippinensis*, Deshayes, sp.

*Gastrochæna Philippinensis*, Deshayes, Zool. Proc. Lond. p. 328, 1854.

*Rocellaria Philippinensis*, H. and A. Adams, Genera, ii. p. 336, 1856.

*Description*.—"R. testâ elongato-angustâ, subovatâ, compressiusculâ, tenui, albâ, anticè inferneque oblique hiantè, hiatu ovato, infernè acuminato, dimidiam partem testæ paulo superantè; valvis tenuè striato-lamellosis; striis arcuatis, secundum peripheriam valvarum anticè tenuibus, approximatis, in medio latioribus, sublamellosis; marginè superiorè postico paulo carinato; umbonibus minimis; laterè antico brevi, recto, subrostrato."—*Deshayes*.

*Hab.*—Philippines, Zebu. Coll. Cuming.

21. *R. Ruppellii*, Deshayes, sp.

*Gastrochæna Ruppellii*, Deshayes, Zool. Proc. Lond. p. 328, 1854.

*Rocellaria Ruppellii*, H. and A. Adams, Genera, ii. p. 336, 1856.

*Description*.—"R. testâ elongato-ovatâ, solidulâ, turgidulâ, candidâ, anticè oblique hiantè; hiatu ovato, latè, inferè attenuato, ferè totam altitudinem testæ æquante; valvis densè striatis, striis obtusis, anticè satis regularibus, appressis, in medio et laterè postico distantioribus, irregularibus, obtusis; umbonibus tumidulis; laterè antico brevi, recto, anticè parum inflexo; ligamento prælongo, angusto."—*Deshayes*.

*Hab.*—Red Sea. (Ruppell.) Coll. Cuming.

1861.]

22. *R. spathulata*, Deshayes, sp.

*Gastrochæna spathulata*, Deshayes, Zool. Proc. p. 329, 1854.

*Rocellaria spathulata*, H. and A. Adams, Genera, ii. p. 336, 1856.

*Description*.—"R. testâ elongato-angustâ, cuneiformi, compressiusculâ, tenui, fragili, albâ, anticè longe hiante, hiatu fere totam longitudinem testæ æquante, inferne sensim attenuatâ; valvis anticè angustis, posticè latioribus, spathulatis, irregulariter striatis, striis lateris antici tenuioribus, magis regularibus, rectis, in medio rugulosis, arcuatis, inæqualibus, umbonibus minimis, acutis, ferè terminalibus; laterè antico brevissimo; ligamento elongato, angusto, fuscescente; sinu pallii angustissimo, acuto, profundissimo, usque umbones versus ascendente."—*Deshayes*.

*Hab.*—Philippines, Bohol. Coll. Cuming.

23. *R. Stimpsonii*, Tryon.

*Description*.—"R. testâ elongato-angustâ, albâ, extremitate anticâ brevissimâ, acuminatâ; valvis concentricè dense striatis; umbonibus prominulis, ferè terminalibus; hiatu anguste-elongatâ, ferè totam longitudinem testæ æquante; marginè anteriore et posteriore fere parallelis. Long. .62, lat. .24, poll.

*Hab.*—Beaufort Harbor, N. C. Wm. Stimpson, M. D. Coll. Smithsonian Institution.

The above description is drawn up from a single valve obtained by Dr. Stimpson in the harbor of Beaufort, N. C. It is so very different from the other species of *Rocellaria* found on our Southern Coast and in the West Indies, that I have not hesitated in regarding it as new. The great length of the valve in proportion to its breadth, and the nearly parallel margins, distinguish it from *R. ovata* and *R. hians*. In the latter, the beaks are more nearly terminal. *R. dubia* of Europe, besides the above differences, has a truncated posterior end, whilst this is regularly rounded; and all the above species are much more inflated, with a wider hiatus, than in *R. Stimpsonii*.

The hinge exhibits small but well marked laminae.

24. *R. tenera*, Deshayes, sp.

*Gastrochæna tenera*, Deshayes, Zool. Proc. p. 327, 1854.

*Rocellaria tenera*, H. and A. Adams, Genera, ii. p. 336, 1856.

*Description*.—"R. testâ elongato-angustâ, tenui, pellucidâ, compressiusculâ, anticè angustâ, posticè paulo latiorè, subdilatatâ, anticè apertissimâ, hiatu totam altitudinem æquante, lateraliter paulo sinuoso; valvis anticè inæqualiter tenuè striatis, in medio distanter arcuato-subplicatis; umbonibus tumidulis, subterminalibus; laterè antico brevi, subhorizontali, in suturâ cristato, et emarginato; sinu pallii magno, profundo, triangulari, apicè acutissimo, basi lato."—*Deshayes*.

*Hab.*—Philippines. Coll. Cuming.

## Subgenus SPENGLERIA.

25. *R. Mytiloides*,\* Lamarek, sp.

*Gastrochæna Mytiloides*, Lam. Anim. sans Vert. v. p. 447, 1818.

"(Desh. ed.) Anim. sans Vert. vi. p. 49, 1835.

Hanley, Desc. Cat. p. 10, t. 9, f. 37, 1842.

Catlow, Conch. Nomenc. p. 2, 1845.

*Rocellaria Mytiloides*, H. and A. Adams, Genera, ii. p. 336, 1856.

(No name.)

Rumphius, Amboinsche Rarit. t. 45, f. P, 1705.

*Description*.—"R. testâ ovatâ; valvis areâ longitudinali pyramidatâ distinctis; rugis transversis, fuscis."—*Lamarck*.  $1\frac{1}{2}$  inch long.

*Hab.*—Isle of France.

[Dec.

26. *R. plicatilis*, Deshayes, sp.

*Gastrochæna plicatilis*, Deshayes, Zool. Proc. Lond. p. 329, 1854.

*Rocellaria plicatilis*, H. and A. Adams, Genera, ii. p. 336, 1856.

*Description*.—"R. testâ elongato-ovatâ, tenui, fragili, pellucidâ, compressiusculâ, longè hiantè, posticè truncatâ, hiatu maximo, elongato, totam altitudinem testæ æquante, infernè sensim attenuatâ; valvis in tres areas divisis, unâ anticâ latâ, transversim regulariter striatâ, striis tenuissimis, oblique sublente striolatis, parte secunda oblique medianâ, angustâ, lævigatâ, posticâ pyramidatâ, prominentiore, sulcis depressiusculis circumdatâ, transversim profundè sulcatâ, quasi scalariformi, areâ circâ ligamentum planulatâ, elongato lanceolatâ, ligamento crasso, elongato."—*Deshayes*.

*Hab.*—Philippines, Zebu. Coll. Cuming.

27. *R. rostrata*,\* Spengler, sp.

*Gastrochæna rostrata*, Spengler, Nov. Act. Sc. Soc. ii. 1783.

*Gastrochæna callosa*, Philippi, Weigmann's Archiv, 1845.

*Gastrochæna Chemnitziana*, D'Orbigny, Sagra's Cuba, Moll. p. 229, t. 29, f. 29, 30.

Beau, Cat. Coq. Guadalupe, p. 27, 1858.

*Rocellaria rostrata*, Mörch, Catalogue, 1853.

H. and A. Adams, Genera, ii. p. 336, 1856.

*Pholas hians*, (partim,) Chemnitz, x. f. 1680—'81, 1788.

*Description*.—"R. testâ oblongo-cuneatâ, tenui, albidâ, concentricè striatâ, areâ anali longitudinali pyramidatâ, externè sulcatâ, plicis transversis rectis ornata; laterè anali elongatâ, transversim truncato; laterè buccali angustato, obtuso; hiatu magno. Long. 24 mill."—*D'Orbigny*.

*Hab.*—West Indies.

This species is distinguished from *R. truncata* by its large transverse lamellar ribs, their place being occupied in the latter species by coarse striae. The anterior margin of *R. rostrata* is also more convex and not emarginate and the portion of the shell anterior to the umbones is wide, and not acuminate as in *R. truncata*.

It resembles *R. mytiloides*, but may be distinguished, according to D'Orbigny, by the "*cotes anales plus droites, son sillon lateral bien plus prononce, et ses stries plus regulieres*." The specimens of the two species in the collection of the Academy, though authentic, do not exhibit sufficient distinctive characters to clear the mind from all doubt, though the probability is that they are properly separated.

28. *R. truncata*,\* Sowerby, sp.

*Gastrochæna truncata*, Sowerby, Zool. Proc. Lond. p. 21, 1834.

Th. Müller, Syn. Test. Viv. p. 235, 1836.

Hanley, Desc. Cat. p. 10, t. 9, f. 40, 1842.

Catlow, Conch. Nomenc. p. 2, 1845.

Jay, Catalogue, 4th edit. 1850.

Carpenter, Mazatlan Shells, Brit. Mus. Cat. p. 14, 1857.

*Rocellaria truncata*, H. and A. Adams, Genera, ii. p. 336, 1856.

*Description*.—"R. testâ oblongâ, posticè rotundato-truncatâ, striatâ, sordidè albicantè; epidermidè tenui lamellosâ, posticè tectâ; laterè antico brevissimo, subacuminato. Long. 1.4, lat. 0.7, alt. 0.7, poll."—*Sowerby*.

*Hab.*—In Sinu Panamensi, (Isle of Perico.) Found in Spondyli.

This is a very distinct species, and is well authenticated both by the numerous specimens existing in cabinets, and by Mr. Carpenter's excellent description. The original diagnosis by Sowerby is rather meagre, though much better than several others by this author. The hinge is armed with a distinct spatulate lamina.

1861.]

## CUCURBITULA.

*C. cymbia*,\* Spengler, sp.

*Gastrochæna cybium*, Spengler, Nov. Act. Sc. Soc. ii. 1733.

*Fistulana lagenula*, Lamarck, Anim. Sans Vert. v. p. 436, 1818.

“ (Desh. ed.) Anim. sans Vert. vi. p. 31,  
1835.

Bosc, Hist. des Coq. ii. p. 205, 1824.

Hanley, Desc. Cat. p. 3, t. 13, f. 59, 1842.

Catlow, Conch. Nomenc. p. 2, 1845.

*Cucurbitula lagenula*, Gould, Boston Proc. viii. p. 22, 1861.

*Description*.—“*C. nanâ*, laterè affixâ; vaginâ lagenœformi, segmentis transversis articulatâ.”—*Lamarck*.

“*T. elongatâ*, arcuatâ, tenuis, lacteâ, posticè quadrangularis, anticè declivis, et in rostrum protractâ; umbonibus ventricosis ad quadrantem anticalem positis; marginè dorsali posticâ rectâ; marginè ventrali incurvatâ; angulis posticis rotundatis; fascie dorsali latè ovato-cuneatâ, posticè cito angustatâ; fascie ventrali ovatâ, omnino hiante. Long. 12; lat. 6; alt. 3 millim.”—*Gould*.

*Hab.*—“Inhabits Hong Kong Harbor, 10 fathoms, Shelly Sand.” W. Stimpson. “Red Sea;” label of specimen, from G. B. Sowerby, in Coll. A. N. S.

The tube of this species is a well known object in Conchological Collections; it is strange that the valves were never described until this year. It is widely distributed as a fossil species, and, had we included its synonymy, as such, the list would extend to a page or more. Although the descriptions by the older writers are sufficiently comprehensive for a perfect recognition of the species by its tube alone, still it is very questionable, whether, considering that Dr. Gould was the first to describe the entire Mollusk, the credit should not be given to him for the species.

## BRYOPA.

1. *B. aperta*,\* Sowerby, sp.

*Clavagella aperta*, Sowerby, Genera, No. 13, f. 1, 2, 3, 4, 1820–24.

Crouch, Introd. Lamarck, t. 2, f. 7, *a*, *b*, 1827.

Deshayes, Encyc. Meth. Vers. ii. p. 240, 1830.

“ Lamarck, Anim. sans Vert. 2 edit. vi. p. 25,  
1835.

Deshayes, Expl. Sci. de l’Algerie, Moll. p. 15, t. 1, f. 1.

Cuvier, Regne, Anim. (Audouin’s Ed.) Moll. t. 117, f. 2.

Reeve, Conch. Syst. i. p. 35, t. 18, 1841.

Hanley, Desc. Cat. p. 2, t. 9, f. 21, 1842.

Cailliaud, Guerin’s Mag. Zool. 1842, t. 49, f. 1–7, t. 50,

f. 1 and 2, t. 51, f. 1–4.

Cailliaud, Chenu’s Ill. Conch. *Clavagella*, p. 4, t. 1,  
f. 3–6.

Catlow, Conch. Nomenc. p. 2, 1845.

H. and A. Adams, Genera, iii. t. xci. f. 3, *a*, *b*, *c*,  
1856.

Gray, Figs, Moll. Anim. v. t. 340 f. 6, 7, 8, 1857.

*Clavagella vivens?* Rang, Man. Moll. p. 342, 1829.

*Clavagella sicula*, Dellachiaje Anim. Sans Vert. t. 83, f. 19 and 23,  
t. 84, f. 18, 22, 23.

*Bryopa aperta*, Gray, Zool. Proc. p. 314, 1858.

H. and A. Adams, Genera, ii. p. 649, 1858.

*Description*.—“*B. excavatio ovatâ*, rotundâ, superascensâ; tubo cum limbis; valvis subtriangularibus, ovatis, maximè oscilatis, concavis, rugosis, margaritaceis intus; umbone subrotundato.”—*Cailliaud*.

*Hab.*—Mediterranean Sea.

[Dec.



A very complete account of this species is given in Cailliaud's Monograph, contained in Guerin's Magazine. M. Calliaud considers the following species (*B. lata*) a synonym: not being entirely satisfied that such is the case, I have not united them under one description. A full anatomical description, splendidly illustrated, is contained in Deshayes' Mollusca of the Exploration of Algeria.

2. *B. lata*, Broderip, sp.

*Clavagella lata*, Broderip, Zool. Proc. p. 111, 1834.

- “ “ Trans. 1, p. 265, t. 30, f. 8-10, 1835.  
 Owen, (Anatomy,) Trans. 1, p. 267, t. 3, f. 11-16, 1835.  
 Müller, Syn. Test. Viv. p. 240, 1836.  
 Hanley, Desc. Cat. p. 2, t. 11, f. 4, 1842.  
 Deshayes, Traite, Elem. p. 25, t. 1, f. 12-14, 1843-50.  
 Cailliaud, Chenu, Illus. Conch. p. 5, t. 3, f. 7.  
 Catlow, Conch. Nomenc. p. 2, 1845.  
 H. and A. Adams, Genera, ii. p. 338, 1856.  
 “ “ “ “ ii. p. 649, 1858.  
 Gray, Zool. Proc. p. 315, 1858.

*Bryopa lata*,

*Description*.—“*B. camerâ rotundato-ovatâ, valvâ liberâ, latiusculâ, subtrigonâ, subconvexâ, externâ concentricè rugosâ, intus nitente; umbone subrotundato.*”—*Broderip*.

*Hab.*—Indian Ocean, Pacific.

3. *B. Melitensis*, Broderip, sp.

*Clavagella Melitensis*, Broderip, Zool. Proc. p. 116, 1834.

- “ “ Trans. i. p. 265, t. 35, f. 5-8, 1835.  
 Müller, Syn. Test. Viv. p. 240, 1836.  
 Cuvier, Regne Anim. (Andouin's edit.) t. 117,  
 f. 1, *a, b, c, d.*  
 Hanley, Desc. Cat. p. 2, t. 11, f. 3, 1842.  
 Cailliaud, Guerin's Mag. Zool. t. 50, f. 4, 1842.  
 “ Ill. Conch. Chenu, *Clavagella*, p. 4,  
 t. 1, f. 5, and t. 3, f. 1-6.  
 Forbes, Rep. Ægean Invert. p. 142, 1843.  
 Deshayes, Expl. Sci. de l'Algerie, Moll. p. 14,  
 t. 1, f. 2.  
 Catlow, Conch. Nomenc. p. 2, 1845.  
 H. and A. Adams, Genera, ii. p. 338, 1856.  
 Gray, Figs. Moll. Anim. v. t. 340, f. 9, and t. 341,  
 f. 1, 1857.

*Clavagella angulata*, Philippi, Enum. Moll. Sicil. ii. p. 2, t. 13, f. 3, 1844.

*Bryopa Melitensis*, H. and A. Adams, Genera, ii. p. 649, 1858.

*Description*.—“*Testâ subrotundatâ, convexâ, rugosâ, intus subnitens; tubo longitudinaliter corrugate.*”—*Broderip*.

*Hab.*—Greece, Venice, Malta, Sicily.

Dr. J. E. Gray, in Proc. Zool. Soc. 1858, writes this as a synonym to *B. aperta*. I have followed Deshayes and Cailliaud in considering it distinct. Deshayes has detected differences in the animals of the two species, and the shells may be readily separated by the differences in shape of the valves, which appear to be permanent.

Subgenus DACOSTA.

4. *B. Australis*,\* Sowerby, sp.

*Clavagella Australis*, Sowerby, Stuchbury Cat. App. t. 1, f. 1.

Hanley, Desc. Cat. p. 2, t. 9, f. 22, 1842.

H. and A. Adams, Genera, ii. p. 338, iii. t. xci. f. 3,  
*a, b, c*, 1856.

Bryopa (S. G. Dacosta,) Australis, H. and A. Adams, Genera, ii. p. 649, 1858.

Dacosta Australis, Gray, Zool. Proc. p. 315, 1858.

Clavagella elongata, Broderip, Zool. Proc. p. 116, 1834.

“ “ Trans. i. p. 265, t. 35, f. 1-4, 1835.

Müller, Syn. Test. Viv. p. 240, 1836.

Hanley, Desc. Cat. p. 2, t. 11, f. 1, 2, 1842.

Cailliaud, Guerin's Mag. Zool. p. 17, t. 50, f. 3, 1842.

“ Chenu, Illust. Conch. Clavagella, p. 4, t. 1, f. 4.

Catlow, Conch. Nomenc. p. 2, 1845.

H. and A. Adams, Genera, ii. p. 338, 1856.

“ “ “ “ p. 649, 1858.

Bryopa elongata

*Description*.—“ B. camerâ elongato-ovatâ; valva liberâ elongatâ, subtrigonâ, convexâ, externè concentricè valdè rugosâ, intus nitente; umbone acuto.”—*Broderip*.

*Hab.*—Pacific.

I agree with Dr. Gray in uniting *B. elongata* with *B. Australis*, a comparison of the descriptions and figures of the two species demonstrates their entire identity.

5. *B. balanorum*, Scacchi, sp.

Clavagella balanorum, Scacchi, Mss. Philippi, Weigman's Archiv für naturg. i. p. 181, t. 3, f. 1-6, 1340.

Cailliaud, Guerin's Mag. Zool. p. 16, t. 52, f. 1-5, 1842.

Cailliaud, Chenu's Ill. Conch. Clavagella, p. 4, t. 1, f. 7.

Hanley, Desc. Cat. p. 2, t. 10, f. 21, 1842.

Philippi, Enum. Moll. Sicil. ii. p. 1, t. 13, f. 2, 1844.

Catlow, Conch. Nomenc. p. 2, 1845.

Gray's Figs, Moll. Anim. v. t. 340, f. 1-5, 1857.

H. and A. Adams, Genera, ii. p. 338, 1856.

“ “ “ “ p. 649, 1858.

*Bryopa balanorum*,

*Description*.—“ B. testâ bivalvis in conceptaculo ovali, rotundatâ; conceptaculum ipsum in fistulam subtetragonam productum; valvæ subtrigonæ, rugosæ.”—*Cailliaud*.

*Hab.*—Naples.

I have strong doubts respecting the distinctness of this species from *B. aperta*. The shell is uniformly smaller, and the tube short, just extending beyond the surface of the masses of *Balani* in which it is imbedded. Perhaps the young shell of *B. aperta*?

#### BRECHITES.

1. *B. annulus*,\* Deshayes, sp.

Aspergillum annulosum, Deshayes, Mss. in Mus. Cuming.

Reeve, Monog. Asp. t. 1, f. 1, a, b, 1860.

Brechites annulus, Gray, Zool. Proc. p. 312, 1858.

*Description*.—“ B. testâ valvis sublatè ovatis, tumidiusculis: vaginâ elongato-attenuatâ, undique undato-annulosâ; fimbriâ peramplâ, regulari, tubulis longis, minimis, confertis; disco valdè convexo, perforationibus parvis, numerosis, parum tubulosis.”—*Reeve*.

*Hab.*—Singapore.

This species may be distinguished from *B. javanus* and *B. pulchrus* by the annular markings on its tube. The frill is much more regular than in either of the other species.

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2. *B. Javanus*, Lamarck, sp.

*Aspergillum Javanum*, Lamarck, Anim. Sans Vert. v. p. 439, 1818.

“ (Desh. edit.) Anim. sans Vert. vi. p. 20,  
1835.

Blainville, Malacol. p. 576, t. 81, f. 2, 1825.

Crouch, Introd. Lam. t. 2, f. 5, 6, 1827.

Cuvier, Regne Anim. (Audouin's ed.) t. 119, f. 2.

Wyatt, Conch. t. 33, f. 3, 1838.

Anton, Verzeich der Conch. p. 1, 1839.

Reichenbach, Conchylien, p. 122, 1842.

Hanley, Desc. Cat. p. 1, 1842.

Reeve, Conch. Syst. t. 17, f. 3-5, 1843.

“ Monog. Asp. t. 1, f. 3, 1860.

Deshayes, Traite, Elem. i. pt. 2, p. 15, f. 1, 2, 3.

Potiez et Mich. Gallerie des Moll. ii. p. 273, 1844.

Catlow, Conch. Nomenc. p. 1, 1845.

Chenu, Ill. Conch. Asp. p. 2, t. 2, f. 1, 2.

*Aspergillum Listeri*, Gray, Ann. Philos. 1825.

“ Zool. Proc. p. 311, 1858.

*Clepsydra Javanica*, Schumacher, Essai d'un, Nov. Syst. p. 261, 1817.

*Penicillus Javanus*, Bosc, Hist. Nat. des Moll. v. p. 154, t. 41, f. 1, 1824.

*Brechites Javanus*, H. and A. Adams, Genera, ii. p. 339, t. xci. f. 4a, 1856.

*Brechites*, Mörch, Catalogue, 1853.

*Phalus testaceus*, Lister, t. 548, f. 3, 1685.

*Phalus marinus*, Rumphius, Amboinsche, t. 41, f. 7, 1705.

Gualtieri, Test. t. 10, f. m. 1742.

*Tubulus marinus*, (partim) Klein, Tab. Mar. Gen. p. 20, 1753.

Martini, Conch. i. p. 42, t. 1, f. 7, 1769.

*Serpula Penis*, (partim) Linnæus, Gmelin.

Brooke, Conch. t. 9, f. 130, 1815.

Knorr, Vergnüg, iv. t. 28, f. 1, vi. t. 40, f. 1, 1773.

Schreibers, ii. p. 372, 1793.

Schroeter, Einleit. Conch. ii. p. 554, 1784.

*Serpula aquaria* (partim,) Dillwyn, Cat. p. 1083, 1817.

Mawe, Conch. t. 34, f. 3, 1823.

Wood, Index, Test. edit. 2, t. 38, f. 34, 1828.

Woodarch, Introd. t. 4, f. 61, 1831.

*Serpula perforata*, Shaw, Nat. Misc. vi. t. 188.

*Aquaria radiata*, Perry, Conch. 1811.

*Description*.—“*B. testâ valvis sublatè ovatis, tumidiusculis; vaginâ elongato-attenuatâ, subannulosâ; fimbriâ amplâ, irregulari, subflexuosâ, tubulis parvis, longis, confertis, hic illic ramoso-agglomeratis; disco valdè convexo, perforationibus numerosis, parvis, parum tubulosis.*”—*Reeve*.

*Hab.*—Java.

*Aspergillum sparsum* of Sowerby is sometimes quoted as a synonym of *B. Javanus*—it is, however, more closely allied to *Brechites aquaria* of Burrow, in the synonymy of which we have placed it.

Dr. Gray has named this species *B. (Aspergillum) Listeri*, alleging that the *Aspergillum Javanum* of Lamarck included several species; but since the majority of conchologists have designated this shell as Lamarck's species; it does not seem necessary to adopt Dr. Gray's name at this late period.

3. *B. pulchrus*, Deshayes, sp.

*Aspergillum pulchrum*, Deshayes, Mss. in Mus. Cuming.

Reeve, Monog. Asp. t. 3, f. 13, 1860.

Gray, Zool. Proc. p. 312, 1858.

*Aspergillum Javanum*, var. *Chenu*.

*Description*.—"B. testâ valvis ovatis, anticè subattenuatis; vaginâ angustâ, obscurè annulosâ; fimbriâ perampla, profusè ramosâ, tubulis prælongis minutis, crispatis, numerosissimis, irregulariter dichotomis, disco minutè perforato, perforationibus spinoso-tubulosis."—*Reeve*.

*Hab*.—Singapore.

*B. pulchrus* is remarkable for the profusion of twisted tubuli constituting its fringe. It is a smaller shell than *B. Javanus*, and is apparently a good species.

Subgenus WARNEA.

4. *B. Australis*, *Chenu*, sp.

*Aspergillum Australe*, *Chenu*, *Illust. Conch.* p. 3, t. 3, f. 1, 1a.

*Catlow*, *Nomenc.* p. 1, 1845.

*Brechites Australis*, *H. and A. Adams*, *Genera*, ii. p. 339, 1856.

*Warnea Australis*, *Gray*, *Zool. Proc.* p. 310, 1858.

*Aspergillum Cumingianum*, *Chenu*, *Illust. Conch.* p. 3, t. 3, f. 4, 4a.

*Catlow*, *Conch. Nomenc.* p. 1, 1845.

*Reeve*, *Monog. Asp. Conch. Icon.* t. 2, f. 7, a, b, 1860.

*Brechites Cumingianus*, *H. and A. Adams*, *Genera*, ii. p. 339, 1856.

*Aspergillum incertum*, *Chenu*, *Illust. Conch.* p. 4, t. 4, f. 5.

*Catlow*, *Conch. Nomenc.* p. 1, 1845.

*Reeve*, *Monog. Asp.* t. 4, f. 19, 1860.

*Brechites incertus*, *H. and A. Adams*, *Genera*, ii. p. 339, 1856.

*Description*.—"B. vaginâ longâ, rectâ, subclavatâ, arenas et zoophyta agglutinante; disco plano, irregulariter fimbriato, tubulis extus minimis et subprominulis perforate; fissurâ profundè incisâ, limbis foleaceis infernè decoratâ; valvis æqualibus, inclusis."—*Chenu*.

*Hab*.—Australia.

The three species quoted above may not be the same, but more specimens will require to be examined to prove their distinctness.

5. *B. vaginiferus*,\* *Lamarck*, sp.

*Aspergillum vaginiferum*, *Lamarck*, *Anim. sans Vert.* v. p. 430, 1818.

" (*Desh. ed.*) *Anim. sans Vert.* vi. p. 21, 1835.

*Sowerby*, *Genera*, f. 1, 2.

*Hanley*, *Desc. Cat.* p. 1, t. 9, f. 23, 1842.

*Ruppell*, *Atlas. Reise, Nord. Afric.* t. 12, f. 2.

*Savigny*, *Expl. Egypt, Moll.* t. 14, f. 9.

*Guerin*, *Iconog. du Reg. Anim.* t. 33, f. 7.

*Reeve*, *Conch. Syst.* t. 17, f. 1, 2, 1843.

*Chenu*, *Conch. Illust. Asp.* p. 2, t. 1, f. 1, a, b, c,

t. 4, f. 9, a, b, c, and t. 5, f. 1-9.

*Gray*, *Figs. Moll. Anim.* t. 341, f. 2, 1857.

*Reeve*, *Monog. Asp. Conch. Icon.* t. 1, f. 2, 1860.

*Brechites vaginiferus*, *H. and A. Adams*, *Genera*, ii. p. 339, iii. t. xci. f. 4, 1856.

" (*S. G. Warnea*,) *vaginiferus*, *H. and A. Adams*, *Genera*, ii. p. 649, 1858.

*Warnea vaginifera*, *Gray*, *Zool. Proc.* p. 339, 1858.

*Aspergillum Delessertianum*, *Chenu*, *Conch. Illust. Asp.* p. 3, t. 1, f. 2.

*Catlow*, *Nomenc.* p. 1, 1845.

*Reeve*, *Monog. Asp.* t. 2, f. 6, 1860.

*Brechites Delessertianus*, *H. and A. Adams*, ii. p. 339, 1856.

*Description*.—"B. testâ valvis oblongo-ovatis, concentricè tenuissimè lirato-

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striatis, posticè angulatis; vaginâ longissimè subrectâ, arenulas agglutinante, limbo ad superam extremitatem conspicuè trifariam ad quinquefariam foliato; fimbriâ brevi, tubulis subamplis, liberis, sæpè irregularibus; disco convexo, amplo, perforationibus amplis, tumidiusculis."—*Reeve*.

*Hab.*—Red Sea.

There is but little doubt of the identity of *B. Delessertianus* with this species. Gray and Reeve both consider it the same. The differences in *B. Delessertianus* are not sufficient for a separation, unless the examination of a large number of specimens shall prove them to be constant.

## PENICILLUS.

1. *P. aquaria*, \* Burrow, sp.

*Serpula aquaria*, Burrow, Elem. p. 166, t. 22, f. 3.

*Brechites aquarius*, H. and A. Adams, Genera, ii. p. 339, 1856.

*Penicillus aquarius*, H. and A. Adams, Genera, ii. p. 649, 1858.

Gray, Zool. Proc. p. 312, 1858.

*Aspergillum sparsum*, Sowberby, Genera, No. 27, f. 3-5.

*Penicillus sparsus*, H. and A. Adams, Genera, ii. p. 649, 1858.

*Aspergillum semifimbriatum*, Chenu, Ill. Conch. Asp. p. 4, t. 3, f. 5.

Catlow, Conch. Nomenc. p. 1, 1845.

Reeve, Monog. Asp. t. 2, f. 5, 1860.

*Serpula penis?* (pars) Linnæus, Gmelin, etc.

*Description.*—"P. testâ valvis sublatè ovatis, posticè subangulatis, vaginâ tumidiusculâ, sæpè distortâ, infernè contractâ; fimbriâ subrectâ, tubulis sub-elongatis, dichotomis; disco parviusculo, perforationibus simplicibus."—*Reeve. Desc. of Semifimbriatum.*

*Hab.*—Red Sea.

Burrow's description of *P. aquaria* is entirely unsatisfactory, and he is only given credit for this species, on account of his figure, which represents it well enough.

Mr. Reeve considers *P. semifimbriata* doubtfully distinct. Dr. Gray regards it, however, as a merely distorted form of this species. The latter is undoubtedly correct, as a comparison of the figures of the two species abundantly establishes. Dr. Chenu's description is drawn up from a single specimen in the cabinet of Hugh Cuming.

2. *P. dichotoma*, \* Chenu, sp.

*Aspergillum dichotomum*, Chenu, Ill. Conch. Asp. p. 3, t. 2, f. 6.

Catlow, Conch. Nomenc. p. 1, 1845.

Reeve, Monog. Aspergillum, t. 3, f. 9, 1860.

*Brechites dichotomus*, H. and A. Adams, ii. p. 339, 1856.

*Aspergillum disjunctum*, Deshayes, Mss. in Mus. Cuming.

Reeve, Monog. Asp. t. 3, f. 12, 1860.

*Description.*—"P. testâ valvis oblongo-ovatis, subtrapezoideis; vaginâ breviusculâ, supernè gradatim attenuatâ, sæpè distortâ, infernè subcontractâ; fimbriâ subamplâ, valdè irregulari, tubulis tenuibus elongatis promiscuè distortis et agglomeratis, sæpè dichotomis; disco parviusculo, convexo, minutè perforato."—*Reeve*.

*Hab.*—Singapore.

Dr. Gray considers this species to be a variety of *P. aquaria*, from which it constantly differs, however, in having a much more irregular frill, with the tubuli more numerous.

I have ventured, after a comparison of figures and descriptions in Reeve's Monograph, to include *P. disjuncta*, in the synonymy of this species.

3. *P. radix*, \* Deshayes, sp.

*Aspergillum radix*, Deshayes, Mss. in Mus. Cuming.

Reeve, Monog. Aspergillum, t. 3, f. 11, 1860.

1861.]

*Penicillus radix*; Gray, Zool. Proc. p. 312, 1858.

*Description*.—"P. testâ valvis ovatis, utrinque subangulatis; vaginâ supernè compressâ et longitudinaliter sulcatâ; infernè globoso-tumidâ, de inde angustè contractâ; fimbriâ amplâ, tubulis elongatis, confertis, parum irregularibus; disco parvo, profusè minutè perforato."—*Reeve*.

*Hab.*—Amboina.

Mr. Reeve does not consider this species as positively distinct, but states that Mr. Cuming possesses three specimens, all alike. Judging from the figure and description, I do not doubt its specific weight.

Subgenus CLEPSYDRA.

4. *P. strangulata*, Chenu, sp.

*Aspergillum strangulatum*, Chenu, *Illust. Conch.* p. 3, t. 2, f. 4.

Catlow, *Conch. Nomencl.* p. 1, 1845.

*Brechites strangulatus*, H. and A. Adams, *Genera*, ii. p. 339, 1856.

*Penicillus* (S. G. *Clepsydra*) *strangulatus*, H. and A. Adams, ii. p. 649, 1858.

*Clepsydra strangulata*, Gray, Zool. Proc. p. 313, 1858.

*Description*.—"P. vaginâ longâ, clavatâ, variè pictâ, supernè strangulatâ; disco plano, tubulis minimis tecto; fimbriâ regulariter triplicatâ; fissurâ rectâ; valvis inæqualibus, incluso-depressis."—*Chenu*.

*Hab.*—N. E. Coast of Australia.

FÆGIA.

1. *F. agglutinans*, Lamarck, sp.

*Aspergillum agglutinans*, Lamarck, *Anim. Sans Vert.* v. p. 430, 1818.

" (Desh. edit.) *Anim. Sans Vert.* vi.

p. 21, 1835.

Deshayes, *Encyc. Meth. Vers.* ii. p. 73, 1830.

Cuvier, *Règne Anim.* (Audouin's ed.) t. 119, f. 1.

Hanley, *Desc. Cat.* p. 2, t. 10, f. 19, 1842.

Catlow, *Conch. Nomencl.* p. 1, 1845.

Chenu, *Illust. Conch. Asp.* p. 2, t. 3, f. 2.

Reeve, *Monog. Asp.* t. 4, f. 18, 1860.

*Brechites agglutinans*, H. and A. Adams, *Genera*, ii. p. 339, 1856.

*Fœgia agglutinans*, " " " ii. p. 650, 1858.

Gray, *Proc. Zool. Soc.* p. 313, 1858.

*Aspergillum Nova Zelandiæ*, Lamarck, *Anim. sans Vert.* v. p. 430, 1818.

" (Desh. ed.) *Anim. sans Vert.* vi.

p. 21, 1835.

Hanley, *Desc. Cat.* p. 2, t. 9, f. 54, 1842.

Chenu, *Ill. Conch. Asp.* p. 2, t. 2, f. 6, 7, 8, 9.

Catlow, *Conch. Nomencl.* p. 1, 1845.

Reeve, *Monog. Asp.* t. 4, f. 17, 1860.

*Penicillus Nova Zelandiæ*, Bosc. *Hist. Nat. des Moll.* i. p. 154, 1824.

*Brechites* (S. G. *Fœgia*,) *Nova Zelandæ*, H. and A. Adams, *Genera*, ii. p. 339, 1856.

*Aspergillum Nova Hollandiæ*, Chenu, *Ill. Conch. Asp.* p. 4, t. 4, f. 8.

Catlow, *Conch. Nomencl.* p. 1, 1845.

*Brechites* (S. G. *Fœgia*,) *Nova Hollandiæ*, H. and A. Adams, ii. p. 339, 1856.

*Description*.—"F. testâ valvis (obtectis); vaginâ clavatâ, arenulas, calculos, et conchas densè agglutinante; fimbriâ vix nullâ, tubulis brevissimis, subamplis, irregularibus; disco convexo, sparsim perforato, perforationibus subamplis, subpapillaribus."—*Reeve*.

*Hab.*—New Holland.

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2. *F. Zebuense*, Chenu, sp.

*Aspergillum Zebuense*, Chenu, Ill. Conch. Asp. p. 3, t. 3, f. 3.  
 Catlow, Conch. Nomenc. p. 1, 1845.  
 Reeve, Monog. Asp. t. 3, f. 8, 1860.

*Brechites Zebuensis*, H. and A. Adams, ii. p. 339, 1856.

*Aspergillum Philippinense*, Chenu, Ill. Conch. Asp. p. 3, t. 4, f. 7.  
 Catlow, Conch. Nomenc. p. 1, 1845.  
 Reeve, Monog. Asp. t. 3, f. 10, 1860.

*Brechites Philippinensis*, H. and A. Adams, Genera, ii. p. 339, 1856.

*Description*.—"E. testâ valvis oblongo-ovatis, posticè subexpansis; vaginâ arenulas agglutinante, supernè subattenuatâ, utrinque longitudinaliter sulcatâ, infernè abruptè contractâ; fimbriâ sub-irregulari, tubulis distinctis liberis; disco parvo, perforationibus perpauca, tubulosis."—*Reeve*.

*Hab.*—Zebu, Philippines. Mus. Cuming.

This, and the preceding, may prove to be one species; it is distinguished from *F. agglutinans*, principally by the much larger number of tubes on its disk, and by the larger size of its tube.

## Subgenus ARYTENE.

3. *F. Recluziana*, Chenu, sp.

*Aspergillum Recluzianum*, Chenu, Ill. Conch. Asp. p. 4, t. 4, f. 1, 1a.  
 Catlow, Conch. Nomenc. p. 1, 1845.

*Brechites Recluzianus*, H. and A. Adams, Genera, ii. p. 339, 1856.

*Aspergillum incrassatum*, Chenu, Ill. Conch. Asp. p. 4, t. 4, f. 2.  
 Catlow, Conch. Nomenc. p. 1, 1845.  
 Reeve, Monog. Asp. t. 4, f. 15, 1860.

*Brechites incrassatus*, H. and A. Adams, Genera, ii. p. 339, 1856.

*Description*.—"F. testâ valvis oblongo-ovatis, vaginæ prolotione bifurcatâ partim indutis; vaginâ mediocri, subcontortâ, calculos parvos sparsim agglutinante; fimbriâ plus minus irregulariter distorta, tubulis hic illic dichotomis; disco parvo, perforationibus paucis, valdè irregularibus."—*Reeve*.

*Hab.*—?

Dr. Gray considers *F. Recluziana* a variety of the following species, *F. tuberculata*; the tubuli in the latter are, however, very regular, and but little spread out, showing a marked contrast to the rather irregular fringe of this species.

Mr. Reeve quotes *F. Recluziana* as a synonym of *F. incrassata*, in which he is incorrect, for the former having a prior place and figure in Chenu's Monograph, must, of course, be retained as the name of the species.

4. *F. tuberculata*, Chenu, sp.

*Aspergillum tuberculatum*, Chenu, Ill. Conch. Asp. p. 3, t. 2, f. 3.  
 Catlow, Conch. Nomenc. p. 1, 1845.  
 Reeve, Monog. Asp. t. 3, f. 16, 1860.

*Brechites tuberculatus*, H. and A. Adams, Genera, ii. p. 339, 1856.

*Fœgia* (S. G. Arytene,) *tuberculatum*, H. and A. Adams, Genera, ii. p. 650, 1858.

*Arytene tuberculata*, Gray, Zool. Proc. p. 313, 1853.

*Aspergillum ornatum*, Chenu, Ill. Conch. Asp. t. 4, f. 3.  
 Catlow, Conch. Nomenc. p. 1, 1845.

*Brechites ornatum*, H. and A. Adams, Genera, ii. p. 339, 1856.

*Aspergillum clavatum*, Chenu, Ill. Conch. Asp. p. 4, t. 4, f. 4.  
 Catlow, Conch. Nomenc. p. 1, 1845.  
 Reeve, Monog. Asp. t. 4, f. 14, 1860.

*Brechites clavatum*, H. and A. Adams, Genera, ii. p. 339, 1856.

*Description*.—"F. testâ valvis ovatis, vaginæ prolotione bifurcatâ partim indutis; vaginâ attenuatâ, subcurvatâ arenulas calculosque parvos aggluti-  
 1861.]

nante; fimbriâ regulariter declivi, contractâ, tubulis subelongatis, confertis, hic illic dichotomis; disco parvo, perforationibus paucis, valdè irregularibus."—*Reeve*.

*Hab.*—Moluccas.

HUMPHREYIA.

1. *H. Strangei*, A. Adams, sp.

*Aspergillum Strangei*, A. Adams, *Zool. Proc.* p. 91, 1852.

*Reeve*, *Monog. Asp.* t. 2, f. 4, 1860.

*Brechites Strangei*, H. and A. Adams, *Genera*, ii. p. 339, 1856.

*Humphreyia Strangei*, H. and A. Adams, *Genera*, ii. p. 650, 1858.

*Gray*, *Zool. Proc.* p. 317, 1858.

*Description.*—"H. testâ adhærente, fusciscente-carneo tinctâ, valvis subquadrato-ovatis, posticè latioribus, subangulari-expansis; vaginâ brevi, distortâ, quadrato-rotundatâ, ad angulas quatuor obtusè carinatâ; fimbriâ discoque lateraliter compressissimè distortis, perforationibus perpaucis, irregulariter sparsis, parum tubulosis."—*Reeve*.

*Hab.*—Sydney Bay, Australia.

On the Genera *Panolopus*, *Centropyx*, *Aristelliger* and *Sphærodactylus*.

BY E. D. COPE.

PANOLOPUS Cope.

Form elongate; body fusiform, tetragonal. Anterior extremities without digits; posterior with a rudimentary one on the inner border. Scales minutely parallel-keeled. Inferior palpebra squamous. Inter-parietal and fronto-parietal distinct; fronto- and internasal confluent, forming a nine-sided shield. Supraanasals, nasals, first upper labial and rostral plates confluent. Nostril longitudinal, in contact with an incomplete labial suture. Dentition pleurodont; teeth obtuse. Auricular opening present.

This genus, though presenting the structure of rostral plate attributed by Dr. Gray to his family Sepsidæ, appears to be an extreme form of the series of genera of Scincidæ (the Diploglossinæ), which we commence with *Microlepis*, *Diploglossus*, etc., and in which the first non-development of extremal parts is seen in *Sauresia*. *Evesia* exhibits a somewhat similar though more degraded condition, and perhaps bears a like relation to certain genera of smooth-scaled Scincidæ *Saurphthalmia*. Besides the present, America possesses six genera which exhibit a deprivation of one or both pairs of extremities or of digits above the number of three on each foot. They are distributed between the families of Scincidæ, Chalcididæ and Zonuridæ. The same families, with another,—the Chamæosauridæ,—are represented in the Old World by no less than thirty-one genera of similar kind. Twelve of these are confined to Africa, ten to Australia. The fact that this arrangement of diminishing series is exhibited by so many categories or families of the Lacertilia, and not only by families, but by subfamilies within themselves,—instead of as a great ordinal gradation toward the Ophidia,—is worthy of our closest attention.

The close analogies presented by the recent acrodont and pleurodont *Strobilosaura*, and their widely divergent affinities with the orders of the past, are also scarcely less suggestive.

*P. costatus*, Cope.

Posterior border of rostral plate chevron-shaped. Internasal bounded laterally by anterior supraorbital and prefrenal. Five scales in the supraorbital series, bounded beneath by a smaller series of five, of which the anterior is elongate, and rests on the median frenal. Postfrenal small. Suboculars two,

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posterior elongate, its angle directed between the third and fourth (distinct) upper labials. Of these there are seven, excluding two anterior, whose sutures are more or less obliterated. Lateral borders of frontal parallel; the posterior doubly sigmoid, medially in contact with the cuneiform interparietal, exteriorly with the small frontoparietals. Parietals small, longer than broad; a transverse postparietal. Six inferior labials; a large transverse symphyseal; seven inferior and five infralabials on each side. Tympanic orifice small, not lobate. Three rows of hexagonal preanal plates, the marginal longer than broad. Scales small, in forty-four longitudinal rows, those of the sides arranged vertically and horizontally. Anterior extremity consisting of brachium and anti-brachium, as long as the commissure of the mouth. It is terminated on its inner face by a tubercle. Posterior extremity as long as the distance from the rictus to the axilla, consisting of femur, tibia and tarsus. Sole tuberculous, with two callosities, that on its external border much the larger; a tubercle-like spur on its inner. Tail very elongate. Length of head and body to vent 3 inches 8 lines; muzzle to auricular orifice 8 lines; anterior extremity 6 lines; posterior 9 lines; tail?

Color above light brown, with numerous small dark brown spots on the dorsal region. Sides dark brown, darker anteriorly, where a bandlike arrangement is assumed as far as the orbit. From the auricular opening posteriorly, this is crossed by numerous blackish brown, vertical bars, with irregular light posterior borders. Mentum whitish; abdomen yellowish.

Specimen No. 1502, Mus. Compar. Zool., Cambridge, Mass., brought from near Jeremie, St. Domingo, by Dr. D. F. Weinland.

#### CENTROPYX, Spix.

Two species of this genus are described by Duméril and Bibron, while Gray and Wiegmann enumerate three. A fourth is here added. Anal spurs exist in *C. calcaratus*, *C. decodon* and *C. striatus* (Wiegmann). I have not seen the male *C. intermedius*.

#### *C. calcaratus*, Spix.

Intermaxillary teeth twelve, the six median smaller. Posterior cephalic plates extending over the whole breadth of the head. Dorsal scales small, keeled, in about forty longitudinal series. Scales of the gular fold not extending beyond its border. Abdominal scales in fourteen longitudinal rows. Preanal scales smooth. Femoral pores twenty.

Above olive green, with a light median dorsal line and two lateral, one extending from each temple to the corresponding groin. Interval between these bands marked with a series of black spots. Tail and extremities spotted; posterior femoral surface marked with a black line, bordered with white. Beneath white, shaded with bluish green.

*Habitat.* Brazil, Guiana.

#### *C. decodon*, Cope.

Intermaxillary teeth ten, one on each side of the median pair, smaller. Posterior cephalic plates narrower than the width of the head. Dorsal scales large, in fourteen longitudinal series, becoming smaller upon the nape. Scales of the gular fold acute, produced, forming a serrate border. Abdominal scales in fourteen longitudinal rows; preanals smooth. Femoral pores seven or eight.

Above olive green, with short, irregular, subtransverse, black, pale-bordered spots on the median and posterior regions, and the base of the tail. A pale band extends from the temple to the crural region; bordered above anteriorly with a black band; beneath, from the axillary region posteriorly, with spots of the same color. A second pale line extends from the tympanic

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orifice to the groin, beneath which are numerous white spots. Posterior extremities speckled with black; a pale line on the posterior face.

*Habitat.* Surinam. Mus. Academy Nat. Sciences; Dr. C. Hering, donor.

*C. intermedius*, Schlegel.

Intermaxillary teeth nine, a single external upon each side sometimes smaller. Posterior cephalic plates narrower than the breadth of the head. Dorsal scales small, in twenty-five to thirty-eight rows. Scales of the gular fold acute, produced, forming a serrate border. Abdominal scales in fourteen longitudinal rows; the preanal strongly keeled. Femoral pores fifteen.

Above brownish olivaceous, beneath paler. A light band extends from beneath the eye to the crural region: this is broadly bordered superiorly with brown, which becomes posteriorly broken into transverse bars. These are finally almost in contact dorsally, and are continued upon the median line of the tail. Upon the nape are indications of three median light streaks. From the axillary region extends a broad brown band, which is finally broken up. Upon the base of the tail and for a short distance anterior to the groin, a second pale line may be observed. Sides, belly and inferior surface of the extremities immaculate. Size similar to that of the preceding species, the length from muzzle to vent being 3 inches 6 lines.

*Habitat.* Barbadoes. Mus. Acad. Nat. Sciences.

I cannot arrive at any greater certainty than did Wiegmann as to whether the present species—his *C. vittatus*—is identical with that called by Gray (from Schlegel) *C. intermedius*. He says, (Herpet. Mexic., 26,) “. . . didici, eandem speciem (si quid ex brevissimis Angli diagnosibus percipere licet) a cel. Schlegel *C. intermediam* appellari, quo nomine nullum potest excogitare melius.” I have followed Wiegmann in regarding them as identical.

*C. striatus*, Gray.

Intermaxillary teeth nine, the median five smaller than the external two upon each side. Posterior cephalic plates narrower than the temporal diameter of the head. Dorsal scales large, in “from seventeen to twenty-five rows.” (?) Scales of the gular fold acuminate, forming a serrate margin. Abdominal scales “in twelve rows,” (Gray.) Præanal scales? Femoral pores as in *C. calcaratus*?

Green olivaceous above, with two yellowish lines upon each side, which embrace a brown or black band: the superior sometimes bordered with black; the sides sometimes spotted. Beneath unicolor.

*Habitat.* Guiana.

ARISTELLIGER, Cope.

Digits slender at the base, free, dilated at the extremity and furnished with a single row of transverse plates beneath. Ultimate joint of all free, elongate, compressed, furnished with a claw, that of the thumb ensheathed. Tail elongate, cylindrical, the squamation minute, verticillate. Femoral and præanal pores none. Pupil elliptic; superior eyelid furnished with a hornlike process. Sides simple.

This genus is related to *Theconyx*, Gray and *Pentadactylus*, Gray, but both of these possess præanal or femoral pores; also in the former the last digital joint is scarcely free. The form is in fact hemidactyl, as Dr. Hallowell has indicated. The hornlike process above the eye, appears to be peculiar to it and to certain species of *Sphærodactylus*.

*A. præsignis*.

*Hemidactylus præsignis*, Hallow., Proc. A. N. Sci. Phila., 1856, p. 222.

Dr. Hallowell's statement that the thumbs of this species are destitute of claws is erroneous; they are sheathed beneath a dorsal hood. The specimens from which the description was taken were either in a peculiar stage of metachrosis, or had been stained by impure spirits. The following is a true ac-

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count of the color:—Above light yellowish brown, with a series of five sub-quadrate ochraceous dorsal spots. Top of the head and two bands converging posteriorly from the superior borders of the orbits, with variations upon the side of the body and neck, of the same ochraceous tint. In the female the dorsal spots are connected by dark ashy reticulations; the dark shade is also prevalent above each axilla, and as a band extending posterior to the orbit. Beneath pale, unicolor.

This species is not mentioned by Mr. Gosse in his interesting volume on Jamaica; it cannot, however, be uncommon in the island. The locality, Nicaragua, assigned by Dr. Hallowell at p. 480 of these Proceedings for 1860, is scarcely likely to prove a correct one.

A. lar, Cope.

Size rather large, head broad, massive. Tail to vent equal to one and one-half times the length of the head and body to vent. Anterior mandibular teeth longer than the median. Superior labials eight, the last beneath the orbit, succeeded by but one supplementary. Inferior eight, the posterior small. Symphyseal plate large, slightly truncate, bordered beneath the labials on each side by a large diagonal shield, which is the first of a diminishing series of four. Gular and dorsal regions granulated, the latter very coarsely; inferior faces of the extremities and thoracic and abdominal regions scaled in about thirty-two longitudinal series upon the latter. About twenty-one lamellæ beneath the penultimate posterior digit. Auricular opening large, the distance from its posterior border to that of the orbit equal to the breadth between the orbits.

Color above grey, with numerous brown spots, especially upon the scapular and ischiadic regions. Crown and front dark; labial region varied. An indistinct brown band extends posteriorly from the orbit, bordered below by a pale one, not more visible.

Length from muzzle to vent 5 inches; from vent to end of tail 7 inches 9 lines.

Discovered near Jeremie, Hayti, by Dr. Weinland. Lent to the author by Prof. Louis Agassiz, Mus. Compar. Zoology, Cambridge, Mass. (No. 1504.)

This species attains a size equal to that of any *Thecadactylus rapicaudus* which I have seen. It considerably exceeds the *T. præsignis*. The proportions of the teeth, the number of subdigital lamellæ, as well as the coloration, serve also to distinguish it from the latter.

#### SPHÆRODACTYLUS, Cuvier.

Eleven species of this genus are known to me through examination of specimens, and one (*S. fantasticus*) from the description of Duméril and Bibron. An additional species (*S. nigropunctatus*) has been described by Dr. Gray, and a fourteenth (*S. lineolatus*) is said to have been published. The last two are South American: the description of the first is too imperfect to permit its identification: that of the last is quoted from Lichtenstein and Von Marten's *Nomenclator Reptilium Mus. Zool. Berlin.*—a work which Dr. Günther calls "printed, but not published."

Cuvier (*Regne Animal*) states that these animals possess retractile claws: the same statement is made by Dr. Gray in his *Synopsis of Reptiles*, in Griffith's edition of the same work. Mr. Gosse informs us that the *S. richardsonii* protrudes at will a sheathed claw from the inner side of the digital pallet, (*Nat. Soj. in Jamaica*, p. 255.) Duméril and Bibron assert (vol. iii., p. 401, 1836) that claws are wanting, which is confirmed by a similar statement made by Dr. Gray in the *Catalogue of Lizards* in the British Museum. MM. Cocteau and Bibron, in *De la Sagra's Cuba*, express the following opinion:—"On a dit qu'ils étaient complètement privés d'ongles; cependant un examen attentif de l'extrémité des doigts, fait voir que la dernière phalange est revêtue d'un écaille sur laquelle se retrouve en relief la forme d'un angle crochu dont 1861.]

les lames, ordinairement repliées sur elles mêmes, se seraient, pour ainsi dire, écartés l'une de l'autre, et étalées ici en une sorte de palette. C'est du moins, la disposition que nous avons observée sur nos deux especes de Cuba." From my own observations I arrive at the conclusion, that all the species possess claws, which are directed obliquely inward between superior and inferior expansions of the digital epidermis: and that the ordinary corneous sheath (*i. e.*, "les lames ordinairement repliées sur elles mêmes") exists, and cannot be said to be represented by the laminæ of the pallet.

Authors generally state, that the iris does not contract the orifice of the pupil, and this is reasonably to be inferred from an examination of specimens in alcohol. Mr. Gosse, however, relates that the pupil of *S. richardsonii* became constricted when exposed to the sunlight; the only specimen of *S. alope* which I have seen (in alcohol) exhibits this form of pupil in a moderate degree.

Dr. Günther has observed a spine upon the superior border of the eyelid in *S. macrolepis*. I have not been able to find other notice of this peculiarity. It appears to be almost a generic character, being doubtfully wanting\* in *S. richardsonii* only.

The following synopsis will, perhaps, improve the state of knowledge regarding the forms of this genus:

I. Dorsal scales rounded, smooth, small.

*S. sputator*, Cuv.

Labial plates  $\frac{5}{5}$ . Light brown, (greenish upon the dorsal region in life, according to MacLeay,) with ten broad, transverse, brown bands, paler medially, of which three are upon the body. Two light lines upon the front, which converge and unite upon the muzzle. Beneath gray. Tail shorter than the body.

*Hab.* Cuba. Mus. Washington, Philadelphia.

*S. cinereus*, MacLeay.

? *S. punctatissimus*, Dum. et Bibr.

Labial plates  $\frac{5}{4}$ . Tail longer than the body. Light gray rufous above, unicolor or punctulated with white, often most abundantly upon the head. A little paler beneath. I cannot distinguish specifically Cuban and Haytian individuals.

Mus. Philadelphia, Washington, Cambridge.

II. Dorsal scales flat, keeled.

\*Lateral dorsal scales similar to the median.

a. Dorsal scales smaller than the ventral.

b. Inferior labials (anterior to posterior border of orbit) five; muzzle less acute.

*S. argus*, Gosse.

Above purplish brown, sparsely dotted with white ocelli, which have dark borders. They are sometimes arranged in transverse series, sometimes longitudinally confluent on the head, forming bands, sometimes almost entirely wanting on the body or tail. Dorsal scales of medium size, nearly similar to those of *S. oxyrhinus*; irregular series of them lighter than others, forming an indistinct pattern of angulated lines.

*Hab.* Jamaica. Mus. Washington, Philadelphia.

\* Its absence in the plate 24, fig. 30, Rept. U. S. and Mex. Bound. Surv. of S. notatus, is an omission of the artist.

*S. millepunctatus*, Hallowell.

Dorsal scales very minute;\* occipital granular; frontal keeled. Muzzle rather short. Auricular orifice smaller than digital expansion. Light brown, spotted with darker brown; a post axillary, a loreal, two postocular and a median occipital brown line. A transverse crural spot, brown bordered posteriorly with white.

*Hab.* Nicaragua. Mus. Philadelphia, Washington.

*S. casicolus*, Cope.

Dorsal scales very minute; occipital granular, frontal keeled. Supranasal plates as long as broad. Muzzle elongate. Auricular aperture larger than digital pallet. Dark brown rufous, with three distant, transverse, dorsal blotches, bordered with lighter; the anterior or interscapular indistinct. A dark spot upon the nape, bounded by two light dots. Numerous short longitudinal white lines upon the dorsal and lateral regions; none upon the head. A loreal and three postocular dark lines. Beneath whitish, chin and sides of neck punctulated with rufous.

*Hab.* Region of the Truando, New Granada. Mus. Washington.

*bb.* Inferior labials (anterior to posterior border of orbit) six; muzzle more acute.

*S. oxyrhinus*, Gosse.

Muzzle acute, depressed; supranasals in contact. Above light brown, with numerous conspicuous black dots (sometimes confluent, according to Mr. Gosse); two light dots, bordered with black, at the base of tail. Belly light brown, throat dotted. Tail long. Pupil round.

*Hab.* Jamaica. Mus. Washington.

*S. alopes*, Cope.

Muzzle very acute, profile sloping regularly from the frontal region. Supranasal plates separated. Pupil apparently elliptic. Tail much longer than body. Dorsal scales smaller than in *oxyrhinus*. Above rufous gray, closely vermiculated with longitudinal rufous lines; tail and extremities spotted with the same. Beneath pale brownish, faintly vermiculated with rufous brown on the gular region and the sides of the neck; many of the abdominal and femoral plates margined with the same.

*Hab.* Near Jeremie, Hayti. Mus. Cambridge.

*aa.* Dorsal scales equal to the ventral.

*b.* Occipito-nuchal scales larger than those on the muzzle; palpebral spine absent or rudimentary.

*S. richardsonii*, Gray.

Cranial and gular scales tuberculiform. Supranasal plates narrow; symphyseal broad posteriorly, bordered by three scales. Dorsal scales in about eighteen rows, their keels very strong. Pupil slightly elliptic, (Gosse.) Color, in spirits, light brown, with seven narrow, irregular, brown cross bands, bordered behind with paler; these are the outlines of broad bands, which are, in life, according to Mr. Gosse, reddish lilac. These are succeeded by darker bands on the tail, which become black at its extremity. Limbs annulated. A narrow cross band on the nape, two on the occiput. A light curved frontal cross band; a similar one anterior to the eye, one posterior, one infero-posterior to it; a transverse postfrontal band. These headbands are bright yellow in life, (Mr. Gosse.)

*Hab.* Jamaica. Mus. Washington.

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\* Dr. Hallowell's statement, Pr. A. N. S., 1860, p. 480, that the ventral scales are keeled, appears to be incorrect.

*bb.* Occipito-nuchal scales smaller than those on the muzzle; palpebral spine distinct.

*c.* Gular scales keeled.

*S. macrolepis*, Günther.

Muzzle short, rostral and supranasal plates moderate, the latter not in contact. Head scales all keeled; interaxillary dorsal scales in twenty rows. Labial plates  $\frac{3}{4}$ ; symphyseal narrowed posteriorly. ♂ Above brown, many of the scales tipped with darker; sometimes a few black spots on the median line. An irregular median rostral streak, which subdivides anterior to the orbits; the resulting two diverge on the occiput and unite on the nape, enclosing an elongate black subgemmiform spot. The modifications of this pattern are various. A postocular streak extending nearly to the shoulder, and an inferior line extending to the auricular opening. Chin vermiculated with black; tail speckled above and below. ♀ Four longitudinal lines broken into spots; an interscapular spot with two white in it; a black nuchal spot, connected or not with a longitudinal line on each side, which unite or not on the muzzle, and which are in contact or not with a round median occipital spot. Chin not spotted. Both sexes whitish beneath.

*Hab.* Island St. Thomas. Mus. Philadelphia, Washington.

*cc.* Gular scales smooth.

*S. notatus*, Baird.

Muzzle rather short; supranasal plates not in contact; symphyseal broad posteriorly. Labials  $\frac{4}{4}$ ; frontal scales keeled, dorsal interaxillary in from seventeen to twenty-two rows. Tail longer than body. Color reddish brown, with faint darker markings on the back, indicating longitudinal streaks. A median longitudinal line upon the head, which expands posteriorly; a superciliary, three postocular and a loreal line; the first mentioned extend for a greater or less distance posteriorly; in some specimens (among them the types) these lines are broken into small spots.

*Hab.* Key West, Florida; New Providence I., Bahamas; Cuba. Mus. Philadelphia, Washington, Salem, Mass.

*S. gilvitorques*, Cope.

Muzzle short; supranasal plates not in contact; symphyseal narrow behind. Labials  $\frac{3}{3}$ ; frontal scales keeled; dorsal interaxillary in about sixteen rows. Color dark brown above, with a yellow collar just anterior to the interscapular region. Head darker, marked with narrow lines as follow; one median, one superciliary, one loreal, two postauricular: beneath a little paler.

*Hab.* Jamaica. Mus. Philadelphia.

\*\*Lateral dorsal scales larger than the median, keeled.

*S. fantasticus*, Cuv.

Muzzle short; labials  $\frac{3}{3}$ ; rostral bordered posteriorly by four scales; nasal plate lateral; symphyseal rhombic. Color yellowish, the head black, vermiculated with white lines.

*Hab.* Martinique.

*S. anthracinus*, Cope.

Size large, (head and body 1 inch 9 lines;) muzzle elongate acute; labials four above, two large and three small below; supranasal plates small, superior; frontal scales keeled; the dorsal strongly keeled, rounded, in ten rows on each side, extending for a considerable distance on the tail. Gular scales smooth. Color black, the large dorsal scales tinged with blue.

*Hab.* Mexico. Mus. Philadelphia.

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## Synopsis of the SILLAGINOIDÆ.

BY THEODORE GILL.

Family SILLAGINOIDÆ Richardson.

*Synonymy.*

Sillaginidæ Richardson, Report of 15th Meeting B. A. A. S, 1846, p. 223.

Gobioides part. Cuvier, Regne Animal, ed. i.

Percoides part. Cuvier.

Sillagoidei Bleeker.

Sciænoidei (Sillaginiformes) part. Bleeker.

Trachinoidæ part. Günther.

The body is elongated and little compressed, highest under the first dorsal fin, and thence nearly uniformly and slowly attenuated towards the caudal peduncle, which is moderately slender. Scales of moderate or small size; their external margins are generally rounded and pectinated. Lateral line simple, with a slight sigmoidal flexure and continued to the base of the caudal fin, or even slightly between its median rays. Head oblong or elongated, conical in profile, gradually decreasing in width above to the horizontally rounded snout, and nearly plane below. Forehead flattened or little convex. Eyes submedian. Nostrils double, approximated and in front of the eyes. Suborbital bones not articulated with the preoperculum. Preorbital bone very large, expanded over the side in front of eye, and entirely concealing the ends of the maxillary bones. A ridge is continued obliquely from the posterior suborbitals on the preorbital. Preoperculum much longer than high, with a prominent longitudinal fold, which, above the inferior horizontal border especially, is separated by a deep channel from the incurved portion which forms the inferior flattened surface of the head. Operculum short and thin. Interoperculum and suboperculum normally developed. Operculum with a slight crest ending in a spine. Mouth small and terminal; the periphery of each jaw more or less semi-elliptical. Intermaxillary bones little protractile downwards, with their ascending and marginal branches nearly equally developed. Supramaxillaries widest at their free ends and forming part of the arcade of the mouth. Teeth on the jaws and the front of the vomer. Branchiostegal membrane free, extending under the throat, but emarginated behind, and concealed under the opercular apparatus. Branchiostegal rays six on each side. Pseudobranchiæ present. Dorsal fins two; the first short; the second elongated and equal to or little larger than the anal, with which it is coterminous. Anal fin with two (or one) small spines. Caudal fin emarginated, with its lobes rounded. Pectoral fins normally inserted on the humeral cincture, with the lower rays branched. Ventral fins thoracic, with one spine and five branched rays. The fins have few or no scales.

The skull is convex below, and has muciferous cavities like that of a Sciænoidei. The pubic bones are well developed and separated from each other before by a sinus between the pedicles, by which they are suspended to the coracoid bones. There are thirty-four to forty-three vertebrae, of which twelve to sixteen are costiferous. The stomach is caecal; the pyloric caeca few (2-5).

The air bladder is simple. The ovaries are generally united nearly in a single mass.

This family is distinguished from all others by the combination of an elongated body, and elongated and nearly equal second dorsal and anal fins, with an oblong or elongated cavernous head, whose preorbital bones are very large, and whose preoperculum is bent inwards below, covering the inferior surface of the head, while a crest or fold separated by a deep groove assumes the aspect of the usual inferior margin.

It manifests more or less resemblance to several families, but its true relationship is rather difficult to be decided.

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By its cavernous skull, it suggests the Sciænoids and the *Acerinæ* among the Percoids, but from both, it is at once separated by the long anal fin which is nearly equal to the dorsal, and by other morphological and anatomical characters, which the description of the family given above will at once suggest.

Among the Percoids, it most resembles the species usually known under the name of *Acerina schraitzer*,\* but as will be readily learned on comparison, the resemblance is simply analogical.

Among the Sciænoids, the most analogous forms appear to be the genera *Pachypops* of Gill, and *Pachyurus* of Agassiz, or *Lepipterus* of Cuvier. The squamation of the fins, characteristic of the Sciænoids, in addition to the shortness of the anal fin of those genera, and the peculiarly dense squamation of the caudal fin of *Pachyurus*, evidently show that they are true Sciænoids and exclude the entertainment of any strict or close affinity to the Sillaginoids.

From the Trachinoids and the allied forms with which the family has been associated by Dr. Günther, it is at once separated by the form and structure of the head.

Originally referred by Cuvier to the family of Gobioides, it was subsequently transferred to the division of the Percoides with thoracic ventrals, less than seven branchiostegal rays, and provided with two dorsal fins. The only other genus referred to that section was *Trichodon*.

Sir John Richardson, in his Report on the Fishes of the Chinese and Japanese waters, framed for it a new family, but subsequently placed it in his family of Uranoscopidæ.

Dr. Bleeker also, at one time, appears to have regarded the family as valid, and named it Sillagoidei. In his recent classification, he has removed it to the family of Sciænoids, and thus arranged it:

Familia 84. SCLÆNOIDEI—SCLÆNINI Bp.

Subfamilia 1. ACERINÆFORMES.

Gen. ACERINA Cuv., COPTODON Gervais.

Subfamilia 2. SILLAGINIFORMES.

Gen. SILLAGO Cuv., SILLAGINICHTHYS Blkr., ASPRO Cuv.

Subfamilia 3. SCLÆNIFORMES.

Gen. All Sciænoids of Günther, except Conodon and Eleginus, the former of which is a Pristipomatoid and the latter a Notothenioid.

The characters which distinguish the Sillaginoidæ from the Sciænoidæ have been previously enumerated. The differences existing between them and *Aspro* are still more decided. As previously remarked, the resemblance to *Acerina* is much greater. The genus *Coptodon* is not at all related to *Acerina*, but is a synonyme of *Tilapia*, the type of which is closely allied, if not identical with the *Chromis niloticus* of Cuvier.†

SILLAGO, Cuv.

*Synonymy.*

Sillago Cuv., Regne Animal, ed. i., vol. ii., p. 258, 1817.

" Cuv. et Val., Histoire Naturelle des Poissons, vol. iii., p. 398.

\*The *Acerina schraitzer* appears to be the type of a distinct genus, to which the name of *Leptoperca* may be given. The genus differs from the restricted *Acerina* by the more slender body and head, and longer dorsal and anal fins.

†The name of *Chromis* cannot be retained for the *C. niloticus*, as the type of that genus is the *Sparuschromis* of Linné, (see Mem. du Museum d'Hist. Nat., tome i, p. 353, 355.) The name of *Tilapia*, though proposed by Sir Andrew Smith, under an erroneous view of its affinities, may be then accepted. The reference by Gervais of a species of the genus to *Acerina*, as was originally the case, is, to use the mildest expression, singular.



*Atherina* sp. *Forspalls*.

*Platycephalus* sp. *Bloch, Schneider*.

*Sciæna* sp. *Bloch, Schneider*.

*Diagnosis*.—Dentes velutini. Pinna dorsalis prima spinis 11 (12); secunda et analis subæquales. Squamæ mediocres, serie longitudinali 50—90.

Body elongated and slightly compressed, rounded and widest on the back, and more or less plane below. Scales on the side of moderate size, (50—90.) Head elongated-conical, compressed, gradually and nearly uniformly narrowed to the snout, which is horizontally rounded; eyes moderate or large and submedian. Mouth small, the periphery of the jaws semi-oval; jaws subequal, or lower shortest. First dorsal fin decreasing in a straight or convex line from the front or anterior rays, and with eleven, rarely twelve, spines. Anal fin with two slender spines, nearly equal to the second dorsal in extent and number of rays. (D. I. 17—23, A. II. 15—23.) Caudal fins emarginated. Ventral fins with the spine sometimes cartilaginous.

Type. *Sillago sihama*, *Rüppell*.

*Syn.*—*Sillago acuta* *Cuv.*

*Sillago* is now restricted to the species having similar forms, scales of moderate size and nearly equal dorsal and anal fins; and it consequently excludes some species that have been referred to it by previous naturalists, the *Sillago punctatus* being taken as the type of one, and *S. domina* as that of another genus. Even in the genus as now restricted, there are more considerable variations than are often found in the same genus. While the ventral spine is slender, and, as usual, osseous in most species, it is in one thick and cartilaginous. Again, some species have cycloid scales in the cheek and forehead, while others have ctenoid. The preoperculum is almost entire in some, while in others it is ciliated. As these differences do not, however, appear to be supported by others, they perhaps can scarcely be regarded as generic, and the species so distinguished have been therefore retained in the same genus.

The following analytical table will exhibit the range of variation in the genus, but, perhaps, is artificial, and may not show the affinities of all.

- I. Anal rays I.—II. 19—23.
- A. Ventral spine slender and osseous.
- a. Cheek and interocular scales cycloid.
- b. Scales large, 50—55 along lateral line. *S. macrolepis.*
- bb. Scales moderate, 70—75 along lateral line.
- Rows above lateral line 4, D. XI., I., 20, 21, A. I. II. 22, 23.
- Body and fins immaculate. *S. sihama.*
- Body immaculate; second dorsal spotted. *S. malabarica.*
- Rows above lateral line 5, 6. D. XI. I. A. I. II. 19—21.
- Body immaculate; dorsal spotted between rays. *S. bassensis.*
- Back spotted. First dorsal brownish above, dotted below; second margined with brown, and with two longitudinal vittæ; caudal with three transverse orange vittæ. *S. maculata.*
- aa. Cheek and interocular scales ctenoid.
- Scales of lateral line 70—75; above three rows. *S. japonica.*
- Scales of lateral line 82—86; above seven rows. *S. parvisquamis.*
- AA. Ventral spine thick and cartilaginous, united with the first ventral ray. *S. chondropus.*
- II. Anal rays II. 15, 16 (18 *Cuv. et. Val.*)
- First dorsal marbled with blackish; second with four or five rows of oblong spots. *S. ciliata.*

1861.]

The following enumeration gives the synonyms of each species, the work in which it was first described, and the habitat.

It is proper to remark that the *Sillago sihama* and *S. malabarica* have been united by Dr. Günther under the name of *S. sihama*, and that *S. bassensis* and *S. maculata* have been also regarded as identical, and described under the latter name. Dr. Günther may be correct in his views, but as he has given no reasons to support them, and as there are well marked differences between those forms, which are generally specific, we prefer, with previous naturalists, to retain them as distinct, until it is demonstrated that their variations are of less value in this group than in most others. Dr. Günther's descriptions are also as restrictive as those of others, that of *Sillago sihama* applying to the one here retained as such, and the one of *S. maculata* rather to *S. bassensis*.

1. SILLAGO MACROLEPIS, Bleeker.  
*Sillago macrolepis* *Bleeker*, *Natuurkundig Tijdschrift voor Nederlandsch Indie*, vol. xvii. p. 166.  
*Habitat*.—Seas of Batavia and Bali.
2. SILLAGO JAPONICA, Temminck et Schlegel.  
*Sillago Japonica* *Temm. and Schlegel*, *Fauna Japonica Pisces*, p. 33, pl. x. fig. 1.  
*Habitat*.—Japanese and Moluccan seas.
3. SILLAGO SIHAMA, Rüppell.  
*Atherina sihama* *Forsk.*, *Descriptiones Animalium*, &c., p. 70.  
*Platycephalus sihama* *Bloch*, *Systema Ichthyologiæ*, *Schneid. ed.*, p. 60.  
*Sillago sihama* *Rüppell*, *Atlas zur der Reise im Nördl. Africa*, *Fische*, p. 9, taf. 3, fig. 1.  
*Sillago erythræa* *Cuv. et Val.*, *Hist. Nat. des Poissons*, tom. iii. p. 409.  
*Habitat*.—Red Sea.
4. SILLAGO MALABARICA, Cantor.  
*Sciæna malabarica* *Bloch*, *Systema Ichthyologicæ*, *Schneid. ed.*, p. 81, pl. 19.  
*Soring* *Russell*, *Desc. and Fig. of Fishes of Coromandel*, tom. 113.  
*Sillago acuta* *Cuv. et Val.*, *Hist. Nat. des Poissons*, tom. iii. p. 400.  
*Habitat*.—East Indian and Chinese seas.
5. SILLAGO MACULATA, Quoy and Gaimard.  
*Sillago maculata* *Quoy and Gaimard*, *Voyage de Freycinet*, *Zoologie*, p. 261 pl. 53, fig. 2.  
*Habitat*.—East Indian and Australian seas.
6. SILLAGO BASSENSIS, Cuv. et Val.  
*Sillago bassensis* *Cuv. et Val.*, *Hist. Nat. des Poissons*, tom. iii. p. 412.  
*Habitat*.—Coasts of South Eastern Australia.
7. SILLAGO PARVISQUAMIS, Gill.  
*Habitat*.—Japanese seas.
8. SILLAGO CHONDROPUS, Bleeker.  
*Sillago chondropus* *Bleeker*, *Verhand. von bet Bataav. Genoots*, chap. deel. xxii. *Percoiden*, p. 61.  
*Habitat*.—Molluscan and Japanese seas.
9. SILLAGO CILIATA, Cuv. et Val.  
*Sillago ciliata* *Cuv. et Val.*, *Hist. Nat. des Poissons*, tom. iii. p. 415.  
*Habitat*.—Australian seas.

#### SILLAGINODES, Gill.

##### *Synonymy.*

*Silago* sp. *Cuv. et Val.*, *Günther*.

*Diagnosis*.—Dentes velutini. Pinna dorsalis prima postice oblique recta vel

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decurvata, spinis 12; secunda p. anali majori, radiis I. 26. Squamæ minimæ, serie longitudinali 170 plus minusve.

Body elongated and scarcely compressed, with the back as well as the abdomen more or less rounded. Scales of the body very small, there being 170 in a longitudinal row in the typical species. Head elongated-conical, compressed, gradually and nearly uniformly decreasing in width to the snout; eyes moderate and submedian. Mouth small; the periphery of each jaw semi-oval; jaws subequal, or lower shortest. First dorsal fin declining from the anterior portion in a straight or convex line, and with twelve spines. Second dorsal longer, and with more rays than the anal (I. 26.) Anal fin with one slender spine, and about twenty-two branched rays. Caudal fin emarginated. Ventral fins with a slender spine.

Type. *Sillaginodes punctatus*, Gill.

The most apparent distinctive characters of this genus are the small size of the scales, and the inequality, in size and number of the rays, of the second dorsal and anal fins. Although the second dorsal fin of the typical *Sillagines* is sometimes longer than the anal fin, the number of its rays is always the same or nearly so, and only in the *Sillago ciliata* is the dorsal longer than the anal. One species is known.

SILLAGINODES PUNCTATUS, Gill.

*Sillago punctata* Cuv. et Val. Hist. Nat. des Poissons, tom. iii. p. 413.

*Habitat.*—Australia.

SILLAGINOPSIS, Gill.

*Synonymy.*

*Sillago* sp. Cuv. et Val., Günther.

*Diagnosis.*—Dentes velutini, serie externa majores. Pinna dorsalis anterior spinis 9, spina secunda elongata, postice oblique incurvata.

Body elongated and subcylindrical. Scales small. Head elongated, depressed and declining towards the snout in a nearly straight line; its width gradually becomes less towards the nostrils, and thence the snout is more attenuated and rounded at its end; eyes very small and placed in the anterior half of the head. Mouth small. Lower jaws shorter than the upper. Teeth of the jaws pluri-seral, larger in the external row. Spinous dorsal fin commencing above the pectorals, with nine rays, the second of which is much elongated; second dorsal elongated, with its height gradually decreasing. Anal fin shorter than the soft dorsal, and nearly co-terminal with it. Caudal fin emarginated. Ventral fins with a slender spine.

Type. *Sillaginopsis domina*, Gill.

*Syn.*—*Sillago domina* Cuv. et Val.

This genus is very distinct from either *Sillago* or *Sillaginodes*, and is distinguished from both by the depressed head, the small eyes, the larger outer row of teeth, and the form of its first dorsal fin.

A single species is known.

SILLAGINOPSIS DOMINA Gill.

*Sillago domina* Cuv. et Val. Hist. Nat. des Poissons, tom. iii, p. 415, pl. 69.

*Habitat.*—Bay of Bengal and East Indian Archipelago.

#### Description of a new species of SILLAGO.

SILLAGO PARVISQUAMIS Gill.

The body is slender and highest under the first dorsal fin, the height there equalling an eighth (12-100) of the total length; under the second, it gradually diminishes, and the height of the constricted caudal peduncle is only a twentieth (5-100). The greatest width nearly equals a tenth of the length; behind, it becomes regularly compressed to the caudal fin.

1861.]

The head has the same form as in the typical species; the curvature above is very slight. Its length forms less than a quarter ( $\frac{23}{100}$ ) of the total; the length of the snout or interval between the symphysis of the upper jaw and the eye exceeds an eleventh ( $\frac{9\frac{1}{2}}{100}$ ) of the same; that of the exposed operculum, 4-100. The height at the occiput equals a ninth ( $\frac{11}{100}$ ) of the total length, or nearly half ( $\frac{11-23}{100}$ ) of the head's; the width is much less than the height ( $\frac{9\frac{1}{2}}{100}$ ), and regularly diminishes towards the snout, where it equals a half of the greatest. The interorbital area is perfectly flat, and its width exceeds the length of the operculum ( $\frac{.04\frac{1}{2}}$ ).

The eyes are nearly central and oval; the long diameter is contained more than eighteen times in the total ( $\frac{.05\frac{1}{2}}$ ) or four times in the head's; the short diameter twenty-five times ( $\frac{4.100}{100}$ ) in the former and nearly six times in the latter.

The scales on the crown and forehead, as well as on the cheeks and opercula, are ctenoid.

The mouth is very small; the periphery of each jaw semi-elliptical; the lower jaw is received within the band of teeth of the upper.

The teeth are uniform, and in a moderately broad band on each jaw and on the vomer.

The first dorsal fin commences at the end of the third tenth of the total length; its second and third spines are longest and nearly equal an eighth of the total length (8-100); the first and fifth are nearly equal; the outline thence declines with a slight curve to the twelfth.

The second dorsal fin regularly diminishes in height from front to rear; the second or first branched ray equals a tenth (10-100) and the penultimate a twenty-second ( $\frac{4\frac{1}{2}}{100}$ ) of the total length.

The anal fin commences before the middle of the total length, and beneath the second or third ray of the second dorsal, and is coterminous with that fin; its two spines are very slender.

The caudal fin is slightly emarginated and its lobes rounded; the median rays form a ninth ( $\frac{11}{100}$ ) of the total length; the longest nearly equal a seventh (14-100) of the same.

The pectoral fins are nearly equal in length to an eighth (13-100) of the total.

The ventral fins are inserted immediately behind the bases of the pectorals; the first and second branched rays are equally long, and exceed an eighth (12-100) of the fish's length. The spine is slender and bony.

The number and character of the rays of the respective fins are indicated in the following formula:

D. XII. I. 22. A. II. 23. C. 10, 1, 8, 7, 1, 9. P. 2, 14. V. I, 5.

The scales are arranged in very oblique rows, the row from the first ray of the second dorsal ending nearly at the base of the twelfth or thirteenth anal one. The exposed parts are nearly twice as high as wide; there are from eighty-two to eighty-six along the lateral line; between that line and the dorsal fin there are seven rows. All are ctenoid.

The color of the body and head is nearly uniform, tinged with purple above the lateral line and more silvery beneath. The first dorsal fin is very minutely punctulated, especially near the margin and the front of each spine. The rays of the second dorsal are each banded with two or three dark bars, which encroach on the membrane in front. The margin of the caudal is lighter. The pectoral and ventral fins are immaculate.

Total length, 6.3-10ths.....	100
Body—Greatest height.....	12
Least height.....	5
Width.....	$9\frac{1}{2}$
Head—Length.....	23
Length of operculum.....	4

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Length of snout.....	9 $\frac{1}{4}$
Diameter of orbit.....	5 $\frac{1}{2}$
Width between eyes.....	4
Height at occiput.....	11
Width at occiput.....	9 $\frac{1}{2}$
Dorsal—Distance from snout.....	30
Height of second spine.....	13
Height of second dorsal's second ray.....	10
Height of second dorsal's penultimate ray.....	4 $\frac{1}{2}$
Anal—Distance from snout.....	48
Caudal—Length of median rays.....	11
Length of longest rays.....	14
Pectoral—Length.....	13
Ventral—Length.....	12

This species is most nearly allied to the *Sillago Japonica*, which is an inhabitant of the same geographical section, but it is amply distinguished from that species by the more slender and elongated form, the smaller size of the scales, and especially the number of rows above the lateral line, the color and the rows of spots or bars which cross the front of the rays of the second dorsal fin. *Sillago Japonica* has also eleven dorsal spines, while the specimen of *S. parvisquamis* here described has twelve.

It best agrees with *Sillago maculata* and *S. bassensis* in the number of rows of scales between the lateral line and dorsal, but the number is even greater than in those species in which also there are only about seventy scales on the lateral line, and five or six rows above. The scales of the cheeks are also cycloid and not ctenoid as in the present.

Finally, *Sillago parvisquamis* is distinguished among all the representatives of the genus as now restricted by the small size of the scales, and, if constant, by the number of dorsal spines, it having twelve, like the *Sillaginodes punctatus*, while all others have eleven.

A single specimen, somewhat damaged, is in a small collection of fishes made by Dr. D. B. Simmons, at Kanagawa. It is preserved in the museum of Mr. Brevoort, to whom I am indebted for the privilege of describing it.

### Synopsis of the CHÆNICHTHYIDS.

BY THEODORE GILL.

Family CHÆNICHTHYOIDÆ Gill.

#### Synonymy.

Gobiidæ part. *Richardson*.  
 Callionynioidei part. *Bleeker*.  
 Blennioidei (Comephoriformes part.) *Bleeker*.  
 Trachinidæ (Trachinina part) *Günther*, 1860.  
 Trachinidæ (Nototheniina part.) *Günther*, 1861.

*Acanthopterygii* corpore elongato nudo, subcylindrico buccis inermibus, capite occipite subplano, rostro elongato spatuliforme, ore terminale, magno; palato lævi; aperturis branchialibus amplis membrana branchiostega radiis sex sustentata, pinnis dorsali analique elongatis, portione spinosa pinnæ dorsalis articulata separata conjunctare; pinnis pectoralibus radiis ramosis; pinnis ventralibus jugalaribus et remotis, radiis I. 5; ventriculo ovali, ramo brevi ascendente; cæcis pyloricis paucibus.

Body rather elongated, gradually and regularly declining from the nape to the caudal fin; anteriorly subcylindrical or scarcely compressed. Skin naked. Lateral line high on the sides and near the dorsal fin, interrupted near the end of the latter. Head moderate or large, with the snout prolonged and spatuliform. 1861.]

Crown depressed and not relieved by crests or ridges. Preorbital bones large; infraorbital chain very narrow, and not articulated with the preoperculum. Opercular bones all present; the interoperculum and suboperculum are moderately developed. Mouth terminal, with the cleft lateral and large, extending to the vertical of the eye. Upper jaw with its arch formed in front almost entirely by the intermaxillary bones, whose pedicles or posterior processes are very short. Supramaxillary bones with their articulations entirely posterior to the intermaxillary slender and gradually enlarged towards their extremities. Teeth developed on the jaws. Palate smooth and unarmed. Branchial apertures capacious. Branchiostegal membrane inferiorly deeply emarginated behind, and provided on each side with six rays. Pseudobranchiæ developed. Dorsal fin with its spinous portion short and usually distinct from the soft. The rays of the latter are (often) simply articulated and not branched. The anal fin is little shorter than the dorsal, and its rays are divided, with the membrane notched behind each. Caudal fin not forked. Pectoral fins well developed, and with their inferior rays divided. Ventral fins jugular or subjugular, separated by a rhomboid area; each with a spine and five rays, the first of which are frequently thickened and entire. The cranium is flattened behind, and the crests are little developed or obsolete. The spatuliform snout is principally formed by the elongated frontal bones. The stomach is of moderate size and cæcal. The pyloric caeca are in a very small number.

The chief distinctive characteristic of this family is doubtless the spatuliform extension of the snout. This combined with the extent of the fins, structure of the head and general form, distinguish the group from all others. It appears to be most closely allied to the Harpagiferoids and Notothenioids. From the former, it is separated by the form of the head as well as by that of the body. From the latter, by the same features, and also by the naked skin.

The representatives of this family, or at least *Chaenichthys*, were at first placed by Sir John Richardson in the Cuvierian family of Gobioids, between *Hæmerocates* and *Comephorus*. Subsequently, in his memoir on Ichthyology published in the Encyclopædia Britannica, he removed *Hæmerocates* to his family of *Uranoscopoidæ*, and retaining *Chaenichthys* in that of Gobiidæ, placed it after *Comephorus* as the last of the family.

Dr. Bleeker, in his "Systematis Piscium Naturalis Tentamen," widely separated the two groups which are here referred to the family, thus distributing them.

Caterva 2. *Platycephalichthyes*.

Ordo 33. *Platycephali*.

Familia 118. (2d of order) *Callionymoidei* = *Callionymini*, Bp.

Gen. *Callionymus* L., *Harpagifer*, Richds., *ΣΥΝΕΙΧΤΗΥΣ*, Richds.

Caterva 3. *Blennii*.

Ordo 34. *Cotti*.

Familia 123 (3d of order) *Blennioidei*.

Subfamilia 4. *Comephoriformes*.

Gen. *Comephorus* Lac., *ΠΑΓΕΤΟΦΕΣ*, Richds., an *huj* loc.

Dr. Günther at first referred *Chaenichthys* to the group *Trachinina* of his family of *Trachinidæ*, but subsequently transferred it to that of *Nototheniina*, formed for *Notothenia*, *Harpagifer* and *Chaenichthys*.

The family has scarcely any affinity to either the *Callionymoids* or *Blennoids*. Besides the form of the head as well as that of the body, it differs from the former, especially by the relative situation of the ventral fins and the extent of the branchial apertures. It is also still distinguished from *Comephorus*, which is the type of a peculiar family little allied to *Blennoids*, by the structure of the head, the presence of ventral fins, and the development of the pelvic bones. It appears, however, to be allied to the *Comephoroids*, but certainly not as much so as to the *Harpagiferoids*, or even the *Notothenioids*. Like its nearest relations, all the representatives of this family are inhabitants of high southern

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latitudes, where they apparently represent the Cottoids of the north, especially the *Oncocotti*. They appear to belong to two natural subfamilies, but one of them is very imperfectly known.

Subfamily CHÆNICHTHYINÆ Gill.

*Synonymy.*

Trachinina part. (group) *Günther*, Catalogue of the Acanthopterygian Fishes.  
 Nototheniina part. (group) *Günther*, Annals and Magazine of Natural History.

Pinna dorsalis prima a pinna secunda disjuncta. Pinnæ dorsalis secunda analisque sat altæ; prior radiis non ramosis. Pinnæ pectorales basibus latis et emarginatis. Pinnæ ventrales utraque radiis spinosa una et quinque articulatis, externis simplicibus, internis ramosis.

First dorsal fin separated from the second. The latter and the anal are moderately elevated and of nearly uniform height. The rays of the second dorsal are simply articulated.

Pectoral fins with their bases broad and subvertical, but emarginated.

Ventral fins well developed and provided with a spine and five soft rays as usual, but with the external of the latter simple and the internal alone branched.

The subfamily of Chænichthyinæ is thus restricted to the genus *Chænichthys* as recently extended by Dr. *Günther*. Only two species are known, each of which represents a distinct genus.

Genus CHÆNICHTHYS Richardson.

*Chænichthys Richardson*, Annals and Magazine of Natural History, 1844.

*Chænichthys Richardson*, Ichthyology of the Voyage of the Erebus and Terror, p. 12.

*Chænichthys Günther*.

Linea lateralis scutellis parvis armata. Rostrum spina recurvata munita. Pinna dorsalis prima secunda bene separata, alta, spinis septem sustentata.

Lateral line armed with small osseous scutellæ. Snout provided with a recurved spine. Teeth cardiform, in a band in each jaw. First dorsal fin not contiguous to the second, elevated and provided with about seven radiating spines. Caudal fin convex or subtruncated. Pectorals fins with its hinder border subtruncated above and obliquely convex below. Ventral fins well developed, and about as long as the pectoral.

*Chænichthys* is here retained with the same limits assigned to it by Sir John Richardson and by Dr. *Günther* in his "Catalogue of the Acanthopterygian Fishes." Subsequently, there was referred to it, by the latter gentleman, a species which does not agree with the characters originally given to it, and which appears to be the representative of a different genus.

CHÆNICHTHYS RHINOCERATUS, Richardson.

*Chænichthys rhinoceratus Rich.*, Ichthyology of the Erebus and Terror, p. 13, pl. vi., figs. 1, 2, 3.

This species is found among the kelp weed on the shores of Kerguelen's Land, and attains a length of nearly two feet. Specimens were caught by the hook.

Genus CHAMPSOCEPHALUS, Gill.

*Chænichthys* sp. *Günther*, (1861.)

Linea lateralis inermis. Rostrum spina obsoleta. Pinna dorsalis spinosa secundæ approximata, spinis decem munita.

Lateral line unarmed, formed by small tubules. Snout with no spine. Teeth of the jaws cardiform. First dorsal fin contiguous to the second, as long, or longer, than high, sustained by ten spines. Caudal fin subtruncated or scarcely convex. Pectoral fins large, subtruncated behind, above and below obliquely convex. Ventral fins well developed, and about as long as the pectoral.

1861.]

*Champscephalus* is readily distinguished from *Chænichthys* by the absence of plates along the lateral line, and the different form of the dorsal fin.

CHAMPSOCEPHALUS ESOX Gill.

*Chænichthys esox* Günther, Annals and Magazine of Natural History.

*Habitat.*—Port Famine.

Subfamily PAGETODINÆ Gill.

Pinna dorsalis pone nucham incipiens, parte spinosa vix vel non articulata discreta. Pinnæ ventrales longæ et graciles.

Dorsal fin commencing close behind the nape, with no marked distinction between the spinous and articulated portions. Both the dorsal and anal fins are represented to be low. Ventral fins long and slender.

As the genus *Pagetodes* is only known by an unfinished drawing, made during the voyage of the Erebus and Terror, its characters are very imperfectly ascertained, and it may even belong to a different family from *Chænichthys*, but it is improbable that such is the case; its physiognomy is quite similar to that of the latter genus, and the characters, if correctly represented, will be doubtless found to be of secondary value, as above considered, and not indicative of family rank.

The species for which the subfamily is established is an inhabitant of high Southern latitudes. "When the ships were in the high latitude of 70°, 10' S., and longitude 178½°, a fish was thrown up by the spray in a gale of wind against the bows of the Terror, and frozen there. It was carefully removed for the purpose of preservation, and a rough sketch was made by the surgeon, John Robertson, Esq., but before it could be put in spirits, a cat carried it away from his cabin and ate it." In allusion to the manner in which it was discovered, Sir John Richardson has thought fit to name it *Pagetodes*.

It is difficult to believe that the dorsal and anal fins are as low as represented in the figure of the species, nor can the opercular region be represented correctly. The drawing is certainly very unsatisfactory for the establishment of a distinct group, but as the genus has been named, it is advisable to correctly classify it in order that it may not be renamed, at the same time premising that its arrangement is entirely provisional, and that it may possibly even prove to belong to the same group as *Chænichthys*.

Genus PAGETODES Richardson.

*Pagetodes Richardson*, Ichthyology of the Erebus and Terror, p. 15.

Rostrum inerme. Pinnæ pectorales obliquiter truncatæ. Pinna caudalis emarginata.

Snout unarmed. Teeth in each jaw conspicuous. Dorsal and anal fins low. Caudal fin emarginated. Pectoral fins moderate, behind obliquely truncated downwards and forwards, rounded at their upper angle. Ventral fins very slender and tapering.

PAGETODES.

*Pagetodes Rich.*, Ichthyology of the Erebus and Terror, p. 15, pl. 8, fig. 3.

### Synopsis of the HARPAGIFEROIDS.

BY THEODORE GILL.

Family HARPAGIFEROIDÆ Gill.

*Synonymy.*

Goboidæ part. *Richardson*.

Callionymoidei part. *Bleeker*.

Trachinidæ (*Pseudochromides* part. *Günther*, 1860.

Trachinidæ (*Nototheniinae*) part. *Günther*, 1861.

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*Acanthopterygii* cottoidei buccis inermibus; membrana branchiostega radiis 6 sustentata; pinnis dorsali analique elongatis, pinna dorsali radiis spinosis paucibus pinnam parvam distinctam formantibus; pinnis pectoralibus radiis inferioribus ramosis; pinnis ventralibus jugularibus, sat remotis, radiis I, 5; ventriculo cæcali, cæcis pyloricis paucibus.

Body oblong, generally highest under the first dorsal fin, subeylindrical or even depressed in front, with the caudal peduncle moderate. Skin naked. Lateral line high on the sides, ending near the termination of the second dorsal, continued in front on the head, and connected by a transverse nuchal line with the opposite one. Head moderate, depressed and subcordate or subrhomboid above. Preorbital bones moderate and lateral: infraorbital small and not connected with the preoperculum. Opercular bones all present. Operculum and suboperculum spinigerous. Mouth terminal, with the cleft moderate and lateral, extending near or beneath the eyes. Upper jaw with its arch chiefly formed by the intermaxillary bones, which are scarcely protractile and have very short posterior processes. Supramaxillaries expanded towards ends. Teeth on the jaws. Palate unarmed. Branchial apertures principally lateral. Branchiostegal membrane beneath emarginated behind, and sustained on each side by six rays. Pseudobranchiæ developed. Dorsal fin double, with a short spinous portion distinct from the soft, and partly above the bases of the pectorals. Anal fin shorter than the second dorsal. Caudal fin not forked. Pectoral fins well developed, and with its inferior rays branched. Ventral fins jugular, separated by a rhomboid area, and with a spine and five branched rays. The cranium has only "a very short occipital spine, which does not rise above the hind head, and is not visible in the recent fish." The vertebræ are in increased number ( $\frac{10+x}{14+y}$ ); the vertebral column of *Harpagifer bispinis* has eleven abdominal, and, according to Richardson, twenty-four caudal, but Günther was unable to find more than eighteen. The stomach is cæcal, and the pyloric branch has a few appendages. The air bladder is obsolete.

This family is readily recognizable by its cottoid form, combined with small suborbital bones, armed opercula, perfect and jugular ventral fins, branched lower pectoral rays, and elongated dorsal and anal fins, the former of which has its spinous rays forming a small separate fin. Its lateral line, connected at the nape to its fellow, is also one of its most distinctive characters.

The nearest allies appear to be the Chænichthyoids, Notothenioids, Bovichthyoids, and more remotely the Callionymoids.

From the Chænichthyoids, the Harpagiferoids are principally distinguished by the form of the head and body, and the anterior extension of the lateral line.

From the Notothenioids, by the scaleless body and armed opercula, and the different physiognomy.

From the Bovichthyoids, they are separated by the branched inferior rays of the pectoral fins, unarmed palate and small first dorsal fin.

From the Callionymoids, they are still more widely removed by the structure of the head, the form of the pubic bones, and the corresponding relations of the ventral fins, the greater development of the dorsal and anal fins and structure of the anal, as well as by the larger branchial apertures, cæcal stomach, and pyloric cæca.

The only known genus was placed by Richardson near *Callionymus*.

Dr. Bleeker regarded *Callionymus*, *Harpagifer* and *Chænichthys* as members of the family of Callionymoidei.

Dr. Günther referred it to the family Trachinidæ and group Pseudochromides, and afterwards to the group Notothenina, together with *Notothenia* and *Chænichthys*.

The Harpagiferoids are confined to the seas of high southern latitudes, and there appear to represent the Cottoids of the boreal seas.

1861.]

## Genus HARPAGIFER Richardson.

*Synonymy.*

Batrachus sp. *Bloch, Schneider.*

Callionymus sp. *Forster.*

Harpagifer *Richardson.* Ichthyology of the Erebus and Terror, p. 11.

Linea lateralis inermis, antice tubulosa, "trans nucham cum pari suo conjugato ramulumque ad orbitam utramque emittens." Operculum spina hamifera sursum armatum. Suboperculum spina subrecta et fere horizontali munitum. Dentes velutini et aggregati ad maxillæ utraque symphysis, lateribus pauciseriati.

Lateral line unarmed, its anterior portion formed by small tubules, inflexed at the nape and joined by a transverse line to its fellow of the opposite side, thence continued to each orbit. Operculum armed above with a hooked or hamiform spine. Suboperculum with a straight horizontal one. Teeth subulate, pluriserial at the symphysis of each jaw, pauciserial on the sides. First dorsal fin sustained by three or four spines. Caudal fin rounded behind. Pectoral fins also rounded behind. Ventral fins with the soft rays all branched, and the second and third longest.

Type. Harpagifer bispinis *Richardson.*

The genus has at most only two known representatives, and perhaps only one, as Dr. Günther has considered as belonging to the same species, forms which have been by Richardson regarded as distinct. Until reasons are given for the support of the belief of their identity, they may be regarded as species, as there appears to be a decided difference in color.

HARPAGIFER BISPINIS *Richardson.*

Callionymus bispinis *Forster.*

Batrachus bispinis *Bloch, Systema Ichthyologiæ, Schneid. ed. p. 45.*

Harpagifer bispinis *Rich.,* Ichthyology of the Erebus and Terror, p. 11, pl. 7, figs. 1-3; p. 19, pl. 12, figs. 8, 9.

D. IV. 22-24. A. 17.

Body dark orange, with three irregular large brown bands; dark above. Fins marbled.

*Habitat.* Falkland Islands.

HARPAGIFER PALLIOLATUS *Richardson.*

Harpagifer palliolatus *Rich.,* Ichthyology of the Erebus and Terror, p. 20, pl. 12, figs. 5-7.

D. III. 22. A. 17.

Body dark orange, with irregular large brown bands; back with a broad white band, extending from the snout backwards and laterally dilated under the middle and near the end of the soft dorsal. Fins marbled.

*Habitat.* Falkland Islands.

This is perhaps only a variety of the preceding species as affirmed by Dr. Günther, but as that gentleman appears to have had no better means of ascertaining than Sir John Richardson, it may be retained as distinct until such is proved.

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**Synopsis of the NOTOTHENIOIDS.**

BY THEODORE GILL.

Family NOTOTHENIOIDÆ, Gill.

*Synonymy.*

Sciænidæ part. *Cuv. et val.*

Sciænidæ part. *Richardson.*

Gobiidæ part. "

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Sciænoidei (Sciæniiformes partim) *Bleeker*.

Gobioidei (Gobiiiformes partim) “

Trachinidæ	{	Trachinina part.	} <i>Günther</i> , Catalogue of the Acanthoptery-
		Pseudochromides part.	
Trachinidæ	{	Trachinina part.	} <i>Günther</i> , Annals and Magazine of Natural
		Nototheniina part.	

*Acanthopterygii* trachinoidei *Eleotriiniis* similes, capite haud cavernoso, pinnis pectoralibus radiis ramosis, pinnis ventralibus jugularibus, *linea laterali elevata* postice vel interrupta, i. e.

*Acanthopterygii* elongati, buccis inermibus, vertibriis  $\frac{10+x}{14+y}$ ; corpore regulariter squamosa; capite lateraliter inflata, ossibus haud cavernosis, operculibus integribus, rostro gibbosa, ore terminali, modico; palato lævi; aperturis branchialibus magnis; radiis branchiostegalibus 6; pinnis dorsali analique longis; pinnæ dorsalis portione spinosâ articulatâ separata; pinnis pectoralis radiis inferioribus ramosis; pinnis ventralibus jugularibus, I. 5; stomacho postice expanso, cæcis pyloricis paucibus.

Body oblong or elongated, generally highest at or near the nape, and thence slowly and regularly decreasing to the caudal fin, where it is most compressed; anteriorly subcylindrical. Preanal region generally shorter than the head, rarely longer. Skin covered with regularly imbricated scales of moderate size. Lateral line running high on the sides and near the dorsal fin, rarely uninterrupted; generally terminating near the end of the dorsal, and reappearing along the middle on the sides of the tail, and thence continued to the caudal fin. Head moderate, scarcely or not at all compressed, with the snout moderate and little decurved. Eyes moderate, lateral but partly visible from above. Infra-orbital bones very small, and not articulated with the preoperculum. Opercular bones all present, normally developed and unarmed. Nostrils double, between each eye and the snout; the anterior very small. Mouth terminal, with the cleft lateral, and extending near the vertical of the eye. Upper jaw formed chiefly by the premaxillary bones, which are scarcely protractile, the ascending or posterior processes being very short. Supramaxillary bones expanded towards the ends as usual, mostly retractile under the preorbital. Lips tumid. Teeth acute, present on the jaws. Palatines smooth. Branchial apertures capacious. Branchiostegal membrane below deeply emarginated behind, and provided on each side with six rays. Pseudobranchiæ developed. Dorsal fin double; the spinous portion commences near the nape, is short, and distinct from the soft part; the latter is elongated. Anal fin little shorter than the soft dorsal, and unarmed, with its rays divided like the dorsal, and the membrane notched behind each. Caudal fin moderately developed and not forked. Pectoral fins well developed, with broad bases normally inserted on the scapular arch; its lower rays are branched. Ventral fins jugular, each provided with a spine and five branched rays, the third or fourth of which is generally longest; rarely the second. The cranium is nearly or quite smooth above, and the crests and ridges are rudimentary or obsolete. The vertebræ are in greatly increased number; in one species (*Notothenia purpureiceps*, Rich.) there are forty-six, fifteen of which are abdominal. The stomach is moderate and cæcal. Pyloric appendages are present in small number (3—5).

The family thus characterized is composed of forms that have been by most authors referred partly to the family of Sciænoids and partly to that of Gobioids, but which Dr. Günther has recently placed together in this “family” of Trachinidæ, at the same time distributing them among two of his “groups.”

One of the forms alone was known to Cuvier. He referred it to the family of Sciænoids and named it *Eleginus*. In that family, it had been retained by every naturalist until removed by Dr. Günther. It appears, however, to have very little affinity to any true Sciænoïd, and differs in almost every respect.

Another form was made known by Sir John Richardson under the name of *Notothenia*, and placed by him in the family of Gobioids near *Eleotris*. From that family, as naturally constituted, it decidedly differs by the cæcal stomach, the presence of pyloric appendages, &c.

Dr. Günther, in his Catalogue of Acanthopterygian Fishes, regarding the lateral line as affording distinctive characters, distinguished two of his four groups of the *Trachinidæ* by the continuation of that line to the caudal fin, or its interruption or termination near the end of the dorsal fin.

*Eleginus* having a continuous lateral line was referred to the Trachinina.

*Notothenia*, with an interrupted lateral line, was placed among the æseudochromides.

It appears that the groups so characterized are only technical and artificial, and not natural. The group Trachinina, which is arranged as the second of the family, is composed of the following genera: *Trachinus* L., *Percis* Schneider, *Aphritis* Cuv. et Val., *Sillago* Cuv., *Eleginus* Cuv. et Val., *Epicopus* Günther, *Percophis* Cuv. et Val., *Chanichthys* Rich., *Bovichthys* Cuv. et Val., and *Trichodon* Steller. The genus *Homalopomus* of Girard, it is supposed, may also belong to the group.

As regarded by us, there appear to be several distinct families confounded in this one group. They may be briefly distinguished as follows:

I. Lower pectoral rays simply articulated.

A. Ventral fin thoracic. First and second dorsals sub-equal.....TRICHODONTOIDÆ.

AA. Ventral fins jugular.

Ventrals approximated. Anal very long.

Body scaly.....TRACHINOIDÆ.

Ventrals separated by a wide area. Anal moderate. Body naked.....BOVICHTHYOIDÆ.

II. Lower pectoral rays branched.

B. Head cavernous. Preoperculum abruptly bent inwards beneath the head. Ventrals thoracic.....SILLAGINOIDÆ.

BB. Head with bones not cavernous. Ventrals jugular or subjugular.

a. Snout not produced. Body scaly.

b. Lateral line submedian along tail.....LATILOIDÆ.\*

bb. Fins trachinoid. Lateral line interrupted, or continuous on the tail. ....NOTOTHEONIOIDÆ.

aa. Snout spatuliform. Body naked. ....CHÆNICHTHYOIDÆ.

The genus *Homalopomus* of Girard originated from a mistake of its author. Its species is a member of the Gadoid genus *Merluccius*, near which it was subsequently placed by its describer. A form that has been retained in the family of Latiloidæ, and which was first referred by Günther to the Trachinina, has nevertheless much resemblance to that genus.

The characters used in the above analytical synopsis, to distinguish the various supposed families, are coincident with others of importance; their combination produces or accompanies special modifications of form and difference of physiognomy, and those variations appear to be of family value. Such families appear to be of equal rank with those accepted by the most scientific of the modern therologists and ornithologists, and with those of the reptilian orders of Chelonians and Saurians as viewed by Agassiz, Gray and others. Their value also seems to be much greater than those of the families of Ophidians established by Dr. Günther, which have apparently very little title to such rank;\* it may be further remarked that some of the families recently

\* Mr. Cope, in his admirable series of memoirs on the Ophidiens, is doing much to equalize the groups of that order, and assimilate the value of its families, subfamilies and genera to those of higher vertebrata. With many modifications, the families of Günther are more properly regarded as subfamilies.

instituted by Dr. Gray among the terrestrial pulmoniferous mollusks, appear to have also less right to rank as such. On some future occasion it is proposed to discuss more fully the meaning and limits of families among the fishes. It may perhaps not be uninteresting to here exhibit the views, regarding the present forms, of a naturalist who has been for many years investigating with a prodigious activity the whole class, who has described nearly an eighth of all the known species, inclusive of both recent and fossil ones, and who, by the admirable precision and clearness of his descriptions, surpasses any of his predecessors.

Dr. Bleeker has distributed members of the seven groups, above elevated to family rank, among five of his orders and seven different families. The most patent mode to show the wide differences of his views from those of Günther, will be to arrange them in the regular serial order adopted by himself. Two other groups are introduced which contain the remaining Trachinidæ of Günther. They are the Percoid subfamily of Mesopriodontiformes, with the genus *Latilus* and the family of Uranoscoipoidei.

Caterva 1. Katapieseocephali.

Ordo 24. Percæ.

Subordo 4. Percichthyini.

Sectio 1. Paristempteri.

Tribus 2. Percichthyini.

Familia 76, (14.) Percoides.

Subfamilia 6. Mesopriodontiformes.

Gen. *LATILUS*, Cuv. (&c.)

Subfamilia 8. Trichodontiformes.

Gen. *TRICHOODON* Steller.

Sectio 2. Areiognathi.

Familia 84, (22.) Sciænoidei, = Sciænini, Bon.

Subfamilia 2. Sillaginiformes.

Gen. *SILLAGO*, Cuv. *SILLAGINICHTHYS*, Blkr. *Aspro*, Cuv.

Subfamilia 3. Sciæniformes.

Gen. *ELEGINUS*, Cuv. All others are true Sciænoids, except *Conodon*, which is a Pristipomatoid.

Ordo 26. Scombri.

Tribus 1. Sphyrænichthyini.

Familia 93, (1.) Sphyrænoidei, = Sphyrænidæ, Bon.

Gen. *Sphyræna*, Art. *Paralepis*, Risso. *PERCOPHIS*, Cuv. (fort. tolid subfamilia,) &c. (extinct genera.)

Caterva 2. Platycephalichthyes.

Ordo 31. Uranoscopi = Uranoscopini, Bp.

Familia 114. Uranoscoipoidei.

Gen. *Uranoscopus*, Gron. *Ichthyoscopus*, Swns.

Ordo 33. Platycephali.

Familia 118, (2.) Callionymoidei = Callionymini, Bon.

Gen. *Callionymus* L. *Harpagifer* Richds. *CHÆNICHTHYS* Richds.

Caterva 3. Blennii.

Ordo 34. Cotti.

Familia 120, (2.) Cottoidei = Cottini, Bp. = Cottidæ, Sws.

Gen. *BOVICHTHYS*, Cuv., *Cottus*, L. and the typical Cottoids, but two genera repeated (*Aspidocottus*, Gir. = *Clyptoecottus* "Gir." Ayres); *Hemilepidotus*, Cuv. = *Calycelepidotus*, Ayr.)

Ordo 35. Blennii.

Familia 121, (1.) Trachinoidei.

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Gen. TRACHINUS Art., APHRITIS Cuv., PERCIS Klein, PINGUIPES Cuv., Malacanthus Cuv., Heterostichus Gir.

Familia 123, (3.) Blennoidei.

Subfamilia 4. Comephariformes.

Gen. Comephorus Lac., PAGETODES Richds., an huj loc.

There certainly is scarcely room for greater differences of opinion than those apparent in the respective arrangements by Günther and Bleeker of the above enumerated genera. The classification of the latter is so fundamentally different from any other, that it is impossible to equalize or parallel his groups above families with those of other ichthyologists. It can be only remarked that, among the Teleostean fishes of Müller, the orders are of less value than those generally accepted by ichthyologists, but, at the same time, all the osseous Ganoids are interposed between the genus *Amphisila* and the *Pectorales pediculus* of Cuvier, and the other Teleosteans. On further study, it is probable that Dr. Bleeker, with his usual candor, will be himself the first to modify some portions of his classification. Dr. Günther appears to be correct in approximating to each other many of the above mentioned forms and in separating them from others into which they had been referred, but wrong in collecting them in one family. Some of the allocations which Dr. Bleeker has made in this, as in many other instances, has doubtless resulted from confidence in the correctness of others. One such case is the retention of *Heterostichus* in the family of Trachinoidei, to which it had been referred by Dr. Girard. That genus is, however, very nearly related to *Myxodes* of Cuvier, and is consequently a Blennoid. In the monographic synopses of the various groups which it is proposed to publish, the relations of the families here noticed will be more fully discussed.

Dr. Günther himself, shortly after the publication of the second volume of "The Catalogue of the Acanthopterygian Fishes," modified his classification of the Trachinidæ by introducing an additional subfamily—"Nototheniina"—in which he included *Notothenia* and *Harpagifer*, previously placed in the group of Pseudochromides, and *Chaenichthys* of the former one of Trachinina. The group so constituted was distinguished by its distinct dorsal fins and interrupted lateral line. The modification appears to be an improvement on the former arrangement, but the remarks previously made on the value of the characters of the several types, are equally applicable to the revised classification.

We now offer a synopsis of the respective groups which appear to us to be nearly related, and together to constitute a homogeneous and distinct family:—

Lateral line interrupted. Body regularly tapering.....	NOTOTHENINÆ.
Abdominal region shorter than head. Dorsal spines slender..	Notothenia.
Abdominal region longer than head. Dorsal spine short and stout.....	Macronotothenia.
Lateral line continuous. Body subfusiform.....	ELEGININÆ.
Abdominal region shorter than head. First dorsal triangular.....	Eleginus.

The family thus formed appears to be a perfectly natural one, notwithstanding the difference of the lateral line. The lateral line of the genus *Eleginus* may be said to represent the anterior or superior one of *Notothenia*, continued in an uninterrupted course to the caudal fin. An inferior line runs along the middle of the side of the caudal peduncle in *Notothenia*, and is often visible a short distance in front of the termination of the higher one. The lateral line may be therefore said to be partly double. But as the presence of two parallel lateral lines is exceedingly uncommon in fishes, and the line of *Eleginus* is homologous to the upper one of *Notothenia* if projected backwards, the lower one consequently disappears in the former.

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In other families, such as the Chromoids, Pomacentroids and Labroids, the lateral line is also generally interrupted, or it is sometimes obsolete behind, and sometimes the superior or anterior portion is deflected and joins the inferior and posterior one, thus forming a continuous line, but not pursuing an uninterrupted course. No instance is apparently known where the superior part is entirely developed at the expense of the inferior.

In other respects, the likeness of *Notothenia* and *Eleginus* is very apparent, and was commented on by Sir John Richardson; yet he, with too implicit reliance on Cuvier, retained the latter in the family of Sciænoids, while he referred the former to that of Gobioids on account of the flexibility of the dorsal spines of the typical species, and the resemblance to *Eleotris*. All of the essential characters of *Notothenia* and *Eleginus* appear, however, to be shared, the differences being indicative of much less than family rank. The general physiognomy, the essential structure of the fins and the anatomical features, as far as known, are similar. The system of muciferous pores is also entirely homologous; it is most apparent in *Eleginus*, and may be illustrated here.

The lateral line is continued forwards by pores nearly along the oculo-scapular groove, beneath the eyes and near the margin of the snout; again, along the margins of the preopercula and beneath the dentary bones. At the nape are generally three pores between those of the oculo-scapular grooves. Five others are arranged in a more or less regular quincunx in and behind the interorbital area: between each one, forming the anterior angle of the quincunx and the tubular nostril, is generally another. Supernumerary ones are frequently interposed between the preceding; more rarely all on the crown and forehead are rudimentary or obsolete, as in the genus *Macronotothen*.

It remains to indicate the distinctions between the family and others. From the Sciænoids it is distinguished by the non-development of a cavernous skull, the increased number of vertebræ, the structure of the fins and the extent of the anal, the position of the ventral fins, the number of branchiostegal rays, the course of the lateral line, and the absence of scales on the fins. The physiognomy is also quite different.

It differs from that of the Gobioids by the form of the stomach and the presence of pancreatic cæca, the structure and extent of the vertical fins, the relation of the ventral ones, the presence of a lateral line and the structure of the scales.

It is more nearly allied to the Latiloidæ, the Harpagiferoidæ and the Chænichthyoidæ, but its physiognomy is unlike that of any of them. From the first, it is also distinguished by the structure of the fins, the course of the lateral line and perhaps the development of the muciferous pores. From the Harpagiferoids, by the scaly body and the unarmed head. From the Chænichthyoidæ, by the scaly body, as well as the form and structure of the head and the normal development of the snout.

It might, perhaps, be natural to unite the two last named forms in the same family with the present, but the different aspect of the respective groups joined to the positive characters distinguishing them, scarcely appear to warrant such a combination. The Harpagiferoids are in some respects the most closely allied. The Notothenioids seem to hold a position in the Southern seas analogous to that of the codfishes of the Northern ones.

#### Subfamily NOTOTHENIINÆ (Gthr.) Gill.

##### *Synonymy.*

Nototheniina, part. (*Notothenia*) *Günther*, *Annals and Magazine of Natural History*.

*Notothenioidæ* corpore regulariter attenuata, lineâ laterali postice interrupta.

Body robust and anteriorly subcylindrical. Lateral line interrupted behind. 1861.]

Head moderate, oblong, with the cheeks more or less tumid. Profile in front of eye, convex or slightly decurved. Eyes chiefly anterior. Mouth moderate and oblique. Spinous dorsal fin small and distinct from the soft one. The rays of the latter and of the anal are branched.

The subfamily of the *Nototheniinae* is at once recognized by the interrupted lateral line as well as by the form of its body. The first dorsal fin is generally composed of slender spines like those of the Gobioids, but in one genus the spines are robust, acute and short.

The representatives of the group are confined to the southern latitudes, and are principally inhabitants of the sea bounding the Falkland Islands and Kerguelen's Land.

Genus *NOTOTHENIA* Richardson.

*Synonymy.*

*Notothenia* Richardson, Ichthyology of the Erebus and Terror, p. 5.

" *Günther*, Catalogue of the Acanthopterygian Fishes, &c., vol. ii., p. 260.

*Nototheniinae* corporis portione abdominale breve, capite brevior; pinna dorsali prima radiis 5—6, gracilibus et flexilibus; pinnis pectoralibus caudalique convexis.

Body robust, with a stout and short caudal peduncle, and with the preanal or abdominal region shorter than the head. Scales rather small and ciliated. Head more or less scaly, with the skin above soft and naked, or covered with scales. Pores of the nape, oculo-scapular grooves, preoperculum and inter-orbital regions developed. Posterior nostrils subtubular. Teeth of the jaws uniserial on the sides, at the symphysis generally pauciserial. First dorsal fin about as high as long, with its spines flexible, five to six in number. Anal fin commencing under or near the middle of the pectoral fins, and distant from the ventrals less than the head's length; the distance is less than half the length of the fin. Caudal fin convex behind. Pectoral fins large and also convex behind. Ventral fins with its third or fourth rays longest, or both subequal.

Type. *Notothenia coriiceps* Richardson.

The genus *Notothenia* is here really retained with the same limits as were assigned to it by Sir John Richardson, but that gentleman referred to it with doubt a species which has apparently very little affinity with the typical species, and which has been in this synopsis of the family accepted as the type of a distinct genus. The present contains fishes whose length varies from about five to fifteen inches. The species closely resemble each other in physiognomy and general appearance, but yet differ remarkably in the extent of the squamation of the head, there being every variation from almost entire nudity to nearly perfect investment of scales; the preopercular margin, the snout and region behind the supramaxillary bones, are, however, always naked. Although there is scarcely ever so great a variation in the distribution of the scales in one natural genus, I am quite unable to find any other characters which are coincident with the modifications of the squamation that have any pretensions to generic importance. As there is also a strict gradation between the extremes of nudity and squamation, it would appear that there can be little doubt of the generic identity of all the well known species.

There are, however, two forms which are imperfectly known, that manifest considerable variation from their congeners in the relative extent of the second dorsal and anal fins. In one the anal fin has several more rays than the dorsal, while in the typical *Notothenia* the number is either somewhat less or equal. In the second, the anal fin has only two-thirds as many rays as the soft dorsal. That modification appears to be also accompanied by the presence of a wider cranium. Whether those differences are indicative of other modifications of

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structure has not been mentioned. They must, therefore, for the present at least, be retained in the same genus.

The following analytical synopsis is chiefly intended to show the gradations in the extension of the scales on the head :—

- I. Anal rays 25—33, not exceeding those of soft dorsal.  
 Ia. Anal rays 27—33.  
 A. Second dorsal with more rays than anal. Head naked above.  
 a. Scales before or on sides of nuchal groove none.  
 Operculum above *upper* rib scaly; scattered scales before *upper* angle of preoperculum.  
 D. V. 31—33. A. 27—29.  
 Broad lateral band and narrow dorsal band yellow..N. *virgata*.  
 Bands none. Dorsal and anal uniform..... N. *cornucola*.  
 Bands none. Dorsal and anal margined with lighter..... N. *marginata*.  
 aa. Scales between nuchal and oculo-scapular grooves.  
 b. Prenuchal scales in *one* oblique band on each side. Operculum above *superior* rib scaly. Scattered nearly uniserial scales below sub-orbitals. D. V. 35 A. 28. .... N. *coriiceps*.  
 bb. Prenuchal scales in *two* patches on each side. Operculum above *inferior* rib with imbricated scales.  
 c. Cheeks with *lower half* naked. D. IV. 35, A. 31..N. *purpuriceps*.  
 cc. Cheeks *entirely* scaly. Preopercular margin naked as usual. D. V. 35, A. 31—33 ..... N. *cyanobrancha*.  
 AA. Second dorsal and anal nearly equiradiate. Head scaly above and between eyes. Operculum entirely covered with imbricated scales. Cheeks entirely scaly. (Naked along preopercular margin and behind maxillaries as in others.)  
 b. Scales above irregular or scattered. D. VI. 28, A. 28..... N. *sima*.  
 bb. Scales above imbricated. D. VI. 33—34, A. 33..N. *tessellata*.  
 Iaa. Anal rays 25. D. V. 31..... N. *magellanicus*.  
 II. Anal rays 30; dorsal only (IV.) 25..... N. *phocæ*.  
 III. Anal rays only 21 (D. V. 30—31.)..... N. *macrocephalus*.

1. NOTOTHENIA VIRGATA Richardson.

*Notothenia virgata* Richardson, Ichthyology of the Erebus and Terror, p. 18, pl. xi., figs. 5, 6.

*Habitat*.—Falkland Islands.

2. NOTOTHENIA CORNUCOLA Richardson.

*Notothenia cornucola* Richardson, Ichthyology of the Erebus and Terror, p. 8, pl. viii., figs. 4, 5; *ib.* p. 18, pl. xi., figs. 3, 4.

*Habitat*.—Falkland Islands.

This species is closely allied to *N. virgata*, and may be the same; it still more nearly resembles the following.

3. NOTOTHENIA MARGINATA Richardson.

*Notothenia marginata* Rich., Ichthyology of the Erebus and Terror, p. 18, pl. xii., figs. 1, 2.

*Habitat*.—Falkland Islands.

This may be identical with the former, and has been united to it by Dr. Günther; it differs by the paler margins of the dorsal and anal fins.

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4. *NOTOTHENIA CORIICEPS* Richardson.  
*Notothenia coriiceps* *Rich.*, Ichthyology of the Erebus and Terror, p. 5,  
 pl. iii., figs. 1, 2.  
*Habitat.*—Coasts of Kerguelen's Land and of the Auckland Islands.
5. *NOTOTHENIA PURPURICEPS* Richardson.  
*Notothenia purpuriceps* *Rich.*, Ichthyology of Erebus and Terror, p. 7, pl. ii.,  
 figs. 3, 4.  
*Habitat.*—Kerguelen's Land.
6. *NOTOTHENIA CYANORANCHA* Richardson.  
*Notothenia cyanobrancha* *Rich.*, Ichthyology of the Erebus and Terror, p.  
 7, pl. iv.  
*Habitat.*—Kerguelen's Land.
- NOTOTHENIA SIMA* Richardson.  
*Notothenia sima* *Rich.*, Ichthyology of the Erebus and Terror, pl. xi., figs.  
 1, 2.  
*Habitat.*—Falkland Islands.
8. *NOTOTHENIA TESSELLATA* Richardson.  
*Notothenia tessellata* *Rich.*, Ichthyology of the Erebus and Terror, p. 19,  
 pl. xii., figs. 2, 3.  
*Habitat.*—Falkland Islands.
9. *NOTOTHENIA MAGELLANICA* Richardson.  
*Gadus magellanicus* *Forster* apud *Bloch*, *Systema Ichthyologiæ*, *Schneid.*  
 ed., p. 11.  
*Notothenia magellanica* *Rich.*, Ichthyology of the Erebus and Terror, p. 9.  
*Lota magellanica* *Rich.*, op. cit., p. 61.  
*Habitat.*—In littoral sea-weed of Terra del Fuego.  
 Richardson, having apparently forgotten that he had seen a drawing of this  
 species and identified it as a *Notothenia*, afterwards referred to it as *Lota*.  
 This and the following two species are very imperfectly known.
10. *NOTOTHENIA PHOCÆ* Richardson.  
*Notothenia phocæ* *Rich.*, Ichthyology of the Erebus and Terror, p. 8.  
*Habitat.*—Antarctic Ocean (Lat. 65°, Long. 155° W. of Greenwich.)
11. *NOTOTHENIA MACROCEPHALUS* Günther.  
*Notothenia macrocephalus* *Günther*, Catalogue of the Acanthopterygian  
 Fishes, &c., vol. ii., p. 263.  
*Habitat.*—Falkland Islands.

Genus *MACRONOTHEN* Gill.*Synonymy.**Notothenia* ? sp. *Richardson*.*Notothenia* sp. *Günther*.

*Nototheniinae* corporis portiore abdominale elongato, capite longiore; pinna dorsali prima radiis 7, validis, acutis et brevibus; pinnis pectoralibus caudalique truncatis.

Body little robust, with a rather slender caudal peduncle, and with the preanal region longer than the head. Scales small and ciliated. Head with few scales, mostly naked, and above with the sculpture of the bones apparent. Pores scarcely developed. Posterior nostrils subtubular. Teeth of the jaws villiform, stouter and subulate in the outer row. First dorsal fin low, and sustained by about seven short and pungent spines. Anal fin distant more than the head's length from the ventrals, the distance being about equal to the length of the fin itself. Caudal fin moderate, and obliquely subtruncated behind. Ventral fins with the fourth ray longest.

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Type. *Macronotothen Rossii Gill.*

The present is most nearly allied to the genus *Notothenia*, but is distinguished from it by many important characters, all those above enumerated being peculiar, with the exception of the size of the scales and the character of the nostrils, both of which are common to it and *Notothenia*. The most striking difference is the extent of the abdominal region, which entails a corresponding modification of the fins. One of the most positive technical characters is the brevity and pungency of the dorsal spines.

*Macronotothen* is at present represented by only one species, which attains to a length of about three feet. All of the species of *Notothenia* are comparatively small, the largest known not exceeding fifteen inches.

MACRONOTOthen ROSSII Gill.

*Notothenia* ? *Rossii Richardson*, Ichthyology of the Erebus and Terror, p. 9, pl. ix., figs. 1, 2.

*Notothenia Rossii Günther*, Catalogue of the Acanthopterygian Fishes, &c., vol. ii., p. 263.

*Habitat.*—Unknown.

Subfamily ELEGINIINÆ Gill.

*Synonymy.*

Sciænidæ partim *Cuvier*, et auct. al.

Trachinina partim *Günther*.

*Notothenioidæ* corpore fusiforme, lineâ laterali ad pinnam caudalem extendente.

Form subfusiform in profile, highest under the first dorsal fin. Lateral line uninterrupted and continued to the caudal fin. Head moderate or small, with the profile in front of eyes convex or slightly decurved, and with the opercular region somewhat tumid. Eyes principally in the anterior half of the head. Mouth moderate and oblique. Spinous dorsal fin small and distinct from the soft. The rays of the latter fin, as well as of the anal are branched.

The Eleginiinæ are distinguished by the subfusiform body and by the continuation of the lateral line above to the caudal fin. Like *Nototheniinae*, they are inhabitants of the Southern seas; but representatives extend much farther towards the equator.

Genus ELEGINUS *Cuvier*.

*Synonymy.*

*Eleginus Cuvier et Val.*, Histoire Naturelle des Poissons, tom. v., p. 158.

*Eleginus Gay, Richardson, Günther.*

Body rather slender, subfusiform in profile, highest above the abdomen, rather rapidly decreasing between the dorsal and anal fins, and with the caudal peduncle slender. Scales rather small, and minutely ciliated. Head scaly above and on the sides, but with the snout and preorbital region naked. Pores of the nape, oculo-scapular grooves and forehead well developed. Nostrils simple. Teeth of the jaws villiform and in a narrow band. First dorsal fin triangular, with eight or nine rapidly decreasing spines. Second dorsal and anal fins highest in front, and slightly incurved behind. Anal fin distant from the ventrals about a head's length, longer than that interval. Caudal fin emarginated. Pectoral fins pointed. Ventrals with the second or third ray longest.

Type. *Eleginus maclovinus Cuv. et Val.*

Three species of *Eleginus* have been described, and a fourth nominal one has been added by Sir John Richardson. The last is doubtless identical with the typical species of the genus, having been described from specimens taken at the same islands as those of which the *Eleginus maclovinus* is an inhabitant; and the remarks concerning its abundance and uses themselves strongly corroborated.]

roborate the identity of the two species. The *Eleginus bursinus* is very imperfectly known, no characteristic or distinctive character having been assigned to it by Cuvier and Valenciennes, their notice chiefly comparing it with the *E. maclovinus*.

The following synopsis indicates the principal differences between the species.

Caudal emarginated. Angle of preoperculum obtusely angular.  
 Greenish, with blackish margined scales..... *E. maclovinus*.  
 Brownish. Second dorsal spotted..... *E. bursinus*.  
 Caudal entire or convex. Angle of preoperculum nearly rectangular. Body one-sixth as high as long..... *E. chilensis*.

1. *ELEGINUS MACLOVINUS* Cuv. et Val.

*Atherina macloviana* Lesson, Voyage de la Coquille, Zoologie, vol. ii., p. 202, pl. 17.

*Eleginus maclovinus* Cuv. et Val., Hist. Nat. des Poissons, tome v., p. 158, pl. 115.

*Eleginus falklandicus* Richardson, Voyage of the Erebus and Terror, Fishes, p. 30, pl. 20, figs. 1—3.

*Habitat*.—Falkland Islands.

2. *ELEGINUS BURSINUS* Cuv. et Val.

*Eleginus bursinus* Cuv. et Val., Hist. Nat. des Poissons, tome v., p. 161.

*Habitat*.—Port Jackson, Australia.

3. *ELEGINUS CHILENSIS* Cuv. et Val.

*Eleginus chilensis* Cuv. et Val., Hist. Nat. des Poissons, tome ix., p. 480.

*Habitat*.—Chilian coast.

[NOTE.—After the preceding paper had been forwarded to the Academy, it was discovered that two species, (*Aphritis undulatus* and *A. porosus*,) referred by Jenyns to the genus *Aphritis*, not only are generically distinct, but belong to a different family, and form a genus nearly related to *Eleginus*, which will be at an early date described as *Eleginops*. *Aphritis* is apparently most nearly related to the genus *Percophis*.

The Committee to which was referred Dr. Slack's Handbook to the Museum of the Academy of Natural Sciences, recommended that it be published with the sanction of the Academy. The report was adopted and the Committee discharged.

On motion, permission was granted to Mr. E. D. Cope to state to the Academy a few observations which he had made upon certain Cyprinoid fish in Pennsylvania during the previous summer:

He had observed that the *Cyprinella analostana* of Girard—the only known eastern representative of the genus—found hitherto only in the Potomac—extended into the northern regions of the Susquehanna basin, having been discovered by him in Elk Lake, Susquehanna Co. It had since been found in the Delaware region, near Philadelphia, by Mr. J. Burke, who had placed specimens in the Academy's aquarium; and near Trenton, N. Jersey, by Mr. Abbott, the ichthyologist. The *Pliargyrus* of the Susquehanna, obtained from the Raystown Juniata, Bedford Co., the Meshoppen Creek, Susquehanna Co., and the Elk Creek, Chester Co., he believed to be a different species from that most common in the tributaries of the Delaware, which latter differs materially from the New England fish called by some *P. cornutus*. The *Leucosomi* appeared to be similarly distributed. That of the Susquehanna

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is *L. cataractus* of Prof. Baird,\* an abundant fish, and one that takes the bait very eagerly. That inhabiting the Brandywine, the Rancocas and other tributaries of the Delaware, differed from this and from the New England species, *L. pulchellus*, Storer, in the greater size of its scales. The number which the lateral line traverses is 47; in *cataractus*, the same; in *pulchellus*, 59. Other specific peculiarities were presented in the following diagnostic form:—

Length of head entering into total length (including caudal fin), four and three-quarter times; greatest depth of body seven-eighths the length of the head, of which the diameter of the orbit occupies a little more than one-fifth. Length of the superior surface of the head a little less than one-third the distance between the extremity of the muzzle and the base of the dorsal fin, and twice the breadth between the orbits. The distance from the base of the caudal fin to the anterior border of that of the dorsal is nine-tenths the distance anterior to the latter point. Ventral fin opposite the dorsal; its anterior border shorter than that of the anal, which is similarly related to the dorsal in that respect. The muzzle projects slightly beyond the mandible. Mouth cleft obliquely downward, its rictus corresponding with a point marking three-fourths the distance from the end of the muzzle to the anterior rim of the orbit. Barbels quite small, even in large specimens. Membranous border of the operculum narrow; that at the bases of the scales slight. The exposed portions of the scales upon the sides are twice as high as wide, and nearly symmetrical; there are about twenty strong radii, and numerous weak concentric lines, which are strongest near the margin. Eight rows above the lateral line, five below; total fourteen; seven rows upon the caudal peduncle at its middle.

This species had been called *Semotilus corporalis* by Mr. Abbott, (Proceed. Acad. Nat. Sci., Phila., 1861, p. 154,) but Mr. Cope was of the opinion that *Cyprinus corporalis* of Mitchell was a different fish. He also dissented from the generic determination of the former author. He proposed, therefore, that it be known as *Leucosomus rhotheus*. Mr. Abbott's radial formulæ were correct, but there were apparent inaccuracies in the description of color; without living specimens, a correction could not be made, but its general appearance when drawn from the water, as far as Mr. Cope recollected, was silvery, without spots or bands. Shortly after death the upper regions became of a light steel blue. Mr. Cope further stated that *Semotilus atromaculatus* of Mr. Abbott's article was also a *Leucosomus*. Specimens of another *Leucosomus* had been sent to the Academy from the Alleghany River.

He had found neither *Ceratichthys* nor *Exoglossum* in the Delaware streams, though they abounded in those of the Susquehanna.

Mr. Cope stated that he had made the interesting discovery of the occurrence of the genus *Chrosomus* Raf. in the Susquehanna basin. It had been previously known exclusively as a transalleghean type. The specimens of the species which he called *Chrosomus eos*, were caught in the Meshoppen creek, Susquehanna county. The peculiarities which first strike the eye as separating them from those of *C. erythrogaster*, are—1st, the absence of lateral line; 2d, the nearly straight dorsal outline; 3d, the want of prominence of the premaxillary region, and the downward slope of the mouth; 4th, the confluence on the tail of the lateral colored bands. A groove extends on each side of the body above the position corresponding to that of the rudimentary lateral line of *erythrogaster*; along this the superior lateral black stripe runs. The inferior band becoming confluent with the upper, traverses the median lateral line of the peduncle of the tail. The depth of the body anterior to the dorsal fin enters the length exclusive of the caudal fin, a little more than four times. Thus it is a more slender species than the *erythrogaster*. The

\* Iconogr. Encyclop. ii. p. 216.

diameter of the eye is greater than the distance from its anterior border to the end of the muzzle; it enters the length of the head  $3\frac{1}{2}$  times. The proportions of the fins are similar to those in *erythrogaster*, excepting in the absence of one ray in the anal, and two in the caudal. The formula is D. 8, C. 18, A. 8, V. 8, P. 16. Of the five larger pharyngeal teeth the smallest is much hooked. In specimens  $2\frac{1}{2}$  inches long taken in September, the abdomen was yellowish silvery as far as the inferior lateral line; above this the tint was brownish vitelline, darkest superiorly. No silvery between the bands.

In presenting to the Academy a specimen of *Phalotris tricolor* (*Elapomorphus tricolor* D. and B.) from Paraguay, Mr. Cope took occasion to state that in his opinion *Elapomorphus* as left in the *Erpetologie Générale* was a union of three generic forms, which he stated to be the following. First *Elapomorphus*, having four frontal plates; species, *E. blumii*, *E. affinis* Rhdt., *E. wuchereri* Gthr.; second *Phalotris*, in which the post-frontals are confluent,\* species, *P. tricolor*, *P. lemniscatus*, *P. reticulatus* Peters sp. and *P. bilineatus*; third, *Apostolepis*, in which the prefrontals are obliterated; species, *A. lepida* Rhdt. sp., *A. flavotorquata* and *A. orbigny*. Prof. Reinhardt had subsequently, very properly in Mr. Cope's opinion, placed the *E. gabonensis* Dum. in his genus *Urobelus*, (the African type,) with the *U. acanthias* of Kroyer.

The obtuse tail, and peculiar frontal plates of *Apostolepis*, were observed in the genus *Sympholis* Cope. But the latter differed widely in its equal, grooveless teeth, its loreal plate approaching the orbit, and its nasal confluent with the first superior labial. The tail was shorter and more obtuse, the body more massive, the gastrosteges narrower, one small preocular above the loreal, one or no postocular. The eye very small, the muzzle prominent, obtuse, and furnished with a large rostral shield. No traces of scale pores, or posterior extremities. Urosteges two-rowed. He thought this singular form bore some affinity to *Stenorhina*, and perhaps to *Conopsis*, Gthr., which he had not seen. *S. lippiens* had been sent from Guadalaxara, Mexico, by Mr. I. I. Major, to the Smithsonian Institution. The following diagnostic notice was offered: five separate upper labials, all higher than long except the last; the first two in contact with the orbit. Third and fourth separated from occipital by one temporal. Each of the latter is a little longer than broad, and has its external anterior angle cut off by suture. The place of a superior postocular is occupied by a process of the superciliary; the inferior is on one side supplanted by the second superior labial. Superciliary plate as broad as the vertical; the latter is elongate hexagonal, the anterior and posterior angles equal and right. The frontals heptagonal, broad as long; rostral prominent, depressed, angular posteriorly. Scales higher than long, in nineteen rows. Tail scarcely twice as long as head, terminating in a convex shield. Anal plate entire. Total length 20 in. 9 lin., color yellow, with eighteen black bands on the body more or less incomplete inferiorly, two on the tail, and one covering the muzzle to behind the eyes.

The same locality and explorer had furnished the fifth species of *Coniophanes*, *C. lateritius*, which Mr. Cope exhibited to the members. The coloration was brilliant and at once characterized it. The whole body was bright vermillion punctulated with brown, passing through orange to golden on the belly. The head, and neck for ten scales posteriorly were black, the labials bordered and traversed by yellow lines, and the occipitals dotted with the same. Throat and chin yellow, black spotted. The head was broad posteriorly, and the outline converged rapidly to the acute prominent muzzle. Loreal square; one pre-, two postoculars. Seven upper labials, eye over third and fourth, fifth very large. Ten inferior labials. Scales in nineteen rows. Vertical plate nearly as broad as long. Anal divided. Total length 24 in. 3 lines, of this the tail is seven inches.

\*Vid. Pr. A. N. S. 1861, p. 302

The following remarks by Dr. Stewardson, on the *Ailanthus* Silk Worm, are here introduced, having been accidentally omitted in their proper place :

At a meeting of the Academy, held March 5th, Dr. Stewardson called the attention of the members to the subject of the recent introduction of the *Ailanthus* Silk Worm into France, and its probable adaptation to our own country. Having been much interested in the short notices which he had met with in the French journals, he mentioned the subject to his friend, G. Roberts Smith, of this city, who kindly obtained for him from Paris a case containing specimens of this new silk worm (*Bombyx cynthia*), of its cocoon, and of the silk obtained from them, in the several states of crude silk, thread and woven cloth. These specimens were exhibited for the inspection of the members. In the month of June, through the kindness of the same gentleman, eggs of this *Bombyx* were received from Paris. The first lot entirely failed, most of the eggs having hatched before reaching their destination. From a second importation, which arrived a few days subsequently, Mr. Evans, an intelligent manufacturer in the neighborhood of Philadelphia, who warmly interested himself in Dr. Stewardson's views of introducing the cultivation of this silk in our country, succeeded in raising a few worms, which formed their cocoons in July. Towards the middle of August the butterflies made their appearance, and the eggs laid by them hatched their worms from the 30th of August to the 3d of September. A part of these worms were placed by Mr. Evans upon a copse of *Ailanthus* in the neighborhood of his house. Another portion were placed by Dr. Stewardson upon a large *Ailanthus* tree in a private garden in Philadelphia. The remainder were fed by Dr. S. in a room at his own house. Those placed in the open air were exposed to violent rains and wind, but without injury. Nearly all those placed upon the tree in the city came to maturity and spun their cocoons, about eighty in number. Of those placed in the open air by Mr. Evans, many were destroyed by birds, but in other respects the success was perfect. About forty cocoons were obtained by Dr. S. from the worms raised at his house. A specimen of one of the latter, feeding upon the leaf of the *Ailanthus*, and on the eve of forming its cocoon, was exhibited to the members of the Academy, by Dr. Stewardson, at their meeting, held October 1st, at which time he gave a short history of his experiments and their results.

The *Ailanthus* Silk Worm, brought from China to Turin, in 1857, was introduced into France by M. Guérin-Méneville, in 1858, and already the results of its cultivation have been so encouraging, that but little doubt is now entertained that the production of this silk will soon become an extensive branch of industry in that country.

From a statement recently made to the French Academy, by M. Guérin-Méneville, it appears that the cocoons, which at first had to be carded, have been successfully unwound, but by what process he does not mention. This last discovery adds most materially to the value of this silk, and the ease with which the *Ailanthus* can be cultivated upon the poorest soils, together with the comparatively small amount of labor required in raising the worms, which, when a few days old, are placed upon hedges in the open air, and require scarcely any further attention, render this culture particularly worthy of attention in this country. The experiments of Dr. Stewardson convince him that our climate is well adapted to raising this worm, and that in this latitude two crops can be obtained in a season. Having succeeded in raising upwards of one hundred cocoons, he hopes, with the assistance of any gentlemen who may feel an interest in the subject, during the coming season, to continue the experiments upon this interesting subject on a more extensive scale.

The Reports of the Recording Secretary and Curators were read, as follows :

## REPORT OF THE RECORDING SECRETARY FOR 1861.

During the year ending 30th November, 1861, there have been elected sixteen members and fifteen correspondents.

One member has resigned.

Eight members have died, to wit: Mr. John H. Markland, Dr. Charles Huffleagle, Dr. Samuel Moore, Dr. Richard Clements, Mr. Francis Peters, Mr. George M. Keim and Dr. George Spackman.

The death of the following correspondents has been announced: Prof. F. Tiedemann, of Heidelberg, and Dr. M. Grateloup, of Bordeaux.

During the same period the following papers have been read and ordered to be published in the Journal or Proceedings of the Academy:

By Charles C. Abbott, four, to wit: "Description of two new Species of *Pimelodus*, from Kansas." "Observations on *Cottus Copei*." "Notes on the Habits of *Aphredoderus Sayanus*." "On *Cyprinus Corporalis*, etc."

By Harrison Allen, M. D., two, to wit: "Description of new Pteropine Bats from Africa." "Description of a new Mexican Bat."

By W. G. Binney, two, to wit: "Catalogue of land and fresh-water Univalve Mollusks, etc." "Notes on the Terrestrial Mollusks of the Peninsular of California."

By A. D. Brown: "Description of two new Species of *Helix*."

By S. B. Buckley, two, to wit: "Notes on Ants in Texas." "Notes on the Bartram Oak."

By John Cassin: "Descriptions of new Birds from Western Africa, in the Museum of the Academy of Natural Sciences of Philadelphia," published in the Journal.

By E. D. Cope, four, to wit: "Catalogue of Colubridæ in the Museum of the Academy, etc., part 3." "Notes and descriptions of Anoles." "Contributions to the Ophiology of Lower California, Mexico and Central America." "On the Reptilia of Sombrero and Bermuda."

By Elliott Coues, three, to wit: "Monograph of Tringæ of North America." "Notes on the Ornithology of Labrador." "Monograph of the Genus *Ægithus*, etc."

By Wm. H. Edwards: "Descriptions of certain Species of Diurnal Lepidoptera."

By D. G. Elliott: "Description of a new species of *Pitta*."

By Wm. M. Gabb, six, to wit: "Description of some new Species of Tertiary Fossils from Chiriqui." "Synopsis of American Cretaceous Brachiopoda." "List of the Mollusca inhabiting the neighborhood of Philadelphia." "Descriptions of new Species of Cretaceous Fossils from New Jersey, Alabama and Mississippi." "Descriptions of new Species of American Tertiary Fossils, etc." "Notes on Cretaceous Fossils, etc."

By Wm. M. Gabb and George H. Horn: "Monograph of the Fossil Polyzoa of the Secondary and Tertiary Formations of North America," published in the Journal.

By Theodore Gill, seventeen, to wit: "Description of a new Species of the Genus *Anableps*." "On the Classification of the *Eventognathi*." "Appendix to the Monograph of the *Phylipni*, etc." "Synopsis of the Subfamily of *Clupeinæ*, etc." "Synopsis of the Subfamily of *Percinæ*." "Synopsis Generum *Rhyptici et Affinium*." "Revision of the Genera of *Sciæninæ* of North Ame-

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rica." "On the identity of the Genera *Neomœnis* of Girard and Lutjanus of Block." "On the Haploidonotinae." "On the Genus *Aristotremus*." "Synopsis of the Uranoscopoids." "Notes on some Genera of Fishes of the Western Coast of North America." "On a new type of Aulostomatoids, etc." "On the Genus *Podothecus*." "Description of a new Generic Type of Blennoids." "Monograph of the Tridigitate Uranoscopoids." "Synopsis of the Polynematoids." "Catalogue of the Marine Fishes of the Eastern Coast of North America, etc."

By George H. Horn: "Descriptions of new North American Coleoptera."

By Robert Kennicott: "On three new forms of Rattlesnakes."

By Isaac Lea, nine, to wit: "Description of twenty-five new Species of Unionidæ, from Georgia, Alabama, Mississippi and Florida." "Description of a new Species of Neritina, etc." "Description of two new Species of Anodonta, etc." "Description of new Species of Anodonta and Lithasia." "Descriptions of twelve new Species of Uniones from Alabama." "Description of a new genus (*Strephobasis*,) etc." "Description of forty-nine new Species of the Genus *Melania*." "Description of new Fossil Mollusca from the Cretaceous formation of Haddonfield, N. J." "New Unionidæ of the United States," published in the Journal.

By John L. LeConte, M. D., two, to wit: "New Species of Coleoptera inhabiting the Pacific District of the United States." "Notes on the Coleopterous Fauna of lower California."

By F. W. Lewis, M. D.: "Notes on new and rare Species of Diatomaceæ of the United States Seaboard."

By F. B. Meek: "Descriptions of new Cretaceous Fossils, etc."

By F. B. Meek and A. H. Worthen: "Descriptions of new Palæozoic Fossils, etc."

By Thaddeus Norris: "Description of a new Species of *Osmeus*, etc."

By Baron R. Osten Sacken: "Nine new North American Limnottiaceæ."

By Temple Prime, two, to wit: "Synonymy of the Cyclades, etc." "Descriptions of new Species of *Cyrena*, *Corbicula* and *Sphærium*."

By Edmund Ravenel, M. D.: "Descriptions of new recent Shells from the Coast of South Carolina."

By J. H. Slack, M. D.: "Description of a new Species of Rodent of the Genus *Spermophilus*."

By William Stimpson, two, to wit: "On the Marine Shells brought from Hudson's Bay by Wm. Drexler, etc." "Notes on certain Decapod Crustacea."

By George Suckley, M. D., U. S. A.: "Description of a new Species of North American Grouse."

By Philip R. Uhler, three, to wit: "Rectification of the Paper upon Hemiptera of the North Pacific Exploring Expedition." "Hemiptera of the North Pacific Exploring Expedition, etc." "Descriptions of four new Species of Hemiptera, etc."

By H. C. Wood, Jr, three, to wit: "Descriptions of new Species of Scolopendra, etc." "On the American Chilopoda, etc," published in the Journal. "Description of a new Species of the Genus *Thelyphonus*."

By John Xantus: "Description of three new Species of Star-fishes."

In all 77 papers.

During the same period the By-Laws have been amended as follows :

Article VIII. Chapter X. Add the words "of more than twenty of those extra copies." Adopted 31st December, 1860.

Article II. Chapter II. Lines first and second, to read thus: "No person residing in Philadelphia, or within a circuit of thirty miles, unless he be an Officer of the Army or Navy, can be chosen a Correspondent."

Article II. Chapter III. Introduce instead of the word "City," the words "aforesaid District and a Circuit of thirty miles around it;" and adding to the close of said article, "But this should not be construed with an exemption

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from payment of the regular dues on the part of those who, at the time of their election or afterwards, may have their permanent residence outside of said Circuit." Adopted 26th March.

All of which is respectfully submitted,

B. HOWARD RAND, M. D.,

*Recording Secretary.*

## REPORT OF THE CURATORS FOR 1861.

Notwithstanding the unsettled condition of affairs of the country which absorbs so much the attention of our members as well as of all other citizens, the Museum of the Academy, during the year about closing, has presented about as much prosperity as in preceding years.

The collections generally continue in a good state of preservation, and none of the more perishable objects have suffered injury, except the entomological cabinet. In this department the orthoptera, which appear to have attracted little attention either for study or preservation, have been nearly destroyed. The other orders have been slightly damaged, but the Curators will shortly take steps to prevent further injury. The extensive herbarium and ornithological cabinet, as well as the collections of mammals, reptiles, fishes and crustacea, are in excellent condition.

A greater number of persons have visited the Museum this year than at any previous time. This, though gratifying as indicative of an increasing interest in our Institution, is attended with a result which requires some remedy. The movements of crowds of visitors give rise to clouds of dust which penetrates the cases and obscures the specimens. In default of means to render the cases impervious to dust, a person should be employed to cleanse the specimens.

The limited space occupied by the Academy is fast becoming inconveniently crowded by its collections, and it is to be regretted that we have no provision for a further extension of our space. Certain collections receive no accommodation whatever; as, for instance, a series of rocks or geological specimens. The last resource of the Curators to accommodate large objects is to mount them in the air above the cases occupying the floor, as has been recently done with the skeleton of a whale. For want of room, the Curators are almost constantly obliged to use the library, in the unpacking and packing of boxes. It is greatly to be hoped that an opportunity may arise which will give us the means of amplifying our space for the accommodation of our rapidly increasing museum and library.

The most important contributions to the Cabinet of the Academy during the year, are as follows:

1. The skeleton of a whale 30 feet in length, presented by George Davidson. It was mounted by James A. Wood, and now forms one of the most conspicuous objects of the Museum. The whale was captured last summer in the Delaware river, opposite Philadelphia.
2. A collection of 2500 specimens of marine animals, obtained last summer on the coast of Maine. Presented by Dr. J. H. Slack.
3. A large collection of marine animals from New Providence, Bahamas. Presented by H. C. Wood, Jr.

Besides the preceding, in addition to many objects received in exchange and on deposit, the following have been presented in the various departments of the Cabinet:

*Mammals.*—Eighty-six specimens of 30 species of rodents, bats, and carnivora, were presented by Dr. J. L. LeConte; the Smithsonian Institution presented 29

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specimens of 18 species of rodents and ruminants; 18 specimens of 14 species, chiefly quadrumana, were presented by Dr. J. H. Slack; 18 specimens, 8 species of Texas animals were presented by Dr. A. L. Heermann; and 11 others were presented by Van Amberg's Menagerie Co., Dr. J. M. Corse, S. B. Buckley, Geo. Davidson, J. R. Campbell, J. Krider, and Dr. J. Bryan.

*Birds.*—Ninety-nine specimens of 57 species of Western African birds, collected by Du Chaillu, were presented by Messrs. T. B. Wilson, S. and J. Jeanes, I. Lea, F. Rogers, C. E. Smith, A. H. Smith, J. Leidy, W. P. Foulke, E. Harris, W. S. Vaux, J. D. Logan, G. A. McCall, J. C. Trautwine, E. Durand, W. M. Uhler, S. W. Mitchell and J. L. LeConte. Thirty-nine specimens of 37 species, principally American birds, were presented by Dr. J. C. Letterman, T. Sitgreave, Dr. W. Gibson, Dr. A. L. Heermann, J. Jeanes, J. H. Slack, G. Davidson, J. H. Powel, C. J. and W. S. Wood, Mr. Orthwein, Dr. A. J. Foard, A. C. Thomas, and J. Rodgers. Dr. Slack presented 62 eggs, 27 species, from Minnesota; C. S. Westcott, 15 species eggs and 5 nests; Mr. Gabb, the egg of a Rhea; and Alfred Newton the nest and eggs of the Waxwing, *Ampelis garrulus*.

*Reptiles.*—Seventy-one specimens, 20 species of Texas reptiles, were presented by Dr. A. L. Heermann; and 19 specimens, of 16 species, were presented by Geo. Davidson, H. C. Wood, Dr. A. Wilson, E. C. Mitchell, E. D. Cope, M. Canby, and W. J. Chaloner.

*Fishes.*—The Smithsonian Institution presented 175 species, chiefly of American fishes. Mr. S. Powel presented 20 species, Dr. W. Gibson 16, Dr. Ruschenberger 17, and 10 others were derived from Capt. J. M. Dow, H. C. Wood, T. Norris, W. M. Gabb, J. T. Darby and Mr. Vanderslice.

*Mollusks.*—Lieut. T. T. Field presented a fine collection of shells from the Bay of Panama and other places; G. W. Tryon, Jr., presented 80 species of *Helix*; S. S. Haldeman 8 species *Ancylus*; and 70 species of shells were presented by G. Lincecum, T. Prime, G. W. Tryon, Jr., Dr. Ruschenberger, T. Bland, W. G. Binney, J. L. Mackey, Dr. Showalter, A. L. Heermann and M. Miles.

*Articulates.*—The Smithsonian Institution presented 55 species of crustacea, Geo. Davidson 12 species; and others were presented by Capt. J. M. Dow, J. Starr, Dr. Jos. Wilson, J. T. Darby and C. S. Westcott.

Of insects, Dr. A. L. Heermann presented a collection from Texas; and several specimens were obtained from Lieut. Field and A. Wilson. There were also presented several spiders, scorpions, and myriapods by Lieut. Field, H. C. Wood, J. T. Darby.

*Radiates.*—The Smithsonian Institution presented 35 species of corals, types described by Dana. Thirty-six echinoderms of 25 species were presented by Dr. W. F. Atlee, Capt. J. M. Dow, S. Powel, Dr. W. Gibson, Lieut. T. Y. Field, Dr. Ruschenberger, and Dr. F. W. Lewis. Four other radiates were presented by M. Newkirk, Dr. Cleburne and S. Powel.

*Anatomy.*—Dr. Jonathan C. Letterman, U. S. A., presented two skeletons of the camel, 1 of the Rocky Mountain sheep, and the skull of a grizzly bear. Dr. Heermann presented 8 skulls of mammals, Geo. Davidson 4, Mr. Krider 1, and Dr. D. P. Heap an ancient Roman skull. Miscellaneous specimens were presented by R. G. Curtin, Capt. Dupont, Dr. Cleburne, C. E. K. Kortright, R. E. Griffith, C. P. Eakin, Geo. Davidson and Dr. F. G. Smith.

*Fossils.*—An interesting collection of mosasaurus' remains from New Jersey, were presented by Dr. J. H. Slack, J. Hopper, O. C. Herbert and U. Smock. Some cretaceous crocodilian and shark remains were presented by W. W. Lamb, a collection of miocene shark teeth by H. C. Yarrow, a miocene cetacean vertebra by T. J. Yarrow, Jr., M. D., a fine *Carcharodon megalodon* tooth by Dr. J. M. Corse, and a few other vertebrate remains by Rev. W. A. Breed, H. C. Yarrow, Abbott and Slack. S. S. Lyon presented 20 fine species of carboniferous fossils from Kentucky, Dr. Slack 98 species from the Isle of Man; and Dr. W. C. Dixon presented 8 species of coal plants from Virginia. Dr. W. 1861.]

Spillman presented a collection of eocene shells from Mississippi; and a number of other fossils were received from Ellwood Morris, A. L. Gerhart, C. C. Abbott, H. C. Wood, H. C. Yarrow, G. Lincecum, A. L. Heermann, W. M. Gabb, S. Ashmead and the Smithsonian Institution.

*Minerals.*—The British Consul, C. E. K. Kortright presented a fragment of a meteorite from India. A few minerals were presented by Dr. F. A. Genth, T. Y. Field, J. H. Slack, W. Cleburne, Gillette & Matthews, Mr. Struthers, E. L. Perkins, J. D. Sergeant, G. W. Farquhar, J. C. Fisher and W. W. Wright.

*Botany.*—Mr. Gideon Lincecum presented a collection of Texas plants comprising about 1000 species, S. B. Buckley a collection of Australian plants, Dr. J. L. LeConte a small collection from the herbarium of his father, the late Maj. LeConte, and Dr. I. I. Hayes a collection of living Arctic plants obtained in his late expedition.

*Miscellaneous.*—Mr. E. Samuels presented 33 mounted microscopic specimens, chiefly diatoms; F. W. Lewis 93 specimens, chiefly minute injections, sections of bones and teeth, &c.; and S. Powel 52 specimens. Mr. Pennock presented specimens of cannel coal and a variety of its products; and several rocks, &c. were presented by J. T. Piggott, G. Lincecum, Burke and Slack, and O. N. Rood.

Submitted by

JOSEPH LEIDY,

*Chairman of the Curators.*

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The election of officers for the ensuing year was held, in accordance with the By-Laws, with the following result:

<i>President</i> ,.....	ISAAC LEA, LL. D.
<i>Vice Presidents</i> ,.....	Robert Bridges, M. D., Wm. S. Vaux.
<i>Corresponding Secretary</i> ,.....	Thomas Stewardson, M. D.
<i>Recording Secretary</i> ,.....	B. Howard Rand, M. D.
<i>Librarian</i> ,.....	R. E. Griffith.
<i>Treasurer</i> ,.....	Wm. C. Henzey.
<i>Curators</i> ,.....	Joseph Leidy, M. D., Wm. S. Vaux, John Cassin, J. D. Sergeant.
<i>Auditors</i> ,.....	Wm. S. Vaux, Joseph Jeanes, Aubrey H. Smith.
<i>Publication Committee</i> ,.....	Wm. S. Vaux, Isaac Lea, Robert Bridges, Joseph Leidy, Thomas Stewardson.

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