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PROCEEDINGS

OF THE

ACADEMY OF NATURAL SCIENCES

OF

PHILADELPHIA.

25763

1872.

PUBLICATION COMMITTEE.

JOSEPH LEIDY, M.D., WM. S. VAUX,
ROBERT BRIDGES, M.D., GEO. W. TRYON, JR.,
EDW. J. NOLAN, M.D.

PHILADELPHIA:
ACADEMY OF NATURAL SCIENCES,
Corner Broad and Sansom Streets.
1872.

Hall of the Academy of Natural Sciences,
Philadelphia, March 4, 1873.

I hereby certify that printed copies of the Proceedings for 1872 have been presented at the meetings of the Academy, as follows:—

Pages	1 to 24	. . . .	April	16, 1872.
"	25 to 56	. . . .	June	25, 1872.
'	57 to 72	. . . .	July	9, 1872.
"	73 to 88	. . . .	"	16, 1872.
"	89 to 120	. . . .	"	30, 1872.
"	121 to 168	. . . .	September	3, 1872.
"	169 to 200	. . . .	October	15, 1872.
"	201 to 232	. . . .	"	22, 1872.
"	233 to 264	. . . .	December	17, 1872.
"	265 to 280	. . . .	February	11, 1873.
"	281 to 296	. . . .	March	4, 1873.

SAMUEL B. HOWELL, M.D.,
Recording Secretary.

PHILADELPHIA:
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LIST OF CONTRIBUTORS,

With reference to the several articles contributed by each.

For Verbal Communications see General Index.

PROCEEDINGS

OF THE

ACADEMY OF NATURAL SCIENCES

OF

PHILADELPHIA.

1872.

JANUARY 2.

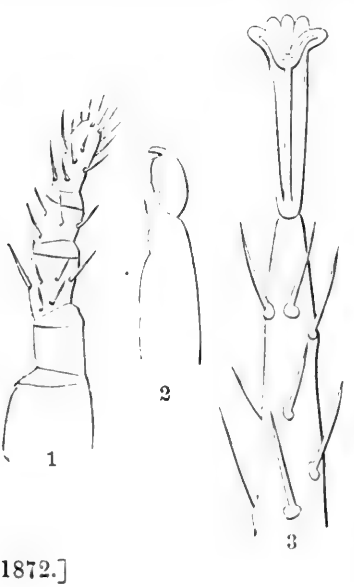
Mr. WM. S. VAUX, Vice-President, in the chair.

Twenty-three members present.

The following paper was presented for publication:—

"List of the Reptilia of the Eocene Formation of New Jersey." By EDW. D. COPE.

On a Mite in the Ear of the Ox.—Prof. LEIDY remarked that he had received a letter from Dr. Charles S. Turnbull, in which he stated that while studying the anatomy of the ear he had discovered in several heads of steers, at the bottom of the external auditory meatus, a number of small living parasites. They were found attached to the surface of the membrana tympani. Specimens of the parasite preserved in glycerine, and a petrosal bone with the membrana tympani, to which several of the parasites were clinging, were also sent for examination. These prove to be a mite or acarus, apparently of the genus *Gamasus*. The body is ovoid, translucent white, about $\frac{3}{5}$ of a line long, and $\frac{2}{5}$ of a line wide. The limbs, jaws, and their appendages are brown and bristled. The body is smooth or devoid of bristles. The limbs



are from $\frac{2}{5}$ to $\frac{1}{2}$ a line long. The feet are terminated by a five-lobed disk and a pair of claws, as represented in figure 3. The palpi are six-jointed, as represented in figure 1. The mandibles end in pincers or chelæ, resembling lobster claws, as represented in figure 2. The movable joint of the chelæ has two teeth at the end. The opposed extremity of the fixed joint of the chelæ is narrow, and ends in a hook.

Whether this mite is a true parasite of the ear of the living ox, or whether it obtained access to the position in which it was found after the death of the ox in the slaughter house, has not yet been determined. Dr. Turnbull observed it only in the position indicated.

January 9.

The President, Dr. Ruschenberger, in the chair.

Twenty-three members present.

January 16.

The President, Dr. Ruschenberger, in the chair.

Twenty-one members present.

January 23.

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

Twenty-six members present.

Mr. Thomas Meehan said that among the ranchmen and miners of California a belief exists that the mammoth *Sequoias* will live eight or ten years after being girdled. These trees often had strips of bark taken off for some distance up, and completely round, for the purpose of exhibition in other countries.

This belief has been generally discredited by those of us accustomed to the prevalent ideas of the effects of girdling. But experience having taught him how often popular observation was nearly at least correct, notwithstanding our predisposition to believe implicitly accepted conclusions, he had watched for some opportunity to test, by some observations of his own, the Californian idea.

A few years ago an Austrian pine on his grounds had the main stem partially girdled by an insect. The opportunity before referred to suggested itself; and he completed the injury, entirely girdling the stem. It was then staked securely to prevent the wind from breaking it off at the injured place. The part above the injury was about four years old, and the whole tree perhaps ten years. It continued to grow both above and below the wound until the last season, when the upper portion died. The whole of the section between the horizontal tier of branches above the girdling and the tier below, a space of about eighteen inches, died the same season with the girdling. He now exhibited a portion of the trunk with part of the stem, which died the year of girdling; and part of the piece which had grown above, and died last year. There were four concentric rings of wood in the former and eight in the latter, showing that it had made four annual circles of wood after the complete girdling.

He then observed that we might assume that the vital functions could scarcely be carried on between the upper portions of the tree and lower, if the intervening cells were dead. He supposed the cells forming the annual concentric masses of wood had a longer period of vitality in some species of trees than in others. In many trees it was well known that such a girdling as that performed on the pine would destroy them in one season. A recent examination of a trunk of *Paulownia* led him to believe that in that tree the cells of the annual circles lived but two years. It was probable that even in the pine family the period of vitality might vary with different species. In the Rocky Mountains of Colorado he had seen many hundreds of trees of *Pinus ponderosa* which had the whole of the bark for about six feet from the ground stripped from the trees for the purpose of getting at the inner bark, which was used as food by the Ute Indians; yet he saw no trees which indicated that they had been destroyed by this heavy girdling process. In the case of the Austrian pine, however, though the formation of wood went on above the girdled portion, growth was not as vigorous as before. The first season after the young shoots were about one foot in length; but these annually decreased, until last year they were but two inches.

Prof. Cope exhibited the cranium of a humped-backed whale from the Caribbean Sea, obtained by Dr. Goës, of St. Bartholomew's, and presented to the Academy through the liberality of Messrs. Wm. S. Vaux and Isaac Lea. He pointed out that while the scapula and cervical vertebræ were of the type of the true *Megapteræ*, the development of the coronoid process of the mandible was comparable to that seen in *Balænoptera*. The orbital plates of the frontal are rather wider than in *M. longimana*. The species was named *Megaptera bellicosa*. Its size was about that of the *M. longimana*, but the flippers were shorter. A full description appeared in the Proceedings of the American Philosophical Society for 1871.

Prof. Cope exhibited a portion of the skeleton of a large crocodile from the cretaceous green sand of New Jersey, belonging to the genus *Holops*. The teeth were smooth, cylindric, acute.

and much curved, the muzzle gavial-like. The cervical vertebræ were very large, and of depressed form; the walls of the long bones unusually thin, and pneumatic foramina large. He called it *Holops pneumaticus*.

JANUARY 30.

Mr. WM. S. VAUX, Vice-President, in the chair.

Twenty members present.

Mr. Wm. Swaim was elected a member.

The following standing committees were elected for 1872:—

ANTHROPOLOGY.

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

COMPARATIVE ANATOMY.

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

HERPETOLOGY.

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

ARTICULATA.

Geo. H. Horn,
R. S. Kenderdine,
T. Hale Streets.

BOTANY.

E. Durand,
Thos. Meehan,
Rachel Bodley.

INVERTEBRATE PALÆONTOLOGY.

T. A. Conrad,
H. C. Wood, Jr.,
Persifer Frazer, Jr.

MAMMALOGY.

Harrison Allen,
Edw. D. Cope,
Henry C. Chapman.

ORNITHOLOGY.

Bernard A. Hoopes,
Edwin Sheppard,
Theodore L. Harrison,
Jas. A. Ogden.

ICHTHYOLOGY.

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

RADIATA.

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

VERTEBRATE PALÆONTOLOGY.

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

MINERALOGY.

Wm. S. Vaux,
E. Goldsmith,
Jos. Wilcox,
Clarence S. Bement,
Persifer Frazer, Jr.

Stratigraphic Geology.

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

Physics.

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

Chemistry.

F. A. Genth,
Robt. Bridges,
E. Goldsmith.

Instruction and Lectures.

Hector Tyndale,
R. S. Kenderdine,
Wm. S. Halsey.

Library.

Jos. Leidy,
Robt. Bridges,
Geo. W. Tryon, Jr.

On favorable report of the committee, the following paper was ordered to be printed:—

LIST OF THE REPTILIA OF THE EOCENE FORMATION OF NEW JERSEY.

BY EDW. D. COPE.

The Eocene Formation occupies in New Jersey, according to Cook, a band extending from near the centre of the State, northeastward, to the Atlantic coast in Mammouth County, in the neighborhood of Deal. Lithologically it consists of a light green glauconite mixed with variable quantities of clay and fine sand. The character of its fossils is marine, including sharks, rays, sawfishes, and swordfishes in great abundance. These forms especially abound in the southwestern part of its area, for example, at Vincenttown, but in the northeastern region reptiles are more abundant, with cetaceans. It is also in that section, near to Shark River especially, overlaid by a thin stratum of loamy sand, which contains fragmentary remains of terrestrial vertebrates of the Miocene period; *e.g.*, *Elotherium*, *Dicotyles*, *Rhinocerus*, etc. Whether the larger mammal described as *Hemicaulodon* (Cope) and *Anchippodus* (Leidy) were derived from this or from the Eocene bed remains uncertain.

The reptiles belong to the *Ophidia*, the *Crocodilia*, and the *Testudinata*, and number only ten species. They are as follows:—

OPHIDIA.

PALÆOPHIS LITTORALIS, Cope.

Proc. Acad. Nat. Sci. Phila., 1868, 234. Trans. Amer. Philos. Soc., XIV. 227.

Shark River.

PALÆOPHIS HALIDANUS, Cope.

l. c. 1868, 235. Tr. A. P. S., XIV. 227. *Dinophis*, Marsh.

Squankum.

PALÆOPHIS GRANDIS Marsh.

(*Dinophis.*) Amer. Journ. Sci. Arts, 1859, 398; Cope Trans. Amer. Philos. Soc., XIV. 228.

Shark River.

TESTUDINATA.

PUPPIGERUS PARVITECTA, Cope.

Trans. Amer. Philos. Soc., XIV. 155 (*Chelone*). *P. parviscutum* (lapsu calami) l. c. 235.

Squankum.

LEMBONAX POLEMICUS, Cope.

Trans. Amer. Philos. Soc., XIV. 168.

Farmingdale.

LEMBONAX PROPYLAEUS, Cope, sp. nov.

Established on an anterior portion of a carapace. This is very peculiar in all respects, and throws much light on the character of the genus. The anterior vertebral or nuchal bone is preserved entire. It is recognized from its combination of a free concave margin, with a basis of attachment of the first dorsal vertebra, and from the first marginal bone on each side symmetrically placed. The sutures thus exposed are very peculiar, and entirely unlike those of any turtle known to me. It is a kind of compound gomphosis, or mixture of the gomphosial and squamosal types. The prominences are long, and penetrate deeply; they are flat, and many grooved on both sides. The suture uniting the nuchal and first costal consists of a median lamina from the former, and two from the latter, fitting into grooves, but deeply grooved, and divided on the edges. That uniting the first marginal is double squamosal, the former entering a groove of the latter, which sends its inferior lamina far under the marginal.

The nuchal is crescent shaped, the anterior or free margin forming the concavity. The horns or external angles are much more produced than is usual in turtles, extending on the inner side of the marginals, and gradually tapering to a point. The middle of the edges of the first marginal takes part in the concavity of the front of the carapace. This concavity is thus more extensive, both in respect to its depth and width, than in any living member of the order, having but a slight representation in some of them. Its edge is subacute in the middle and thickened laterally. It is bordered on each side apparently by a prominent angle for the edge of one (the best preserved) of the marginals turns posteriorly, and is thinned out.

The texture of the bone is closely spongy, with scarcely any dense layer without or within. This point alone distinguishes the form from any found in the cretaceous strata. The external surface of the carapace is smooth, and without trace of sutural grooves of the horny scuta. The carapace is very thick, more so than in any species of the order known, except the *Agomphus firmus*.

Measurements.	M.
Width of nuchal between antero-external angles (above)	0.225
Length do. three inches to right of middle	.11
Thickness	.02
Thickness first marginal	.30

The length of the carapace, if proportioned to the size of the nuchal bone, as in *Chelydra serpentina*, would be forty inches, with the width nearly the same. If the length of head and tail were relatively less than in that species, and more than in the species of *Chelone*, the total length would have been seven and one-half feet.

Of the affinities of the genus little can be said. The characters of the plastron, as I noted when describing the genus, are more those of *Chelydra* than *Chelone*, and the present specimen adds to the weight of the conclusion. The extensive union of the first marginal and nuchal, and of the same with the first costal, are very different from *Chelone*. The character of the sutures is equally distinct from anything seen in *Chelydra*.

As compared with *L. polemicus*, the present reptile is thicker and probably considerably larger. The plastron is usually equal to or thicker than the carapace in tortoises. In the present animal the carapace is much thicker than the plastron of *L. polemicus*. From Farmingdale, Monmouth County, N. J., from the pits of the Freehold and Squankum Marl Company. Presented by the attention of A. J. Smith, director.

LEMBONAX INSULARIS, Cope, sp. nov.

Established on marginal and nuchal bones of a specimen from the Eocene bed of Vincenttown. The first marginal forms a prominent marginal angle, the sutures of the nuchal and second marginal approaching each other at a strong angle. The margin of the nuchal is continuous with the transverse edge of the adjoining marginal, and has not bordered it on the free side for any distance, as is striking in *L. popylaeus*. There has evidently been less concavity of this margin than in that turtle. The suture between the two is also peculiar in not underrunning the marginal to the same extent, and a portion of it underruns the nuchal. It is indeed possible that these bones represent the caudal and adjacent marginals, but the presence of a fragment bearing the support of a vertebra is more suggestive of the nuchal.

A prominent peculiarity of the bone is its great thickness. The first marginal near its suture with the second, measures an inch and three-quarters. The free margin is very thick and obtusely rounded.

	M.
Estimated length first marginal (one edge broken) . .	0.15
Thickness near suture of second	.045
" of nuchal	.033

Should the size of this turtle be proportioned to the thickness of the carapace, or to its relation to corresponding parts of the *L. propylaeus*, it will have been one of the largest species of the order, say from ten to twelve feet in length.

The above descriptions leave much to be desired in regard to the characters of the genus. The peculiarities of the sutures distinguish the form from *Chelydra*, and the association with an especially marine fauna suggests natatory limbs like those of *Propleura* or *Chelone*.

CROCODILIA.

THECACHAMPSA SQUANKENSIS (?Marsh).

Amer. Journ. Sci. Arts, 1869, 391 (*no description*). Cope, Trans. Amer. Philos. Soc., 1869, 65.

Squankum.

THECACHAMPSA SERRATA, Cope, sp. nov.

Established on cervical and dorsal vertebræ of an adult crocodile of about the size of a South American jacare (*J. sclerops*). The teeth are not preserved, so that reference to this genus is only made in consequence of the simple form of the hypapophyses of the cervical vertebræ, a character belonging also to other genera. The neural arches and odontoid element are co-ossified. The axis is compressed concave laterally, and with a very prominent hypapophysial extending on the anterior half keel of the body. The parapophyses are inferior or on the lower plane, and look backwards. They are separated by a concavity from the diapophysial projections, which is continuous with the anterior surface of the odontoid.

In a posterior cervical the cup of the centrum is transverse oval, and the neural canal ample and transverse. The parapophysial articular surfaces are J-shaped, the convexity forwards. The roof of the canal is deeply excavated on the middle line above, and from the fossa thus formed the ridge of the neural spine rises. This ridge is peculiar in the possession of a double row of teeth or serræ separated by pits; on the posterior edge a median series of teeth is most prominent. The edge of the cup is thick, of the ball strongly shouldered, the shoulder obsoletely ridged.

The first dorsal has a similar transverse articular surface and neural canal, and the serration of the neural spine is strongly marked. The parapophysial articular-face is an isosceles spherical triangle with the long angle upwards.

	M.
Axis and odontoid, length	0.058
Cervical length (total)	.042
Diameter of cup, outside measure, vertical	.028
Diameter of cup, outside measure, horizontal	.031
Diameter canal, transverse	.02
" neural spine at base	.018

The serration of the neural spines constitutes the most striking peculiarity of this crocodile. The use of the structure cannot be surmised, as they were in large part at least concealed by muscles and integument. It is intermediate in size between the *T. minor* and *T. squankensis*.

Presented to the writer by A. J. Smith, the courteous director of the marl pits of the Farmingdale and Freehold Marl Company. They were found in the Eocene marl of Farmingdale.

? THECACHAMPSA MINOR, Marsh.

Amer. Journ. Sci. Arts, 1870.

The smallest of our crocodiles, stated by Marsh to belong perhaps to the same genus as the *T. squankensis*.

FEBRUARY 6.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-five members present.

The following paper was presented for publication: "Synopsis of the Species of Chelydrinæ." By E. D. Cope.

Notice of Corundum.—Prof. LEIDY remarked that the specimens of corundum presented this evening were of unusual interest and beauty. They were from Franklin, Macon County, N. C., where the mineral is said to occur in some abundance, contained in a vein of chlorite. The specimens are fragments of large crystals, presenting portions of the faces of the latter. They exhibit in association the three varieties of the mineral. Mainly composed of gray corundum, with the crystal surfaces of bright ruby, and the interior with mingled rich blue sapphire. The ruby and sapphire, though of fine color, have not been found in a condition fit for gems. Some small crystals of gray corundum exhibit brilliant and translucent summits of ruby.

A large crystal of corundum from the same locality is now in the city. It is a truncated, six-sided, compressed pyramid, about two feet in length, and weighs about three hundred pounds. The summit is one foot by six inches in diameter. It is much fissured, and has a quantity of chlorite adherent or partially imbedded towards the base. The surface is ruby; the interior is of gray corundum with mingled sapphire.

Remarks on Fossils from Wyoming.—Prof. LEIDY made the following observations: The various fossils from the tertiary formation of Wyoming, which both I and Prof. Marsh have referred to *Lophiodon*, I suspect to belong to a genus distinct from this, as represented by the species *Lophiodon isselense*, of France. In this, as in the related and living Tapir, there are six molars in both upper and lower series. In the upper premolars of the *Lophiodon isselense* a single ridge extends from the outer part of the crown to the inner lobe, and the last lower molar has a trilobate crown.

In *Hyrachyus agrarius*, which I suspect to be the same as the *Lophiodon Bairdianus* of Prof. Marsh, there are seven molars to both upper and lower series. The upper two back premolars have two well-marked ridges extending between the outer and inner part of the crown; and the last lower molar has a bilobed crown, as in the Tapir.

Portions of two lower jaws, which I exhibit, probably belong to a smaller species of *Hyrachyus*, perhaps to the same animal as that indicated by Prof. Marsh under the name of *Lophiodon nanus.* One of the specimens was obtained, by Dr. Joseph K. Corson, U. S. A., at Grizzly Buttes; the other, by Dr. J. Van A. Carter, at Lodge-pole Trail, Wyoming. In both these the molar series is six, and the last molar has a bilobed crown. In the upper jaw specimen referred to *Lophiodon nanus* by Prof. Marsh, there are seven molars. One less in the lower jaw may be regarded as a less important character than the others separating *Hyrachyus* from *Lophiodon*, in which view I refer the specimens to the former under the name of HYRACHYUS NANUS. Probably also the other species which have been noticed under the names of *Lophiodon modestus, L. affinis*, and *L. pumilus*, may be viewed as pertaining to *Hyrachyus.*

I further exhibit portions of jaws of several individuals of a small pachyderm allied to *Hyopsodus.* The specimens were discovered, by Dr. J. Van A. Carter, at Grizzly Buttes and Lodge-pole Trail, Wyoming.

In *Hyopsodus*, seven molars, a feeble canine, and the incisors together form an unbroken row. In the lower jaw specimens, which I propose to refer to a genus with the name of *Microsyops*, six molars, a comparatively large canine, and the incisors form the corresponding series.

In *Hyopsodus*, the lower true molars, except the last one, are of uniform width at the fore and back part of the crown. In *Microsyops* the fore part of the crown is decidedly narrower than the back part. In both genera the crown of these teeth is composed of an outer pair of demiconoidal lobes with crescentoid summits and an inner pair of conical lobes. In *Hyopsodus* the contiguous horns of the crescentoid summits of the outer lobes conjoin in the antero-internal lobe, and the anterior horn of the crescentoid summit of the antero-external lobe ends at the base of the antero-internal lobe. In *Microsyops* the anterior horn of the crescentoid summit of the antero-external lobe ends in a tubercle in front of the antero-internal lobe, while its posterior horn ends in the latter; but the anterior horn of the postero-external lobe, instead of joining the antero-internal lobe, as in *Hyopsodus*, ends at the base of the antero-external lobe. The character of these teeth leads me to the belief that the jaw specimens referred to *Microsyops* belong to the same animal as that named *Hyopsodus gracilis* by Prof. Marsh, and with this view I propose the name of MICROSYOPS GRACILIS, which may be used in either case, whether the animal is or is not the same as *Hyopsodus gracilis.*

Two additional specimens I suppose belong to an insectivorous animal, though they may perhaps indicate a small marsupial. They were obtained, by Dr. Carter, at Lodge-pole Trail, Wyoming. One of the specimens, an upper jaw fragment, contains a molar tooth. This resembles the back molars of the Opossum, but with the outer lobes of the crown proportionately better developed, and the median lobes reduced to a minute condition. A strong basal ridge bounds the crown externally, a thin one anteriorly, and a strong festoon-like portion at the bottom of the inner lobe posteriorly. The second specimen, an isolated tooth, is a diminished representative of the one described. It may be a last upper or other premolar of the same animal, or a corresponding true molar of a smaller species. We have no means of determining the probability of these specimens belonging either to *Omomys* or *Triacodon*, and I propose to name the animal to which they pertained *Palæacodon verus*. The larger tooth is 2 lines fore-and-aft, and $2\frac{1}{2}$ lines transversely; the smaller one is $1\frac{3}{4}$ lines fore-and-aft, and 2 lines transversely.

February 13.

The President, Dr. Ruschenberger, in the chair.

Twenty-one members present.

February 20.

Mr. Wm. S. Vaux, Vice-President, in the chair.

Twenty-four members present.

The following paper was presented for publication: "On an Extinct Whale from California." By Edw. D. Cope.

February 27.

Mr. Wm. S. Vaux, Vice-President, in the chair.

Nineteen members present.

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

SYNOPSIS OF THE SPECIES OF THE CHELYDRINÆ.

BY E. D. COPE, A.M.

This group of tortoises, so far as their structure is exactly known, is confined to North and Tropical America. The number of species is small, though the present list adds several to those previously known. Their structure is highly interesting, as expressing relationship to groups which existed during mesozoic time. I allude to the family of *Propleuridæ*, found in the cretaceous greensand of New Jersey, which possessed features of the sea-turtles, combined with those of the present group, or the snappers. The latter possess the imperfect and small plastron of the *Propleuridæ*, conjoined with the ambulatory limbs of the *Emydidæ*. In other respects they resemble the *Emydidæ*, and I am inclined, until further discoveries of structural peculiarities shall have been made, to allow them to remain in that family, although both Dr. Gray and Prof. Agassiz have referred them to a distinct one, under the name of *Chelydidæ*. Certain it is, that they are also related to the *Cinosternidæ*, which is peculiar in the absence of the mesosternal bone. *Claudius* approaches the latter family in its short tail and lack of posterior vertebral bones.

The only possible exception to the rule of distribution above laid down, is the genus *Platysternum*, Gray, from eastern Asia. This form has been placed here, but appears to associate them with more typical *Emydidæ;* until its structure be better known, its position will remain doubtful.

The vertebræ of *Chelydra serpentina* present some peculiarities as compared with *Trionyx Testudo* and *Emys*, as follows:—

Testudo polyphemus. Cervical vertebræ 2–3 and 4 opisthocœlian, 4th biconvex, remainder procœlian. Caudal vertebræ all procœlian.

Trionyx ferox. Cervical vertebræ all opisthocœlian, caudals all procœlian.

Chelopus guttatus. Cervical vertebræ as in *Testudo*, the balls of the posterior transverse bilobed; caudals all procœlian.

Chelydra serpentina. Cervicals as in *Testudo;* the caudals all opisthocœlian.

There are only three well-ascertained genera of this family, to which a fourth may perhaps be added. They are distinguished as follows:—

I. Tail elongate, five pairs of scuta of the plastron.

Two rows of marginal scuta; inguinals separated from ventrals by a long scute. MACROCHELYS.
One row of marginals; inguinals as last. . CHELYDRA.

II. Tail short, four pairs or fewer scuta of the plastron.

Anterior lobe of plastron fixed. CLAUDIUS.
Anterior lobe of plastron movable on the remainder? STAUREMYS.

MACROCHELYS, Gray.

Gypochelys, Agassiz.

MACROCHELYS LACERTINA, Schweigger.

Chelydra, Schw., *Chelydra temminckii*, Troost., *Chelonura*, do., Holbrook, *Emysaurus*, do., Dum. Bibr.

Mississippi River and rivers of Texas.

CHELYDRA, Schw.

Chelonura, Flem. *Emysaurus*, Dum. Bibr.

CHELYDRA SERPENTINA, L.

From Canada to Equador.

This species presents an extraordinary range, enduring both arctic cold and tropical heat. I can find no specific difference between shells from Pennsylvania, Mexico, and Equador. Prof. Peters has reached the same conclusion respecting Equadorian specimens.

CHELYDRA ROSSIGNONII, Bocourt.

Miss. Sclentif. Mexique Reptiles et Batrach, 1870, p. 18, Tab. V., fig. 2.

This species differs from the last in having four barbels instead of two, a larger plastron with a stouter bridge, and in the stronger and longer dentations of the posterior margin of the carapace.

Mexico and Guatemala (Bocourt).

Some extinct species of this genus have been discovered in the miocenes of Europe.

CLAUDIUS, Cope.

Proceed. Ac. Nat. Sci. Phila., 1865, 1867. Bocourt, Miss. Sci. Mex. Rept., p. 19.

This genus has received several accessions through the efforts of those excellent naturalists, MM. Sumichrast and Bocourt. The latter has described two species as previously named, but I think the identifications must be reconsidered, and one of the names originally proposed by himself (*C. megalocephalus*), be retained. The species are thus distinguished:—

I. Inguinal scuta two.

Shell depressed, broad, carinæ very weak; one long anal plate; inguinals transverse; tail smooth; head brown, shielded above to behind the eyes. C. SEVERUS.

Shell with three elevated keels, the carapace emarginate between the anal scuta; one short anal plate; inguinals longitudinal; tail with four rows of tubercles; head white spotted above, brown spotted below. C. PICTUS.

II. Inguinal scuta one or wanting.

Head very wide, smooth above; two anal scuta; lobes of plastron subsimilar; dorsal keel grooved. C. MEGALOCEPHALUS.

Head narrower, with a horny shield on the top of the nose; posterior lobe of plastron narrower and more acute than anterior; dorsal keel simple. C. ANGUSTATUS.

CLAUDIUS SEVERUS, Cope, sp. nov.

Carapace an elongate oval, with convex sides; the upper surface nearly plane in profile, rising anteriorly, sloping to the anterior margin, and descending rather abruptly to the posterior. General form rather depressed, the middle line including the entire width of the vertebral scuta below the level of the proximal part of the costals. The latter present an obtuse longitudinal carina on the two median. The two central vertebral scuta also possess a weak keel, of which a trace appears anteriorly on the fifth or last; first and second flat. The scutal sutures bounding the vertebrals, costals, and marginals (except those between the last) are bounded by flat but marked grooves of the shell. Thus a continuous band-like groove extends round the carapace above the marginal bones, and is continuous with a similar one passing along the anterior margin of each costal, and undulate grooves along the margins of the vertebrals. The first costal is one-fourth longer than the second. The vertebrals are hexagonal, longer than broad, with a rounded notch behind and projection in front. The first is narrowed urceolate, deeply notched behind, and margining nearly half the first marginal in front. The nuchal is broad transversely, and very narrow; the anterior one narrower than the posterior. The last and penultimate are a little wider, the last joining the last costal by a very short suture. The margin of the carapace is regular without notch behind or elsewhere. The plastron is small, rather broad, and rounded in front, and much contracted and acute behind. The bridge is rather wider than in *C. angustatus*, and more as in *Chelydra.* The anterior lobe is immovable in the dried specimen. Pectoro-abdominal suture transverse, length of pectoral on median suture equal abdominal and two-thirds femoral length, and equal to that of the anal. Latter much longer than wide. The abdominal plate is the only one which covers the bridge from within, but does not extend quite half-way across. Each is met by two large inguinals, which are broadly in contact with each other, and are broader than long.

The color of the carapace is brown, but wherever rubbed of a wax-yellow. The marginals at the bridge are principally a strong yellow, which color covers the whole of the plastron.

The soft parts are preserved in alcohol. The head is large for the size of the carapace, and is remarkably broad, and with rather short muzzle. This projects, however, much beyond the mouth, the end of the under jaw visible when closed, being scarcely beyond the margin of the orbit. Beak short, obtuse, not dentate; an obtuse festoon of the tomia below the orbit. Two beards. Head covered with skin above, except from the line of the posterior margin of the orbits to the end of the muzzle, which is protected by an undivided horny plate.

The skin is but slightly granular. There are five curved scuta on the inner side of each fore foot, and a single row of scuta above on each digit. The fore feet are webbed to the bases of the ungues. The hind feet are well palmate, and with a free outer web supported by a clawless toe. There are six curved scuta on the inferior outer face of the base of the lower leg, of which the first and third reach the external margin, and the others are more internal except the lowest, which is very small. The tail is very short, depressed, and incurved, with a terminal compressed corneous scale. It is smooth, or without tubercles, above and below, but anterior to the anus above are three pairs of very small tubercles, one on each side of the median line.

Color of soft parts dirty white below, dark brown above; sides of head with close yellow reticulations behind. Throat and lower jaw yellow; a dark spot on each side of the symphysis continued towards the angles of the jaws, where yellow reticulations appear above it.

Measurements.	M.
Length of carapace (straight)	0.18
" " " (over all)	.23
" " plastron	.126
" " " anterior lobe from hyo-hyposternal suture	.056
" " " posterior lobe from same point	.069
Width " " at ano-femoral suture	.018
" " " anterior lobe at anterior abdominal suture	.058
" " bridge (least)	.018
" " head at tympana	.051
Length of " " (straight)	.053
" " tail from anus	.024
Width of palm (greatest)	.030
" " sole "	.035

This species was found at Santa Efigenia, on the western side of the Isthmus of Tehuantepec, Mexico, by Francis Sumichrast, and sent by him to the collections of the Smithsonian Institution. (Coll. No. 485.) I am indebted to the secretary, Prof. Henry, for the opportunity of making an examination of it. Prof. Sumichrast says of it in his notes, that it is rare, and only lives in muddy pools. In the young the dorsal crests are more distinct. During life the anterior lobe of the sternum possesses a slight mobility, which disappears on drying.

CLAUDIUS PICTUS, Cope, sp. nov.

Staurotypus salvinii, Bocourt, Miss. Sci. Mex. Rept. 22, tab. v., fig. 3, 1870; nec Grayii Proc. Z. S. Lond., 1864.

This fine species has been identified by MM. Duméril and Bocourt with the species described by Dr. Gray, as above cited; but it appears to me to be very distinct and perhaps pertinent to another genus. Dr. Gray describes the anterior lobe of the sternum in *S. salvinii* as narrowed like the posterior, while it is broadly rounded in this animal. He also states that in his species the tail has a median crest of compressed tubercles, as in *Chelydra*, with a lateral series on each side. In this species there are four series of minute warts, as in the other *Claudii*, and in no way resembling those of *Chelydra*. This is evidently not Gray's species, and it remains to compare it with the *Claudii*, and especially with *C. severus*. It differs from this tortoise in the carapace with more nearly parallel sides, with three stronger or more elevated keels above. It differs in the possession of an emargination between the anal scuta. The plastron differs in the shorter and less acuminate posterior lobe with shorter bridge. The femoral scuta extend behind the abdominals on the bridge, while the latter cover its entire width in *C. pictus*. The infra-marginal plates are longer than wide in this species; in *C. pictus* they are transverse. The tail of this species exhibits the usual four rows of tubercles, while in *C. severus* it is smooth. The head is narrower in *C. pictus*, and the colors more varied. Thus the top of the head is pale spotted on a brown ground, the jaws are yellow with brown cross-bands; a yellowish band extends from their angle over the tympanum to the side of the neck. Carapace yellowish-brown with a dark brown spot on the posterior part of each scutum; limbs brown above; plastron yellow with a brown spot on each scutum. Length of carapace, .136 m.

From Vera Paz.

This species is beautifully figured by Bocourt, as above cited.

CLAUDIUS MEGALOCEPHALUS, Boc.

Ann. Sci. Nat. Zool., 1868, X. p. 122. *C. angustatus*, "Cope," Bocourt, Miss. Sci. Mex. Zool. Rept., p. 20, tab. iv.

This species and the *C. angustatus* constitute the typical and smaller forms of the genus, distinguished by the very slender bridge of the plastron and single inguinal or intermarginal. The present animal, after being described as distinct by Bocourt, was subsequently referred to the longer described *C. angustatus*, but I am disposed to regard his first conclusion as the more correct, having received from Sumichrast a second specimen of the latter, which confirm its characters.

In *C. megalocephalus*, according to Bocourt, the head is very wide and the muzzle short, with hooked beak. Its upper surface does not display the oval horny scute seen in *C. angustatus*, and though there is a convexity of the edge of the maxilla below the front of the orbit, it is not an acute tooth as in the type of *C. angustatus*. This appearance may perhaps be due to age.

The carapace is three keeled above, the median keel fissured in its length. The keels traverse all the costal and vertebral scuta, except perhaps the last vertebral. The plastron is rather wide with the anterior lobe a little longer; neither lobe is much narrowed, and there are two anal scuta whose average length equals that of the femorals. The median suture of the abdominals is only one-third that of the pectorals (three-fifths in *C. angustatus*). Tail very short, with four series of minute tubercles above. Length of carapace .118 m., width .079.

Color above dark brown; plastron light reddish-brown (Bocourt), neck yellowish below.

From Mexico.

CLAUDIUS ANGUSTATUS, Cope.

Proceed. Acad. Nat. Sci. Phila., 1865, p. 187; Proceed. Amr. Phil. Soc., 1869, tab. ix.

This species is rather more slender than the last; the head is narrower, and the posterior lobe of the plastron narrower and more acute. The horny plate on the nose, and the undivided dorsal keel, constitute other distinctions, the last of which are noticed by Bocourt. In one of our specimens there is a single anal scutum, in another there are two.

STAUREMYS, Gray.

Proc. Zool. Soc. London, 1864, p. 127; Supplement to Catal. Shield Rep., 1870, p. 65, f. 22.

This name was applied by Dr. Gray as a subdivision of *Staurotypus*, Wagl., which belongs to the *Kinosternidæ*, a family defined by the absence of the mesosternal bone. If this arrangement expresses the true affinities of the species referred to it, it is unnecessary to introduce it here. Dr. Gray states that the anterior lobe of the sternum is movable as in *Staurotypus triporcatus*, but is more acute than in that species, being in this respect like the posterior lobe. This difference is only specific, and the supposed genus *Stauremys*, as defined by Gray, would not appear to stand on any foundation. Should, however, it turn out to embrace a species of *Chelydrinæ*, it will rest on the character given above, as distinguishing it from *Claudius*, viz., the movable anterior lobe of the sternum. M. Bocourt appears to believe it to be one of this group, from his referring to it a species of *Claudius* (*C. pictus*, Cope), and as he may be correct, I introduce it into the present synopsis.

Dr. Gray's descriptions render it plain that the only known species is quite distinct from those described above.

STAUREMYS SALVINII, Gray.

Loc. cit.

Shell brown; temple and side of neck pale marbled: below pale, about the size of *Claudius severus*.

Haumanchal, Guatemala.

ON AN EXTINCT WHALE FROM CALIFORNIA.

BY PROF. E. D. COPE.

George Davidson, of the United States Coast Survey, recently presented the Museum of the Academy of Natural Sciences, the proximal portion of the left ramus of the mandible of a whalebone whale. The specimen was found in digging a well at San Diego, on the coast, in the southern part of the State, at a depth of seventy-four feet below the surface, July 27th, 1871.

The angle and condyle are broken from the specimen, and the distal extremity was not preserved. It possessed a coronoid process, the apex of which has been lost. The inner face is plane, somewhat convex above, behind the basis of the coronoid process. Anteriorly it becomes more convex, the surface turning inwards to the superior and inferior margins. The exterior face is convex, so that at the posterior foramen its diameter above the middle is greater than that below the middle. The inferior outline, from below the coronoid process to below the last external foramen, is straight, not decurved. It is obtuse most of this distance, but becomes narrowed at the anterior point. The superior margin is obtuse anteriorly, narrowed acute for ten inches anterior to the coronoid process; it is not truncate anteriorly. The internal foramina are large, and form a series below the upper margin, without distinct groove. The external foraminal series terminates much anterior to the interior, that is, the last external is opposite the sixth from behind of the inner row. There is no internal Meckelian groove. The Meckelian cavity of the ramus is large behind the coronoid, but small and in the upper part of the ramus at the last exterior foramen. The dental foramen is large and above the base of the Meckelian cavity, to that its inner wall descends to the floor of the latter. Below the base of the coronoid the inferior part of the ramus is rounded, but narrower than at the dental foramen.

Measurements.	M.
Length from middle of base of coronoid to last exterior foramen	0.22
" to last interior foramen	.10
Extent measured by four last interior foramina	.064
Depth (inner side) at basis coronoid	.10
" at last exterior foramen	.079
Greatest transverse diameter ramus at last external foramen	.042
Depth Meckelian tube at last external foramen	.024
" " " at mental foramen	.047
Width " " " " "	.032
" ramus two inches behind basis of coronoid process (where broken)	.047
Depth of do. at do. about	.095

The presence of coronoid process indicates that the present species was a finner, and allied to *Balænoptera.* Though there are no vertebræ or other elements to determine its reference to this genus or to its ally *Eschrichtius*, it may be proper to refer it provisionally to the latter genus, since so many of its allies on the Atlantic coast formations have been found to be referable to it. This course is still more appropriate from the fact that the strata of tertiary age near San Diego are reported to be of miocene age, the same in which the eastern *Eschrichtii* have been found. As to its specific characters, these differ entirely from those of the latter. The ramus lacks the decurvature of most of them. In size it approaches nearest the *E. polyporus*,[1] Cope, and *E. priscus*, Leidy. It is much less convex externally than the latter. The exterior series of pores does not extend so far posteriorly as in *E. polyporus*, and the dental foramen has a superior position, besides other differences. Size that of *E. priscus.*

The species may bear the name of its discoverer, and be called ESCHRICHITUS DAVIDSONII, in recollection of the efforts of George Davidson to aid the cause of science in various ways.

This whale, when living, probably attained a length of about forty feet.

[1] Proceed. Amer. Phil. Soc., 1870, p. 285.

MARCH 5.

Mr. VAUX, Vice-President, in the chair.

Eighteen members present.

The following papers were offered for publication :—

"Remarks on the Synopsis of the Genus Chettusia (Lobivanellus) with a Description of a New Species by J. A. Ogden." By Dr. O. FINSCH.

"On Numerical Order in the Branching of some Coniferæ." By THOS. MEEHAN.

MARCH 12.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-four members present.

The following paper was presented for publication :—

"On Prehistoric Human Art from Wyoming and Colorado." By E. L. BERTHOUD.

MARCH 19.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-two members present.

MARCH 26.

The President, Dr. RUSCHENBERGER, in the chair.

Eighteen members present.

On favorable report of the committees, the following papers were order to be published:—

REMARKS ON THE "SYNOPSIS OF THE GENUS CHETTUSIA (LOBIVANELLUS), WITH A DESCRIPTION OF A NEW SPECIES BY J. A. OGDEN."

BY DR. O. FINSCH.

The newly described *Chettusia nivifrons*, Ogden (p. 196), is without the slightest doubt identical with CHETTUSIA CRASSIROSTRIS, De Fil. (*Defilippia crassirostris*, Salvad.), our *Limnetes crassirostris* (Vögel, Ost. Africas, p. 641). On the plate (Pl. I.) the back and scapulars are wrongly "dark-brown" colored, instead of "light brownish-gray," as accurately noticed in the description. A very good and trustworthy representation is given by von Heugliss: Ornithologie Nordostafricas, t. XXXIII.

To *Ch. senegalla*, p. 194: "*Vanellus albifrons*, Bripp."(!) noticed as a synonym of this species, has never been published by Dr. Brippell, at least I could not find the source.

The next ally of *Ch. senegalla* is *Ch. lateralis*, Sin. (p. 195, No. 5), which finally will turn out to be only a stage of plumage. (*Vide* Ost. Africa, p. 643.)

To *Ch. inornata*, Schl. p. 195. This must stand as *Ch. cinerea*, Blyth., which is wrongly used as a synonym of *Ch. gregaria* (No. 10).

Ch. inornata, Sws. (nec. Schleg.) is by no means identical with *inornata*, Schlegel, but a very different species from Western Africa, which has been omitted in the Synopsis, as also the following well-marked species:—

Ch. (Hoplopterus) *ventralis*, Wagl. ex India, by mistake as synonymous with *Ch. gregaria* noticed.

Ch. (Hoplopterus) *speciosa*, Wagl.	ex Africa.
Ch. (Hoplopterus) *cayana*, Sabh.	ex America merid.
Ch. coronata, Gml.	ex Africa.
Ch. melanoptera, Bripp.	ex Africa.
Ch. (Lobivanellus) *biloba*, Gml.	ex India.
Ch. (Lobivanellus) *pectoralis*, Cuv.	ex Australia.
Ch. (Sarciophorus) *pileatus*, Gml.	ex Africa.

BREMEN, G., February, 1872.

ON NUMERICAL ORDER IN THE BRANCHING OF SOME CONIFERÆ.

BY THOMAS MEEHAN.

In a paper entitled "Adnation in Coniferæ," read at the Chicago meeting of the American Association for the Advancement of Science, and which was published in the "Proceedings" for 1868, I pointed out that the true leaves of Coniferæ were mostly adherent to the stem—not merely "decurrent" as is usually said of some of them; and that the vigor of the axis or stem was the measure of the adhesion. I now propose to show that axial vigor also determines the law of branching in some cases, and that the branching is on a numerical plan.

In the most vigorous growths of *Thuja occidentalis*, the common American arbor vitæ, the leaves are almost wholly united with the axis, only the delicate sharp awns are free. These are arranged in pairs, one leaf opposite the other. The upper pair alternates with the lower (decussate). A branch appears at the eighth node; and always at the eighth node when the vigor of the branch remains the same. As the axis weakens the branches appear at the sixth node. This is the general average. With greater weakness the fourth node gives birth to the branch; and finally as the plant takes on its frondose flattened form, a branch pushes from every alternate node. But in no case does a branch push at an odd number. They are always from the second, fourth, sixth, or eighth node.

In *Thuja gigantea*, Nutt., the same law prevails, the sixth and eighth being more numerous.

In *Libocedrus decurrens* all appear to be on the alternate plan. I have seen no instance, even in vigorous shoots, where the branches push otherwise than from every second node. This is also true of *Chamæcyparis Lawsoniana*, Parl.; and of *C. obtusa*, Sieb., *C. pisifera*, and *C. retusa*—all probably varieties of one thing.

In *Biota orientalis*, the branching is mostly from the fourth node, occasionally from the second or sixth; rarely one will come from the third and odd number. In the curious variety *B. O. pendula*, Parl., where the plant has lost or never achieved the power to produce frondose branches, the numerical order is lost: branchlets push at any indefinite point along the stem.

In *Chamæcyparis sphæroidea*, Spach., the American white cedar, the branching is pretty regular at the fourth node, sometimes from the second, rarely from the fifth.

In *Chamæcyparis nutpænsis*, Spach., the yellow cedar of the Pacific Coast, the course is the same as in the American arbor vitæ.

Sometimes in very stout shoots of this plant the leaves will be in whorls of three. It is curious to note then that the branching is on the odd numbers; either at three, five, or so on; but yet not in a regular graded series as in its normal condition and in the arbor vitæs. I have counted as many as fifteen nodes without a branch, and this absence of order in branching also exists in junipers. In these the leaves are mostly in threes, though still decussate, and the branching takes place at the odd numbers, and is irregular.

Callitris quadrivalvis has four leaves in a whorl, and here again we have the irregular branching of the junipers.

The result of these observations is that in a large number of cases the frequency of branching is in company with declining vigor; that presence of leaves in an opposite pair is favorable to a regularity of branching on even numbers; and that whorls of three or more are associated with irregular branching on odd numbers.

It is proper to remark that this branching has reference to the growth of one season. There are axillary dormant buds at every node, which may push according to circumstances during any subsequent year.

In connection with this subject are some observations worthy of note, though not probably original. As soon as the branching at alternate nodes begins in *Libocedrus*, *Thuja*, *Biota*, and others, the frondose character commences. The pair of adated leaves just above the node which bore a branch, is much contracted. These are always on the upper and lower faces, and are known as the dorsal leaves. The next pair of leaves are more developed, more free from cohesion with the axis, and from one of them a branchlet usually springs. These are the marginal leaves. Usually the branchlets, one from a node and from every second node, are alternate with the ones above and below it; but when the branchlet pushes from the main branch, the first series of two or sometimes three are one above another, and on the upper side. The flattened frondose form is the result of this plan of development. Rarely two branchlets will proceed from each node, one from the axil of each opposite leaf.

In some species each succeeding pair of cohering leaves are of equal length and strength. In the *Thujas* and in *Chamæcyparis Lamsoniana* this is characteristic; but in *Libocedrus decurrens*, and *Chamæcyparis obtusa*, and allies, every first pair succeeding a branchlet, and which on the flattened conditions constitute the dorsal pair, are very much abbreviated and shortened, so much indeed as to scarcely proceed beyond the line of the lower pair, and thus some writers have been led to describe these plants as having 4-verticillate leaves.

The seedling or first year's growth of *Biota orientalis* exhibits this subverticillate character. The first pair of leaves succeeding the cotyledons is so near as to appear almost two of a series of four cotyledon lobes. For many successive nodes the leaves appear to be 4-verticillate.

In regard to the early leaves of coniferous plants, those which follow the cotyledons are nearly free, having little cohesion with the stem or "decurrence," as botanists say. As the axis becomes thicker, or, as I have termed it in the paper referred to, endowed with more vitality, there is less of the free portion and more of the adnated or cohering, until in *Pinus* there is nothing left but a thickened bed or *pulvinus;* and the axial bud which generally marks the diverging place of the proper leaf has to push and in a difficult way perform the function of leaves. If any thing tend to check the vitality of the tree, so that the axial buds do not develop, the adnating power is weakened, and the true leaves again become free from the stem. This is seen in *Pinus edulis*, Engl. At any time through its existence, where the branches are weak by being shaded or starved by other branches, the *pulvini* develop into true leaves, and the axial bud, usually producing two "needles," does not push. Street trees and osier willows when annually trimmed, though the subsequent growth is vigorous, increase their trunks slowly in girth, and die much earlier than uncut ones. Thus their vitality is impaired. Some pine trees when cut down push up strong sprouts, and these will often have the pulvini developed into true leaves as in the weakened *Pinus* *edulis*. I have shown already, in the paper before referred to, that *Thujopsis borealis* (*Chamæcyparis*, *Nutkænsis*, Spach.) also throws out free leaves always in the weakened cutting state. In some garden varieties of *Thuja* and *Biota* the weak axis of the seedling condition remains throughout many succeeding years of growth. In all these cases the leaves are free. These free leaved forms are still regarded by some excellent European botanists as species of unknown introduction, although, as stated in my paper on "Adnation in Conifera," their derivation from *Thuja* and *Biota* is founded on direct evidence. I refer to this incidental matter chiefly to add the new observation, in connection with the leading points of the present paper, that with their weakened condition, the regular numerical order of branching, as noted in the fully developed forms, does not exist.

I do not suppose this law of vital vigor so far as developed will account for all the phenomena of free or adnated leaves; or for all the numerical relations of branchlets to the nodes. I have myself pointed out some apparent exceptions, but I trust I have made it clear that it performs no mean part in the order of these things.

April 2.

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

Twenty-three members present.

The following paper was presented for publication:—

"Descriptions and Illustrations of Genera of Shells." By T. A. Conrad.

Remarks on some Extinct Mammals.—Prof. Leidy exhibited specimens of fossils from the Tertiary of Wyoming. One of these is an upper jaw fragment with two molars; the other a lower jaw fragment with a single molar. The upper molars have crowns composed of four lobes, of which the outer are like the corresponding ones in *Anchitherium*. Of the inner lobes, the front one is much the larger, and is prolonged outwardly in advance of the antero-external lobe. It is homologous with the antero-internal and antero-median lobes as existing in *Anchitherium* in a completely connate condition. The postero-internal lobe is the smallest of the crown. It is conical and conjoins that in front. A barely perceptible trace of a postero-median lobe is seen. A strong basal ridge incloses the crown, except externally, where it is feebly produced.

The three upper molars occupied a space of 8 lines. The first molar is $2\frac{1}{2}$ lines fore and aft and $3\frac{1}{4}$ transversely; the second is $2\frac{3}{4}$ lines fore and aft, and the last one $2\frac{1}{4}$ lines.

A question arises as to whether these teeth pertain to any of the animals previously indicated from lower jaw specimens with teeth. They are too large for the known species of *Hyopsodus* or *Microsyops*. They nearly accord in size with the lower molars of *Notharctus*, and perhaps belong to this genus. *Limnotherium* appears not to differ from this, as the number of teeth and their constitution are the same.

The lower jaw fragment accompanying the upper one may belong to the same animal. The molar it contains, though resembling those of *Notharctus*, differs in several points. I propose to refer the fossils to a species with the name of Hipposyus formosus.

Prof. Leidy further remarked that he had recently the opportunity of examining the tooth described by Prof. Marsh under the name of *Palæosyops minor*. The tooth evidently belongs to the curious pachyderm with the beaver-like incisors named *Trogosus castoridens*. On observing the molar tooth, which is not worn away like those in the jaw specimen upon which the latter was named, it at once called to mind, the tooth which had been described under the name of *Anchippodus riparius*. On comparison, it would appear as if the specimens referred to *Palæosyops minor* and *Trogosus castoridens*, really belong to the same genus and species. The tooth of *Anchippodus riparius* was obtained from a tertiary formation, miocene or eocene, in Monmouth Co., N. J. If the determination is correct, it would go to show that the Bridger Tertiary formation of Wyoming was contemporaneous with the Tertiary deposit of Monmouth Co., N. J.

Prof. COPE stated that the largest mammal of the Eocene formations adjoining those of Wyoming, *i. e.* of the Wahsatch group of Hayden, was the *Bathmodon radians*, Cope, of about the size of Rhinocerus. It was an odd-toed ungulate, with peculiar dental characters. The incisors were well developed above and below as in the Tapir, but the dental series was little interrupted. The crowns of the upper molars were all wider than long, and presented mixed characters. On the outer margin one only of the two usual crescents of Ruminants was present, but a tubercle represented the anterior one. The one which was present was directed very obliquely inwards. Inner crescents were represented by two angles, the posterior forming the inner angular margin of a flat table, the anterior, a mere cingulum at its anterior base. The arrangement of these parts was stated to be of interest in connection with the relationships between the types of hoofed animals. The single outer crescent was a ruminant indication, while the inner table resembled the interior part of the crown of *Titanotherium.* It differed, however, in its early union with the outer margin, its edge being thus possibly homologous with the posterior transverse crest in *Rhinocerus.* The premolars had two or three lobes with crescentic section arranged transversely. He regarded the genus as allied to *Chalicotherium.*

He stated that the mammalian fauna of Wyoming and Utah more nearly resembled that of the Paris Basin than any yet discovered in our country, and that it had been discovered to contain a still greater number of generalized mammalian forms. One of the most marked of these was the genus just described by Dr. Leidy.

APRIL 9.

The President, Dr. RUSCHENBERGER, in the chair.

Sixteen members present.

Remarks on some Extinct Vertebrates.—Prof. LEIDY directed attention to some fossils upon which he made the following observations. Several teeth and jaw fragments from the Loup Fork of the Niobrara River, Nebraska, obtained by Prof. Hayden, appear to indicate a large species of Felis, not previously described. The most characteristic specimen consists of an upper sectorial molar about as large as that of the Bengal Tiger, and consequently much too large for either of the largest existing american cats, the Panther and the Jaguar. It is as much too small to have pertained to the American Lion, *Felis atrox*, for its breadth is but slightly greater than that contained in the lower jaw from which the latter was described. Breadth of the crown of the tooth is $15\frac{1}{2}$ lines; its thickness in front 8 lines. The measurements in the corresponding teeth of a Bengal Tiger are, 16 lines in breadth, and $7\frac{1}{2}$ lines in thickness in front. The form of the fossil tooth is the same as in the other feline species.

The extinct species may be named FELIS AUGUSTUS.

A distal extremity of a humerus, from the Niobrara River, about the size and construction of the corresponding part in the Bengal Tiger, may belong to this species.

Another fossil, consisting of a detached body of a vertebra, apparently indicates an extinct reptile allied to *Plesiosaurus* and *Discosaurus*. The specimen, recently received from Prof. Hayden, was obtained in 1870, on Henry's Fork of Green River, Wyoming. It is free from attached matrix, and was the only specimen pertaining to the animal which was found. It probably belonged to a formation of earlier date than that of the same locality which has yielded other fossils previously described.

The vertebra is from the base of the tail, and is much shorter in relation to its other dimensions than in *Plesiosaurus* or *Discosaurus*. The extremities are concave, and encircled near the margin of the articular surfaces with a narrow groove. Posteriorly there are two large articular facets, as widely separated as the bone would permit, for the junction of a chevron. Anteriorly there are no marks of chevron attachment. The roots of strong transverse processes or diapophyses project from the sides of the body just above the middle. The neural arch was completely co-ossified with the body, leaving no trace of its earlier separation.

The breadth of the body is 23 lines; its depth 19 lines, and its length 1 inch.

Viewing the specimen as probably representing a genus different from those mentioned, I propose to name it with the species as OLIGOSIMUS GRANDÆVUS.

Another fossil is a remarkable specimen, obtained by Prof. Hayden in the "Black Foot country" at the head of the Missouri River. It looks as if it had formed part of the dermal armor of some huge saurian or perhaps of an armadillo-like animal. It is imperfect, and looks as if it were half broken away. In its present state it is hemiovoid, about two inches in diameter, concave below, and convex above, where it is covered by about fifteen large mammillary bosses.

Accompanying this specimen there is a distal phalanx, which may belong to the same animal. It is rather less than two inches long. The articular surface is transversely elliptical, $1\frac{1}{4}$ inch wide, and 11 lines deep, and feebly depressed, so as to indicate a moderate degree of mobility. The upper surface of the bone slopes to the end and is transversely convex. The extremity is expanded at the borders. Beneath are several vascular perforations. Though the specimens are not sufficiently characteristic to determine positively whether they belong to a mammal or a reptile, or whether they even belong together to the same animal, the former one is so peculiar that I am disposed to regard it as representing a genus and species, which may be named TYLOSTEUS ORNATUS.

Curious habit of a Snake.—Mr. COPE made the following remarks:—

I had for some time a specimen of *Cyclophis æstivus*, received from Fort Macon, N. Ca., through the kindness of Dr. Yarrow, living in a wardian case. The slender form of this snake, and its beautiful green and yellow colors, have led to the opinion that it is of arboreal or bush-loving habits. It never exhibited such in confinement, however, and instead of climbing over the Caladia, ferns, etc., lived mostly under ground. It had a curious habit of projecting its head and two or three inches of its body above the ground, and holding them for hours rigidly in a fixed attitude. In this position it resembled very closely a sprout or shoot of some green succulent plant, and might readily be mistaken for such by small animals.

Intelligence in Monkeys.—I have two species of *Cebus* in my study, *C. capucinus*, and a half-grown *C. apella.* The former displays the usual traits of monkey ingenuity. He is an admirable catcher, seldom missing anything, from a large brush to a grain, using two hands or one. His cage door is fastened by two hooks, and these are kept in their places by nails driven in behind them. He generally finds means sooner or later to draw out the nails, unhook the hooks and get free. He then occupies himself in breaking up various objects and examining their interior appearances, no doubt in search of food. To prevent his escape I fastened him by a leather strap to the slats of the cage, but he soon untied the knot, and then relieved himself of the strap by cutting and drawing out the threads which held the flap for the buckle. He then used the strap in a novel way. He was accustomed to catch his food (bread, potatoes, fruit, etc.) with his hands, when thrown to him. Sometimes the pieces fell short three or four feet. One day he seized his strap and began to throw it at the food, retaining his hold of one end. He took pretty correct aim, and finally drew the pieces to within reach of his hand. This performance he constantly repeats, hooking and pulling the articles to him in turns and loops of the strap. Sometimes he loses his hold of the strap. If the poker is handed him, he uses that with some skill, for the recovery of the strap. When this is drawn in, he secures his food as before. Here is an act of intelligence which must have been originated by some monkey, since no lower or ancestral type of Mammals possess the hands necessary for its accomplishment. Whether originated by Jack, or by some ancestor of the forest who used vines for the same purpose, cannot be readily ascertained.

After a punishment, the animal would only exert himself in this way when not watched; as soon as an eye was directed to him, he would cease. In this he displayed distrust. He also usually exhibited the disposition to accumulate to be quite superior to hunger. Thus he always appropriated all the food within reach before beginning to eat. When different pieces were offered to him, he transferred the first to his hind feet to make room for more; then filled his mouth and hands, and concealed portions behind him. With a large piece in his hands, he would pick the hand of his master clean before using his own, which he was sure of.

APRIL 16.

Mr. VAUX, Vice-President, in the chair.

Twenty-three members present.

The following paper was presented for publication:—

"Studies of the Tyrannidæ. Part I. Revision of the Species of Myiarchus." By ELLIOTT COUES.

APRIL 23.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-one members present.

The following paper was presented for publication:—

"Catalogue and Synonymy of the Family Lucinidæ." By GEO. W. TRYON, Jr.

Prof. P. FRAZER, Jr., noticed a granular sediment at the bottom of several bottles of water from the Geyser Spring, Saratoga, and on taking them out they proved to be phanero-crystalline individuals of peculiar form. This form seemed at first sight to be that of the sphenoid or wedge-shaped hemi-pyramids of one of the tetragonal or rhombic systems. On testing the crystals they proved to be nothing else than carbonate of lime, and the difficulty lay in making their habitus and composition harmonize. Arragonite crystals they certainly were not, and if they were calcites it is evident that they could not be sphenoids.

On a closer examination it turned out that they were acute rhombohedrons with four planes largely and the other two planes only very minutely developed, thus giving to the crystal the appearance of a tetrahedron or sphenoid, two of whose angles were truncated by small planes.

It suggested itself as a means of obtaining crystals from a saturated carbonic acid solution of those substances not readily soluble in pure water, to allow the gas to escape uniformly but slowly, and thus allow each crystal time to complete its complement of planes.

April 30.

The President, Dr. Ruschenberger, in the chair.

Twenty-nine members present.

The death of Wm. W. Gerhard, M.D., was announced.

The following were elected members: Geo. Stiles, M.D., Passmore Williamson, Bloomfield H. Moore, Mrs. Bloomfield H. Moore, Alfred D. Jessup, Wm. F. Miskey, Wm. G. Freedly, F. B. Gowen, E. Burd Grubb, Thos. R. Dunglison, M.D., and John Thompson.

Permission being granted, Dr. H. Allen called attention to a novel method of studying the appendicular skeleton of vertebrates. He had found that a radiated arrangement of bones could be detected in the shoulder girdle. The recognition of such a plan suggested the propriety of characterizing rays as divergent from a hypothetized centre with respect to their positions to the longitudinal axis of the body. The scapula thus becomes the *neurad;* the pre-coracoid and coracoid bones the *heamad;* while the ray of the arm is the *manad.* The neurad ray is single and may segment twice, as in some batrachians, or but once, as in others of the same class. The heamad rays never segment. They may be single or double. The manad rays are multiple in fishes, and may not diverge from a single point. In *Gobius* some of these rays appear as actinapophyses to the neurad rays.

The manad rays are single in other vertebrates. They do not segment in fishes, but may twice segment ("glenoid"-brachium) with other forms. It is necessary to remember that the centre of this radiate arrangement is not at all times at the shoulder-joint, but may be at a point at which the "glenoid" (Parker) scapular, pre-coracoid, and coracoid bones converge. This is instanced in man and the salamander.

The study of the pelvic girdle yields similar results to those above stated. The centre here is at the acetabulum. The neurad ray (ilium), the two heamads (pubis and ischium), as well as the pesad (femur) do not segment. The late Y-shaped ossification (man) is without morphological value.

Dr. A. endeavored to establish a plan for the construction of the hand and foot, by premising a system of divergent rays projecting from the distal extremity of the manad and pedad segments respectively. He conceived it to present a better principle of action than does the hypothesis of Gegenbaur, which rests upon marginal chains of ossicles appended distad to the limb.

In the fish the primal divergence of the rays from the multiple manad are infinite, and do not permit of subsequent divergences. In all other vertebrates the primal divergence is finite (single), and the subsequent divergences vary; they attain their maximum number (four) in the carpus and tarsus of *Ichthyosaurus* and *Plesiosaurus*.

In taking the limbs of the salamander[1] as illustrations, it is found that the humerus gives off at the elbow two rays, the ulna and radius. The ulna at the wrist gives off two rays in the shape of carpal bones, which are serially homologous with the radius and ulna. The lateral (*i. e.* outer) ray segments three times to produce the outer toe. The median (*i. e.* inner) ray segments once and then yields divergents to produce by serial segmentation the toes placed median to the axis of the carpal quantity. The radius does not present divergents but segments to project the innermost toe. In this arrangement the ulna is seen to be the more potential of the divergents of the humerus, since its several divergences make up the bulk of the hand and account for the projection of all the toes excepting the innermost. In the foot the fibula is the more potential bone, since the area of its related divergences yields the bulk of the foot, as does the ulna in the hand. Again, of the first ulnar divergence the median is the more potential, since the lateral passes off to the outer toe, exhibiting axial repetition of segments only. The tendency for the greater potentiality to be found in the median ray of any given divergence, finds an apparent exception in the penultimate divergence in *Ichthyosaurus* and *Plesiosaurus*, where it would appear as though the lateral ray yielding the last divergence is the *outer* instead of the *inner* side. Enough is secured, however, to modify the prevalent idea concerning the acquisition of toes. Conceding that the above scheme is correct, it will follow, that, inasmuch as in the several divergences the median rays are favored, and the toes are the ultimate projections of such rays, they may be initiated from towards the centre and not always from the sides. It was observed, for example, that in the bi-dactylous foot of the *Proteus* the ulnar divergent produced an axis composed of five segments to constitute the outer toe. The radial divergent repeated segments four times, the terminal three comprising the inner toe. Now, the hand

[1] Gegenbaur.

of the *Proteus* is *tri*-dactylous, and it is found that the third toe is the median ray of a divergence terminating the *ulnar* projection.

In this connection reference was made to Buhl's[1] account of a case of congenital defect in the human foot, in which four toes only were present. The missing toe was the fourth, which is the *median* terminal divergent of calcaneal side of foot; the normal arrangement of the human foot being as follows: The potential side (tibial (?), remembering the twist of the posterior extremity, caused the speaker to consider the potential side of the foot to be homologous with the ulnar side of the hand) is segmented twice (astragalus and scaphoid) to produce three divergents (1st, 2d, and 3d metatarsals), each of which segments four times in forming the first three toes. The outer weaker side segments serially twice (calcaneum, cuboid) to yield two divergents (4th and 5th metatarsals), which thence form the fourth and fifth toes.[2]

The relations between the term actinapophysis and the term ray, as used in the above descriptions, were next dwelt upon. It was proposed to restrict the term actinapophysis to a segment projected from the *side* of an axial ray, while such axial rays are always in themselves projections from a hypothetical non-osseous centre. It follows that unless a ray can be traced to such centre, it cannot be considered of primal value, and becomes actinapophysal. In the event of the correctness of this hypothesis, many of the identifications of Parker must fall.

Actinapophyses may behave like primal rays with respect to the bone from which they spring. The separately ossified tip to the acromion process is an example. This is an interesting expression of an actinapophysis projecting in an opposite direction to the axis of its own ray. Ruge,[3] in his descriptions of abnormalities of the acromion, figures two disjuncted actinapophyses in the above position. They are, it was judged, the two centres of ossification of the acromial tip, not co-ossified axially, as is the rule, but placed as divergents to the primal ray.

Dr. A. felt inclined to claim for such centres the name of "centres of nutrition," and to revert the present application of the theory to Goodsir[4] (1845).

[1] Congenital absence of femur, etc. Zeit. f. Rat. Med., 1860, p. 128.

[2] In the hand the radius (ulna, Gegenbaur) yields the scaphoid for a segment, and the trapezius and trapezium as divergents (probably). The ulna gives the semilunar for a segment and magnum unciform and cuneiform for divergents; the fourth and fifth toe are secondary divergences from the unciform (probably).

[3] Zeit. f. Rat. Med., 1859, p. 258.

[4] "Of the forces which exist in connection with centres of nutrition nothing very definite can yet be stated. When this branch of inquiry shall have been opened up, we shall expect to have a science of organic forces bearing direct relations to anatomy, the science of organic forms."—*An. and Path. Obs.*, Art. Centres of Nutrition.

[June 25,

The speaker was of the opinion that, as a principle, it was capable of interpreting much of the skeleton. He had reason to believe, that, the bilaterality of centres of ossification (Serres) so far as they apply to the neural and heamal axes (vertebral column and sternum) being assumed, all other arrangements of the scleral tissues were about "centres of nutrition." The costal series (inclusive of the clavicles), with its multiple segmentations and occasional actinapophyses; and more especially the infra-cranial arches (the branchial (hyoid), mandibular apparatuses), were held to be parts of a system similar to the above in kind.

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

ON PREHISTORIC HUMAN ART FROM WYOMING AND COLORADO.

BY E. L. BERTHOUD, A.M., C.E.

[Journal of a Reconnoissance made along Creek Valley, Colorado, in October and November, 1871.]

GREELEY, COLORADO.

Oct. 21, 1871. We leave Greeley, lat. 40° 25′, long. 104° 36′ west, at 2½ P.M., cross Câche La Poudre Railroad, half mile east of town, our course is N. 60° east. Camping in the evening below the mouth of the Câche La Poudre, and on north bank of South Platte River, our reconnoissance line takes us to Low Wet Creek, three miles north of the river, but the total want of water in the creek compels us to go to Platte River for camp.

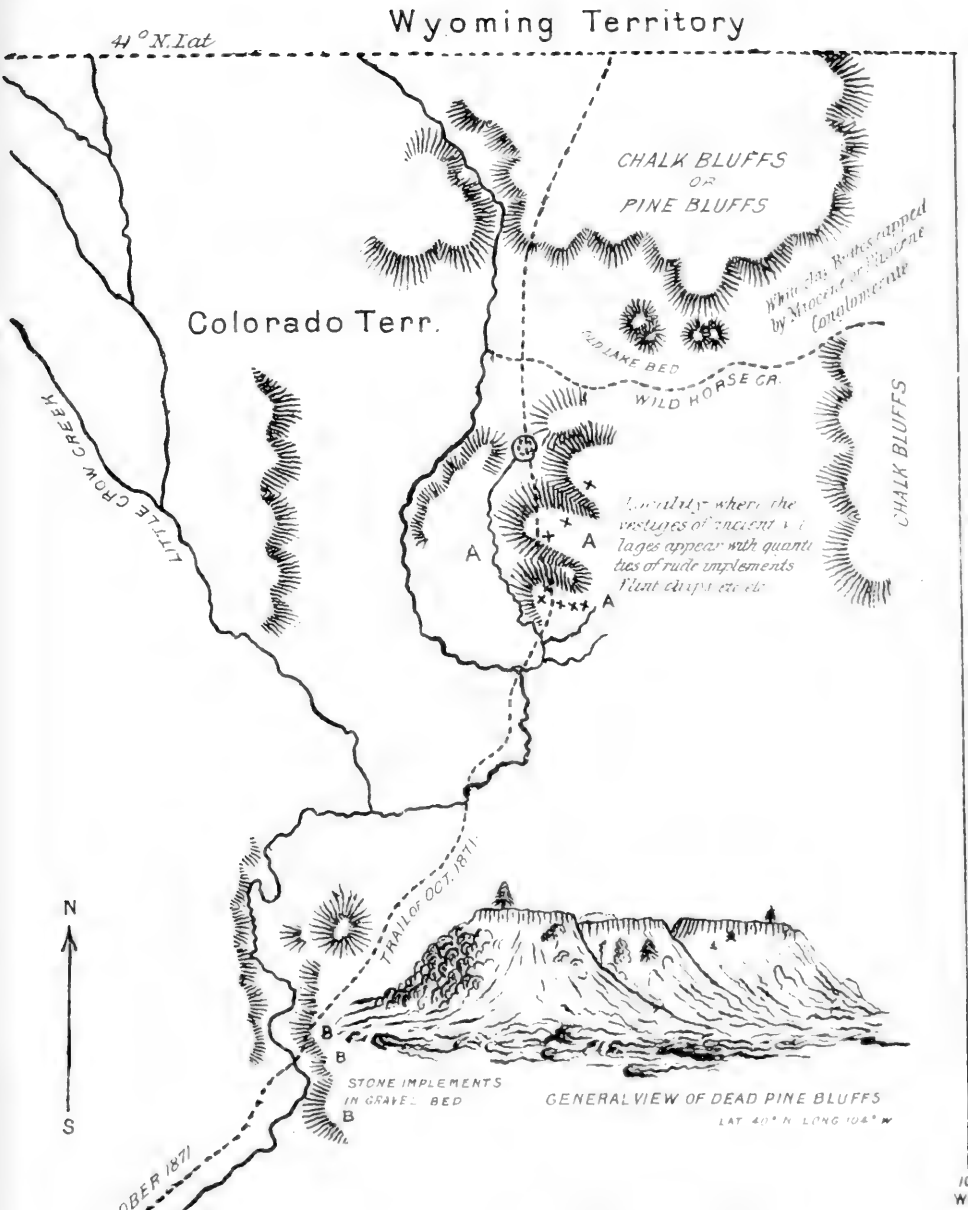
Altitude above the sea 45.56. Vegetation is getting more stunted; the only trees and shrubs found are *Populus angulata*, *Salix muhlenbergiana? Rhus triloba*, and *Negundo aceroides; Cerasus serotina:* while a few *Cleome integrifolia*, and *Aster Novæ-Angliæ?* are yet in flower, and *Cactus opuntia*, covers the high prairie everywhere.

Platte River abounds in wild geese, *A. canadensis;* brant, *A. Bernicla;* some white gulls and sooty terns.

Oct. 22. Leave camp at 7 A.M., course N. 36° east. Travelling to-day to reach Crow Creek for evening camp; soil is sandy and covered in every direction with prickly pear of most annoying thickness; our view in every direction except west is bounded by a dreary, grayish, monotonous prairie, still it is singular to see what a large amount of animal life exists here.

Three kinds of wolves, the little prairie fox *Canis velox*, antelopes, badgers, prairie dogs, two kinds of rabbits, black-tailed deer were seen by us to-day at 3 P.M., in full sight of Crow Creek; we find in several prairie ridges multitudes of *Ostræa* or *Inoceramus* shells, forming beds of dark, soft earthy limestone. Reaching Crow Creek we camp in a bend of the stream.

Oct. 23. We follow Crow Creek to-day for nine or ten miles in a course on average about N. 40° east. Water and grass scarce and bad. We cross and recross the creek to-day, but it is dry and sandy, and its banks wofully parched; at 3 P.M. finding a



MAP
SHOWING LOCATION
OF
IMPLEMENTS, FIRE-PLACES
etc. etc.

SCALE FOUR MILES TO

water hole of green slimy liquid, we camp on the west side of the creek.

While investigating the formation of the bluffs capped with gravel, we find many beautiful moss agates, and numerous flakes and rude stone implements, mixed in tertiary gravel and seemingly coeval with it.

Oct. 24. Crossing Crow Creek at camp our course is N. 23° and N. 11° east.

On leaving Crow Creek I obtained a complete suite of stone implements and rude fragments which occur mixed in a gravel and sand deposit that composes the summit and sides of the low bluffs on the east bank. I found them in the gravel, in the soil, in every kind of position, and sometimes weather beaten or stained by weather and rain. The accompanying gravel is composed of smooth pebbles of quartzite jasper, agate, granite, mica, slate, basalt; with a few shells and fossil wood, or wood opal; while in the low grounds at the foot of the bluffs ancient fireplaces, burnt fragments of bone and wood, with flint and agate, chips and implements, almost universally distinct from those on the summit of the low hills bordering Crow Creek; so much is this the case, that the two seem to point to a distinct era, the later presenting some progress and refinement even in stone implements.

The evidences of the oldest and rudest art do not even show traces of fire or fireplaces; rough implements, irregular piles of pebbles, are all that is left us to show and identify to the observer the obscure seat of a still more obscure barbarism.

Another fact puzzles me, that whenever and wherever on Câche La Poudre, Big Thompson River, Clear Creek, Crow Creek, and Platte River, we find evidences of "Pre-aboriginal" occupation, it is invariably on the low bluffs bordering these valleys, and in a tertiary gravel deposit; but if we go back in the higher region of the prairies, they almost disappear or present a difference in form or material.

The shape, the location, the rude barbarism of these first attempts of art irresistibly lead us to compare them to the rude tools of Abbeville in France, or the implements of kerne in England. I am glad to be able to give a few shells from this place, which will serve to guide us in determining the age of the gravel beds of Crow Creek.

We are fast nearing the high table-land, between South Platte

River, Crow Creek, and Pole Creek; this is a dividing ridge capped by conglomerate in many places, and under this on Low Wet, Little Crow Creek, etc., miocene beds with Oreodon, Titanotherium and fresh-water turtles. The gravel beds of Crow Creek may be quaternary? but they seem made up from the decomposed capping north of us, and at Golden City apparently underly the newer tertiary beds, capped with basalt?

Continuing our course about N. 15° east we reach Crow Creek again in the evening; passing over a bed of lignite or tertiary coal. Prairie very sandy and dry; formation soft sandstone and clay beds.

Oct. 25. Course about N. 11° to 17° east, following Crow Creek three or four miles. I noticed in two places in the steep bluffs bordering the stream the burnt stones and black carbonaceous remains of old fireplaces, from four to eight feet below the present surface.

At 11 A.M. we again leave Crow Creek, and begin to cross another large bend in that stream. We are in sight of bright, white bluffs north of us and directly in our course. These are the white or chalk bluffs, that extend west to near the foot of the black hills and on the boundary between Colorado and Wyoming Territories, on the parallel of 41° N. Antelopes abound here, we saw also to-day sixteen wild horses, which at the first sight of our men went off at a rattling pace; the patriarch of the flock, a fine black stallion, driving the rest before him.

Passing over a flat well-grassed prairie bottom we reach at 1 P.M. some long low ridges, that insensibly are lost in a low flat bottom, bordering a small dry affluent of Crow Creek.

Halting here to await the arrival of the party some two miles back, I strolled over the ridges to pick up specimens of agates or fossils; while so occupied I found at the foot of the first ridge the evidences of the deserted site of an ancient village; the stone heaps and circles, the projecting and polished boulders, the stray flint tools and weapons, the multitudes of broken flakes or fragments left in the primeval workshop; while all around dispersed in rude circles, the boulders of quartzite, of jaspery rocks, yellow, red, or gray, nowhere else "*in situ*," speak of some method or manner of industry, totally unlike our more modern Indian or mound builder's vestiges.

I made a sketch of this locality, marked A A A on the map, and also made a collection of the better formed implements and weapons. I examined this locality critically, to get some clue to its antiquity.

North, half a mile farther, another old site was reached, marked by four large boulders, placed on end in some sort of rude order. Crossing a small valley I reached another spot indicated by similar rude monuments, and characterized by heaps of ancient implements and chiplings of the most primitive kind; these are strewn in every direction on a grassy ridge sloping down into a small valley. The boulders here and elsewhere may have been placed as rallying points for the family circle of the "Pre-aboriginal" man.

Located on points of land and extended promontories, these ancient sites favor strongly the idea of location near some ancient estuary or fresh-water lake; whose vestiges the present topography of this region favors.

Note on the Shells accompanying the Flints.—These represent four species, three only determinable. My friend, T. A. Conrad, to whom I submitted them, states that one of them is a *Corbicula*, the other a *Rangia*, both estuary shells, "certainly not of later age than older Pliocene, or possibly Miocene, but there is no trace of *Rangia* in the Eocene."—E.D. Cope.

DESCRIPTIONS AND ILLUSTRATIONS OF GENERA OF SHELLS.

BY T. A. CONRAD.

CRASSATELLA, Lam.

Subgenus PACHYTHÆRUS.

C. Pteropsis, Conrad, Pl. I., fig. 1. Cretaceous.

C. Ripleyana, Conrad, fig. 7. Cretaceous.

C. ligeriensis, D'Orb. fig. 10. Cretaceous.

I do not suppose this group of Cretaceous, Eocene, and Oligocene shells will be recognized as a genus distinct from CRASSATELLA, and therefore I propose it as a subgenus to mark the differences which characterize the species of Cretaceous and older tertiary formations, and distinguish them from Miocene and recent forms.

For description of the subgenus, see Amer. Journ. of Conch., vol. v. p. 47.

CRASSATELLA.

Miocene and recent.

C. undulata, Say, Plate I., fig. 9.

PLEUROCONCHA.

Shell radiately ribbed, hinge of right valve with 2 cardinal teeth, posterior one immediately under the apex, triangular, thick, and directed obliquely posteriorly, anterior tooth approximately direct, no cartilage pit as in Crassatella.

Crassatella Gallieni, D'Orbigny.

I originally proposed this genus under the objectionable name of RADIOCONCHA, and as it has not been accepted I feel at liberty to alter the orthography though not the meaning of the name.

In an attempt at a natural classification of bivalves it would be wrong to include this shell in the genus CRASSATELLA, as the above diagnosis must render evident to any one who studies the subject.

In indicating the genus an error occurred in quoting the name of *Guerangeri*, instead of *Gallieni* as I intended. It seems hardly possible that any one could suppose that I would quote the ASTARTE figured on the same plate as the type of the genus. Had I done so it would have been quoted ASTARTE, not CRASSATELLA. *C. Robinaldini* was incorrectly referred to this genus.

PTYCHOMYA, Ag., is described as having 3 diverging cardinal teeth in each valve, which with other characters show a wide generic difference between it and PLEUROCONCHA.

PLIONEMA, Conrad.

Shell subrotund, sculptured with close radiating lines or fine ribs; hinge of left valve with 2 robust diverging teeth; lunule none.

Astarte Guerangeri, D'Orbigny.

The radiating ribs and lunule are I think sufficient to distinguish this as a subgenus. When it is considered that all the numerous species, Cretaceous and recent, of the genus ASTARTE or CRASSINA are characterized by a well-marked and generally profound lunule, and when ribbed, always concentrically, the *Astarte Guerangeri* forms too marked an exception to place it in the group of typical species.

SCAMBULA.

Shell triangular, compressed; in the right valve one direct tooth under the apex, with a pit on each side of it, and a long lateral tooth anteriorly, posterior dorsal margin carinated, which prominent line fits into a doubled lateral tooth, in the opposite valve, left valve with 2 long approximate direct teeth, and a long anterior marginal lateral tooth, pallial line invisible, inner margin finely crenulated on a raised line.

S. perplana, Conrad, Pl. I., fig. 2

The crenulations on the shell closely resemble those of PACHYTHÆRUS (Cretaceous forms of CRASSATELLA), being arranged in a slightly prominent line. The hinge of this shell is very distinct from that of CRASSATELLA.

PTEROMERIS.

Shell triangular, compressed, radiately ribbed, not oblique: hinge of left valve with 2 diverging cardinal teeth, the anterior one slightly grooved; the posterior one elongated, profoundly bifid; posterior hinge margin carinated.

P. perplana, Pl. I., fig. 3.

This genus was indicated in the Proceedings of the Academy of Natural Sciences in 1862. It was not founded on *Astarte minutissima* as stated by Stoliczka, but on *Cardita perplana* a Miocene shell. MICROMERIS was proposed for the former, which from

Lea's description and figure must be sufficiently distinct in generic character.

In the Eocene catalogue published in the American Journal of Conchology, *Astarte minutissima* was incorrectly referred to PTEROMERIS. This shell, and *Cardita atomus*, Deshayes, look much alike externally.

VETERICARDIA.

This genus was improperly printed *Vetocardia*, and I here restore the correct orthography.

V. crenalirata, Pl. I., fig. 4.
Venericardia dupiniana, from D'Orbigny, fig. 11.

Stoliczka has figured a shell under the name of *Cardita Jaquenoti* which has more external resemblance to VENERICARDIA than any cretaceous form known to me, but the hinge is different from that of CARDITA or VENERICARDIA, and also from that of the present genus.

PLEUROMERIS.

P. tridentata (Cardita), Say.

May be regarded as the type of this genus, which was described in the Amer. Journ. of Conch., vol. III., p. 12.

P. decemcostata, Pl. I., fig. 8

This is a Miocene species in which formation most of the species are found, though the genus first appeared in the Eocene. I refer to this genus *Cardita Kickxii*, *C. chamæformis*, Sowerby, *C. scalaris*, *C. analis*, Phil.

EULOXA.

Equivalved; hinge of right valve having a long oblique bifid tooth immediately under the apex, and one pyramidal thick distant tooth anteriorly, left valve with 3 distant cardinal teeth, one under the apex oblique thick entire, posterior tooth slender and very oblique, anterior tooth small, pallial line with a slight sinus; inner margin entire.

E. latisulcata, Pl. I., fig. 5. Proceed. Acad. Nat. Sciences, vol. xiv. p. 585.

This genus essentially differs from CRASSINA in the thick anterior tooth of the right valve; in having 3 teeth in the left valve, and in having a dental pit in the right valve where CRASSINA has a prominent tooth, and in having a pallial sinus. I know of one species only, *E. latisulcata*, a Miocene fossil.

ALVEINUS.

Shell equivalved, smooth; hinge of both valves with a central pit or emargination; right valve with 2 approximate tuberculiform minute teeth, the first immediately under the apex and the other beneath and a little in advance of it; a lanceolate furrow in front of it; left valve with 2 tuberculiform teeth situated in respect to each other in a line with the anterior hinge margin; a submarginal channel runs entirely round the valves to the apex; pallial line entire?

A. minutus, Conrad, Pl. I., fig. 6. Amer. Journ. Conch., vol. i. p. 138, Pl. X., fig, 2.

A minute shell of the Oligocene period found at Enterprise, Miss. The exterior has much resemblance to that of a ventricose *Dosinia*. The channel around the submargin of the entire shell is, I believe, an unique character. The figure is greatly enlarged. We have but two specimens of this little bivalve, which is extremely thin in substance.

PARASTARTE.

Comparing this minute shell with *Goodallia triangularis*, the hinge is found to correspond with that of the latter, and therefore *P. triquetra*, Conrad, (Proceed. Acad. Nat. Sciences, 1862) must be named *Goodallia triquetra*.

LATIARCA.

Shell triangular, thick, capacious; hinge line narrow medially, broad at the ends; cardinal plates elevated strongly and rugosely striated transversely, the larger plates descending; medial plates very irregular; lower margin of posterior cicatrix elevated and acute, area between the beaks with conspicuous grooves angulated under the beaks.

Latiarca idonea, Conrad, Pl. II., fig. 1. Amer. Journ. Conch., p. 289. Eocene.

The most essential difference between this genus and *Idonearca* is the want of the internal plate, very prominent in the latter, which is also a much shorter shell, with a broader hinge plate.

Cucullæa crassatina, Lam., is a fine example of this genus. Deshayes, Coq. Foss. pl. XXXI., fig. 8, 9.

IDONEARCA.

Shell triangular, thick, ventricose, with radiating lines, hinge broad, medial cardinal plates prominent, linear, transverse, or direct and transversely striated ; anterior and posterior plates elongated, oblique or descending, angular at the inner ends and strongly striated transversely, inner plate prominent, curved, cardinal area subequal, grooved.

I. capax. Pl. II., fig. 2. Journ. Acad. Nat. Sci., 2d series, vol. III., p. 328, pl. XXXV., fig. 2.

This genus is one of the most characteristic of the Cretaceous forms, and has the earliest and most developed form of hinge, now represented by the recent *Cucullæa.* Stoliczka confounds with Macrodon, the two very distinct genera of Idonearca and Grammatodon. The latter is a Jurassic genus unknown in Cretaceous strata.

Having obtained the hinge of a New Jersey bivalve belonging to a group of which *Cucullæa vulgaris*, Morton, is the typical form, I am enabled to subjoin a list of all the species of Idonearca known to me.

American.	European.	Syrian.
antrosa, *Morton.*	glabra, *Sowerby.*	*brevifrons*, *Conrad.*
capax, *Conrad.*	disparilis, *D' Orbig.*	*induratus*, *Conrad.*
Matthewsoni, *Gabb.*	Gabrielis, *D' Orbig.*	*opiformis*, *Conrad.*
Tippana, *Conrad.*	fibrosa, *D' Orbig.*	*orientalis*, *Conrad.*
truncata, *Gabb.*	Marciana, *D, Orbig.*	*subrotunda*, *Conrad.*
	sagittata, *D' Orbig.*	*Syriaca*, *Conrad.*
	tumida, *D' Orbig.*	
	Indian.	
	disparilis, *D' Obigny.*	

TRIGONOARCA.

This genus is eminently characteristic of the Newer Cretaceous series. It has very marked and distinct generic characters, particularly in having teeth like Axinæa and an internal elevated plate like Idonearca and Cucullæa.

Stoliczka doubts whether this genus should not rather be a subgenus of Noetia, a very strange reference considering that Noetia is strongly ribbed, has comparatively fine hinge teeth, no internal plate and reversed beaks, and above all is no older than the Miocene, while TRIGONOARCA disappeared at the close of the Chalk epoch. It combines the characters of AXINÆA and IDONEARCA and connects these with CUCULLÆA.

The American species have a very short posterior hinge area, which is rather long anteriorly.

Subgenus BREVIARCA.

Shell short; hinge area minutely striated across; hinge line descending at the ends; cardinal plates minute, crowded.

T. perovalis, Plate II., fig. 4.

T. Saffordii, Gabb, Plate II., fig. 3.

STUDIES OF THE TYRANNIDÆ.—PART I. REVISION OF THE SPECIES OF MYIARCHUS.

BY ELLIOTT COUES.

A complete and perfectly satisfactory account of this family can only be rendered by some one who has access to the principal European collections as well as those of this country. But if the large amount of United States material is thoroughly worked up, it may become an important contribution to the urgently needed monograph of the future. The present is the first one of a series of papers in which more or fewer of the genera of *Tyrannidæ* will be considered as time and circumstances may allow. The basis of these "studies" should be explicitly stated. The investigation is grounded, first, upon the entire Smithsonian series, which, in the liberal policy pursued by the authorities of that institution, is placed in my hands; and probably, in the end, the specimens will be made up in sets, labelled in accordance with my views, and distributed to home and foreign societies. Through the friendly offices of Mr. J. A. Allen, the whole collection of the museum of Comparative Zoology has been sent to me. The large suite of the Philadelphia Academy is examined, as well as the Lafresnaye types and other specimens in the Boston Society's Museum; while I have received, through the courtesy of Dr. Brewer and Prof. Hyatt, such specimens as the rules of the society permit to leave the building. Mr. Lawrence generously places the flycatchers of his private cabinet at my service; they represent all his types and many other indispensable examples. Prof. Orton has promptly signified his willingness to transmit, from the extensive collection of Vassar College, Poughkeepsie, such specimens as I may desire to inspect. Others are derived from my own cabinet and miscellaneous sources. Since it does not appear that there is any important material in southern or western cities, what is just recounted virtually represents the gross amount available in the country; and what this is may be inferred by the fact, that the specimens of *Myiarchus* alone are over two hundred in number.

Genus MYIARCHUS Cabanis.

Myiarchus, Cab., Fn. Peruv. 1844, 152. Type *Muscicapa ferox*, Gm.
Despotina, Kaup, ?——, 1851.[1] Type —— ——?
Kaupornis, Bp., ? Ateneo Italiano, 1854. Type *Myiobus stolidus*, Gosse.
Blacicus, Cab., J. f. O. 1855, 480. Type *Myiobius tristis*, Gosse.
Myionax, Cab., Mus. Hein. ii. 1859, 73. Type *Muscicapa crinita*, L.
Non *Myiarchus* apud Bp. Consp. Av. i. 188.
Muscicapa, Tyrannus, Tyrannula, Aliquorum.

The genus, so called, rests upon no structural characters, while its synonyms are among the vagaries of ornithology. But the term is a convenient designation of a group of flycatchers modelled in the likeness of *Musciapa crinita*, L. They stand near *Tyrannus* proper, and closely resemble the olivaceous, yellow-bellied species ("Laphyctes") of the latter, such as *verticalis;* but are distinguished by not having the outer primaries emarginate, nor the wings longer than the tail, nor a flame-colored crest. The bill and feet of the two genera do not differ noticeably; or rather, these members, in the species of *Myiarchus*, vary as much *inter se* as the difference between *Myiarchus* and *Tyrannus* in the same respects.

But the distinction between *Myiarchus* and *Tyrannus*, due to the tolerably strong features of the latter genus, is considerable, compared with the differences subsisting between *Myiarchus* and several allied olivaceous flycatchers. Color aside, there are no substantial characters by which the *Myiarchi* can be distinguished generically from "Empidias" *fuscus*, "Empidonax" *acadicus*, "Myiodynastes" *audax*, and others, among which I am not sure that some forms with which I am at present unacquainted may not fall in *Myiarchus* as defined for the purposes of this paper.

In the matter of external anatomy, or contour, we can only say that *Myiarchi* are rather large tyrannulas, with the nearly even tail so lengthened that when measured inside the coccyx it equals or rather exceeds the wing in length; with the wing rather short, and its point formed by the third, or third and fourth quills, closely supported by the second and fifth, the first being only as long as the inner primaries; with the bill of the most ordinary tyrannuline shape, a little more or less than half its own length

[1] I quote this and the following name on Gray's authority, having no means of verifying the references.

broad opposite the nostrils, and a little shorter than the tarsus, which latter somewhat exceeds the middle toe and claw in length; and with the occipital and coronal feathers somewhat lanceolate and lengthened into a slight crest.

Coloration is a good arbitrary clue to the genus. The upper parts are more or less olive, sometimes clear and bright, sometimes grayish or brownish; the throat is more or less ashy, variable in shade; the belly is more or less yellow, from a rich shade to a mere trace; and the wing and tail feathers are marked with rufous, sometimes intense, and occupying the whole of certain feathers, sometimes reduced to a mere trace; but even in those species, in which it is at a minimum, it may be detected in some specimens. If one will lay the following birds side by side, one will see this distinctive brand of coloration running through them all, though at first sight such a form as *antillarum* does not particularly resemble *validus*. The *Tyranni* afford a parallel series between extremes, from the most olivaceous yellow-bellied species, like *verticalis*, to the dark ashy white-bellied *carolinensis*. Still, in a certain per cent. of specimens of several *Myiarchi* the rufous is ordinarily imperceptible.

Judged by the foregoing standard, "Blacicus" *tristis* is a pure *Myiarchus;* in fact, it is the insular representative of *nigriceps*, as *stolidus* is of *lawrencei*. "Blacicus" *pallidus*, however, falls under "Contopus," owing to the smallness of the feet. "Tyrannus" *antillarum*, Bryant, referred by Gray to typical *Tyrannus*, is certainly a true *Myiarchus*, being simply an insular variety of *M. stolidus*. But this error of Gray's is a slight matter, compared with his assignment of *stolidus* itself to an entirely different genus of another sub-family; this bird being pure *Myiarchus*, only specifically distinguishable from *M. lawrencei* as its insular representative. I know nothing of the "Onychopterus tuberculifer Lafr." which Gray interpolates betwixt the larger and smaller species of typical *Myiarchus;* but I suspect it does not belong just here. Likewise I have not seen four other species ascribed to the genus, viz.: *tricolor*, *cantans* and *gracilirostris*, Pelzeln, and *fasciatus*, Landb.; so I cannot say whether or not they fall in the group as here defined; but there is little, if any doubt, that they belong here. Excepting these, I have before me, I believe, types or typical specimens of all the described species of *Myiarchus;* and these I purpose to elaborate in this paper. And that I may not be misunderstood in my method of treating them, I will state explicitly that I am governed, on this occasion, by the following arbitrary rules or definitions:—

I. I predicate "species" upon specimens presenting any definite, constant, tangible characters whatsoever, that do not, so far as it appears, grade into the characters of other specimens.

II. I predicate "varieties" upon specimens presenting indefinite and inconstant yet tangible characters that are seen to grade into the characters of other specimens.

III. I predicate "synonyms" upon specimens presenting indefinite, inconstant, and intangible characters due to individual peculiarities, or to age, sex, season, or locality; as well as upon specimens presenting no special characters at all.

My present belief is, that there are only four[1] forms of *Myiarchus* that do not intergrade, and that are differentiated from a common original stock to such degree, or in such manner, that we cannot account for their respective peculiarities according to highly probable laws of geographical variation depending upon differences in food, climate, etc.; but I cannot here enter upon debatable ground. According to the foregoing practically convenient if not very scientific rules, I find that the specimens examined represent nine species, two of which each present three tangible varieties.[2]

Before proceeding to handle these species and varieties I will recount several propositions that should receive due consideration.

a. The normal inherent variability in size, of the whole bird and of its several members, is at least 12 per cent. of the mean. (This is independent of all extraneous influences.)

b. Size varies in direct ratio with the latitude of the breeding place.

c. Size of peripheral parts, as compared with total size, varies

[1] One is the series comprising *crinitus*, *validus*, *cinerascens*, *tyrannulus* and *phæocephalus;* the second is *lawrencii* and *nigriceps;* the third, *stolidus;* fourth, *tristis*.

[2] In defining these varieties, as I do beyond, I must not be taken as meaning that the characters assigned always apply in full force: that would be *primâ facie* evidence of species. On the contrary, I describe the extreme phase of variation, which shades by insensible steps into the "typical" condition of the species.

in inverse ratio with the latitude of the breeding-place.[1] (Cf. Allen, Bull. Mus. Comp. Zool. ii. p. 229.)

d. The ♀ is generally a little smaller than the ♂.

e. Intensity of coloration varies in direct ratio with the temperature and humidity of the breeding-place. Moisture, however, intensifies color more than heat; aridity tones down color more than cold. Birds from hot dry places, therefore, are paler *cæteris paribus*, than birds from wet places of the same or even lower temperature. (Cf. Allen, op. cit. p. 239.)

f. The rufous coloration belongs to the category of what some call "embryonic features," in the sense that it generally decreases with age. Young birds are suffused with rufous to an extent rarely if ever seen in the old; this is shown both in the greater extent of the color on the quills and tail, and in the modification of the olivaceous by admixture, young birds being "browner" than the old.

g. In the adult state, the freshest plumage is the most olivaceous, as the feathers wear browner with exposure.

h. The yellow coloration increases with age to a certain extent; and in the fall is at least as bright as, if not brighter than, in spring, in equally mature birds.

i. The sexes do not differ in color to a recognizable degree.[2]

k. Variation unconnected with age, sex, or season, is in inverse ratio with the migration or changeable geographical distribution of individuals.

This last important generalization is well illustrated in the cases of *crinitus* and *stolidus*. The former is the most extensively dispersed species of the genus, being found at different seasons from Guatemala to New England. As its individuals are never con-

[1] But certain localities produce larger bills, in opposition to this rule, or show greater variability in the size of the bill, according to influences at present unknown; *e. g.*, the large bills of the Tehuantepec *Myiarchi;* the extremely variable bills of the Jamaican *M. stolidus.*

[2] An unquestionable fact, in its application to *crinitus* and some others. Authors, however, speak of color-differences in the sexes of the South American species, *ferox.* I have been unable to verify such statements, and think that a point of *age*, not of sex, is involved, younger birds having rufous that afterward disappears. If so be it, that such sexual differences really subsist in the case of *ferox*, then my entire characterization of that species falls to the ground, and the bird cannot be specifically distinguished from the variety of *crinitus* that I call *irritabilis*, beyond.

tinuously subjected to local modifying influences of a special kind, it preserves its peculiarities intact; specimens from the extremes of its range are utterly indistinguishable. But the non-migratory individuals of Mexico, belonging to the same *crinitus* stock, present recognizable local varieties; whilst *M. stolidus*, a thoroughly localized bird, stationary in several places, has developed several sharply distinguished insular races peculiar to the islands they respectively occupy.[1]

I can offer no satisfactory explanation of the fact that several species of the genus are distinguished by the amount of rufous coloring, though I suspect it may be referable to proposition *e*, considering fuscous a "more intense" coloration than rufous. Certainly the northernmost bird, *crinitus*, and the bird of the New Mexican deserts, have the most rufous of any continental forms. The extent of rufous decreases even in the Mexican varieties of *crinitus*, is still less in *lawrencii*, and almost or quite disappears in the purely tropical *nigriceps*, *ferox*, and *phæocephalus*. But even continental specimens of an opposite character occur, whilst the insular species, *validus* and *stolidus*, offer completely rebutting testimony.

This general question of the production of the rufous aside, study of these birds makes it evident that large allowance must be granted for purely individual—commonly called "accidental"—differences in amount or intensity of the rufous in specimens of the same species. Though it is certain that, for example, *validus*, *cinerascens*, and *crinitus*, with its varieties, may each be recognized with tolerable facility by their respective patterns of the rufous, whether occupying the whole, or a small part, or a different part of the inner webs of the rectrices, yet it is equally certain that no such slight distinctions as its occupying a fourth, a fifth, or a sixth of the web, fading insensibly or changing abruptly into the fuscous, etc., can be relied upon at all. Among the varieties of *M. stolidus*, indeed, we can trace the restriction of the rufous by insensible degrees, from its occupying two-thirds of the inner web to its narrow edging of the feather, and finally to its forming a mere trace at the end. Moreover, the rufous differs so much in

[1] *Cf.* remarks upon the more stationary forms of *Aegiothus*, as compared with the most nomadic individuals (*linarius*) of the genus. Coues, P. A. N. S. P. 1869, p. 182, *et seq.*

extent and even in pattern in the same individual at different stages of plumage, that we can only compare age for age and season for season with any success in determination of specific characters. It is most probable that even the wide limits I set for variability in this respect, due to age, season, and individual peculiarity, will require to be somewhat enlarged.

The foregoing paragraphs must not be construed as any attempt to undervalue the interesting and sometimes extremely curious characters distinguishing the several species. Though in the following pages I may appear to have "unnecessarily," if not unwarrantably, reduced the number of species, yet I am persuaded that no unprejudiced ornithologist could have reached different conclusions upon study of the same material. It may be well to remember that two hundred specimens of *Myiarchus* have never before been examined by one person at a *coup d'œil;* and I really think that with two thousand specimens instead of two hundred, I should not be able to establish as many species as are here allowed. Others will judge whether I have placed the species here discussed upon sure footing; I simply ask for impartial criticism.

1. Myiarchus validus.

Tyrannus crinitus, Gosse, B. Jam. 186; nec auct.
Myiarchus validus, Cab., Orn. Not. ii. 351, et auct.
Myionax validus, Cab., M. H. ii. 73.
Pyrocephalus (*Myionax*) *validus*, Gr., H.-L. No. 5520.
Tyrannula gossii, Bp., C. A. i. 189.
Red Petchary, Anglicè.

M. inter majores, rostro crasso, tarsum æquante; coloribus intensis; olivaceo-fuscus, gulâ cinereo-plumbea, hinc ventre sensim sordide flavido; remigibus, rectricibus tectricibusque alarum superioribus et intus et extus rufomarginatis, tectricibus alarum caudæque inferioribus rufescentibus. Long. tot. 7.50–8.50, alæ et caudæ 3.80–4.20, tarsi et rostri .80–.90, digiti 3tii cum ungue .70–.80; rostri latitudo ad nares .35–.40. (Poll. Angl. et dec.)

Hab.—Ins. Jamaica. (Mus. S. I. et G. N. L.)

Obs.—A stationary localized form which by isolation from its allies and continuous subjection to special modifying influences, has become so far differentiated as to be recognizable on sight, and which is not now known to intergrade with its nearest ally, *crinitus*.

The bill is nearly at the maximum size for the genus, is largely light-colored at base below, and not perfectly black elsewhere, as in var. *cooperi*, another subtropical form. The rufous coloration is at the maximum both of intensity and extent; it occupies a part or the whole of every single feather of the wings and tail and their coverts; it is intense on the outer edges of the primaries, paler on the inner edges of these and other remiges, paler still (yet not whitish) on the outer edges of the inner remiges; it tips and edges all the upper coverts, and suffuses all the under coverts, both of wings and tail; it usually occupies the whole outer rectrix, and whole inner web of the other rectrices (saving the middle pair), excepting a narrowest possible shaft line; moreover, it narrowly edges the outer webs of the rectrices. In fact, the tail might be described as rufous, with the central rectrices and a narrow shaft line on the others, fuscous. Nothing like this is known to occur in any continental form. Likewise the bird has a peculiar sordid aspect below, arising from impurity both of the ash and the yellow; which colors have no definite line of separation.

Jamaica the only recorded locality.

No synonymical questions involved.

Specimens examined, five.

2. Myiarchus crinitus.

a. var. *crinitus*.

Muscicapa crinita, L., S. N. i. 325.
Tyrannus crinitus, Sws., Quart. J. xx. 1826, 271.
Myiobius crinitus, Gr., G. B. i. 248.
Tyrannula crinita, Bp., C. A. i. 189.
Myiarchus crinitus, Cab., J. f. O. iii. 1855, 479, et auct.
Myionax crinitus, Cab., M. H. ii. 73.
Myiarchus (Myionax) crinitus, Scl., C. A. B. 232.
Pyrocephalus (Myionax) crinitus, Gr., H.-L. No. 5518.
Muscicapa ludoviciana, Gm., S. N. i. 934.
Tyrannus ludovicianus V., O. A. S. i. pl. 45.
Muscicapa virginea, Müll. (G. R. Gr.)
M. virginea cristata, Briss. Orn. ii. 412. P. E. 569, f. 1. (G. R. Gr.)
Crested Flycatcher, Anglicè.

M. inter majores, rostro modico, tarso breviore, coloribus claris; olivaceus, gulâ cinerea, hinc ventre, crisso tectricibusque alarum inferioribus flavis; remigibus primariis et extus et intus, rectricibus (mediis exceptis) intus nec extus rufomarginatis; rectrice exteriore, remigibus secondariis, tectricibusque alarum superioribus flavidalbido marginatis, in pogoniis rectricum interioribus colore rufo latissimo, fusco angustissimo, lineâ rectâ segregatis; rostro fusco, infra ad basin pallido. Long. 7.50–8.00, alæ et caudæ 3.80–4.20, tarsi .75–.85 (nunquam .90?), digiti 3tii .65–.75, rostri .70–.80, rostri lat. .33–.40.

Habitat æstiv. partibus orient. Reip. Amer. Sept., hyeme Amer. Centrali, præsertim Guatemala. (Costa Rica, Lawr., Ann. Lyc. 1868, 115.) Cuba? (Gundl., 239.) An Amer. Merid.?

Obs.—These references and diagnosis apply exclusively to the bird that breeds in the United States, entirely withdrawing in the fall to winter in Central America. This is pure *crinitus;* the birds that summer in Mexico and elsewhere south of the United States have developed other varieties (infrà). During the extensive migrations, its passage seems rapid and its path narrow; for we have no Antillean (except as above) nor West Mexican quotations of the bonâ fide *crinitus*, and few Mexican skins are certainly referable to it. In passing from its winter headquarters, either it flies across the Gulf, or else it hugs the eastern coast of Mexico. I have yet to see typical *crinitus* from South America.

Diagnostic points to be remembered are these: bill never quite black; stout and comparatively short, hardly or not equalling the tarsus, which latter never (?) touches .90; back pure olive, throat pure ash, belly, etc., pure yellow; inner secondaries and upper wing coverts and outer rectrix edged with yellowish-white (never rufous—*cf. validus*), in marked contrast with rufous edgings of primaries and inner webs of rectrices; all rectrices but the middle pair so nearly completely rufous on the inner webs that a mere line of fuscous persists next the shaft (*cf. irritabilis et cooperi*); this runs of equal breadth the whole length of the feathers (*cf. cinerascens*); it is sometimes inappreciable on some feathers (then about as in *validus*); none of the rectrices ever with more than a trace of rufous on the outer web.

About sixty specimens examined. (Mus. S. I., etc. etc.) Nearly all these not of the United States are Guatemalan, are positive duplicates of Pennsylvania skins, for instance, and were doubtless hatched in the United States. Other Guatemalan examples and many Mexican skins of birds that never saw the United States, represent different varieties, as follows.

b. VAR. *irritabilis*.

Tyrannus irritabilis, Vieillot, Ency. Meth. 1823, ii. 847, ex Suiriri pardoy-rojo, Azara, Apunt. ii. 143, No. 195. Paraguay.
Tyrannula irritabilis, Bp., C. A. i. 189. "Amer. Merid. Parag."
Myiarchus erythrocercus, Scl. et Salv., P. Z. S. 1868, 631, 632. Venezuela.
Myiarchus mexicanus, Lawr., A. L. N. Y. ix. 1869, 202. Yucatan.
Myiarchus yucatanensis, Lawr., P. A. N. S. P. 1871, 235. Yucatan.
Pyrocephalus (*Myionax*) *erythrocercus*, Gr., H-L., No. 5522 ("*crinitus* p. Hartl.; *irritabilis* p. Bp.; *ferox* ♂, Burm.")
Num *Myiarchus mexicanus*, Kaup, P. Z. S. 1851, 51 ?

M. *Myiarcho crinito* ipsissimo simillimus, sed notæo aliquantulum obscuriore, gastræo aliquantulum dilutiore, rectricibus rufo et fusco fere dimidiatis ! rostro modico, nec crassitie *M. cooperi* pari.

Habitat in America Centrali et Meridionali. Paraguay (*Page;* avis Azarana-Vieillotiana ipsissima! Mus. S. I., No. 16,349). Parana (*Page;* Mus. S. I., No. 16,348). Bahia (Mus. G. N. L.; spec. cum typo *erythrocerci*, Scl., comparatum et identicum esse probatum). Venezuela (unde *erythrocercus* ipsiss.). Yucatan (Mus. S. I. et G. N. L. specimina typica *yucatanensis*, Lawr., 1871 = mexicanus Lawr., 1869). Guatemala (Mus. G. N. L). Costa Rica (Mus. S. I., No. 29,423).

Obs.—This bird, so far from being specifically distinct from the ordinary North American form, is so extremely similar as to be with difficulty recognizable as a variety of typical *crinitus*. The size is the same; there are no evident nor constant differences in the relative proportions of bill, feet, tail, and wings, and the general colors only differ by a shade. The bill is exactly as in *crinitus;* having neither the elongate, constricted shape of *cinerascens*, nor the general bulkiness of var. *cooperi* and of *validus*. In most of my specimens it happens that the plumage is old and worn, so that these look browner or grayer on the back than is usual for true *crinitus;* but the Paraguay and Parana skins in better feather are not to my eye an appreciable shade different from several United States skins; the yellow below, however, is recognizably paler, and the gular ash seems to have a little more pectoral extension. There is, however, one obvious and *nearly* constant discrepancy in the pictura of the tail feathers, enabling me to predicate a variety. On on average the rufous and the fuscous on the inner webs of the rectrices are dimidiate—half-and-half in amount; this never occurs to my knowledge in United States *crinitus* (cf. descr.). The relative breadth varies as follows: The fuscous occupies from $\frac{2}{3}$ to $\frac{3}{5}$ in the type of "yucatanensis" and other skins of the same, shot at the same time by the same person; from $\frac{3}{5}$ to $\frac{1}{2}$ on different feathers of the tail of the Bahia specimen "compared with type of 'erythrocercus' in Mus. P. L. S.;" from $\frac{1}{2}$ to $\frac{1}{3}$ in the Parana and Paraguay skins; from $\frac{1}{3}$ to $\frac{1}{4}$ in some Central American skins; and then we have $\frac{1}{5}$–$\frac{1}{6}$ to nil in a Nicaraguan (S. I., No. 41,789) and in various North American skins. Comment is unnecessary.

As the foregoing synonymy may be regarded with mistrustful surprise, it becomes me to state my case explicitly. "Tyrannus irritabilis Vieill." is generally enumerated amongst the synonyms of *crinitus*—correctly so, leaving out of consideration the varieties of the latter. But Vieillot's bird, being based on Azara, is of course South American, and I have yet to see pure *crinitus* from that portion of the continent, all my South American specimens being characterizable as above. So we have "a local habitation and a name," as firm ground for further investigation.

I take the Nos. 16,349, 16,348 (Paraguay and Parana) as being unquestionably the Azara-Vieillot bird; they are both distinguishable from United States *crinitus* by the characters above detailed; but one of them has the fuscous stripe along the inner web much broader than the other.

Next, the Bahia skin (Mus. G. N. L.), as I see by the label, has been compared with the type of erythrocercus, in Mus. P. L. S., and found identical. It is in poor plumage, quite brownish above, and "streaky" below, and has the fuscous rather broader still, but there is less difference in the breadth of the fuscous in this specimen, and in No. 16,348, than there is between 16,348 and 16,349. All three are unquestionably identical. This fixes the status of "erythrocercus."

Then, the type of "yucatanensis" Lawr. 1871 (="mexicanus" Lawr. 1869), now in my hands, has the rufous and fuscous exactly as in typical "erythrocercus," and is in other respects a duplicate of the latter. That Mr. Lawrence did not recognize this identity is doubtless due to the fact that his example of "erythrocercus" was not in his hands at the time. When he published "yucatanensis (based on the same Yucatan specimen he called "mexicanus" in 1869) he did so simply upon Dr. Sclater's announcement that *mexicanus* Kaup was the bird called "cooperi" by Baird—quite a different variety, and usually held to be a different species.

Thus we arrive at the above synonymy. I should add, in justice to an excellent young ornithologist, noted for discriminative abilities, that I am not the first to perceive the identity of the specimens here discussed. They are all labelled "mexicanus" in Robert Ridgway's handwriting—he having accurately distinguished them from the following larger, heavier-billed form from Southern Mexico. But Kaup's name, even if it belongs here, is clearly anticipated by Vieillot's.

Specimens examined, ten.

C. VAR. *cooperi*.

"*Tyrannula mexicana*, Kaup, P. Z. S., 1851, 51," auctoritate Sclateriana, fide Lawr., P. A. N. S. P. 1871, 235. *Non auctorum!*

Tyrannula cooperi, Kaup, P. Z. S. 1851, 51. Non *Muscicapa cooperi* Nuttall, quæ *Contopus borealis*.

Myiarchus cooperi, Baird, B. N. A. 180.—Scl. P. Z. S. 1859, 384; C. A. B. 233.—S. and S., Ibis, 1859, 122, 440.

M. *Myiarcho crinito* similis; maximus inter majores; rostro enormi, nigro; notæo obscuriore, gastræo dilutiore; fusco et rufo in pogoniis interioribus rectricum ferè dimidiatis. Long. rostri a fronte in apicem .80–1.00; alæ et caudæ 3.90–4.25; tarsi .85–.95; long tot. (exuviarum) 7.50–9.00.

Habitat.—Mexico, præsertim partibus merid.-occid. "Mexico" (Verreaux, Sallé, Mus. S. I.). Tehuantepec (Sumichrast, Mus. S. I. et G. N. L.). Mazatlan, Guadalaxara (Grayson, Mus. S. I.) "Gautemala" (Mus. P. L. S., fide ejusd. Cat.).

Obs.—This variety is distinguished, in its extreme of development, from *crinitus* by the larger size, skins running up to nine inches; by the larger bill, which sometimes attains a length of an inch, and equals, or even slightly exceeds, the tarsi, which are themselves usually a tenth of an inch longer than in *crinitus;* by the olivaceous being not so clear as in *crinitus*, nor the under parts (usually) so bright yellow; and especially by the presence of a band of fuscous on the inner webs of the rectrices, varying from $\frac{1}{6}$ or $\frac{1}{4}$ to nearly $\frac{1}{2}$ the width of the vanes. In its strongest differentiation, the variety looks very different from typical *crinitus*, but with only a dozen specimens on hand, I can trace it directly into *crinitus*, of which it is unquestionably a mere local race. It seems nearly confined to southern and southwestern Mexico; Sclater, however, quotes it from Guatemala.

The Mazatlan and Guadalaxara skins are the two biggest *Myiarchi* I ever saw; one of them is marked "length (fresh) $9\frac{1}{2}$;" their bills are enormous, comparing with ordinary *crinitus* almost as *Tyrannus magnirostris* or *crassirostris* do with *carolinensis*. They are scarcely different from *crinitus* in color, except in the definite fuscous stripe, about $\frac{1}{3}$ the width of the inner web, on the tail feathers. The several Tehuantepec skins are essentially similar, but grade towards *crinitus*, or rather towards *irritabilis*, and in other skins the boundary line is too shadowy to be seen at all.

Of my own knowledge, of course I have no idea what the "Tyrannula mexicana" of Kaup is—for no one who has not seen the type can tell anything about it. But, according to Mr. Lawrence (*l. c.*), Dr. Sclater has recently examined the type, and announces it is what Prof. Baird called "cooperi" in 1858. Now I have in my hand the specimen (No. 9100, Mus. S. I., "Mexique," *Verreaux*) that furnished the account in the Birds of North America, and it is one of the large heavy-billed examples of true var. *cooperi* as characterized in this paper; that is to say, "mexicanus" Kaup, and "cooperi" Kaup, are one and the same thing, if Dr. Sclater has correctly apprehended Prof. Baird's article. I hardly see, however, how this can be, for Kaup must have *meant* to indicate two species or varieties, and it is reasonable to suppose his specimens showed *some* differences. My own surmise is, that the type of "mexicanus" is one of those intermediate specimens that Dr. Sclater could hardly help identifying with Baird's description of "cooperi," the latter's No. 9100 being by no means one of the largest-billed specimens; and it seems to be also Mr. Ridgway's opinion, to judge by his labelling, that "mexicanus" is rather referable to the smaller-billed variety above characterized under the name of *irritabilis*. However, the game is not worth the candle, since fortunately it proves that the name need not be used at all; and the sooner "mexicanus" is forgotten the better. It has caused vexatious mistakes enough already, four different authors having used it in as many different senses, in the vain attempt to identify something not identifiable.

Turning to a more inviting point, it is interesting to observe how many *Myiarchi* come to a focus, as it were, on and near the Isthmus, and thence radiate in all directions. First we have in winter the birds that breed in the United States, constituting true *crinitus;* another, non-migratory, set spreading for a short distance northwestward to form the local race *cooperi*, and yet another, chiefly spreading southward throughout the greater part of South America, forming the variety *irritabilis*. It is little, if any, beyond the southern terminus of *cinerascens*, forms the southern limit of *lawrencei*, and constitutes the northern boundary of *nigriceps* and *tyrannulus* (*ferox*). In fact, every continental species treated of in this paper, excepting *phæocephalus*, occurs between Tehuantepec and Panama; this is the very centre of the genus.

Specimens examined, twelve.

3. MYIARCHUS CINERASCENS.

Tyrannula cinerascens, Lawr., A. L. N. Y. v, 1851, 109 (descr. orig.).
Myiarchus cinerascens, Scl., Ibis, 1859, 121, 440; P. Z. S. 1859, 384; C. A. B. 233 (excl. syn. *Tyr. mexicana*, Kaup).
Myarchus mexicanus, Bd., B. N. A. 179 (sed non *Tyr. mex.*, Kaup); Coues, P. A. N. S. P., 1866, 59; Coop., B. Cal. i., 316, cum fig.
Myionax mexicanus, Cab., M. H. ii., 74 (non Kaup).
M. mexicanus var. pertinax, Bd., P. A. N. S. P., 1859, 303 (Cap. St. Lucas).

M. inter majores, rostro angusto, nigro; coloribus dilutis; olivaceo-cinereus, pileo brunnescentiore, gulâ ex albida cinerea, ventre sensim ex albido flavo; remigibus secondariis tectricibusque alarum superioribus albido marginatis; remigibus primariis rectricibusque rufo-indutis ut in M. crinito, sed rufo vix in apicem rectricum porrecto, et ab fusco lineâ curvatâ segregato. Statura M. crinito par, tarsis longioribus (.80–.90), rostro angustiore (.27–.33).

Habitat partibus Reip. Amer. S. merid.-occid., et Mexico.—Utah (*McCarthy*). Nevada (*Ridgway*). N. Mexico, Arizona (*Coues*). California (*Cooper*). Cap. St. Lucas (*Xantus*, "var. pertinax"). Texas (*Couch*). Mazatlan (*Grayson*). Mirador (*Sartorius*). Tehauntepec (*Sumichrast*). Orizava (*Botteri*). Mus. S. I., G. N. L., E. C., etc.

Obs.—One of the better marked species of this difficult group. I have seen no indeterminable specimens, though I suspect that questionable ones will yet appear from southwestern Mexico. But the fact that the bird occurs there associated with varieties of *crinitus* without losing its distinctive features, favors the supposition of its integrity.

The most reliable peculiarity of *cinerascens* is the *contour* of the rufous on the rectrices. In all other *Myiarchi* examined the rufous, no matter how broad or how narrow, is straight-edged against the fuscous from base to tip; but in *cinerascens* it occupies the whole inner web for about $\frac{1}{2}$ or $\frac{2}{3}$ the length of the feather, and then bends inward to give way to fuscous that consequently possesses most or all of the tip of the feather. It is a curiously slight matter to be so constant as it appears; and it is not absolutely invariable. Thus, in U. S. specimens, constituting the best-marked examples, the rufous is commonly altogether shut off from the end of the feathers, while in Tehuantepec skins the rufous gains the very tip, being but little encroached upon by the fuscous. However, even in these specimens, which barely escape being troublesome, the peculiar pattern *is* exhibited. But in no case do other than *adult* birds show the peculiarity; *e. g.*, in No. 1595, Mus. E. C., shot from the nest in Arizona, the wings and tail are nearly as rufous as in *validus!* the margins of all the remiges and upper wing coverts, and all the tail feathers are rufous, the rectrices having each merely a narrow shaft-line of fuscous; the upper parts are grayish-brown, without olive; the cap warm pure brown, the belly white, slashed with yellow.

But *cinerascens* has other marks, none of them infallible, all of them nevertheless useful. It is the *palest Myiarchus* of all. The upper parts are gray, merely suffused with olive, and browner on the head; the gular ash is gray and hoary; the belly very pale yellow, or yellowish-white, without sharp demarcation from the hoary on the breast; the margining of the inner secondaries and wing coverts is grayish-white (not yellowish nor ochrey-white); the bill is almost perfectly black. My palest birds come from the United States deserts and from Cape St. Lucas; here the olive above and yellow below are barely appreciable. Tehuantepec and Mazatlan birds are the brightest; here the yellow is almost as pure as in *crinitus* (and these, it will be remembered, are the ones with rather dubious tail-coloration).

There is nothing diagnostic in the size or shape of this bird, but several tangible characters are *usually* exhibited. Compared with *crinitus*, the bill has a constricted, somewhat more terete shape; probably it is rarely if ever quite half as wide as long opposite the nostrils. The tarsi average longer, frequently touching .90. The wings average a little shorter relatively, and the tail a trifle longer, the latter exceeding the former, on an average, .10 to .25, instead of equalling the wings.

Var. "pertinax" not distinguishable even as a local race; the specimens vary *inter se*, and some of them are perfect duplicates of my Arizona skins. The yellow-bellied Tehuantepec bird comes much nearer the requirements of a geographical variety.

Baird's erroneous identification of Kaup's "mexicana" is perfectly excusable, and, indeed, was well nigh unavoidable under the circumstances. Kaup's careless notice is worthless for all practical purposes, and we have to thank Dr. Sclater for telling us what his bird really is. (Cf. Lawr., P. A. N. S. P., 1871, 235.) Other American writers copied Baird's mistake. This point settled, the synonymy of the bird is plain, Mr. Lawrence's original description being perfectly satisfactory.

Specimens examined, thirty-five, from the above-mentioned and intermediate localities.

4. Myiarchus tyrannulus.

Muscicapa tyrannulus, Müll. (G. R. Gr., H.-L. No. 5527.)
Muscicapa aurora, Bodd., P. E. 571, f. 1. (G. R. Gr.)
Muscicapa flaviventris, Steph. (G. R. Gr.)
Muscicapa ferox, Gm., S. N. i. 934, e Buff. l. c. Max. Beitr. iii. 285.
Tyrannus ferox, Vieill., Enc. Met. ii. 848; Sws., Quart. J. xx. 1826, 276; D'Orb., Voy. Ois. 306.
Myiarchus ferox, Cab., Orn. Not. i. 248; Schomb. Guiana. iii. 700; M. H. ii. 73; Burm., Syst. Uebers. ii. 470; Scl. P. Z. S. 1855, 150; C. A. B. 233.
Myiarchus swainsoni, Cab., M. H. ii. 72. (Specim. Braziliana.)
Myiarchus panamensis, Lawr., A. L. N. Y vii. 1860, 284, 295. (Spec. e Panama et N. Grenada). Id., ibid. ix. 1868, 115. (Costa Rica.)
Myiarchus venezuelensis, Lawr., P. A. N. S. P., 1865, 38. (Sp. junior. e Venez.)

M. inter majores, rostro modico; olivaceo-fuscus, gulâ cinereâ, ventre flavo, alis caudâque fuscis, haud rufo indutis, rectricibus concoloribus, remigibus primariis intus, secondariis ex intus et extus, flavido marginatis. Long tot. 7–7.75; alæ 3.30–3.70, caudæ 3.50–3.90, tarsi .80–.90, rostri .65–.75.

Habitat.—Amer. Cent. et Merid. Panama (*Hicks*, *McLeannan*, *Galbraith*, Mus. G. N. L.). Venezuela (*Nash*, Mus. G. N. L.). New Granada (*Schott*, Mus. S. I.). Costa Rica (*Arcé*, Mus. O. S., fide Lawr. l. c.). Para, Bogota, Trinidad, Tobago, Bolivia (Mus. P. L. S., fide ejusd. Cat.). Bahia (*Bryant*, Mus. S. I.). Brazil (Mus. L. Agassiz).

Obs.—The ordinary South American *Myiarchus* is distinguished at a glance from all the foregoing by the reduction of the rufous edging of the rectrices and primaries to a mere trace, or its entire absence.

This bird averages a little smaller than *crinitus;* the bill is shaped and colored exactly as in that species, but is rather smaller; the wings are shorter, both absolutely and relatively, not often quite equalling the tail; the tarsi, on the contrary, are a little longer. In these respects the bird tallies to a nicety with *cinerascens.*

The colors are rarely if ever as bright and clear as in *crinitus.* There is generally a mere trace of rufous on the outer edges of the primaries and rectrices, and in younger birds is quite noticeable; but I have never seen a touch of it on the inner webs of the rectrices. The outer edges of the wing coverts and inner remiges, and the outer edges of the outer rectrices, and the inner edges of the remiges, are whitish or pale yellowish; otherwise the wings and tail are concolor and unicolor.

With both Mr. Lawrence's types, a typical Brazilian *swainsoni* labelled in Dr. Sclater's handwriting, and various unquestionable *ferox* before me, I cannot distinguish even a geographical variety among them all. They are indisputably identical.

Swainsoni is one of those constantly recurring cases of the attempt to distinguish Brazilian individuals from specimens of the same species from northern South America. Sometimes, I know, local influences have produced modifications recognizable as geographical varieties, and I am willing to admit in this case that *swainsoni* may run a shade darker, and possibly average a trifle larger than ordinary *ferox;* but the difference is not even tangible, much less reasonably constant. Birds from either locality differ as much among themselves as they do from each other; and some specimens of *swainsoni* are more like *ferox* than they are like other specimens of *swainsoni.*

Panamensis, as originally described, was compared with *crinitus* and *cinerascens*, and its striking differences correctly indicated. But I am persuaded that if Mr. Lawrence had compared it with *ferox*, he would have been satisfied of its identity with the latter.

Venezuelensis is based upon a youngish bird, which, as usual in this genus (see above), shows more rufous than is retained in adult life. The outer webs of the rectrices show quite a rufous edging; but there is none at all on the inner webs; and in all other respects the specimen is a perfect duplicate of some skins of *ferox*.

The older names above quoted, including the one it seems necessary to adopt for the species, are given upon Gray's authority. I have not been able to look up the references, but I presume there is no doubt of their pertinence.

Specimens examined, thirteen.

5. Myiarchus phæocephalus.

Myiarchus phæocephalus, Scl., P. Z. S. 1860, 481; C. A. B. 233. (Babahoyo, Ecuador.) Lawr., A. L. N. Y. ix. 1869, 237. (Guayaquil.)

M. inter majores, rostro modico; olivaceus, caput versus cinerascens, gulâ cinerea, ventre flavo, pileo alis caudaque fuscis, his non rufo notatis, remigibus interioribus rectricibusque exterioribus extus albido marginatis; staturâ *M. crinito* par?

Hab.—Ecuador (*Frazer*, Mus. P. L. S., fide Cat. A. B.). Ins. Puna, Guayaquil (*Reeve*, Mus. S. I., No. 54,083).

Obs.—My material is insufficient for a satisfactory determination in this case, but the species is different from any other, so far as I can judge from the single imperfect specimen before me, labelled *phæocephalus* in Lawrence's handwriting, which is the basis of his citation, *l. c.* It is apparently an old bird moulting, the quills and tail feathers being ungrown. The wings and tail are blackish with the whitish edgings above mentioned, and are without a trace of rufous; in these respects the bird is like *ferox*, but there the resemblance ends, *phæocephalus* being clear olive, much like *crinitus* on the back, shading on the head and neck into olivaceous ash, not very different from that of the throat. The pileum shows quite dusky in contrast. The whitish edgings of the remiges and outer tail feathers are strong. The dimensions cannot be given exactly, but the bird seems to have been nearly 8 inches long, with the wing and tail each about $3\frac{3}{4}$; the bill measures .75 from the front, the tarsus .90.

Additional information respecting the bird is desirable, since there is room for suspicion that it is a local race of the preceding.

6. MYIARCHUS LAWRENCII.

Tyrannula lawrencii, Gir., 16 Sp. Tex. B. pl. 2.

Myiarchus lawrencii, Baird, B. N. A. 181, pl. 47, f. 3. Scl., P. Z. S. 1859, 366, 384. Id. et Salv., Ibis, 1859, 121, 440. Taylor, ibid. 114. Lawr., A. L. N. Y. ix. 1868, 113. Id., ibid. ix. 1869, 204.

Blacicus lawrencii, Bd., B. N. A. 182.

Pyrocephalus (*Myiarchus*) *lawrencii*, Gr., H.-L. No. 5525 (cum 5529).

Myiarchus mexicanus, Scl., P. Z. S. 1856, 296.

Myiarchus rufomarginatus, Cab., M. H. ii. 73.

Myiarchus nigricapillus, "Cab. MSS." (e specim. costaricensibus; cf. J. f. O. 1861, 249), apud Scl., C. A. B. 233. Lawr., A. L. N. Y. ix. 1868, 113; recte haesitat!

M. inter minores, rostro lato depresso; fusco-olivaceus, pileo statim fuscescente, gulâ cinerea, ventre statim flavissimo; remigibus tectricibusque et extus et intus rufomarginatis, rectricibus omnibus semper extus, crebrissime necnon intus rufomarginatis. Long. tot. 6–6.75; alæ et caudæ 3.00–3.33, rostri .62–.70, tarsi .65–.75.

Habitat.—Mexico et Amer. Cent. Texas? (auct. *Giraud.*) N. Leone (*Couch*, apud Baird). Colima (*Xantus*). Mazatlan (*Grayson*). Orizava, Tehuantepec (*Sumichrast*). Guatemala (*Salvin et al.*). Merida (*Schott*). Grecia, Barranca, Angostura (*Carmiol*, *Frantzius*).

Obs.—With much the same strong olive, clear ash, and rich yellow that characterize *crinitus*, *lawrencii* is distinguished on sight by its smaller size; pileum *generally* dark, in strong contrast to the back; wing coverts and inner secondaries edged with much the same rufous as the primaries are (as in *validus*), and very narrow rufous edging of the tail feathers, often wanting altogether on the inner webs, and almost always stronger on the outer webs than on the inner ones. In young birds the edging of the inner webs is usually very noticeable, but it is never, so far as I have seen, so broad as is usually the case with the associated continental species and varieties; never half the breadth of the vane. Furthermore, the bill of *lawrencii* departs from the thick, deep, heavy style of the larger *Myiarchi*, and is broad and flat nearly as in the smaller olivaceous flycatchers, such as *Contopus* and *Empidonax*. It varies much, as usual, in precise shape, but is generally just about half its own length broad at the nostrils.

Mr. Lawrence has already very properly called attention to the fact, that the supposed *M. nigricapillus* of Dr. Cabanis offers no tangible specific characters; while for myself I cannot make out that it is even a recognizable variety. It is true that in Costarica *lawrencii* tends to be a little darker on the pileum, with the yellow a little more extensive; but it is also true that these characters will not decide the status of ten per cent. of current specimens. *Nigricapillus* is simply a slight tendency towards *nigriceps*.

The normal variations in size and color are precisely parallel with those already discussed under head of *M. cinerascens*. Northern and western specimens average a trifle paler than usual; the southernmost are the brightest. Sometimes the edgings of the inner remiges and the coverts are whitish. Tehuantepec skins show the stoutest bill; this is likewise the case in *crinitus* var. and *cinerascens*, showing the uniform operation of some unknown local influences. One example (34,810, Mus. S. I., Costarica) has exceptionally short wings and tail, these members measuring only 2.80 and 2.90 respectively.

Specimens examined, thirty-three. The bird seems to range throughout Mexico and Central America. I have never seen a United States skin, and though the species may overstep the Mexican boundary, this remains to be shown. Probably Giraud's bird came from Northeastern Mexico, as some others of his sixteen "Texas" birds certainly did.

7. Myiarchus nigriceps.

Myiarchus nigriceps, Scl., P. Z. S. 1860, 68, 295; Cat. A. B. 234 (Ecuador). Lawr. Ann. Lyc. 1861, 327 (New Grenada).

Myiarchus brunneiceps, Lawr., l. c. (nomen pro temp.).

M. inter minores, rostro lato depresso; clarè olivaceus, pileo statim nigricante, gulâ restricta clarè cinerea, pectore et ventre flavissimis; alis caudaque fusco-nigris, hâc innotatis, illis minime rufalbida marginatis. Long. tot. 5.60–6.25; alis et caudæ 2.90–3.10, rostri .60–.65, tarsi .65–.70, rostri lat. ad basin .30.

Habitat.—Ecuador (Pallatanga, Esmeraldas, *Fraser*, fide Scl., l. c.; Quito, *Backalew*, Mus. S. I.). Panama (*McLeannan* and *Galbraith*, Lawr., l. c.). Mus. G. N. L. and S. I.

Obs.—Distinguishable on sight from *lawrencii* by the black or blackish cap, in marked contrast with the clear olive back, extension of the rich yellow high up the breast, and particularly by the absence of rufous on the tail; in this respect comparing with *lawrencii* just as *ferox* does with *crinitus*. The wings, as usual in the genus, share the extinction of rufous on the tail; a mere rufous trace can only be detected in some specimens on the outer edges of a few primaries, the inner edges of which, however, show it a little more plainly. For the rest, the secondaries and coverts are evidently ochrey-whitish margined. The bird will average smaller than *lawrencii*, but the difference in size is not marked.

The three specimens examined, one of them the basis of Mr. Lawrence's remarks upon the proposed "brunneiceps," which he has since abandoned, are absolutely identical. Having no doubt that *nigriceps* is simply a geographical representative of *lawrencii*, I fear that troublesome specimens will yet occur from intermediate localities. But the differentiation has become perfectly tangible, and I have seen no connecting links, so that I can indorse the species, upon the principles already laid down for my guidance in this paper.

8. Myiarchus stolidus.

Notandum: species flexibilis, per insulas Antillarum singulatim diffusa, in stirpes locorum varios secreta, characteres tamen communiter prœbentes, ut sequuntur. Statura maxima inter species minores generis; long. tot. 6.50–7.50, alæ et caudæ 3.00–3.50, rostri .65–.75, tarsi .70–80. Rostrum elongatulum, quodammodo coarctatum. Notæum fusco-olivaceum, in pileo statim aut sensim fuscescens. Gula ex albido cinerascens. Venter ex albido flavescens aut flavus, rariore albidus. Remiges primarii et rectrices fusci, et extus et intus rufo-marginati, rarissime innotati. Tectrices alarum superiores et remiges secondarii flavidalbido-marginati.

I admit none of the many nominal species established upon this elastic type; for they all run into each other. But I can distinguish three local races, the extremes of which are readily characterized, though their mutual intergradation—as perfect as we ever see in stationary insular birds—renders it impossible to put them on substantial specific bases.

Compared with the only large insular species (*validus*), these birds of the *stolidus* pattern fill the same position that *lawrencii* holds in relation to the larger continental species and varieties with which it is associated, though they are perfectly distinct from *lawrencii*. In the lengthened and constricted bill *stolidus* differs from the flatter-billed *lawrencii*, and copies a noticeable feature of *cinerascens*.

a. VAR. *stolidus.*

Myiobius stolidus, Gosse, B. Jam. 168.
Tyrannula stolida, Kaup, P. Z. S. 1851, 51.
Myiarchus stolidus, Cab., J. f. O. 1855, 479, et auct. March, P. A. N. S. P. 1863, 288.
Tyrannula (*Myiarchus*) *stolida* var. *dominicensis*, Bry., P. B. S. N. H. xi. 1866, 90. St. Domingo.
Pitangus (*Kaupornis*) *stolidus*, Gray, H.-L. No. 5438.
Myiarchus ——— ("common tom fool") March, l. c. 289.
Myiarchus ——— ("greater tom fool"), March, ibid.
Myiarchus ——— ("curiously feathered bird"), March, ibid. Albino.

M. fusco-olivaceus, pileo statim fusco, gulâ pallidè cinereâ, ventre flavo, pogoniis rectricum interioribus fusco et rufo fere dimidiatis.

Habitat.—Ins. Jamaica. St. Domingo. Hayti.

Obs.—To take this variety as a standard for comparison of the others (though of course it is no more "typical of the species" than either of the others is), I find its particular character in the combination of decidedly yellow belly with tail feathers so broadly edged on the inner web with rufous that this color and the fuscous occupy nearly equal areas. Either color may be restricted to one-third of the width of the web, but neither is ever wanting. The primaries are lightly touched with rufous on their outer webs; the secondaries and upper coverts are edged with soiled whitish, always evident, generally yellowish, in young birds tinged with rufous. The dark olive of the back is generally pretty pure, contrasting with the blackish cap; but in weather-worn plumages the upper parts are grayish-brown, including the pileum, and in such ragged state the wings show little edging, and the yellow of the belly looks pale and dirty.

This bird is best known by Jamaican material, but specimens from some of the other islands are indistinguishable. I have before me all the specimens upon which Mr. March (*l. c.*) based his remarks upon the smaller Jamaican "petcharies" or "tom fools;" there is certainly nothing but pure *stolidus* among them, though their individual variations are unusually great. Some of the skins appear to somewhat exceed the normal limits above given in size, and the differences in the size and shape of the bill are remarkable. One has a twisted bill; several others are albinotic, a condition to which the species seems singularly liable in this locality.

Examining Dr. Bryant's typical examples of var. *dominicensis* (Port-au-Prince; *Younglove*), I can see that, as he says, the remiges and rectrices are a little more rufous than in most Jamaican skins; but I also find that they can be precisely matched by some of the latter, and consequently I am unable to recognize a variety in this case. Dr. Bryant's other varieties (*lucaysiensis* and *antillarum*), however, are quite different.

b. VAR. *phœbe.*

Tyrannus phœbe, D'Orb., Sagra's Cuba, Ois. p. 84. Excl. syn.
" —— *sagræ*," Gundl., Av. Cuba.
Tyrannula (*Myiarchus*) *stolida* var. *lucaysiensis*, Bry., P. B. S. N. H. xi. 1866, 66. Inagua and Nassau.
Tyrannula bahamensis, Bryant, ibid. p. 90 (in text). (Not *Empidonax bahamensis*, Bry.).

M. olivaceo-fuscus, pileo sensim obscuriore, gulâ et pectore cinereo-albis, ventre albo vix flavo-tincto, remigibus vix rufomarginatis, pogoniis rectricum interioribus rufo et fusco fere dimidiatis.

Hab.—Cuba. Bahamas.

Obs.—The Cuban and Bahaman birds (which are precisely alike) ordinarily have the inner webs of the rectrices, as in Jamaican *stolidus*, nearly half rufous, half fuscous; but the rufous tends to be a little restricted, half the breadth of the vane seeming to be its maximum width, while it is frequently reduced to a mere edging, especially in Cuban skins. Variety *phœbe*, however, is well distinguished from variety *stolidus* by other characters, the chief of which is the almost entire absence of yellow on the under parts. These, in fact, are "white," shaded in front with ashy, and just tinged behind with yellow—the latter, however, is sometimes inappreciable. The rufous edging of the primaries is at a minimum; the whitish edging of the secondaries and upper coverts is at a maximum. There is not so much olive in the color of the upper parts as in var. *stolidus*, while the cap is much less abruptly darker.

Dr. Bryant says that his variety (*lucaysiensis*) is "larger than either the Jamaican *stolidus* or the Cuban *sagræ*," and probably this is so, on an average, but any difference there may be in this respect eludes me in comparing any except the largest *lucaysiensis* with the smallest of the others. I can only distinguish *lucaysi-*

ensis from true *stolidus* by the nearly white belly, and find it absolutely inseparable from the Cuban *sagræ*.

I cannot find where (if anywhere) Dr. Bryant has characterized the Bahaman bird as "*bahamensis*;" but on p. 90, in text under "dominicensis" he says that the latter "differs from sagræ and bahamensis in the distinct yellow of the abdomen," etc., showing that his "bahamensis" is a white-bellied bird, and being from the Bahamas, it must be the same as *lucaysiensis*.

c. VAR. *antillarum*.

? *Myiarchus sp.*, Taylor, Ibis, 1864. Porto Rico.
Tyrannus (*Myiarchus*) *antillarum*, Bry., P. B. S. N. H. 1866, p. 2. Porto Rico.
Myiarchus antillarum, Sund., Of. Vet. Ak. Forh. 1869, 599.
Tyrannus (*Tyrannus*) *antillarum*, Gray, H. L. No. 5544.

M. olivaceo-fuscus, pileo sensim obscuriore, gulâ et pectore cinereo-albidis, ventre albo vix aut non flavo-tincto, remigibus primariis minimè rufo-marginatis, rectricibus omnino immarginatis, sed crebrissime macula rufa in apice pogonii interioris notatis.

Hab.—Porto Rico (*Bryant*, *Swift*, *Latimer*, Mus. S. I.). An Tobago (*Jardine*)?

Obs.—The Porto Rican form is almost a species. Local differentiation is here at an extreme, the better marked examples looking very little like the Jamaican *stolidus*, and not particularly resembling even the whitish-bellied Cuban *phœbe*. In extreme cases the tail feathers have no rufous edging at all, and the belly is pure white. But we have already seen, in the Cuban and Bahaman bird, that the belly fades away from the yellow that is found in the Jamaican, through every shade, till it is sometimes white; and we have likewise observed the reduction of the rufous to a mere edging of the rectrices; thence into *antillarum* is but a step. Some specimens of *antillarum* have the inner webs margined with rufous part way down; and the difference in this respect between these and some Cuban *phœbe* is not so great as may be found among different individuals of either of the other varieties. These examples of *antillarum* also show the most yellowish on the belly, this often exceeding the amount exhibited by Cuban or Bahaman skins. In the purest *antillarum*, however, the rufous is usually restricted to a mere trace at the end of the inner webs, and it may disappear altogether.

I could easily and plausibly describe *antillarum* as a species, but

I am confident that my mode of treating it is a better way. In fact, my view is simply an amplification of the judicious query that Dr. Bryant inserted after the word "species" in the first sentence of his original description.

Avoiding all qualified expressions, and ignoring details, I may finally recapitulate and discriminate the three insular varieties of *stolidus*, thus:—

Var. *stolidus:* Belly yellow, tail feathers edged with rufous.

Var. *phœbe:* Belly white, tail feathers edged with rufous.

Var. *antillarum:* Belly white, tail feathers not edged with rufous.

Twenty-nine specimens examined of the several varieties, from the localities above quoted.

9. Myiarchus tristis.

Myiobius tristis, Gosse, B. Jam. 167, pl. 41.
Blacicus tristis, Cab., J. f. O. 1855, 480, et auct.
Pyrocephalus (*Blacicus*) *tristis*, Gray, Hand-List. i. 363, No. 5536.

Minimus inter minores, rostro lato depresso; olivaceo-fuscus, pileo nigrescente, gulâ e cinerea albidâ, ventre flavo, remigibus rectricibusque minimè rufo marginatis, illis extus et intus, his extus nec intus. Long. tot. 5.50–6.00, alæ et caudæ 2.75–3.00, rostri .60, tarsi .68, rostri lat. ad nares .33.

Hab.—Jamaica. Mus. S. I. and G. N. L.

Obs.—The smallest species of the group, and the one showing the least rufous on the tail and primaries of any of the smaller ones, unless it be *antillarum*. There is no rufous at all on the inner webs of the rectrices, but close inspection will show rufous traces on the outer webs of these feathers near the base, at any rate; rufous edging is evident on the outer webs of the primaries, and a very pale cast of rufous is more conspicuous on their inner webs. The upper wing and tail coverts show the same thing, but the edging of the inner secondaries is whitish.

This species does not particularly resemble any of the foregoing. It shows perhaps the broadest and flattest bill of any; the width of the bill, at or just behind the nostrils, exceeding half its length. In this respect it departs notably from *M. stolidus*, its geographical associate, and repeats *lawrencii* and *nigriceps*. Its affinities are really closest with the last named. Although *nigriceps* and *tristis* do not sufficiently resemble each other to render special comparison necessary, they are still evident geographical representatives—*tristis* holding the same relation to the insular forms with which it is associated, that *nigriceps* does to the continental form *lawrencii*, which it replaces in Northern South America.

Of the five following birds, referred by their respective authors and others to the genus *Myiarchus*, I have no information:—

1. *Myiarchus fasciatus*, Landb., Leybold, J. f. O. 1865, 402. Mendoza.
2. *Myiarchus cantans*, Pelz., op. cit. 182. Brazil. Probably=*tyrannulus*.
3. *Myiarchus tricolor*, Natt., Pelz. Orn. Bras. ii. 182. Brazil. Probably=*nigriceps*.
4. *Myiarchus gracilirostris*, Pelz., op. cit. 183. Brazil. Probably=*nigriceps*.
5. *Tyrannus tuberculifer*, D'Orb. and Lafr., Syn. No. 6. D'Orb., Voy. Ois. p. 307, pl. 32, f. 1, 2. Bolivia. *Myiobius tuberculifer*, Gray. *Myiarchus tuberculifer*, Cab. *Tyrannula tuberculifer*, Bp. *Pyrocephalus* (*Onychopterus*) *tuberculifer*, Gray, H.-L. No. 5523. *An Myiarchinus verus?* The description indicates a bird of the *Myiarchus* pattern of coloration, and D'Orbigny says that it is allied to *M. ferox*.

CATALOGUE AND SYNONYMY OF THE RECENT SPECIES OF THE FAMILY LUCINIDÆ.

BY GEORGE W. TRYON, JR.

ORDER LUCINACEA, H. & A. ADAMS.

Genera of Recent Mollusca, ii. 466. 1857.

Family LUCINIDÆ, H. & A. Adams.

Genera, ii. 466. 1857.

Genus LUCINA, Bruguiere.

Encyc. Meth. t. 284. 1792.

1. L. ARGENTEA, Reeve, Icon. sp. 6. 1850.
Moluccas.
2. L. ARTEMIDIS, Carpenter, Zool. Proc. 201. 1856.
Acapulco.
3. L. BICORNIS, Reeve, Icon. sp. 8. 1850.
Philippines.
4. L. BOREALIS, Linn. Syst. Nat. Edit. xii., 1134. 1767. Reeve, Icon. sp. 13. 1850.
Tellina radula, Mont. Test. Brit. 68. 1803.
Lucina alba, Turton, Dith. Brit. 114, t. 7, f. 6, 7. 1822.
Venus spuria, Gmelin, Syst. Nat. xiii. Ed. 3284. 1790.
Venus circinnata, Brocchi, Coq. Foss. Sub-app. ii. 552, t. 14, f. 6.
Lucina lactea, Macgillivray. Moll. Aberd. 255. 1843.
Lucina leucoma, Macgillivray. Moll. Aberd. 256. 1843.
Northern Europe.
5. L. CALIFORNICA, Conrad, Jour. Philad. Acad. vii. 255, t. 20, f. 1. 1837.
L. annulata, Reeve, Icon. sp. 17. 1850.
California.
6. L. CONCENTRICA, Ad. & Ang. Zool. Proc. 426, t. 37, f. 19. 1863.
South Australia.
7. L. COLUMBELLA, Lam. Anim. s. Vert. v. 543. 1818. Reeve, Icon. sp. 30. 1850.
L. Adansoni, Orb. Moll. Isl. Canaries, 107, t. 8, f. 26–28. 1839.
Canary and Cape Verde Is. Senegal.

8. L. CARNOSA, Dunker, Novit. Conch. t. 26, f. 4–6. 1865.
Port Natal.

9. L. CRISTATA, Recluz. Mag. Zool. 270, 1842, t. 60. 1843.
Campeche.

10. L. CANDEANA, Orb. Moll. Cuba, ii. 299, t. 27, f. 43–45.
Cuba.

11. L. CRYPTELLA, Orb. Voy. Am. Merid. 587, t. 84, f. 18–20.
Pernambuco.

12. L. DENTIFERA, Jonas. Philippi Neue Conch. ii. 206, Lucina, t. 1, f. 3. Reeve, Icon. sp. 10. 1850.
Red Sea.

13. L. DUNKERI, Menke, Zeit. Mal. 41. 1845.
Northwest Africa.

14. L. FENESTRATA, Hinds. Voy. Sulphur, 66, t. 19, f. 2. 1844.
Monte Christi.

15. L. FILOSA, Stimpson, Shells, N. Engl. 17. 1851. Gould, Invert. Mass. Ed. 2. f. 404. 1870.
L. radula, Gould (not of Mont.), ib. Edit. 1, 69. 1841.
New England.

16. L. GEMMA, Reeve, Icon. sp. 64. 1850.
Philippines.

17. L. GIBBIA, Desh. Guerin's Mag. t. 107. 1844.
Sumatra.

18 L. JAMAICENSIS, Chemn. Conch. Cab. vii. 24, t. 38, f. 408, 409. 1784. Reeve, Icon. sp. 7. 1850.
L. funiculata, Reeve, Icon. sp. 40. 1850.
West Indies.

19. L. LACTEA, A. Adams, Zool. Proc. 225. 1855.
Australia, New Zealand.

20. L. MAZATLANICA, Carp. Mazat. Cat. 99. 1857.
Panama, Mazatlan.

21. L. PENNSYLVANICA, Linn. Syst. Nat. Edit. xii. 1134. 1767. Reeve, Icon. sp. 29. 1850.
L. aurantia, Desh. Anim. s. Vert. vi. 236. 1835. Reeve, Icon. sp. 31. 1850.
L! speciosa, Reeve, Icon. sp. 32. 1850. (*Red Sea*, Err. Loc.)
L. trisinuata, Orb. Moll. Cuba, ii. 300, t. 27, f. 46–49. 1853.
L. virgo, Reeve, Icon. sp. 28. 1850.
West Indies.

22. L. PISIDIUM, Dunker, Mal. Blatt, 227. 1860.
Japan.

23. L. PISUM, Reeve, (*not Phil.*) Incon. sp. 66. 1850.
Singapore, Port Essington.

24. L. PORTESIANA, Orb. Voy. Amer. Merid. 586, t. 84, f. 10, 11.
Rio Janeiro.

25. L. PUSILLA, Gould, Bost. Proc. viii. 282.
North Carolina.

26. L. PECTINATA, Carp. Mazat. Cat. 100. 1857.
Mazatlan.

27. L. PROLONGATA, Carp. Mazat. Cat. 100. 1857.
Mazatlan.

28. L. SEMPERIANA, Issel. Mal. Mar. Ross. 82. 1870.
Red Sea.

29. L. SIMPLEX, Reeve, Icon. sp. 11. 1850.
North Australia.

30. L. SULCATA, Reeve, Icon. sp. 20. 1850.
Hab.—?

31. L. TENUISCULPTA, Carp. Philad. Proc. 57. 1865.
Mazatlan, California.

32. L. UNDATA, Carp. Zool. Proc. 279. 1865.
Gulf of California.

33. L. VITREA, Desh. Guerin's, Mag. t. 106. 1844.
Sumatra.

34. L. VOORHŒVEI, Desh. Journ. de Conch. 2d ser. ii. 106, t. 11, f. 1. 1857.
L. mirabilis, Dunker, Novit. 77 t. 26, f. 7–9. 1865.
Mozambique.

Subgenus HERE, Gabb.

Pal. Calif. ii. 28, 100. 1869.

35. L. EXCAVATA, Carp. Mazat. Cat. 98, 1857.
Panama, Mazatlan.

36. L. LINGUALIS, Carp. Ann. Mag. N. Hist. 3d ser. xiii. 313. 1864.
Cape St. Lucas.

Subgenus WOODIA, Deshayes.

Anim. s. Vert. bass. Paris, 1, 790.

37. L. DIGITARIA, Linn. Syst. Nat. Edit. xii. 1120. 1767.
L. digitalis, Lam. Anim. s. Vert. v. 544. 1818. Reeve, Icon. sp. 65. 1850.
Mediterranean.

Subgenus CYCLAS, Klein.
(not Brug.) Meth. Ostracol. 129. 1753.

38. L. DENTATA, Wood. Gen. Conch. 195, t. 46, f. 7. 1817.
L. strigilla, Stimpson, shells, N. E. 17. 1851.
L. Americana, C. B. Ad. Contrib. Conch. 243. 1852.
L. Chemnitzii, Phil. Zeit. Mal. 1848.
L. divaricata, Lam. (not Linn.) Anim. s. Vert. v. 541. 1818.
L. divaricata, (part) Chemn. Conch. Cab. vi. 134, t. 13, f. 129. 1782.
L. quadrisulcata, Orb. Voy. Amer. Merid. 584. Moll. Cuba, ii. 294, t. 27, f. 34, 36.
L. Lamarckii, Dunker, Weinkauff, Journ. Conch. x. 315. 1862.
L. eburnea, Reeve, Icon. sp. 49. 1850.
L. pilula, C. B. Ad. Contrib. Conch. 244. 1852.
L. Sechellensis, Orb. Voy. Am. Merid. 384.
L. Cumingii, Ad. and Ang. Zool. Proc. 426, t. 37, f. 20. 1863.
L. serrata, Orb. Voy. Am. Merid. 384. Moll. Cuba, ii. 295, t. 27, f. 37, 39. 1853.
L. ornata, Reeve, Icon. sp. 48. 1850.
L. ornatissima, Orb. Voy. Am. Merid. 384.

New England to Brazil, W. Coast N. and S. America, E. Coast of Asia, Seychelles, Isl. Bourbon, Australia.[1]

39. L. DIVARICATA, Linn. (not of Lam. etc.) Syst. Nat. Ed. xii. 1120. 1767.
L. digitaria, Poli (not Linn.) Test. Utr. Sicil. t. 15, f. 25. 1791.

[1] It is very curious to observe that most of the above distinguished authors, finding that the West Indian *divaricata* of Lamarck, Gmelin, and Chemnitz is distinct from the European *divaricata* of Linn., have each immediately rechristened the former without troubling themselves to ascertain whether any one else had previously made the same discovery. To this carelessness, and to the *insane* desire to describe species, are to be ascribed the terrors of the science to the novitiate, who in nine cases out of ten is frightened at the very threshold by an heterogeneous mass of a hundred thousand names, representing probably not more than one-fifth that number of species. Long and familiarly known to Conchologists as this species is they have permitted nearly all of the above synonyms to stand as distinct species. The geographical range is great, but well established by numerous authorities. 1872.]

Cardium discors, Mont. Test. Brit. 37. 1803.
L. undularia, S. Wood. Crag. Foss. 844.
L. commutata, Phil. Enum. Moll. Sicil. i. 32, t. 3, f. 15 1836.
L. arcuata, Mont. Test. Brit. 85, t. 3, f. 2. 1803. Reeve, Icon. sp. 61. 1850.

Europe.

40. L. GIBBA, Gray, Ann. Philos. 136. 1825. Reeve, Icon. sp. 54. 1850.
L. sphæroides, Conrad, Jour. Phil. Acad. vi. 262, t. 9, f. 10. 1831.
L. divaricata (part.), Chemn. Conch. Cab. vi. t. 13, f. 130. 1782.

Senegal.

Subgenus CODAKIA, Scopoli.
Introd. Hist. Nat. 1777.

Lentillaria, Schum. Essai Nov. Syst. 147. 1817.

41. L. ANTILLARUM, Reeve, Icon. sp. 37. 1850.

West Indies.

42. L. BELLA, Conrad, Jour. Acad. Phil. vii. 254, t. 19, f. 11. 1837.
L. fibula, Reeve, Icon. sp. 4. 1850.
L. munda, A. Adams, Zool. Proc. 225. 1855.
L. ramulosa, Gould, Bost. Proc. iii. 276. 1850. Moll. U. S. Expl. Exped. 415, f. 523. 1852.

California, Sandwich Isles, Australia?

43. L. CANCELLARIS, Phil. Zeit. Mal. 21. 1846.

Mazatlan.

44. L. IMBRICATULA, C. B. Adams, Bost. Proc. ii. 9. 1845.
L. occidentalis, Reeve, Icon. sp. 38. 1850.
L. pecten, Reeve (not Lam.), Icon. sp. 34. 1850.
L. pectinata, C. B. Adams, Contrib. Conch. 243. 1852.
L. pectinella, C. B. Adams, Contrib. Conch. 244. 1852.

West Indies.

45. L. INTERRUPTA, Lam. (*Cytherea*), Anim. s. Vert. v. 574. 1818. Reeve, Icon. sp. 5. 1850.

Fiji, Torres Straits.

46. L. LINTEA, Conrad, (MSS. ?)

Tampa Bay.

47. L. MINUTA, Desh. Isl. Reun. 20, t. 3, f. 4–7. 1853.

Isl. Bourbon.

48. L. NASSULA, Conr. Proc. Philad. Acad. 24. 1846.
Tampa Bay, Fla.
49. L. OBLIQUA, Reeve, Icon. sp. 42. 1850.
Chusan.
50. L. PARVULA, Gould, Bost. Proc. viii. 36. 1861.
Bonin I. Loo Choo, Hakodadi, Australia.
51. L. PUNCTATA, Linn. Syst. Nat. Ed. xii. 1134. 1767. Reeve, Icon. sp. 2. 1850.
Mazatlan, Panama.
52. L. RETICULATA, Poli (*Tellina*), Test. Utr. Sicil. 1, t. 20, f. 14. 1791.
L. pecten, Lam. (not Linn.) Anim. s. Vert. v. 543. 1818. Reeve, Icon. sp. 38. 1850.
L. squamosa, Desh. Expl. Sci. Mor. 95.
Mediterranean, W. Coast Africa.
53. L. REEVEI, Desh. Conch. Ins. Reun. 19, t. 3, f. 8, 9. 1863.
Isle Bourbon.
54. L. RUGIFERA, Reeve, Zool. Proc. 68. 1835. Reeve, Icon. sp. 1. 1850.
Australia.
55. L. SCOBINATA, Recluz, Journ. de Conch. III. 252, t. 10, f. 6. 1852.
Guadaloupe.
56. L. TIGERINA, Linn, Syst. Nat. Edit. xii. 1133. 1767. Reeve, Icon. sp. 3. 1850.
L. exasperata, Reeve, Icon. sp. 4. 1850.
L. costata, Orb. Moll. Cuba. ii. 296, t. 27, f. 40, 42. 1853.
So. Coast U. S., West Indies, Brazil, Amboyna (Rumph.), *Nicobar Is.* (Chemn.)

Subgenus MILTHA, H. & A. Ad.
Genera, ii. 466. 1857.

57. L. CHILDRENI, Gray, Zool. Jour. i. 221. 1825. Reeve, Icon. sp. 12. 1850.
Brazil.

Genus **MYRTEA**, Turton.
Conch. dith. 133. 1822.

Cyrachæa, Leach. Gray, Ann. Mag. N. H. xx. 272. 1847.
1. M. CIRCINNATA, A. ADAMS, Ann. Mag. N. H. ser. iii., ix. 226. 1862.
Japan.

2. M. DECUSSATA, A. Adams, Ann. Mag. N. H. ser. iii., ix. 226. 1862.

Japan.

3. M. DELICATULA, A. Adams, Ann. Mag. N. H. ser. iii., ix. 226. 1862.

Japan.

4. M. FABULA, Reeve, Icon. Lucina, sp. 69. 1850.

Philippines.

5. M. FIMBRIATULA, A. Adams, Ann. Mag. N. H. ser. iii., ix. 225. 1862.

Japan.

6. M. GIBBA, A. Adams, Ann. Mag. N. H. ser. iii., ix. 225. 1862.

Japan.

7. M. LAMELLATA, A. Adams, Ann. Mag. N. H. ser. iii., ix. 226. 1862.

Japan.

8. M. LAYARDI, A. Adams, Zool. Proc. 225. 1855.

Ceylon.

9. M. MURICATA, Chemnitz (*Tellina*), Conch. Cab. xi. t. 199, f. 1945–6. 1799.

L. ochracea, Reeve, Icon. sp. 44. 1850.

L. scabra, Lam. Anim. s. Vert. v. 542. 1818. Reeve, Icon. sp. 45. 1850.

L. Nuttallii, Conrad, Jour. A. N. S. Philad. vii. 255, t. 20, f. 2. 1837.

Tumbez, Peru, to California.

10. MYRTEA OBESULA, A. Adams, Ann. Mag. N. H. 3d ser. ix. 226. 1862.

Japan.

11. MYRTEA PLICATULA, A. Adams, Ann. Mag. N. H. 3d ser. ix. 226. 1862.

Japan.

12. MYRTEA RETICULATA, A. Adams, Ann. Mag. N. H. 3d ser. ix. 225. 1862.

Japan.

13. MYRTEA SEMINULA, Gould, Bost. Proc. viii. 36. 1861.

Hong Kong.

14. M. SPINIFERA, Mont. (*Venus*), Test. Brit. 577, t. 17, f. 1. 1803. Reeve, Icon. Lucina sp. 39. 1850.

Lucina Hiatelloides, Philippi, Enum. Moll. Sicil. i. 32. 1836.

Astarte ornata, Goldfüss, Petr. Germ. ii. 195, t. 135, f. 9.

Europe.

15. M. STRANGEI, A. Adams, Zool. Proc. 225. 1855.

Moreton Bay.

16. M. VENUSTA, Phil. Abbild. und Beschreib. ii. 206, Lucina, t. 1, f. 2. Reeve, Icon. Lucina, sp. 15. 1850.

Bay of Manilla.

Genus PHILIS, Fischer.

Jour. Conch. ix. 345. 1861.

P. CUMINGII, Fischer, Jour. Conch. ix. 346. 1861.

Moluccas.

Genus LORIPES, Poli.

Test. Utr. Sicil. i. 31. 1791.

Anodontia, Link, Samml. iii. 156. 1807.

1. L. ANATELLOIDES, Reeve, Icon. sp. 19. 1850.

West Indies.

2. L. ASSIMILIS, Angas, Zool. Proc. 910, t. 44, f. 8. 1867.

New South Wales.

3. L. BARBATA, Reeve, Icon. sp. 15. 1850.

Hab.—?

4. L. BULLATA, Reeve, Icon. sp. 35. 1850.

Hab.—?

5. L. EDENTULA, Linn, Mus. Ulric, 74. Reeve, Icon. sp. 9. 1850.

L. chrysostoma, Phil. Zeit. Malak. ii. 181. 1845.

West Indies.

6. L. EDENTULOIDES, Verrill, Am. Jour. Sci. xlix. 226. 1870.

Gulf of California.

7. L. FLORIDANA, Conrad, Am. Jour. Sci. 1st ser. xxiii. 344. 1833.

Pensacola, Fla.

8. L. GLOBULARIS, Lam. Anim. sans Vert. v. 544. 1818. Reeve, Icon. sp. 53. 1850.

L. ovulum, Reeve, Icon. sp. 58. 1850.

L. tumida, Reeve, Icon. sp. 52. 1852.

New Caledonia.

9. L. GLOBULOSA, A. Adams.

10. L. GUARANIANA, Orb. Voy. Amer. Merid. 586, t. 84, f. 10, 11.
Rio Janeiro.

11. L. ICTERICA, Reeve, Icon. Lucina, sp. 60. 1850. Angas, Zool. Proc. 651. 1865.
So. Australia.

12. L. LACTEA, Linn, Syst. Nat. 1119. 1767.
L. gibbosa (not Gmel.), Costa, Cat. 21. 1829.
L. leucoma, Turton, Reeve, Icon. sp. 41. 1850.
Amphidesma lucinalis, Lam. Anim. sans Vert. v. 491. 1818.
L. fragilis, Phil. Zeit. Mal. ii. 181, 1845; Moll. Sicil. ii. 25, 1844.
VAR. *L. Desmarestii*, Payr. Cat. Moll. Corse. 44, t. 1, f. 19, 20. 1826.
England, Canary Islands, Mediterranean.

13. L. MALUM, Reeve, Icon. sp. 26. 1850.
Philippines.

14. L. OVUM, Reeve, Icon. sp. 21. 1850.
Philippines.

15. L. PATAGONICA, Orb. Voy. Am. Merid. 587, t. 84, f. 16, 77.
Patagonia.

16. L. PHILIPPIANA, Reeve, Icon. sp. 23. 1850.
L. edentula, Philippi (not Lamarck).
Hab.—?

17. L. PHILIPPINARUM, Hanley, sp. Shells. 1840. Reeve, Icon. sp. 18. 1850.
L. corrugata, Desh. Guerin's Mag. t. 82. 1843.
Singapore, Bay of Manilla.

18. L. PILA, Reeve, Icon. sp. 24, 1850.
Hab.—?

19. L. PLICIFERA, A. Adams, Zool. Proc. 225. 1855.
Borneo, Loo Choo.

20. L. ROTATA, Gould, Bost. Proc. viii. 32. 1861.
Loo Choo.

21. L. VESICULA, Gould, Bost. Proc. iii. 256. 1850. Expl. Exped. 414, f. 525.
Tonga Islands.

22. L. VILARDEBOÆNA, Orb. Voy. Am. Merid. 587, t. 84, f. 14, 15.
La Plata.

Genus **CRYPTODON**, Turton.
Brit. Bivalves, 121. 1822.

Thyatira, Leach, Jeffreys, Mal. et Conch. Mag. ii. 42. 1829.
Axinus, J. Sowerby, Mineral Conch. t. 314. 1823.
Ptychina, Phil. Moll. Sicil. 15. 1836.
Clausina, Jeffreys, Ann. & Mag. Nat. Hist. xx. 18. 1847.

1. C. Croulinensis, Jeffreys, Ann. & Mag. N. H. xx. 19. 1847. *Ibid.* 3d ser. ii. 122, t. 5, f. 2.
Skye and Shetland Islands.

2. C. ferruginosus, Forbes & Hanley, Brit. Moll. ii. 60, t. 34, f. 1. 1853. Reeve, Icon. Lucina, sp. 63. 1850.
Kellia abyssicola, Forbes, Ægean Invert. 192.
Mediterranean to England.

3. C. flexuosus, Mont. Test. Brit. 72 (*Tellina*). 1803. Reeve, Icon. Lucina, sp. 62. 1850.
Axinus angulatus, Nyst. (not Sowb.) Coq. Foss. Belg. 141, t. 6, f. 13.
Venus sinuosa, Donov. Brit. Shells ii. t. 42, f. 2.
Lucina sinuata, Lam. Anim. s. Vert. v. 543. 1818.
Cryptodon bisinuatus, S. Wood, Crag. Moll.
Ptychina biplicata, Phil. Moll. Sicil. i. 15, t. 2, f. 4. 1836.
European Seas.

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Lucina flexuosa, Gould (not Mont.) Invert. Mass. 1st edit. 71, f. 52. 1841.
Thyasira Gouldi, Stimpson, Shells. N. Eng. 17. 1851.
Massachusetts—Connecticut.

5. C. Japonicus, Adams, Ann. & Mag. Nat. Hist. ix. 227. 1862.
N. Japan.

6. C. Manchuricus, Adams, Ibid. 227. 1862.
Manchuria.

7. C. oblongus, Adams, Ibid. 227. 1862.
N. Japan.

8. C. plicatus, Adams, Ibid. 227. 1862.
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9. C. polygonus, Gould, Bost. Proc. viii. 35. 1861.
Cape Good Hope

10. C. Sarsii, Lovén, Index Moll. Scand. 1846. Reeve, Icon. Lucina, sp. 52. 1850.
Norway—Sweden.
11. C. serricatus, Carpenter, Philad. Proc. 57. 1865.
Sts. of Fuca to Catalina Isld.
12. C. suborbicularis, Adams, Ann. and Mag. N. H. ix. 227. 1862.
North Japan.
13. C. subquadratus, Adams, Ibid. 227. 1862.
North Japan.
14. C. subradiatus, Gould, Bost. Proc. viii. 35. 1861.
Simon's Bay.
15. C. sulcatus, Adams, Ann. and Mag. N. H. ix. 227. 1862.
Manchuria.
16. C. transversus (*Lucina*), Bronn. Weinkauff Conchyl. 168. 1867.
Mediterranean.

Genus **GAFRARIUM**, Bolten.

Icon. Museum Bolten. 1798.

Fimbria, Mühlf. Entwurf. 52. 1811.
Idothea, Schum. Essai Nov. Gen. 160. 1817.
Corbis, Cuvier, Regne Anim. ii. 408. 1817.

1. G. cœlatum, A. Adams, Zool. Proc. 62. 1853.
Isld. Luzon.
2. G. elegans, Deshayes.
3. G. fimbriatum, Linn. (Venus.) Syst. Nat. Edit. xii. 1113. 1767. Reeve, Conch. Syst. t. 57.
Fiji Islands, etc.
4. G. scitulum, A. Adams, Zool. Proc. 70. 1853.
Puerto Gallaro.
5. G. Sowerbyi, Reeve, Zool. Proc. 45. 1841. Conch. Syst. t. 58.

Genus **UNGULINA**, Daudin.

Bosc. Hist. Coq. iii. 76. 1802.

1. U. alba, Rang. Hist. Moll. t. 44, f. 1, 2. 1802.
Senegal.
2. U. oblonga, Bosc. Hist. Coq. iii. t. 20, f. 1, 2. 1802.
U. rubra, Roissy, Buff. de. Sonn. Moll. t. vi. f. 20, f. 1, 2. H. & A. Adams, Genera, iii. t. 114, f. 4, 4a.

U. transversa, Lam. Anim. s. Vert. v. 487. 1818
Western Coast of Africa.

Genus **SCACCHIA**, Philippi.
Moll. Sicil. ii. 27. 1844.

1. S. ELLIPTICA, Scacchi (*Tellina*). Osserv. Zool. ii. 14. 1833. H. &. A. Adams, Genera iii. t. 814, f. 5. 5a.
Mediterranean.
2. S. OVATA, Phil. Enum. Moll. Sicil. ii.17. t. 14, f. 9. 1844.
Kellia cycladia? Wood, Crag. Moll, ii. 122, t. 11. f. 4.
Mediterranean.

Genus **MYSIA**, Leach.
Menke, Synopsis, Method. Edit. 2. 112. 1830

Diplodonta, Bronn, Ital. Tertiär geb. 9. 1831.
Sphærella, Conrad, Tert. Foss. 17. 1838.

1. M. ABBREVIATA, Gould, Bost. Proc. viii. 32. 1861.
Hong Kong.
2. M. ALATA, Adams & Reeve (*Cyrenoida*) Voy. Sam. 80, t. 24, f. 12. 1850.
Corea.
3. M. AMERICANA, Morelet.
4. M. BRASILIENSIS, Mittre, Jour. de Conch. 1. 240. 1850. H. & A. Adams, Genera iii. t. 114, f. 6.
Rio Janeiro.
5. M. BULLATA, Dunker, Novitates Conch. 76, t. 26 f. 1–3. 1865.
Ceylon.
6. M. CALCULUS, Reeve, Icon. Lucina sp. 68, 1850.
Gulf of Nicoya.
7. M. COREÉNSIS, Adams & Reeve (*Cyrenoida*). Voy. Sam. 80, t. 22, f. 14. 1850
M. obliqua, Gould (not Philippi) Otia. Conch. 171.
Loo Choo, Corea.
8. M. CUMINGII, Sowerby.
9. M. DOLABRATA, Gould, Bost. Proc. viii. 32, 1861.
Cape Good Hope.
10. M. FIGLINA, Gould, Bost. Proc. viii. 32. 1861.
Japan.
11. M. GLOBULOSA, A. Adams, Zool. Proc. 226. 1855.
Moreton Bay.

12. M. Gouldi, Tryon.
M. obliqua, Gould (not Phil.), Bost. Proc. viii. 32. 1861.
Loo Choo.
13. M. granulosa, Dunker, Zeit. Mal. iii. 1853.
Peurto Cabello.
14. M. Gruneri, Dunker, Ind. Tams. 55. 1853.
Guinea.
15. M. Janeirensis, Reeve, Icon. Lucina, sp. 43. 1850.
Rio Janeiro.
16. M. inconspicua, Phil.
17. M. Indica, Desh.
18. M. leucophæota, Reeve, Icon. Lucina, sp. 59. 1850.
Hab.—?
19. M. lucinæformis, Val. Voy. Hombr. et Jacq. 116, t. 3, f. 3. 1856.
Philippines.
20. M. Moretonensis, Desh.
21. M. Novo-Zelandica, Reeve, Icon. Lucina, sp. 14. 1850.
New Zealand.
22. M. obliqua, Phil. Zeit. Mal. 20. 1846.
Mazatlan.
23. M. oblonga, Sowb.
24. M. Pacifica, Fischer, Jour. de Conch. viii. 376, t. 13, f 3. 1860.
Pacific Ocean.
25. M. Philippii, Gay, Hist. Nat. Chili, vii. 354, t. 8, f. 5. 1854.
Chili.
26. M. Philippinarum, Sowb.
27. M. pisiformis, Deshayes.
28. M. punctata, Say (*Amphidesma*), Jour. Phil. Acad. ii. 308. 1822.
Southern Coast United States.
29. M. rotundata, Montagu (*Tellina*), Test. Brit. 71, t. 2, f. 3. 1803.
Lucina rotundata, Reeve, Icon. sp. 38, 1850. 1803.
Venus lupinus, Brocchi, Cat. Foss. Subapp.
Diplodonta dilatata, Phil. Moll. Sicil. i. 31, t. 4, f. 7. 1836.
Diplodonta Barleei, Jeffreys, Ann. Nat. Hist., Jan. 1858.
Glaucomene Montaguana, Leach. Synopsis, 313.
Southern Coast of England to Mediterranean Sea, Canary Is.

30. M. SAVIGNYI, Vaillant, Jour. Conch. xiii. 124 1865.
Red Sea.

31. M. SEMIASPERA, Phil. Abbild. Tellina 25. 1846.
Lucina orbella, Gould, Bost. Proc. iv. 90. 1851.
Lucina cœlata, Reeve, Icon. sp. 27. 1850.
VAR. DISCREPANS, Carp. Mazat. Cat. 103. 1857.
Guayaquil, Mazatlan to San Diego, Cal.

32. M. SEMIRETICULATA, Orb. Moll. Cuba, 41.
Cuba to Patagonia.

33. M. SENEGALENSE, Reeve, Icon. Lucina, *Errata.* 1850.
M. Adansoni, Reeve, Icon. Lucina, sp. 51. 1850.
Senegal.

34. M. SPHÆRICULA, Deshayes.
Australia.

35. M. SUBGLOBOSA, C. B. Adams.

36. M. SUBQUADRATA, Carp. Zool. Proc. 230. 1855.
Mazatlan to Panama.

37. M. SUBRUGOSA, Dunker, Zeit. Mal. 183. 1848. Novitates Conch. 15, t. 4, f. 10–12.
Hab.—?

38. M. TRIGONULA, Brown, Ital. Tert. Geb. 96 t. 3, f. 2.
Diplodonta apicalis, Phil. Enum. Moll. Sicil. i. 31, t. 4, f. 6. 1836.
Lucina astartea, Nyst. Coq. Foss. Belg. 121, t. 6, f. 4.
Mediterranean—Canary Islands.

39. M. VENEZUELENSIS, Dunker, Zeit für Malak. 184. 1848. Novitates Conch. 15, t. 4, f. 7, 8, 9.
Porto Cabello.

Subgenus FELANIA, Recluz.
Jour. de Conch. ii. 60. 1851.

40. M. ADAMSI, Angas, Zool. Proc. 910, t. 44, f. 9. 1867.
Port Jackson.

41. M. CANDEANA, Orb. Moll. Cuba, ii. 299, t. 27, f. 43, 45.
Cuba.

42. M. CORNEA, Reeve, Icon. Lucina, sp. 25. 1850.
M. sericata, Reeve, ibid. sp. 55. 1850.
Gulf of Nicoya, Mazatlan.

43. M. DIAPHANA, Gmel., Syst. Nat. edit. 13, vi. 3292. 1790.
Le Felan, Adanson, Moll. Senegal, 227, t. 16, f. 8. 1757.
Senegal.

44. M. FRIABILIS, Reeve, Icon. Lucina, sp. 57. 1850.
Hab.—?

45. M. JACKSONIENSIS, Angas, Zool. Proc. 910, t. 44, f. 10. 1867.
Port Jackson.

46. M. NITENS, Reeve, Icon. Lucina, sp. 57. 1850.
Ins. Muerte.

47. M. ROSEA, Recluz, Jour. de Conch. ii. 72 t. 2, f. 10–12. 1851.
W. Coast Africa.

48. M. TELLINOIDES, Reeve, Icon. Lucina, sp. 56. 1850.
West Indies.

49. M. USTA, Gould, Bost. Proc. viii. 32. 1862.
Hakodadi Bay.

UNIDENTIFIED LUCINIDÆ.

? *L. Antarctica*, Phil. Mal. Blatt. i. 166. 1857.
Sts. Magellan.

L. lenticula, Gould, Bost. Proc. iii. 252. 1850.
Patagonia.

L. granulosa, C. B. Ad. Bost. Proc. ii. 9. 1845.
West Indies.

SHELLS OF HERKIMER AND ADJACENT COUNTIES IN THE STATE OF NEW YORK.

BY JAMES LEWIS.

At various times I have prepared catalogues and other papers relating to the shells of this region. The latest catalogues of shell-bearing mollusca of Herkimer and adjacent counties was printed in the Proceedings of the Academy of Natural Sciences in 1860. Since that date several species have been found which previously had not been noticed. Corrections have also been made of species wrongly named.

A few rare land-shells have been detected in obscure retreats, where the progress of civilization has not reached them. For convenience of reference I arrange the species alphabetically, without following the most recent classification, my object being *geographical distribution* rather than classification.

Amnicola Cincinnatiensis ? Anthony.

Erie Canal and Mohawk River. In the rivers, this shell sometimes attains remarkable size. Specimens submitted to Mr. Tryon were pronounced to be *Cincinnatiensis* or *new*. I do not feel disposed to quote this as a new species on account of its size, for the reason that other shells not recognized as new species sometimes attain remarkable size in this region.

A. lustrica, Say.

Schuyler's Lake, Otsego County; Little Lakes, Herkimer County; Smith's Pond, Litchfield, Herkimer County; Erie Canal.

The shells found in Erie Canal are doubtlessly introduced. Have been seen there only on one occasion (1869).

A. pallida, Hald.

Lakes, rivers, and canal. I can distinguish these shells from those shells of Massachusetts called *A. porata*, Say, by Gould, only by their color, due to locality.

Ancylus fuscus, Adams.

Schuyler's Lake and Little Lakes, New York.

Ancylus parallelus, Hald.

Schuyler's Lake and Little Lakes, New York.

Ancylus tardus, Say.

Mohawk River. Found under stones along the margin of the stream at low water. I have found them only during the fall months. None could be found in 1871.

Anodonta edentula, Say.

Mohawk River and Erie Canal; also streams running south to the Susquehanna River.

Anodonta fluviatilis, Lea.

In ponds and streams near Schuyler's Lake.

Anodonta imbecilis, Say.

Erie Canal. Very scarce and small.

Anodonta lacustris, Lea.

Schuyler's Lake, Little Lakes, Smith's Pond, and a small pond at Herkimer. A small variety occurs in a marshy creek on the hills eight miles south of Mohawk.

Anodonta Lewisii, Lea.

Erie Canal and Mohawk River. During the last ten years this species has been very nearly exterminated in the canal, affected, no doubt, by chemicals introduced in the armory sewage at Ilion.

Anodonta subcylindracea, Lea.

Erie Canal, Mohawk River, and ponds at Herkimer. Not abundant.

Anodonta undulata.

Erie Canal and Mohawk River. Scarce.

Bythinella obtusa, Lea.

Erie Canal and Mohawk River. In the rivers this species sometimes grows very large; it is usually much larger here than specimens I have seen from other localities.

Carychium exiguum, Say.

On moist land in the Valley of the Mohawk. I have not found it abundant elsewhere.

Goniobasis livescens, Menke.

Erie Canal and Mohawk River. The shells vary, exceedingly, under the influences of station. The shells are characterized here as elsewhere by a weak epidermis, easily worn off. The species has, no doubt, been introduced from western waters by way of the canal. It is extremely abundant on rocks and hard-clay banks in the Mohawk River, preferring swift water. I have no doubt a variety of this species furnished the type of Mr. Tryon's *Gon. Haldemani.*

Goniobasis virginica, Gmelin.

Common enough in the canal at long intervals. Has no doubt been introduced since 1856. Is said to abound in the Hudson River, and in streams near Buffalo. Is very seldom found in the Mohawk River.

In 1871 I found specimens which attain nearly the size of adults of this species, but which exhibit colors and forms somewhat unlike it. They seem to blend the colors of *Trypanostoma subulare* and *Goniobasis livescens*, and approximate the form and size of *Gon. virginica.* I am persuaded by the circumstances attending them that they are *hybrids*, and probably derived from *Gon. virginica*, and perhaps both the other two mollusca just named. The supposed hybrids are not found apart from *virginica.* Feeling unwilling to assume the responsibility of suggesting *hybridity* in a case which others might have settled by proposing a new species, I submitted specimens to Mr. Charles M. Wheatley for his opinion. I feel privileged to say that Mr. Wheatley assents to my view respecting the shells.

Helix albolabris, Say.

A common species. A variety with a tooth is found in the town of Litchfield. A single *reversed* specimen was found near Mohawk in June, 1871.

Helix alternata, Say.

This is the most abundant Helix of this region. It does not offer any notable varieties.

Helix arborea, Say.

Formerly somewhat abundant, but now extremely rare in the valley of the Mohawk.

Helix chersina, Say.

Damp grounds along the valley of the Mohawk. This species is rare, and very few have been seen for many years.

Helix concava, Say.

Somewhat abundant in damp ravines.

Helix dentifera, Binney.

Found in ravines in the town of Litchfield (1871). Only a very few specimens have been found. Some of these have the reflected margin of the aperture of a beautiful rose color.

Helix electrina, Gould.

Formerly abundant, but now quite scarce.

Helix fallax, Say.

Two specimens from Litchfield (1871), appear to belong to this species. They differ essentially from the variety of *tridentata* found here—heretofore regarded as *fallax.*

Helix fuliginosa, Griffith.

Abundant in some of the ravines in Litchfield.

Helix hirsuta, Say.

I have never found this species. Col. E. Jewett, of Utica, informs me he had found it several years ago near New Hartford.

Helix indentata, Say.

Always rare. It has not been found for several years.

Helix intertexta, Binney.

Found in ravines and on hillsides shaded by poplars. It is not a very abundant species, but may usually be obtained in the months of July and August.

Helix ligera, Say.

I have found a single specimen only. Dr. William Brown, of Litchfield, has half a dozen specimens taken from under an old fence on a hill in Litchfield. The shells are smaller than typical *ligera* and the apex is less pointed. It may be placed between typical *ligera* and *demissa*, and seems to identify these forms as varieties of one type.

Helix lineata, Say.

A rare species. Scarcely twenty living specimens have been found since 1854. [Since the above was written, Dr. Brown has presented numerous specimens found in Litchfield.]

Helix inornata, Say.

Common in ravines. Apparently more abundant than in former years.

Helix minuscula, Binney.

A rare species. Wet land in the Mohawk Valley.

Helix minutissima, Lea.

A few specimens have been found in Litchfield by Dr. Brown (1871).

Helix nitida, Mull.

Usually found abundantly on wet ground, near streams, ponds, and lakes. More common in the valley of the Mohawk.

Helix palliata, Say.

Not abundant. Occurs somewhat more plentifully in the Litchfield ravines than elsewhere.

Helix perspectiva, Say.

Litchfield; very scarce. (1871.)

Helix pulchella, Meill.

Common on damp soil in many localities.

Helix Sayii, Binney.

Common in ravines, but not so abundant as to be found without laborious search.

Helix striatella, Anthony.

Sometimes very numerous in the valley; usually not abundant elsewhere.

Helix tridentata, Say.

A small variety. Common in ravines.

Helix thyroides, Say.

Seen only in the Mohawk Valley. Col. Jewett, of Utica, finds this species abundant and associated with *albolabris* by the side of the railroad embankment, seven miles east of Utica. The few specimens I have found occurred in an alder swamp west of the Mohawk.

Lymnæa catascopium, Say.

Erie Canal and Mohawk River. I have seen a few shells, evidently referable to this species, in a small lake in the south part of Herkimer County.

Lymnæa columella, Say.

Lakes. Not abundant.

Lymnæa desidiosa, Say.

Common.

Lymnæa elodes, Say.

Stagnant water in various localities.

Lymnæa gracilis, Say.

Schuyler's Lake. At times very abundant. Usually scarce.

Lymnæa humilis, Say.

Less abundant than *desidiosa.*

Lymnæa pallida, Adams.

Little lakes. Very scarce.

Lymnæa stagnalis, Say.

Traces of this species have been found in the lakes elsewhere named. A single dried specimen (with the soft parts) was found in the Erie Canal, spring of 1871. Probably introduced from Cayuga Lake.?

Lymnæa umbilicata, Adams.

None have been seen for many years. All that have been found inhabited a pool of stagnant water in a wood lot that has long since been cleared, and the pool dried up.

Margaritana marginata, Say.

Erie Canal and Mohawk River; not abundant.

Margaritana rugosa, Barnes.

More abundant than the preceding, in the same localities.

Margaritana undulata, Say.

Single specimens have been found in the Erie Canal and Mohawk River. The species abounds in streams emptying into Schuyler's Lake.

Melantho decisus, Say.

Inhabits Schuyler's Lake and Little Lakes without any associate species. Found also in the Erie Canal and Mohawk River with the two species next named. A few reversed specimens have been found.

Melantho integer, Say.

The opercle of the adult has the form of that of *M. ponderosus* Say. I am inclined to regard these shells as varieties of *ponde, rosus.* Reversed and malformed specimens occur sometimes in considerable numbers in the Erie Canal. Largest shell found is over two inches long.

Melantho rufus, Haldeman.

This species, as well as *integer*, has evidently been introduced here, but at a more recent date. No shells of this species have been found here earlier than 1855, since which time they have gradually increased in size and numbers. The largest shell yet found is 1.83 inches long. It is in the collection of Mr. Charles M. Wheatley, of Phœnixville, Pa.

Physa heterostropha, Say.

Common in rivers and streams; also in stagnant water. Some of the varieties simulate the forms of *gyrina*, *ancillaria*, and *integra*, but I do not think, from all I have seen, that either of those species can be entered here.

Physa hypnorum, Drap.

A small variety. Not common.

Planorbis armigerus, Say.

Sometimes very abundant in stagnant water. It is not constant in the stations where found.

Planorbis bicarinatus, Say.

Erie Canal, Mohawk River, Schuyler's Lake, Little Lakes, and Smith's Pond. Shells found in Smith's Pond are very white, like ivory. Those found in Little Lakes are small and pale, but not so white as those of Smith's Pond.

Planorbis campanulatus, Say.

Lakes and ponds. The few found in Smith's Pond are white, like *bicarinatus* in the same pond.

Planorbis deflectus, Say.

Lakes. Not abundant.

Planorbis exacutus, Say.

Lakes. Not abundant.

Planorbis parvus, Say.

Stagnant water. Sometimes (rarely) abundant.

Planorbis trivolvis, Say.

Canal, rivers, lakes, and stagnant water.

Planorbis hirsutus, Say.

Schuyler's Lake. Rare.

Pisidium abditum, Haldeman.

I think *P. variabile*, Prime, may be included under this species as a synonym. The shells occur in a great variety of stations.

Pisidium æquilaterale, Prime.

Ditches and Erie Canal. Sometimes plenty.

Pisidium compressum, Prime.

Erie Canal and Mohawk River; also lakes and ponds.

Pisidium ventricosum, Prime.

The shells of this region are between *ventricosum* and *subrotundatum*, Prime. I am inclined to believe *subrotundatum* is a small variety of *ventricosum*. My local specimens were obtained from a stagnant pool near Mohawk, and from Little Lakes.

Pisidium virginicum, Bgt.

Erie Canal and Mohawk River.

Pupa contracta, Say.

Damp flat lands, Mohawk Valley.

Pupa pentodon, Say.

Damp flat lands, Mohawk Valley.

Somatogyrus subglobosus, Say.

Erie Canal. Introduced since 1860. This species comes from the west, and in a very few years has become numerically more abundant than any other mollusc in the canal.

Sphærium croceum, Lewis.

I described this species many years ago. Mr. Prime puts it in the synonyms of one of his species (*S. secure*). Since the publication of Mr. Prime's papers I have had opportunity to study *S. croceum*, and find it in very different circumstances from those which determine the habits of *S. secure*, typical specimens of which I have collected in Massachusetts. My shells are found usually in coarse angular gravel anchored by a byssus. They are more abundant in a small stream that connects the two "Little Lakes" in the south part of this county than elsewhere.

Sphærium fabale, Prime.

Small stream in the town of Litchfield, Herkimer County (headwaters of the Unadilla River). Found in the fall of 1871. Brought to notice by Dr. Litchfield.

Sphærium occidentale, Prime.

Stagnant waters, subject to drying. Not unusually found *alive* in the soil of dried stations.

Sphærium rosaceum, Prime.

This shell I proposed as "*Cyclas errans*," a number of years ago. Mr. Prime puts it in his synonymy of *S. rosaceum*. It seems to me, however, that the *habits* of this mollusc are more like those of *S. partumeium*, Say, which species is usually found in *stagnant* water, while Mr. Prime's *rosaceum* is a *river* shell. My shells are the most fragile of their class that I have seen. From my present knowledge of species and their habits, I am induced now to reclaim my species. I have found these shells usually adhering to the trunks of the "dwarf button-ball" growing in a stagnant pool; a more solid variety sometimes occurs in ditches.

Sphærium simile, Say.

Lakes. Abundant.

Sphærium solidulum, Prime.

Mohawk River. Not plenty.

Sphærium striatinum, Lamarck.

Mr. Say's description of *Cyclas edentula*, if read with the understanding that his idea of the anterior and posterior of bivalves was the reverse of the present usage, will be found to accord to the shells here referred to. This species occurs in the outlet of Schuyler's Lake, in *swift* water among *gravel*, while *S. simile* occurs in still water in *mud* in the same stream. A recent writer supposes *striatinum* to be the young of *simile*. This is an error. *S. striatinum* occurs as far east as the Connecticut River at Springfield, Massachusetts, and is found in many of the larger streams in New York, Ohio, and States westward. Is very abundant in the Erie Canal, less so in the Mohawk River. It has been found in Oneida Lake. (F. E. Spinner.)

Sphærium transversum, Say.

Sometimes abundant in the canal. A few may be found in late summer months in the Mohawk River. Evidently a western species, introduced, though known since 1853 to inhabit the canal.

Succinea aurea? Lea.

A small, orange-colored species found sometimes in the month of June around the "Little Lakes" may be *aurea*. The species has not been authoritatively determined.

Succinea avara, Say.

A large variety, sometimes 11-20 inch long, is found on the moist muddy banks of the Mohawk River, sometimes very plenty, sometimes rare. Smaller shells abound along water-margins on the hill regions south, at Little Lakes, and at Schuyler's Lake. Dr. Brown finds it in Litchfield.

Succinea obliqua, Say.

Damp, shaded grounds along the Mohawk. This species is sometimes found on vegetation and trees, several feet from the ground. *S. Totteniana*, Lea, has similar habits, and has been found on apple-trees or hill-sides near woods.

Succinea ovalis, Gould.

Margins of ditches, river banks, lake-shores, &c. Sometimes very abundant.

Succinea Totteniana, Lea.

Inhabits ravines and hill-sides, wooded. Is nearly as large as *obliqua*, and has similar arborial habits.

Trypanostoma subulare, Lea.

Erie Canal and Mohawk River. Prefers still water and a muddy slope. Very abundant.

Unio cariosus, Say.

Mohawk River and Erie Canal. Scarce.

Unio complanatus, Lea.

Canal, rivers, muddy streams, &c., but not in lakes. Our most abundant species.

Unio lutiolus, Lam.

Mohawk River. Erie Canal, rarely. It is probably more abundant in the river a few miles below Little Falls.

Unio radiatus, Lam.

Lakes. The only *Unio* found in Little Lakes and Schuyler's Lake, though *complanatus* occurs in the *outlet* of Schuyler's Lake, and in streams emptying into the lake.

Unio Tappanianus, Lea.

Mohawk River. Abundant only at times. Some cause not understood makes them scarce only in exceptional seasons, as is the case with many other molluscs.

Valvata tricarinata, Say.

Erie Canal, Mohawk River, Schuyler's Lake, and Little Lakes. In "Little Lakes" the shells are varied; *bicarinata* and *simplex*, occurring as prevailing forms in the upper lake; along the marshy borders *V. sincera*, Say, occurs. I am disposed to believe *sincera* is only a variety of *tricarinata;* and it owes its deviation from the usual forms to the influence of station. "*V. sincera*" is found in *marshes* in Michigan.

Vertigo Bollesiana, Morse.

On vegetation by roadside, margin of a swamp in Litchfield. 1871. Those I have are from Dr. Brown.

Vertigo milium? Gould.

A small species is sometimes found among the drift floated by the rivers at high water in the spring, near Mohawk.

Vertigo ovata, Say.

Litchfield, with *V. Bollesiana*, 1871. It may possibly also occur in the valley; but specimens heretofore regarded as this species were referred by Morse to the following species.

Vertigo ventricosa, Morse.

Sometimes found alive in bogs. Oftener found dead in the high-water drift floated into windrows by the river.

Vitrina limpida, Gould.

In November and December, 1864, I found immense numbers of large, fine specimens of this *Vitrina* along the shaded slopes of a ditch on the flats near Mohawk. The soft parts were very dark. Since that time no specimens of *Vitrina* have been seen near Mohawk though repeated search has been made for them. Dr. Brown, of Litchfield, finds *Vitrina* in his yard. His residence is on a rich soil, the eastern slope of a hill, at an elevation supposed to be about 1260 feet above the sea-level. His specimens are not numerous, but are apparently perennial.[1]

Vivipara contectoides, W. C. Binney.

A colony (from Illinois) planted in the Erie Canal, fall of 1867, is now thriving. A few specimens were found there in the spring of 1871, remarkable for their beauty and perfect development.

Zua lubrica, Leach.

Stations are numerous, but shells not abundant.

MOHAWK, N. Y., Jan. 15, 1872.

[1] Since the preceding notes were written, Dr. Brown has presented numerous large adult specimens taken late in the fall of 1871. The shells are apparently identical with those of the colony of 1864, but are not so pale—being slightly tinged with green. The soft parts of Dr. Brown's specimens are not so dark as those found in 1864. Similar variations in color have been observed in the soft parts of well-known species of Succinea.

SHELLS OF TENNESSEE. (No. 2.)

BY JAMES LEWIS, M.D.

Since the publication of my papers on the Shells of the Holston River, and on the Land Shells of Tennessee,[1] a few supplementary species have come to my notice, and conclusions have been reached respecting some of the operculate univalves that occur in the small streams and springs of Knox, Blount, Monroe, and adjoining counties in Tennessee. In this paper conclusions are presented as to what seem to be, with only one or two exceptions, known species. For the identification of species and varieties in several instances thanks are due to Mr. Lea, Mr. Wheatley, Dr. Hartman, and others. Too much credit cannot be awarded to the enterprise and interest with which Miss Law has extended her explorations.

UNIONIDÆ.

Unio argenteus, Lea.

Conasauga Creek.

Unio Cumberlandianus, Lea.

Conasauga Creek and other streams. Scarce.

Unio Conradicus, Lea.

Conasauga Creek.

Unio Jonesii, Lea.

Conasauga Creek. A single specimen.

Unio pilaris, Lea.

Holston and Clinch Rivers.

Unio Pybasii, Lea.

Various creeks and streams. Somewhat common.

Unio sparus, Lea.

Various creeks and streams. Scarce.

Unio tumescens, Lea.

Holston and Clinch Rivers. Not abundant.

Margaritana minor, Lea.

Conasauga Creek. Not abundant.

[1] American Journal of Conchology.

Anodonta edentula, Say.

Holston River. Scarce.

CORBICULADÆ.

Sphærium fabale, Prime.

Turkey Creek, near Concord. Scarce.

Sphœrium occidentale, Prime.

Lyon's Bend, Knox County.

Pisidium abditum, Haldeman.

Pond Spring, Monroe County; Haskell's Spring, Knox County.

Pisidium compressum, Prime.

Pond Spring. Rare.

Pisidium virginicum, Bgt.

Turkey Creek, a few large single valves; Tellico River, more abundant, not large.

AQUATIC PULMONATES.

Lymnæa columella, Say.

Sinking Creek. Abundant.

Lymnæa desidiosa, Say.

Pond Spring. Abundant. Other localities, a few.

Lymnæa humilis? Say.

A single specimen was taken alive from a rock high up on a bluff facing the Tennessee River in Roane County. It may have strayed from a little spring of water trickling down the cliff a few feet away.

Physa heterostropha, Say.

Specimens are usually found in the various parcels of shells taken from small streams and springs.

Physa hypnorum, Drap.

A single specimen. Station unknown.

Planorbis bicarinatus, Say.

A few small specimens from a lagoon near Chilhower Mountain in Blount County. Larger specimens in Tellico River.

Planorbis parvus, Say.

A few dead shells were sent for identification, taken from some spring. Two specimens, evidently alive when taken, have been found among other shells. This class of shells is apparently scarce in the regions explored.

Ancylus Haldemani, Bourgy.?

Holston River. No specific name was suggested for this shell in my previous paper. It may possibly be *A. obscurus*, Hald.; if so, the two names are probably synonyms.

LAND SHELLS.

Helix arborea, Say.

Blount and Monroe Counties. Very scarce.

Helix clausa, Say.

Blount County. Among forty specimens was one having all the features of *H. Mitchelliana*, Lea.

Helix demissa, Binney.

The typical form is scarce. The few I have secured are small and pale. The larger shell of this group, which in my previous paper I treated as a variety of *ligera*, is proportionally a little more elevated and decidedly yellow. Mr. W. G. Binney, I am informed, regards it as a variety of *demissa*. It is apparently as distinct from the typical *demissa* as *sculptilis*, Bland, is from *indentata* Say. This consideration induces me to reclaim for the larger shell the name *acerra*, hesitatingly suggested in my previous paper. I have a single specimen in no respect distinguishable from the typical *demissa* except by two teeth, within, as in *gularis*.

Helix gularis, Say.

In my endeavors to find *young* specimens of this species among the numerous shells sent by Miss Law, I am constrained to regard as such the small depressed shells which in my former paper I referred to *suppressa*. The shells hitherto regarded as *suppressa* differ so essentially from undoubted specimens of that species from Pennsylvania that I cannot unite them. Among the shells of this type from Miss Law appear to be three varieties of *gularis* differing in size, form, and elevation. A fourth form is more polished and subglobose, with the umbilicus entirely closed. It may be hereafter separated as a distinct species.

Helix hirsuta, Say.

A common species accidentally omitted in former papers.

Helix indentata, Say.

Blount, Knox, and Monroe Counties. Very rare.

Helix inflecta, Say.

A common species accidentally omitted in previous papers.

Helix lasmodon, Phillips.

Besides the usual depressed form, Miss Law reports a single specimen, elevated like some of the varieties of *gularis*.

Helix ligera, Say.

A few well characterized specimens from Monroe County, larger and paler than Ohio shells.

Helix Mitchelliana, Lea.

A single shell. (See *H. clausa*.)

Helix profunda, Say.

A single dead shell found on a bluff in Roane County.

Helix sculptilis, Bland.

Monroe County. Very scarce.

Helicina orbiculata, Say.

Byrd's Bluff, Roane County. Somewhat abundant.

Succina avara, Say.

Single specimen only. Monroe County.

OPERCULATED AQUATIC UNIVALVES.

Trypanostoma aratum? Lea, or **bicinctum,** Tryon.

Holston River. Scarce.

Trypanostoma glandulum, Anth. **Mel. glans,** Anth.

Holston River. This will, I think, prove to be a young *Strephobasis*.

Trypanostoma robustum, Lea.

Holston River.

Trypanostoma Troostii, Lea.

Holston River.

The species that follow are mostly from small streams and springs, to which frequent references will be made; and to save space the various stations are here tabulated, and references made to them (in remarks on species), by numbers.

[Numbers on the right refer to species associated, locally.]

Knox County.

1. Sinking Creek. [6, 8, 10, 12.]
2. Turkey Creek. [7, 8, 9, 11, 12.]
3. Lea's Spring. [6, 8, 10, 12.]
4. Campbell's Station. [7, 8, 9, 11, 12.]

Blount County.

5. Abram's Creek. [2, 11.]
6. Cox's Creek. [8, 11.]
7. Six Mile Creek. [4, 12.]
8. Pistol Creek. [6, 7, 8, 11, 12.]
9. Cox's Spring. [8, 12.]
10. Brook running into Little Tennessee River. [8.]

Monroe County.

11. Bat Creek. [9.]
12. Conasauga Creek. [1.]
13. Fork Creek. [8, 9.]
14. High Falls (Conasauga Creek). [11, 12, 13.]
15. Ghormley's Branch. (Creek.) [9.]
16. Henderson's Branch. [7, 12.]
17. Powdermill Branch. [6, 8.]
18. Brook running into Bat Creek. [4, 7, 8, 9, 12.]
19. Shady Grove. (Brook or creek?) [8, 11.]
20. Tellico River. [1, 3, 14, 15.]
21. Clark's Spring. [8, 12.]
22. Cardin's Spring. [9, 11.]
23. Cannon's Spring, [8.]
24. Carmichael's Spring. [9, 12.]
25. Dougherty's Spring. [8, 11.]
26. Elliott's Spring. [12.]
27. Honeysuckle Spring. [8, 11.]
28. Marshall's Spring. [8.]
29. Pond Spring. [8.]
30. Rausin's Spring. [11.]
31. Rausin's Spring outlet. [11, 12.]
32. Sink Hole Creek. [6, 9.]
33. Williams' Spring. [11.]
34. Wilson's Spring. [8.]
35. Wilson's Spring outlet. [8.]

McMinn County.

36. Athens. [8, 11.]
37. Middle Creek. [8, 12.]

Roane County.

38. Byrd's Bluff. [16.]
39. Bowman's Spring. [11.]
40. Cave Spring. [11.]
41. Periwinkle Branch. [5, 11.]
42. Shanty Branch. [5.]
43. Brown's Spring. [8.]

Rhea County.

44. Piney River. [1, 11.]

Loudon County.

45. Thurston's Creek. [12.]

Trypanostoma Lyonii, Lea.

Localities, 12, 20, 44.

Trypanostoma validum ? Anthony.[1]

Loc. 5.

Trypanostoma fastigiatum ? Anthony.[1]

Loc. 20. The three *supposed* species above named seem to form a natural group with *T. parvum*, Lea, and like that species they are found associated with shells which seem to be a variety of *Anculosa subglobosa*, Say. It is possible some future writer may unite them as one species.

Trypanostoma, (N. S.) Lea.

Localities, 7, 18.

Trypanostoma attenuatum, Lea.

Localities, 41, 32. A variable species, which some of my correspondents call *T. strigosum*, Lea.

Trypanostoma unciale, Hald.

Localities, 1, 3, 5, 8, 17, 32. The species is defined as striate or carinate above. I have separated from it all *plicate-striate* shells that have been referred to this species by my correspondents. The largest shells occur in loc. 8; they are also variable, some of them passing through phases referable to the next species to forms entirely free from striations and carinæ. The most perfect forms occur in loc. 17.

Trypanostoma Estabrookii, Lea.

Localities, 2, 4, 8, 16, 18. The shells of loc. 18 are very fine, perfect, and slender; and have been referred by a correspondent to *T. unciale*. The shells of loc. 16 are small and imperfect.

Goniobasis arachnoidea, Anthony.

Localities, 1, 2, 3, 4, 6, 9, 10, 13, 17, 18, 19, 21, 23, 25, 27, 28, 29, 35, 36, 37, 43. The local varieties are very perplexing, and some of them could not have been identified but for the aid derived from shells of other localities. Some of the various forms have been referred to *Try. unciale;* others to *Gon. baculum;* some of the more slender varieties have been referred to *Gon. carinifera*, Lam. The shells of one locality (23) have been called an undescribed species of *Trypanostoma*. Of two other localities (28, 43) the shells have been supposed to be another undescribed species of *Trypanostoma*. These shells bear a strong resemblance to Mr.

[1] According to Mr. Wheatley.

Lea's figure of *Melania perstriata*, and I have specimens of loc. 28 that were returned to me as *perstriata.*

Shells of loc. 10 bear a strong resemblance to Mr. Lea's figure of *T. Sycamorense*, from which they are (by implication) supposed to be distinct.

Some of the least plicate specimens of loc. 2 are very like Mr. Lea's figure of *Melania oblita*, and, of course, have been referred to *Try. unciale* by my correspondents. I unhesitatingly refer Mr. Anthony's *Mel. baculum* as a synonym to *Gon. arachnoidea; baculum* being the adult form, *arachnoidea* the immature form; *arachnoidea* has priority; but at the same time I think a careful study of the various shells which may yet be identified with *arachnoidea* will result in assigning priority to some other name.

Goniobasis parruta, Lea.

Localities, 2, 4, 11, 13, 15, 18, 22, 24, 32. This is also a variable species. The largest specimens occur in loc. 2; the most perfect shells occur in loc. 18.

Goniobasis acuto-carinata, Lea.

Localities, 1, 3.

Goniobasis aterina, Lea.

Localities, 2, 4, 5, 6, 8, 14, 19, 22, 25, 27, 30, 31, 33, 36, 39, 40, 41, 44. Localities 2, 4, produce remarkably perfect shells which my correspondents have differently named as *graminea*, Hald.; *Saffordii*, Lea, and *aterina*, Lea. Usually this species is much eroded.

Goniobasis castanea, Lea.

Localities, 1, 2, 3, 4, 7, 8, 9, 14, 16, 18, 21, 24, 26, 31, 37, 45. Localities 2, 4 produce shells, the upper whorls of which are smooth; all the other localities produce shells which, when perfect, are slightly but variably carinate above. Some of the varieties have been referred to *Gon. difficilis*, Lea; but as that species is "obsoletely plicate" on the upper whorls, the reference does not seem to have been well considered. Localities 30, 31 produce decallate shells that bear a strong resemblance to figures of *Gon. pulla*, Lea, but possibly not identical. Some of the varieties have been referred to "*Mel. simplex*, Say." I am not able to say the identification is conclusive.

Goniobasis instabilis, Lea.

Locality 14. I have the name from Mr. Lea. The shells are all smooth, which may account for their difficult identification.

Melantho rufus, Hald.

Locality 20. Common.

Melantho decisus, Say.

Locality 20. Less common.

Pomatiopsis lapidaria, Say.

Locality 38. Not abundant.

MOHAWK, N. Y., Jan. 10, 1872.

CATALOGUE OF THE FAMILY CHAMIDÆ.

BY GEORGE W. TRYON, JR.

Family CHAMIDÆ, Swainson.

Man. Malacol, 374. 1840.

Genus **CHAMA**, Linn.

Syst. Nat. Edit. x. 1758.

The subgenus Arcinella, of Schumacher, adopted by H. & A. Adams, has no systematic value, the peculiarities on which it is founded, recognizable at once in the type species, so fade away through the series of species that no distinct line of demarcation remains. The species of Chama are very difficult, owing to irregularity of growth, sculpture, and coloring, and I am convinced that the comparison of large suites of specimens would result in a wholesale reduction of the species. Some of the earlier species, described by Linnæus and Lamarck, cannot be identified with any certainty at this day.

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1. C. æruginosa, Lamarck.

(not identified.)

2. C. arcinella, Linn. Syst. Nat. Ed. xii., 1139. Reeve, Icon. sp. 26. 1846.
   Arcinella spinosa, Schum. Essai, Nov. Gen. 142. 1817.

West Indies.

3. C. aspersa, Reeve, Icon. sp. 24. 1846.

Philippines.

4. C. brassica, Reeve, Icon. sp. 31. 1847.
   Scarcely distinct from *C. Pacifica.*

Philippines.

5. C. Buddiana, C. B. Adams, Panama Shells, 253. 1852.

Panama.

6. C. Carditæformis, Reeve, Icon. sp. 33. 1847.

Hab.— ?

7. C. cistula, Reeve, Icon. sp. 51. 1847.
   C. appressa, Reeve, Icon. sp. 55. 1847.

Honduras.

8. C. Corbierei, Jonas, Menke Zeitsch. 126. 1846. Savigny, Desc. Egypte, t. 14, f. 8.

Red Sea.

9. C. corrugata, Brod. Zool. Trans. i. 305, t. 31, f. 7. Reeve, Icon. sp. 9. 1846.

Real Llejos, Central America.

10. C. crenulata, Lamarck.

(*not identified.*)

11. C. cornucopia, Reeve, Icon. sp. 22. 1846.

Red Sea.

12. C. cristella, Lamarck, Anim. s. Vert. Reeve, Icon. sp. 42. 1847.

Batavia—South Australia.

13. C. crocata, Lamarck.

(*not identified.*)

14. C. Claasseni, Jonas, Zeit. Malak. 127. 1846.

Red Sea.

15. C. decussata, Lamarck.

(*not identified.*)

16. C. divaricata, Reeve, Icon. sp. 20. 1846.

Philippines.

17. C. exigua, Reeve, Icon. sp. 47. 1847.

Singapore.

18. C. echinata, Brod. Zool. Trans. i. 305, t. 39, f. 5. Reeve, Icon. sp. 35. 1847.

Porto Portrero, Central America.

19. C. exogyra, Conrad, Journ. Philad. Acad. vii. Reeve, Icon. sp. 38. 1847.

California, Mexico.

20. C. fibula, Reeve, Icon. sp. 27. 1846.

Philippines.

21. C. florida, Lamarck, Anim. s. Vert. Reeve, Icon. sp. 49. 1847.

Honduras.

22. C. foliacea, Quoy, Voy. Astrol. Reeve, Icon. sp. 8. 1846.

Philippines.

23. C. frondosa, Brod. Zool. Trans. i. 302, t. 38, f. 1, 2. Reeve, Icon. sp. 1. 1846.

C. purpurascens, Conrad.

W. Columbia to Mazatlan.

24. C. GRYPHOIDES, Linn. Syst. Nat. Edit. xii. 1139. Reeve, Icon. sp. 43. 1847.
    C. unicornis, Phil. (*not of Lam.*) Moll. Sicil. i. 68.
    C. asperella, Deshayes, Lamarck, vi. 581.

Mediterranean.

25. C. IOSTOMA, Conrad, Jour. Philad. Acad. vii. Reeve, Icon. sp. 7, 13. 1846.
    C. producta, Brod. Zool. Trans. i. 305, t. 39, f. 4.
    C. coralloides, Reeve, Icon. sp. 18. 1846.
    C. echinata, Brod. (*partim.*) Zool. Trans. i. 306, t. 39, f. 6, 7.

Sandwich Islands.

26. C. JAPONICA, Lam.

(*not identified.*)

27. C. LACINIATA, Adams & Reeve, Voy. Samarang.

China.

28. C. LAZARUS, Linn. Syst. Nat. Edit. xii. 1139. Reeve, Icon. sp. 4. 1850.
    C. damæcornis, Lam.

Mauritius, Philippines.

29. C. LIMBULA, Lam.

(*not identified.*)

30. C. LINGUA-FELIS, Reeve, Icon. sp. 53. 1847.

Philippines.

31. C. LOBATA, Brod. Zool. Trans. i. 303, t. 38, f. 4, 5. Reeve, Icon. sp. 29. 1847.

*West Indies.**

32. C. MEYERI, Jonas, Zeit. für Malak. iii. 127. 1846.

Red Sea.

33. C. MULTISQUAMOSA, Reeve, Icon. sp. 12. 1846.

Philippines.

34. C. MACROPHYLLA, Chemn. Conch. Cab. vii. 149, t. 52, f. 514, 515. Reeve, Icon. sp. 6. 1846.
    C. Lazarus, Lam. (*not Linn.*) Anim. s. Vert.

West Indies.

35. C. NIVALIS, Reeve, Icon. sp. 12. 1846.

Philippines.

* Mr. Reeve says that this locality is erroneous, and that well-authenticated specimens from China are in the British Museum; but Mr. Broderip is correct, as it is a common West Indian species. The Chinese specimens must have made a long voyage before they were collected there.

36. C. OBLIQUATA, Reeve, Icon. sp. 28. 1846.

Philippines.

37. C. PACIFICA, Brod. Zool. Trans. i. 303, t. 39, f. 1. Reeve, Icon. sp. 15. 1846.

C. Broderipii, Reeve, Icon. sp. 2. 1846.

C. imbricata, Brod. Zool. Trans. i. 304, t. 39, f. 2. Reeve, Icon. sp. 3. 1846.

Lord Hood's Islands.

38. C. PANAMENSIS, Reeve, Icon. sp. 45. 1847.

Panama.

39. C. PELLUCIDA, Brod. Zool. Trans. i. 302, t. 38, f. 3. Reeve, Icon. sp. 32. 1847.

Peru to San Diego, California.

40. C. PRÆTEXTA, Reeve, Icon. sp. 46. 1847.

Hab.—?

Perhaps = *C. frondosa*, Brod.

41. C. PLANATA, Reeve, Icon. sp. 25. 1846.

Philippines.

42. C. PULCHELLA, Reeve, Icon. sp. 10. 1846.

C. fimbriata, Reeve, Icon. sp. 41. 1847.

Australia.

43. C. RADIANS, Lam. Anim. s. Vert. Reeve, Icon. sp. 19. 1846

Hab.—?

44. C. REFLEXA, Reese, Icon. sp. 16. 1846.

N. Australia.

45. C. RUBEA, Reeve, Icon. sp. 37. 1847.

Philippines.

46. C. RUDERALIS, Lam.

(not identified.)

47. C. RUPPELLII, Reeve, Icon. sp. 30. 1847.

Red Sea.

48. C. SARDA, Reeve, Icon. sp. 40. 1847.

Honduras.

49. C. SENEGALENSIS, Reeve, Icon. sp. 5. 1846.

Senegal.

50. C. SULPHUREA, Reeve, Icon. sp. 14. 1846.

Philippines.

51. C. SORDIDA, Brod. Zool. Trans. i. 309, t. 39, f. 8, 9. Reeve. Icon. sp. 23. 1846.

Isle of Cuna, Central America.

Doubtfully distinct from *venosa*, Reeve.

52. C. SINUOSA, Brod. Zool. Trans. i. 303, t. 39, f. 11. Reeve, Icon. sp. 11. 1846.
C. ferruginea, Reeve, Icon. sp. 21. 1846.
West Indies to Brazil.

53. C. SPINOSA, Brod. Zool. Trans. i. 306, t. 38, f. 8, 9. Reeve, Icon, sp. 44. 1847.
C. fragum, Reeve, Icon. sp. 48. 1847.
C. Jukesii, Reeve, Icon. sp. 39. 1847.
C. pellisphocæ, Reeve, Icon. sp. 54. 1847.
Lord Hood's I. to California, Philippines, Australia.

54. C. TUMULOSA, Reeve, Icon. sp. 52. 1847.
Honduras.

55. C. VARIEGATA, Reeve, Icon. sp. 50. 1847.
Honduras.

56. C. VENOSA, Reeve, Icon. sp. 34. 1847.
C. Janus, Reeve, Icon. sp. 36. 1847.
Perhaps = *C. sordida*, Brod.
Gallapagos Is.

CATALOGUE OF THE FAMILY CHAMETRACHÆIDÆ.

BY GEORGE W. TRYON, JR.

Family CHAMETRACHÆIDÆ, H. & A. Adams.

Genera of Recent Mollusca, ii. 464. 1857.

Genus **CHAMETRACHÆA**, Klein.

Ostracol. 149. 1753.

Hippopus, Martini, Verzeichn, e. auserl. Samml. 1773.
Tridacna, Da Costa, Elem. Conch. 274. 1776.
Chama, sp. Linn. Syst. Nat.

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1. C. ELONGATA, Lam. Anim. s. Vert. Reeve, Icon. sp. 2. 1862.
(Var.) C. COMPRESSA, Reeve, Icon. sp. 5. 1862.
(Var.) C. ELONGATISSIMA, Bianconi, Mem. Acad. Bologna, vii. t. 25, f. 2.
Mozambique, Philippines.

2. C. CROCEA, Lam. Anim. s. Vert. Reeve, Icon. sp. 9. 1862.
   (Var.) C. CUMINGII, Reeve, Icon. sp. 7. 1862.
   (Var.) C. FERRUGINEA, Reeve, Icon. sp. 8. 1862.

Philippines.

3. C. GIGAS, Linn. Syst. Nat. Reeve, Icon. sp. 1. 1862.
   C. mutica, Lam. Anim. s. Vert.
   C. rudis, Reeve, Icon. sp. 4. 1862.

Indian and Pacific Oceans.

4. C. SERRIFERA, Lam. Anim. sans Vert. Reeve, Icon. sp. 6. 1862.

Moluccas.

5. C. SQUAMOSA, Lam. Anim. sans Vert. Reeve, Icon. sp. 3. 1862.

Moluccas.

Doubtfully distinct from *C. gigas*, Linn.

Genus **HIPPOPUS**, Meuschen.
Mus. Gevers, 488. 1787.

Pelvis, Muhlf. Entwurf. 67. 1811.
Cerceis, Gistel, Naturg. 172. 1848.

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1. H. HIPPOPUS, Linn. (*Chama.*) Linn, Syst. Nat. Ed. xii. 1137.
   H. equinus, Meuschen, Entwurf. 67. 1811.
   H. maculatus, Lam. Anim. s. Vert. Reeve, Icon. sp. 1. 1862.

Eastern Seas.

May 7.

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

Twelve members present.

Mr. Thomas G. Gentry called the attention of the Academy to what he regarded as a rare and remarkable case of hybridism, which occurred between *Macacus nemestrinus*, male, and *Macacus cynomolgus*, female. After exhibiting an alcoholic specimen of the young, and a stuffed specimen of the mother which was clearly identified as *Macacus cynomolgus*, he detailed the leading characters of the two parents.

He stated that the male differed from the female in being more robust and of greater dimensions; in the almost perfect smoothness of the face, which is of a pale flesh color, while in the female it is black and invested with a close growth of short black hairs; in the absence of a crest upon the head of the male, which is a prevailing characteristic of the species (*M. nemestrinus*), and its presence in the female, which is a prominent feature of the species to which she belongs; in color; and, lastly, in the unequal development of the caudal appendage, which in the male is about seven inches in length, and densely clothed with long hairs, while in the female it is more than twice the length, and nearly naked for more than two-thirds of its extent.

He further said that there could be no doubt of the genuineness of the case, as the two had been isolated from all other monkeys during the past two years.

He also called the attention of the Academy to a fact which he believed not to be generally known, and which goes far to show the close relationship between the Bimana and Quadrumana. In this instance, the menstrual flow, as sometimes occurs in the human species, continued at the regular periods up to the time of birth.

May 14.

The President, Dr. Ruschenberger, in the chair.

Twenty-seven members present.

The following paper was presented for publication :—

"Notice of some Crustacea from the Island of St. Martin, W. I. Collected by Dr. Van Rijgersma." By T. Hale Streets, U. S. N.

Mr. Thomas Meehan observed that on several occasions, before the Academy and other scientific bodies, he had offered some facts and suggestions tending to prove that what are popularly termed

Pine needles are not properly leaves, but rather branchlets, which, through the real leaves becoming attached for nearly their whole length to the axis or stem, had of necessity taken on themselves the offices of leaves. He believed that many botanists had coincided with his views; but some very distinguished ones, among others he believed his esteemed friend Prof. Asa Gray, did not feel warranted in fully agreeing with him. He was rather glad of this hesitation, because it was an incentive to him to continue his observations and searches for new facts which might either weaken or confirm his original views.

He now wished to offer to the Academy two additional observations in favor of the axial origin of these so-called leaves.

In plants in general the leaves unfolded contemporaneously with the branches or axes. He could not call to mind an instance where the axis first extended to its full length before the leaves ventured to push forth from the nodes. The axial buds usually remained dormant until this final length was approached. When this occurred, or if anything happened to destroy the apex of the growing shoot, then the axial buds pushed into growth, and never to any great extent before. In the Pine family we had the following axial experience. The buds which bore the needles were axial buds, situated at the base of the scale—the adnated leaf as he maintained. These buds remained nearly at rest until the axis had reached its full length, and in this respect coincided with the axial buds of trees in general. A pine tree in the spring season presented the appearance of an immense chandelier, with its long axial shoots as the naked burners. In this respect it is apparent that, regarding the fascicles of pine needles as branchlets, the law of folial development coincidental with axial growth finds no exception in the Pine family.

The next striking consideration was one derived from the nature of the inflorescence. In vegetable morphology, the floral system of plants was made up of neither leaf nor axis separately, but conjointly of both. In the inflorescence of the pine, the male catkins each took the place of a fascicle. The axial bud at the base of the leaf scale, instead of a bunch of needles, developed as a spike of flowers. This spike or catkin is metamorphosed needles. If these needles were leaves merely, we could hardly expect inflorescence to be formed from them. It would be an exception to regular rule. But regarding the needles of the pine as rather axis than leaf, their development to flowers accords with general law; and he held that it was more philosophical to accept conclusions based on general law, than to hunt for new laws to account for apparent exceptions to general rule.

For his own part he felt there needed no further reasoning than he had offered at previous times; but he thought perhaps these additional suggestions might have weight with other minds that had not yet decided as fully as he had done.

May 21.

The President, Dr. Ruschenberger, in the chair.

Thirty members present.

The following papers were presented for publication:—

"Notes on Lingual Dentition of certain species of North American Land Shells." By Thos. Bland and Wm. G. Binney.

"On a new California Pulmonata." By John G. Cooper, M. D.

Prof. Cope called attention to the anterior curvature of the horn in the common deer *Cariacus virginianus*, and said it was a point of interest to determine whether the true axis or beam was curved forwards or not. On comparison with the *Cariacus macrotis* of the plains, it was found that the true beam was partly erect and was branched (as already shown by Baird) while an anterior snag was directed forward, marking exactly the curved line of the axis of the *C. virginianus*. The curvature of the latter was then shown to be due to the predominant development of this large anterior snag, and the partial suppression of the true beam.

He then exhibited a spike or second year's horn of the *C. virginianus*, and alluded to the occasional occurrence of permanent spike-horned deer in the Adirondack region of New York. He said Alexander B. Lamberton, a gentleman who had spent much time in that region, confirmed the statements that had been made as to their existence, but said that they were rare. He then exhibited a pair of simple beams or spikes of three feet in length, which had been taken from a black-tailed deer (*C. macrotis*) shot within three miles of the Kansas Pacific R. R. in Kansas. They had evidently belonged to an adult animal, and were the first examples of spike-horned deer of that species which had been recorded.

Prof. Cope further remarked that observation on varieties and variation was at the basis of a true system of creation, and that while it was often necessary for the sake of systematic clearness to unite many varieties under one specific head, we did not in this way escape their recognition and study. He said that the necessary exactness of systems had concealed from many the fact as well as the meaning of variation.

There were and had been for years two schools of naturalists, whose modes of treating natural history subjects were quite different. In reference to these modes, they might be called the *technical* and *natural* schools. As, however, the claim of the latter to better appreciation of natural affinities and classifications appeared to him to be doubtful, he thought they had better be called the *pseudo-natural* school, while the so-called technical naturalists were such on account of their pursuing an analytic method. The pseudo-natural school decided on the affinities of organic types by their "physiognomy" or their *facies habit* and the like, reading nature with an artist's eye, and attaining opinions of systems without the trouble of much anatomical study. They protested against the strict adhesion to "technical" (or structural) characters, saying that they violate "natural affinities" oftener than support or express them. Thus their systems become physiognomical, and please the eye by their appearance, rather than the mind by their expression of exact structural relations; in accordance with this system, species were always well distinguished, and could not have been derived from common parents, but that nevertheless everything "runs together," and that the higher groupings are mainly "opinionative,"—in fact, that, although nature has a beautiful system, we do not yet understand it, and that it is "too soon to generalize." Perhaps this obscurity has its advantages, as it certainly shelters in its profundities any theory of creation its supporters may choose to adopt. Hence they might be called the *Anæsthetic* school, or the *Anæsthesiasts* (σν αιιθηις).

The *unnatural* school think that the way of determining the origin and relations of an object is to ascertain of what it is composed. This was to be accomplished by analysis of all its appearances, and an account taken of every character. In this way the structure is learned, and a system based on anatomy is established. As anatomical systems are unnatural, and anatomical characters very difficult to discover by the anæsthesiasts, they regard such systems with disfavor, although they admit that they constitute the only correct classification of bones, teeth, brains, etc. The analysts even find that species having very close specific relationships occasionally present different generic characters. This was proof positive to the Anæsthesiasts of the errors of the technical school. But it was still less to their credit that they laid stress on variations and monstrosities, which were mere accidents. The fact that the analyzers believed in the development of species, showed their systems to be unnatural.

The speaker did not take sides, but observed that, in order to ascertain the relations of a species, he usually examined it first.

Mr. THOMAS MEEHAN said he had recently read, in the published Proceedings of the American Philosophical Society, the report of a discussion between Professor Cope and Mr. Eli K. Price in regard to the Hypothesis of Evolution. Mr. Price appeared to lay much stress on the assumed fact that variations were rather the result of interference by art with the regular flow of natural laws, and that it was therefore unphilosophical to attempt to found any theory of evolution on the facts of variation.

For himself he might say, that no theory of development, so far as he had been able to understand them, had satisfied his mind; but that there was a continual growth of form, wholly unaided by man or any external agency, he thought fully warranted by numerous facts. He believed that this natural and inherent growth force in relation to form, was greater than even some who believed they understood the laws governing evolution were disposed to admit. Not only intelligent minds like that of Mr. Price, but even evolutionists, like Professor Gray and Dr. Engleman—judging from the last edition of the *Manual of Botany*, seemed indisposed to allow great power to inherent change; for whenever a marked change occurred, and there happened to be distinct forms at each end of the line, we find the fact assumed that such change could only occur by outside influences. Thus we find in a recent notice of *Rubus neglectus* of Peck, the expression "hybrid?" Also in relation to the oaks *Quercus tridentata*, *Q. quinqueloba*, *Q. Leana*, *Q. heterophylla*, "probably some or all of them hybrid;" and so on in other instances.

He wished to claim no credit for any particular original discoveries, but thought it had fallen to his fortune perhaps as much as to that of any one, to remark that art both in the animal and vegetable world had had more credit awarded to it in the matter of change than it was entitled to. He had shown long ago in the *American Naturalist*, that even in the production of double flowers, usually deemed peculiarly the privilege of the florist, nature herself was the peer of the gardener. He had shown by direct evidence that some things had been found double in a wild state, and the great probability that the double forms of so many species of such a common thing as the Butter-cup (Ranunculus), and other weeds never cultivated, originated naturally in the same way; and in numerous papers and remarks before this institution, and in other places, he had shown that there was as great variation in those genera which had only one species in a given locality, as there are in the cases of the Oaks and Blackberries before referred to. At the present moment he remembered especially a short paper in the *American Naturalist* on the Ox-eye daisy (*Chrysanthemum leucanthemum*) and in the Proceedings of the Academy on "Variations in Epigæa repens," There are no "allied species" here to hybridize with. They are far out of the way of cultivation. Neither gardening nor hybridization can by any possibility have anything to do with the great variations we see.

But he would now offer another contribution to this class of facts. He had journeyed last summer several hundred miles through the Rocky Mountains of Colorado, and had noted remarkable variations in the only species of Oak in that region, *Quercus Douglassii*, or *Q. Neo-mexicana* of some authors. The first plants he found of this occupied large clumps in flat open spaces, and grew only about three feet high. He felt sure he had several species, and collected specimens accordingly. One form had the leaves so much like the *Quercus Cerris* of Europe, that branches of the two mixed together could scarcely be separated: others came near in their resemblance the European *Quercus robur;* and again some near *Q. alba* of our own country. Did these species grow there, we should assuredly have the remark by the esteemed author of the "Manual." "Probably a hybrid between *Q. cerris* and Q. alba." It was only after many successive days of acquaintance with it, during which it had ranged from a low bush to a small tree—from leaves deeply lobed to leaves almost entire—from leaves of a deep shining green to leaves of a glaucous gray—trees with fruit pretty well matured, to others only just commencing to set their fruit—from long to short pedunculated, elongated to sub-rounded fruit—and so on through other changes—that he was forced to the conclusion that he had but one species to deal with, and such he believed would be the conclusion of any careful botanist.

Whatever may be ultimately accepted as the correct theory of evolution, the fact of evolution so great as to produce forms equal to the most decided species could scarcely be disputed; and this, too, as such cases as this of *Quercus Douglassii* proved, entirely removed from the hand of art, or the agency of hybridization.

May 28.

The President, Dr. Ruschenberger, in the chair.

Thirty-six members present.

The following gentlemen were elected members of the academy: Jos. H. Ogden, Jos. E. Gillingham, D. S. Holman, J. W. Miller, P. P. Morris, and T. M. Drown, M.D.

Mons. E. Rivière, of Menton, France, was elected a correspondent.

On favorable report of the committees, the following papers were ordered to be printed.

Permission having been granted, Prof. Cope exhibited some vertebræ of a Plesiosauroid reptile and those of a smaller species, probably a *Clidastes*, which were found in close proximity near Sheridan, Kansas, by Joseph Savage, of Leavenworth. According to this gentleman, the vertebral column of the *Clidastes* was found immediately below that of the Plesiosauroid and in a reversed position, as though it had been swallowed by the latter or larger reptile. The largest vertebræ of the *Clidastes* were about three-quarters the length and one-fourth the diameter of those of the Plesiosauroid, and the animal must have furnished a large, or at least a long, mouthful for its captor. The bones of the *Clidastes* were not in good condition, but resembled those of *C. cineriarum*, Cope, though smaller.

The Plesiosauroid was new to science, being the third species discovered in the Cretaceous of the Niobrara group. Specifically it was nearest to the *Elasmosaurus platyurus*, Cope, but was readily distinguished by the relatively shorter cervical vertebræ, and the regular acute ridges on the exterior surfaces near the margin of the articular faces, as well as the less contracted form of all the vertebral centra. As the neural arches and the cervical parapophyses were not coössified with the centra, the species was referred to the genus *Plesiosaurus*, with the name *P. gulo*, Cope, and the following description:—

Specimen represented by eleven cervical, thirteen dorsal, and seven or eight other vertebræ, with portions of scapular and pelvic arch and ribs.

The cervicals are longer than wide, and considerably compressed in form anteriorly, but depressed posteriorly; this is partly due to pressure, but not wholly, and it is likely that the posterior centra are about as transverse as in *Cimoliasaurus magnus*, Leidy, while the anterior are relatively several times as long. In the length the latter resemble the English *Plesiosauri*, in which the centra are also compressed. The compressed anterior centra exhibit a ridge on the side above the middle. A more massive ridge extends between the articular extremities at the lower part of the side, and presents a pit for the parapophysis. The pit for the neural spine is of nearly similar size. Where the cervicals begin to be depressed, two foramina appear near together on the inferior face, and the articular extremities display an open obtuse emargination below. They are also emarginate for the neural canal above, so as to have a form approaching a transverse figure 8. In the large posterior cervicals the sides are contracted both below and at the sides. In all the cervicals the articular faces are a little concave, in the larger with some median convexities.

In none of the dorsals preserved are the diaphopyses seen to issue from the centra, hence they are probably not posterior in position. The centra soon become smaller than those of the posterior cervicals, and are subround in section, with a well-marked emargination for the neural canal. The sides are gently concave, and are without angulation, but are marked near the articular extremity with short, sharp, and regular undivided ridges, eight in a half inch. The articular faces are slightly concave and without ridges. There are the two inferior foramina, and one on the lower part of each side. The articular face for the neural arch is an oval pit extending the length of the centrum and interrupted by some transverse ridges near the middle. The vertebræ diminish in size posteriorly. Two centra, probably sacral, resemble the dorsals, but present an extensive vertical articular surface on each side. This has raised edges and terminates above in the longitudinal surface for the neural arch, having thus a T-shape. It narrows below to an obtuse point, and no doubt supported a free diapophysis.

The fragments of the pelvic and scapular arches indicate that they were capacious. The clavicle inclosed a large foramen, was rather narrow, and thickened on the inner edge. Its glenoid surface was wide and sub-rhomboid. Some of the other bones were quite thin.

MEASUREMENTS.

	M.
Length of anterior cervical	0.062
Depth articular face do.	.050
Width of articular face do.	.050
Length of posterior cervical	.070
Depth articular face do.	.052
Width " "	.090
Distance between parapophysi	.048
Length anterior dorsal	.059
Depth articular face do.	.062
Width " "	.072
" neural canal on centrum	.017
Long diameter proximal end clavicle	.114

Associated with these remains were those of a turtle of the size of some of the large *Cheloniidæ* of recent seas. The only portions were the scapulo-procoracoid, the coracoid, and the mandible nearly complete. The two former were like those of *Chelydra;* the procoracoid issuing nearly at the articular extremity, and the coracoid being of moderate elongation and much expanded distally, and with nearly straight axis. The mandibular rami were remarkably slender and with correspondingly short symphysis. The tomia obtuse and directed outwards, the apex flat and obtuse. Coronoid process slightly elevated; articular bone osseous. Length coracoid .250 m.; diameter distally .080; distal width of scapula .058; length ramus of mandible .150; length symphysis .030.

The general characters of this form were thought to agree with *Cynocercus*, Cope, though the individual was larger than that on which the *C. incisus* was established.

DESCRIPTIONS OF NEW SPECIES OF MARINE BIVALVE MOLLUSCA.

BY GEORGE W. TRYON, JR.

1. Crassatella Adelinæ, Tryon. Plate 6, fig. 1.

Shell ovate, triangular, anteriorly rounded, posteriorly produced; umbones depressed, slightly undulated. Surface white with brown rays, occasionally marked with cuneiform characters of darker color under a thin dark brown epidermis; within chocolate color, margins white without crenulations.

Length 3, alt. 2.25, diam. 1.13 inches.

Habitat. unknown. Museum of the Academy.

This species is nearly allied to *C. Antillarum*, Reeve, but is not so gibbous, and is more narrowly produced behind; it is also readily distinguished by its peculiar colored markings.

2. Lucina (Codakia) Distinguenda, Tryon. Plate 6, fig. 3.

Shell orbicular, depressed, disk-like, covered with flattened radiating ridges which are crossed by numerous close-set, raised, concentric striæ. White with a faint tinge of pink: interior with a broad marginal band of deep pink.

Long. 3, alt. 2.65, diam. 1 inches.

Habitat., Gulf of California. W. M. Gabb. Museum of the Academy.

This fine large species has been confounded, by Mr. P. P. Carpenter and others, with an analogous West Indian species—*Lucina tigrina*, Linn. It is readily distinguished, however, by its flattened form and border, and more depressed ribs.

3. Circe (Crista) bidivavicata, Tryon. Plate 6, fig. 2.

Shell oblong-oval, thick, somewhat ventricose, sides declining convexly and ventral margin slightly rounded, covered by radiating rounded ribs which are finally bifurcate and nodose; ribs posteriorly bi-divaricate, forming a series of M's. Rust colored with brown splotches, white within.

Long. 1.65, alt. 1, diam. .65 inch.

Habitat.—Red Sea. Museum of the Academy.

This species resembles *Crista divaricata*, Chemn., its characteristic difference being the doubly divaricate disposition of its ribs.

Tryon: New Marine Bivalve Mollusca.

NOTICE OF SOME CRUSTACEA FROM THE ISLAND OF ST. MARTIN, W. I., COLLECTED BY DR. VAN RIJGERSMA.

BY T. HALE STREETS, U.S.N.

BRACHYURA.

MAIOIDEA.

Pericera cornuta, H. Milne-Edwards. Hist. Nat. des Crust., Vol. I. p. 335; Pl. XIV. bis. Fig. 5.

OCYPODOIDEA.

Gelasimus affinis, Nov. sp.

Male. This species is very closely allied to *G. mordax*, Smith. The carapax is convex longitudinally and slightly so transversely. The dorsal surface of the carapax is very similar to that of *G. mordax*. Like that species it is punctate, and the space between the puncta is perfectly smooth. The regions are but faintly marked out on the dorsum; a prominent sulcus separates the gastric and cardiac regions. The front is broad and deflexed. Its dorsal surface is grooved in the medial line; the tip is curved backward and downward so as to be completely hidden when looked at from above; it is bifid. The front is marginate above at the point where it is curved backward. The upper edge of the superior orbital border is straight, but directed a little backward. The ascent of the outer portion of the curved lower edge is much more gradual and is longer than the inner portion of the same edge, which is curved rapidly downward. The raised margin of the lower edge is finely denticulated. The antero-lateral angle is somewhat projecting, and the anterior portion of the lateral border is thin and straight. The margin is raised, and in some cases finely denticulated. The posterior portion of it is curved inward and terminates opposite the cardiac region. From the point where the postero-lateral border turns inward, a line runs downward and backward in a curved manner to join the posterior border. In the space left by the divergence of these two lines there is one, and in some cases two, short plications.

In the larger cheliped, the merus is triangular in form, the anterior surface is smooth, the borders are granular or tuberculose, and the superior surface is arcuate and crossed by short pecteniform lines, as is also the external surface. The superior and external surface of the carpus is obscurely tuberculose, and the inner surface is crossed by an oblique, smooth ridge. The basal portion of the propodus is shorter than the digital. The superior and external surface is covered thickly with small depressed tubercles. On the superior surface these tubercles are distinct and are separated by distinct intervals, but they become gradually smaller, more numerous, and are thickly crowded together towards the inferior border. A raised tuberculose margin extends from the base of the propodal finger along the whole length of the inferior border to the carpus. The inferior part of the inner surface is minutely granulose, and is crossed by an oblique tuberculose ridge which extends to the evacuation for the reception of the carpus. The space between this ridge and the base of the dactylus is covered with tubercles. The superior edge is carinated; from its posterior part a tuberculate line curves downward around the upper part of the depression into which the carpus folds. The fingers are long and slender, smooth and punctate. The row of tubercles along the inner margin of the prehensile edge of the propodal finger curves upward behind the base of the dactylus. The prehensile edge is armed with tubercles; there is a large one near the middle and another at the tip. The dactylus is tuberculose at its base; its prehensile edge is also armed with tubercles; those in the median line are the largest. The tips are hooked. In the ambulatory feet the merus is broad and compressed, and the upper part of the superior surface is marked by pectiniform lines; the fourth and fifth segments are hairy.

The abdomen is similar to that of *G. pugnax.* The second and third segments are broadest. The terminal segment is narrower than the penultimate, and is arcuate in form.

The female is distinguished from the male by being minutely granulose on the dorsal surface of the carapax, and the carapax is nearly plane transversely.

Dimensions of the male. Length of the carapax .56–.65 in.; breadth .37–.44 in. Length of the hand .74–1 inch. Length of the carapax of the female .50–.53 in.; breadth .31–.37 in.

This species can be distinguished from *G. pugnax* by having the anterior surface of the merus smooth, and a smooth oblique ridge on the inner surface of the carpus. It differs from *G. mordax* in not having the superior surface and the upper part of the external surface obscurely tuberculose, nor is the inferior portion smooth. The carapax in the female is nearly plane, and the lateral margins of the branchial region are not tuberculose.

LEUCOSOIDEA.

CALAPPA GALLOIDES, Stimpson. Ann. Lyc. Nat. Hist. New York. Vol. VII. p. 71.

ANOMOURA.

DROMIA LATOR, H. Milne-Edwards. Hist. Nat. des Crust., Vol. II. p. 174.

PETROLISTHES NODOSUS, Nov. sp.

The carapax is broadly ovate, about as broad as long. It is nearly plane from side to side, and convex from behind forward. The anterior portion is nodulated; the nodules are arranged in a semicircular manner transversely across the dorsum from one hepatic region to the other. There are two nodules, larger than the others, placed in the centre behind and between the orbits. The posterior portion of the carapax is indistinctly imbricated. The front is prominent and deeply tridentated. The middle tooth is the largest and triangular in shape, and very slightly more prominent than the lateral ones. The lateral teeth are broad; their outer margin is convex and the inner is concave; their apices are directed inward. A shallow groove is in the middle of the front; and there is also a groove on each side running down into the lateral teeth. The superior margin of the orbit is inflated and everted. The external angle is acute, but not prominent. The eyes are large. The peduncles of the antennæ are knobby; the first article presents an obtuse tooth on its anterior margin.

The right cheliped was missing. The left is large, compressed, imbricated on the superior surface, and smooth on the inferior. The hand is as long as the carapax; the width is greater at its junction with the dactylus than where it joins the carpus. The posterior margin is covered with a dense pubescence. The dactylus and propodus closely approximate, and their approximated borders are finely denticulated. Their extremities are hooked. The dactylus presents a slight groove on its superior surface. The carpus is shorter than the hand. The anterior margin is armed with four large, serrated, and imbricated teeth; the two middle ones are the largest, and are united at their bases; the external tooth is smallest. The superior edge of the distal extremity of the carpus is dilated. There is a small tooth at the external angle;

and between the two angles are two rounded prominences. The superior surface presents a well-marked ridge with a sulcus on each side of it.

The ambulatory feet are hairy: the third article is broad, compressed, and imbricated. The color of the carapax and cheliped is reddish. The length of the carapax is .025 of an inch.

PETROLISTHES JUGOSUS, Nov. sp.

The carapax is rotundo-ovate in outline, about as broad as long, depressed, and smooth, or very lightly granular under the microscope. The front is deflexed and trilobate. The lobes are rounded; the middle one is more prominent than the lateral ones. There is a well-marked median furrow extending to the tip of the middle lobe; and a furrow on each side which terminates at the anterior border of the lateral lobes. The anterior border of the front presents a well-defined raised margin. The superior border of the orbits is not inflated. The external angle is obtuse and not prominent. The eyes are large; the first article of the antennary peduncle has a projection on its anterior border.

The chelipeds are large, compressed, and granular; the left is larger than the right. The hand is as long as the carapax. Its width is greater at its junction with the dactylus than where it articulates with the carpus. The posterior border is pubescent. The posterior part of the superior surface is broadly grooved, and this groove is continued on the propodus. The anterior part of the upper surface presents another slighter groove; and a broad ridge runs longitudinally along the centre of the same surface. The carpus is shorter than the hand, and its anterior margin is armed with five small teeth. Its upper surface is marked by three longitudinal ridges. The posterior and external borders are dilated. The anterior angle of the merus is armed with a tooth.

The ambulatory feet are pubescent, and minutely granulated under the microscope. The third article is compressed; the fourth and fifth articles are ridged on their upper surfaces, in their long direction. The color is a reddish shade; the chelipeds are more deeply colored than the carapax. The length of the carapax is .019 of an inch.

MACROURA.

PALEMON JAMAICENSIS, Olivier. H. Milne-Edwards. Hist. Nat. des Crust., Vol. II. p. 398.

NOTES ON LINGUAL DENTITION OF CERTAIN SPECIES OF NORTH AMERICAN LAND SHELLS.

BY THOMAS BLAND AND W. G. BINNEY.

We are indebted to Miss Annie E. Law, of Jalapa, Tennessee, and to Mr. Henry Hemphill, of Oakland, California, for the specimens from which we extracted the jaws and lingual membranes here described.

ZONITES LÆVIGATUS, Pf.

Jaw as usual in the genus.

ZONITES INTERTEXTUS, Binney.

The jaw and lingual membrane are as usual in the genus.

ZONITES DEMISSUS, Binney.

Jaw arched, ends attenuated, pointed; anterior surface smooth, cutting edge with well developed sharp median projection.

Lingual membrane as usual in the genus. Laterals above eight in number on either side of central line.

ZONITES LASMODON, Phillips.

Jaw and lingual membrane as usual in the genus.

ZONITES INTERNUS, Say.

The jaw and lingual membrane are those of *Zonites* (or *Hyalina*), and not of *Helix*, thus showing the generic position of the species, which is not so well marked by the shell.

The jaw is slightly arcuate, ends attenuated, pointed; median beak-like prominence to the cutting edge.

The lingual membrane is long and narrow. Central teeth large, with a long median cusp. Laterals like the centrals, but bifid, four in number, marginals aculeate.

PATULA STRIGOSA, Gould.

Jaw long, low, slightly arcuate; anterior surface smooth excepting near the lower margin, where there are numerous, crowded, subobsolete ribs, or coarse striæ, crenellating the cutting edge. There is a very strong muscular attachment to the upper margin.

The lingual membrane is as usual in the genus. (See fig. 129 of L. and Fr. W. Shells, I.) The marginal teeth are wide and low, with one inner, long, obtuse, oblique denticle. and several short side blunt denticles, obtusely rounded.

Patula cooperi, W. G. Binn.

Lingual membrane as in *Patula strigosa.*

Patula idahoensis, Newc.

The jaw very much resembles in form and in its crenellated cutting edge that of *Patula striatella.* (See fig. 141 of L. and Fr. W. Shells, part I.) Its anterior surface has coarse perpendicular striæ or obsolete wrinkles, not well formed ribs. There is a stout membranous attachment to the upper margin. Lingual membrane as in *Patula Hemphilli.* (See Am. Journ. of Conch., VI. 247.)

Patula perspectiva, Say.

The jaw and lingual membrane are quite like those of *P. striatella.* The ends of the jaw, however, are more squarely truncated, and the striæ are not converging.

Helix polygyrella, Bland.

Jaw slightly arcuate, ends but little attenuated, blunt; anterior surface with fifteen broad ribs, denticulating either margin.

Lingual membrane as in *H. auriculata.*

We are indebted to Mr. Harford for the living specimens from which the notes on this species are drawn.

Helix palliata, Say.

Jaw short, high; anterior surface with more than fifteen ribs, denticulating either margin.

Helix obstricta, Say.

Jaw with ten ribs. Lingual membrane as in *H. palliata.*

Helix devia, Gld. var.

This small, doubtful form from Salmon River, Idaho, has the jaw arcuate, ends blunt, with about seven stout ribs denticulating either margin. The lingual membrane is broad, teeth as usual in the genus, the marginals low, wide, with one oblique, bluntly bifid, inner denticle, and several short, blunt, outer denticles.

Helix fidelis, Gray.

In Amer. Journ. Conch., VI. p. 207, pl. ix. fig. 1, we described and figured the jaw as short, high, thick, rough, strongly arcuate, ends attenuated, blunt, cutting edge with a well developed, blunt, median projection, marked with decided longitudinal striæ, which crenellate its margin. We have lately had an opportunity of examining numerous other adult specimens, and find them decidedly costate, usually with about six ribs, denticulating either margin.

Pallifera dorsalis, Binney.

An opportunity has lately been given us by Mr. H. Prime of examining living specimens from Westchester Co., New York. We find Mr. Morse's description and figure of the jaw to be quite correct, and have no doubt of the genus being distinct from *Tebennophorus*. The species appears to us well marked also, especially by the great activity of the animal's motions.

Mr. Prime noticed it climbing on trees, a habit often observed by us in several of our land shells. Thus *Helix thyroides* in the garden of one of us at Burlington, N. J., constantly climbs the fruit trees, to eat the gum which exudes from the branches.

Our figure 535, of L. and Fr. W. Shells, part I., is defective. The head does not extend beyond the mantle. See the upper figure in Terrestrial Mollusks, III., pl. lxiii.

June 4.

The President, Dr. Ruschenberger, in the chair.

Twenty-two members present.

The following papers were presented for publication:—

"Descriptions of Twenty-nine species of Unionidæ from the United States." By Isaac Lea.

"A Contribution to the Ichthyology of Alaska." By Edw. D. Cope.

Note on Gamasus of the Ox.—Prof. Leidy read an extract from a letter from Dr. C. S. Turnbull, in which it was stated that the writer had been misunderstood in relation to the Acarus of the Ox, described in the Proceedings for January 2d. He had seen the cattle killed, and was positive that the mites occupied the position in the ear of the steers while these were alive. Such being the case, the acarus may be viewed as a parasite of the Ox, and may be specifically named Gamasus auris.

Mr. Thomas Meehan presented some specimens of the common asparagus, and remarked that in consequence of observing last year so many plants that had evidently flowered, producing no seeds, he had this year examined them in a flowering condition and found them perfectly diœcious. Imperfect stamens existed in the female flowers, but they were never polleniferous. An occasional gynœcium in the male flower would make a weak attempt to produce a pistil, but no polleniferous flower ever produces a fruit. There was a great difference in the form of the male and female flowers. The former were double the length of the latter, and nearly cylindrical, while the female flower was rather campanulate. Other observers had nearly made the discovery of division in this plant. The old "English Botany" of Smith gave it the character of being occasionally imperfect, and the authors of "Deutchland Flora" considered it as occasionally Polygamous. But Mr. M. was satisfied from a half day's investigation among many plants that in this region at least the asparagus is never perfect, but truly diœcious.

He had observed another matter, small, but which might be of importance to systematic botanists, as well as to those engaged in evolutionary studies. One flower had a quadrifid stigma, and a four-celled ovary. The trinate type, or its multiple, is so closely associated with the endogenous structure, that he considered this circumstance particularly worthy of note.

The male flowers seem very attractive to insects, various kinds of which seem to feed on the pollen. The honey bee was a frequent visitor. None seemed to be attracted to the female flowers. In the division into separate sexes the plant had gained nothing in the way of aid by insect fertilization. Fertilization seemed wholly accomplished by the wind. The male flowers are produced in much greater abundance than the female ones.

Mr. M. added that this discovery had a more than usual practical importance. Many attempts had been made to improve the asparagus, as garden vegetables and the farm cereals had been improved; but it had often been questioned whether these improved forms would reproduce themselves from seed as other garden varieties did. The tendency of thought the few past years had been in the direction of the belief that permanent varieties could be raised, and several improved kinds had been sent out by seedsmen, and were popular to a considerable extent. He said he had himself inclined to this opinion; but this discovery of complete diœcism in asparagus, whereby two distinct individual forms were required to produce seed, rendered a true reproduction of one original parent impossible, as the progeny must necessarily partake of both forms.

Mr. Meehan further said he had been requested by one of the members, Professor Frazer, to call the attention of the Academy to an orange on the table, which had produced a second smaller fruit under the rind of the larger one. The orange externally presented nothing unusual, but on being peeled the second one was found of about one-fifth the size of the principal one, of a turbinate shape, and fitting into the lower larger one as into a cup. This upper secondary orange had the regular colored skin with its endopleura, and the whole inclosed by the regular skin of the primary fruit. He explained that a fruit was formed by the sudden arrestation of growth in a branch, and what would be under ordinary circumstances an elongated branch, with its several nodes and axillary leaves and buds, is to form a fruit compressed and condensed, so to speak, into the organized mass we call a fruit. In the orange before us, the central axis, after having had its elongating direction arrested, made another feeble departure onward, and the small orange was the result. These sudden accelerations of a nearly arrested growth are, though not common, sometimes seen in fruits. They have been most frequently seen in the pear. Here the renewed growth of the central axis bursts through the primary cuticle as seen by the manner in which it is drawn up with the secondary growth. He believed he had seen an instance of a pear making three series of growths in one fruit. In the larch it was quite common to find a branch arrested in its development to form a cone, push out again into vigorous growth at the apex, after resting as it were for nearly a month, while the cone was forming. These larch cones, with branches growing as it were completely through them, are very often seen. Aurantiaceous plants seem addicted to these irregularities. It was not unusual to find several young seedling plants spring from one orange seed.

June 11.

The President, Dr. Ruschenberger, in the chair.

Twenty-five members present.

Prof. Cope offered some remarks on the discoveries recently made by Prof. Marsh as to the structure and characters of the *Pythonomorpha*, based especially on material recently obtained by him in Kansas. As the writer had recently passed in review much similar material, he was much interested in Prof. Marsh's conclusions. These, he said, were of importance. In the first place, he had ascertained that what was formerly supposed to be the inner side of the quadrate bone was the outer side, a conclusion Prof. Cope thought entirely consistent with the other known relations of the parts.

Secondly. He had discovered the stapes, and had entirely confirmed the opinion of the speaker, which Prof. Marsh had apparently overlooked. This was stated as follows:[1] the quadrate "is characterized by the presence of an oval pit. . . . Its use is uncertain, but there is some probability that it received the extremity of an osseous or cartilaginous styloid stapes. A groove on the under side of the suspensorium would accommodate such a rod, and in a position nearly similar to that which it occupies in many of the Ophidia." It is in precisely this position that Prof. Marsh is so fortunate as to have discovered it.

Thirdly. Prof. Marsh believes that he has found the columella. I have supposed it to be wanting, from the absence of its usual points of attachment on the parietal and pterygoid bones. It remains to compare the bone found by Prof. Marsh with ali- and orbito-sphenoid and ethmoid ossifications found in many saurians.

Fourthly. Prof. Marsh has observed the parieto-quadrate arch described by the speaker, and makes the interesting observation that it is formed of three elements, the median connecting the parietal with the opisthotic. This piece, he says, is "apparently the squamosal;" as the latter bone completes the zygomatic arch, it cannot occupy a position in the parieto-squamosal, unless it sends a branch in that direction.

Fifthly. He discovers the malar arch, proving it to be incomplete and supported by the postfrontal bone. Prof. Marsh also observes an ossification in the glenoid cavity of the opisthotic, which he regards as the pterotic (of "Huxley," which should be

[1] Trans. Amer. Philos. Soc., 1869, p. 180.

Parker), an identification which cannot probably be maintained. The connections of the pterotic, where present, are very different. The bone in question is present in *Edestosaurus tortor*, Cope.

Sixthly. Prof. Marsh completes almost entirely our knowledge of the anterior limbs. The previous descriptions of these members in *Clidastes propython*, Cope, *Holcodus ictericus*, Cope, and other species, had left the number of phalanges and their relative positions, as well as those of the carpals, uncertain; these points are now happily supplied by Prof. Marsh's important researches.

Seventhly. He has done much for the pelvic arch and hind limbs. He was the first to announce the existence of both, and actually described the pelvis of *Edestosaurus dispar*; the speaker, however, first described the hind limb in *Liodon crassartus* and *L. dyspelor*, Cope. Prof. Marsh is in error when he says the "absence of these extremities in the *Pythonomorpha* was considered satisfactorily established." I had never stated that they were certainly absent, and the last time I wrote observed that this order "possessed an anterior pair only, or with the posterior pair so reduced as to have been insignificant."[1] They appear, according to Marsh, to have been relatively small in some of the genera. In *Liodon dyspelor*, Cope, the anterior are the smaller. Prof. Marsh lays students under especial obligation for his determinations of the pelvic elements and the excellent figures of all the parts connected with the support of the hind limb. His figure of the fore limb is also highly important, as it will be difficult soon to duplicate his beautifully complete specimen.

In subsequent pages there are six additional species described, bringing up the number from the Kansas Cretaceous to twenty-three. Two new genera are proposed, viz., *Lestosaurus* for those previously referred by myself to *Holcodus*, Gibbes, and *Rhinosaurus* for species allied or belonging to *Liodon*. As to the former, it is no doubt a well-marked genus, and I am willing to believe Prof. Marsh's opinion, that it will not include Gibbes' *Holcodus acutidens*, will turn out to be well founded; but there is, on the other hand, insufficient evidence to show that it is not *Platecarpus*, Cope. If *Liodon curtirostris* be referred to it, it will very probably prove to be *Platecarpus*, as that species presents palatine teeth, much as in *P. tympaniticus*, and the pleurodont character is not wanting in some of the other species. *Rhinosaurus* includes such species as *Liodon proriger*, Cope. As the name has been used two or three times before, it may be altered to *Rhamphosaurus*, but I have always had doubts that the conic projecting snout would distinguish the species generically from the true *Liodon*, with which it agrees in dentition. The type of *Liodon*, *L. anceps* ord., is, however, very little known.

[1] Hayden, Geol. Survey of Wyoming, etc., 1870, p. 385.

Remarks on Mastodon from New Mexico.—Prof. LEIDY directed attention to portions of a lower jaw of Mastodon recently received for examination from the Smithsonian Institution. The specimens were from New Mexico, and were presented to the latter by the Hon. W. F. M. Arny. One of the specimens contains a molar resembling that from California, described before the Academy, and supposed to belong to *Mastodon obscurus*, which was originally named from a tooth said to have been derived from the miocene formation of Maryland. The other fragment is part of the symphysial prolongation of the jaw containing portions of tusks. This resembles in its form and proportions the corresponding part of the European *Mastodon angustidens*. These and other specimens, including the portion of an upper tusk, having a band of enamel, from California, described before the Academy under the name of *Mastodon Sheppardi*, lead to the inference, that a species resembling *Mastodon angustidens*, inhabited North America during the middle tertiary period. The late Dr. Falconer states that he saw at Genoa the cast of a lower jaw of a Mastodon from Mexico, with an enormous beak containing a large lower incisor. The animal to which it belonged was named *Rhynchotherium*. This perhaps may be the same as the species named *Mastodon obscurus*. A full description of the New Mexican and Californian fossils, with plates, will shortly be given.

JUNE 18.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-three members present.

The death of Dr. Wm. Stimpson was announced.

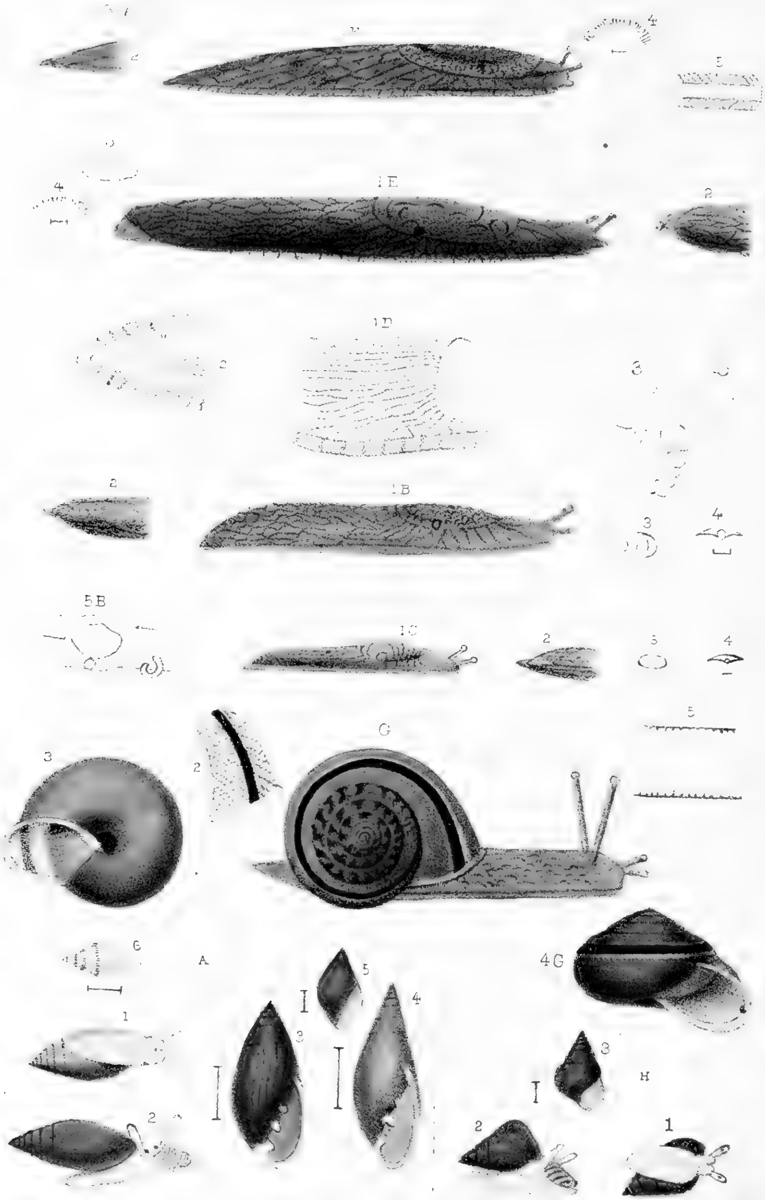
JUNE 25.

The President, Dr. RUSCHENBERGER, in the chair.

Sixteen members present.

The death of John Farnum, Maj. Sydney S. Lyon, John G. Moore, and T. Clarkson Taylor, was announced.

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



Cooper On New California Mollusca

ON NEW CALIFORNIAN PULMONATA, ETC.

BY J. G. COOPER, M.D.

ALEXIA SETIFER. Cp. n. s. Pl. 3, fig. A. 1 to 6.

Sp. ch. Alexia "*A. myosotis*" persimilis, sed testâ juniore ætis brevissimis deciduis munitâ, lineâ spirali ante sutura sitis. Var. *tenuis*, elongata, pallida.

Lat. 0.08 ad 0.14, alt. 0.30 ad 0.40 partes cent. pollici.

Shell very similar to *A. myosotis* (of the northern Atlantic States), but the young provided with short deciduous bristles, arranged in a spiral line just in front of the suture.

Form varying from ovate to lanceolate, translucent, smooth, pale to dark corneous, with a purple tinge, often marked with numerous longitudinal paler stripes; apex short, or rather lengthened and subacute; suture usually distinct, whorls six or seven, the nuclear three or four, very narrow, and nearly alike, with the apex inverted or planorvoid; the last elliptic-ovate, and forming nearly three-fourths of the total length; aperture nearly two-thirds of total length; peristome thickened and projecting horizontally, especially in front, appressed to columella, leaving a slight umbilical fissure open, then blending with a strong plait which winds obliquely inward; parietal wall with a white transverse flat denticle near its middle, and usually a small tubercle above it, making the mouth three-toothed on the inner side.

Young shell showing the bristles on about three whorls, the first two or three being without them, and losing them by wearing off after attaining half its growth.

The variety *tenuis* is slender, elongated, shell usually thinner and paler, sometimes amber-yellow. Many of the more robust form are, however, fully as thin and pale.

Animal yellowish-white, translucent; eyes black; tentacles transparent, faintly wrinkled, muzzle strongly wrinkled transversely.

This species seems chiefly characterized by the bristles of the young shell, but these may exist in some other species, being easily overlooked, or rubbed off in cleaning the shell, which is often covered with adhesive mud.

The usual form of the adult differs much from the figure given by Binney of "*A. myosotis*," more resembling other European species. The variety *tenuis*, however, is very similar to that of Binney and Tryon. The figures show the varieties of form and color met with here, but scarcely two specimens are exactly alike, and some adult shells are as ventricose as the young one figured.

I found this species exceedingly numerous on the stony shore of a tide-water creek within the limits of San Francisco, but only for a distance of about ten rods, where a rocky point comes to the shore, though a few can be found for half a mile on loose stones and timbers, crawling under the stones in great numbers when the tide is out long. They look so similar to the buds of the *Salicornia* which grows about the spot that they may easily be overlooked by enemies when crawling among it. They creep rather rapidly by a steady gliding motion, like the other pulmonates, and live for a week or more in a damp vial, though killed quickly by immersion in fresh water.

Though so numerous that several hundred may be scraped off from the bottom of a small stone, it is strange that this shell has escaped the notice of a host of collectors for more than twenty years, though many of them must have passed within a few yards of the spot, as it is close to the old southern entrance to the city by land. This suggests that it may have been introduced from China on the bottoms of fishing-boats, or as ova in damp nets or otherwise, especially as the Chinese have always made the creek a fishing station, and cultivate the low land along its shores. It is, however, just as likely to be native, and to have been overlooked on account of the limited and rather inaccessible locality it inhabits. Until it is proved that these delicate aquatic mollusca *can* be transported from one country to another by the ways of commerce, it is better to consider them indigenous. I may be able to find them in other similar localities out of the way of foreign vessels.

It is almost as probable that the *Assiminea*, which is equally numerous in the same spot, was introduced in the same way, though that is probably the same as found in other similar creeks about the bay.[1]

[1] *Note on "A. myosotis" of U. S. Atlantic Coast.* The variations of the Pacific shell suggest that the form figured by Binney is only the northern attenuated form of what may occur farther south more fully developed as "*Leuconia*" *Sayii* (Kuster sp.), which, according to Jay's catalogue, is found in New Jersey. Conrad's and De Kay's descriptions of "*borealis*"

I will probably be able to make explorations sufficient to determine most of these doubtful points relating to this and many other species, before the publication of the Conchology of California by the Geological Survey.

LIMAX (AMALIA) HEWSTONI. Cp. n. s. Pl. 3, Fig. B. 1 to 5.

SP. CH. Limax "*L. Sowerbii*" similis, dorso postice valde carinato et altiore; clypeo granulatim rugoso, et sulco subelliptico super spiraculo submediano; colore ex brunneo nigrescens vel supra nigerrima, lateribus pallidioribus, disco motivo infra albescens.

Long. circa duo pollicco, alt. corporis bis major quam lat. disci motivi. Testa oblongo-ovalis, $\frac{1}{5}$ poll.

Similar to *L. Sowerbii* (of England), the back being strongly carinate even when fully extended, and higher than the front of body; shield granulate-rugose, and with a groove, sub-elliptic in outline, above the level of the spiracle, which is just behind the middle; color blackish-brown, or deep black above, the sides paler, the locomotive disk beneath whitish.

Length about two inches or less, height of body twice the width of foot. Shell oblong-oval, $\frac{1}{5}$ inch long. Its other characters agree with those common to most of the subgenera *Amalia* and *Eulimax*. The figures best show the comparative points.

I have named this species in compliment to Dr. George Hewston, of this city, who has made many interesting observations on the habits of the species in his garden.

It is, I believe, the first "*Amalia*" found in the United States, native or naturalized. In the remarkable groove on the shield it differs from any I find described, but, as this is not apparently connected with any organic difference, it seems merely a specific

indicate varieties like ours but not described by Binney, while Say's "*turritus*" is like the young.

Binney's figure of the animal of "*Tralia*," from Charleston, is so much like ours, that it seems probable that it may also be a more southern development of the *Alexia*, while his "*T. pusilla*," from Florida, looks very like some forms of our *A. setifer*, the revolving lines and labial denticles being, perhaps, more perfect characteristics not found far north. *Melampus bidentatus* presents similar variations with a like geographical range. Eastern conchologists may decide whether it is not more likely that the southern shell extends north under a less perfect form, than that the northern shell has come from Europe, and also which of the names quoted is prior, if it is distinguished from the latter.

character. It does not even coincide with the outline of the attached portion, or with the shell, and, though general, is in some so faint as to be scarcely visible.

The *L. fuliginosus*, Gld., seems very similar, and might pass for the same, though described as from "New Zealand," but has ferruginous tentacles.

It is barely possible that this species was introduced from China or elsewhere, as I have not met with it beyond the vicinity of San Francisco, but it is so exceedingly numerous in every garden here that it seems indigenous. It is found in drier places than our others, and is active all summer in moist shady places. I find none like it described from Asia or Europe.

LIMAX (EULIMAX) CAMPESTRIS, Binney.

Var. Occidentalis. Pl. 3, fig. C. 1 to 5.

This, the only indigenous eastern species, has not been before announced from west of the Rocky Mountains, and I, therefore, give a figure of the California form which appears rather more robust than the eastern. It presents the same range of colors, from amber-brown to black, being paler when it first emerges from its retreat in the dry season. I have found it numerous at San Francisco and Santa Cruz, at Clear Lake, Alta, 3625 ft. elev. on west slope of the Sierra Nevada, and Truckee, 5866 ft. high on the east slope, besides observing probably the same at points near lats. 37° and 39° in the valleys. It has not been noticed in Oregon.

ARIOLIMAX CALIFORNICUS. Cp. n. s. ? Pl. 3, fig. D. 1, 2, 3.

Sp. ch. A. forma, colore, etc. "*A. Columbiano*" similis, sed sulcis dorsalibus multo frequentioribus; sæpe bis numero, et transversé reticulatis.

Resembling *A. Columbianus* in form and color, but with the dorsal grooves much more numerous (26 to 36), often twice as many, and the connecting reticulations transverse.

The figures given of portions of this form, taken from life, show the remarkable dissimilarity in the reticulations of the dorsal region, and, did I not find considerable variation among them, I would consider it certainly a different species.

The black form next mentioned agrees with the Oregon animal in this character as shown in E. Young and adult of the yellow form, from one to six inches long, all show the same peculiarity, and it may be only an adaptation to a drier climate. It is quite well shown even in alcoholic specimens, and I am surprised that it has not before been mentioned. Some parts of Mr. W. G. Binney's description may, however, be taken from this variety. The following notes have not before been published, and are all taken from the southern form. Mr. Voy has brought it from the Sierra Nevada, lat. 39°, alt. about 3500 feet, but I have not heard of it elsewhere out of the coast range.

The locomotive disk, anal and generative orifices are like those of *Limax.* Fig. D, 3, shows the latter as preserved in alcohol in a specimen taken *in copulo.* I may be able to describe them more fully from fresh ones. The mantle is minutely granulated, which may have led Mr. Tryon to place it in *Amalia.* The dorsal-grooves are unicolor with the rest of body, but those of the upper margin of foot are colored brown (sometimes very pale), the color permanent in alcohol, and the stripes wider at every fourth or fifth, like the grooves. The longitudinal division of the foot beneath is very faintly perceptible.

The young, just hatched, is pale-yellowish, with pellucid whitish spots, and when an inch and a half long is colored like adult, while the shell is perceptible through the thin shield. This can also be seen by looking into the grisacle of the adult when fully expanded.

Eggs are laid from April 1st to June, and vary in size from 0.44 × 0.36 to 0.35 × 0.26 inch. (probably laid by slugs of various ages). They have a shelly but tough envelope, and, after they are laid, the shell is *often entirely wanting* in the animal, having apparently been absorbed to form the egg-shells! This may explain the absence or fragmentary state of the shell in some species referred to *Arion.*

ARIOLIMAX NIGER. Cp. n. s. Pl. 3, fig. E. 1, 2, 3, 4.

Sp. ch. A. forma, testa, et maxilla "*A. Columbiano*" per similio, sed minor, robustior, colore nigro, tentaculis et disco motivo infra pallidioribus, maxilla costulis circa xx, dorso non carinato.

Long. ii. et dim. poll. (65 millimetres.)

In form, shell and jaw, it resembles *A. Columbianus*, but is smaller, back rounder, more robust, black, with tentacles and locomotive disk beneath paler, its jaw with only about 20 riblets. Length $2\frac{1}{2}$ inches.

Dr. Gould mentions a "small specimen uniformly slate color" (probably from alcohol), which indicates that this is also found in Oregon. A very young one from east of S. F. Bay has the shield and back brownish with small irregular black spots, and no carination perceptible as it is in the yellow species, which shows it stronger in the young than the adult. The dorsal grooves agreeing with those of the Oregon form suggested that it was only a southern dwarfed variety of that, which is often mottled with blackish; but Dr. Gould's specimen was also small, and may indeed have been collected in California. Here I find none intermediate between this and the yellow variety. The color and dorsal grooves agreeing with *Limax Hewstoni* also suggested hybridity, but I have never found this in the same localities with that species. We thus have three very distinct species often equally black, but the only common cause I can guess for this similarity is possibly more nocturnal habits than in the others. The comparative rarity of this form may be a consequence of more thorough concealment in the daytime. I found them copulating in December, and the young was found in February probably recently hatched.

ARION? ANDERSONII. Cp. n. s. Pl. 3, fig. F. 1, 2, 3, 4, 5.

Sp. ch. A, "*Arioni foliato*" similis, sed multo minor, spiraculo prope medio clypei forte granulato rugosi, testâ internâ validâ; cauda acuta. Foramen generativum ut in *Ariolimax* et *Limax Hewstoni* situm.

Long. ii. et dim. poll.; lat. dioci motivi plus quam dimidium alt. corporis.

Similar to "*Arion foliolatus*," but much smaller, the spiracle close to middle of shield, which is strongly granulæ-rugose; a strong internal shell; tail acute. Length two and a half inches; breadth of locomotive disk more than half the height of body. Form slender, gradually tapering from the shield backwards to an acute point; shield large, covering one-third of back, distinctly granular, the spiracle not perceptibly anterior to middle, except when the animal is fully extended; upper tentacles little over one-fifth of the length of mantle, which is free in front nearly as far back as the spiracle, and a narrow edge free behind; dorsal furrows about 18, distinctly darker colored; foot slightly projecting at sides, the lateral bands distinctly separated beneath and marked by muscular fibres running obliquely backward and outward on the under surface.

Color. Reddish-gray, the body somewhat clouded with black, the shield paler, clouded, or more usually with a dark band on each side above the spiracle, converging in an elliptic form; a pale dorsal streak. Head uniform pale-brown, tentacles darker. Foot and often the mantle tinged with olive.

Shell large and thick, the nucleus near posterior left corner obtusely rhomboidal, concave beneath. Length about 0.14, breadth 0.06 inch.[1] Jaw arcuate, wider near middle, with 20 to 30 riblets denticulating the lower margin.

Hab. Near south and east sides of San Francisco Bay northward to Santa Cruz. It is confined to well wooded hills or damp river-banks, being less able to bear heat and dryness than our other slugs. I have named it for Dr. C. L. Anderson of the latter place, a zealous naturalist, who has much aided me by collecting this and other species of mollusca.

This species combines the form and spiracle of *Arion* with the shell and jaw of *Ariolimax*, making the generic distinctness of the two forms doubtful, and consequently connecting *Arion* still more closely with *Limax*. The minute caudal mucous gland and acute tail of this species also approach the character of *Limax*, and make the modern separation of these genera into separate families still more unnatural.

The rule adopted by Agassiz of founding family divisions on modifications of the general forms, and *genera* only on those of special organs, will apply well in the case of these animals. But a difficulty arises here in the disagreement of this species in several points from the latest definition of the genus *Arion*, in those characters above indicated as connecting it with *Ariolimax*. Still, as *Arion* is the older genus, it would seem more proper to extend its generic limits to include a more developed shell and jaw than usual, than to make *Ariolimax* include a species as different from the type in form, position of spiracle, and structure of locomotive disk. The form of the caudal termination seems like that of *Arion hortensis*. Orifice of generative organs about half-way between tentacle and shield as in *Limax*, etc.

In colors, this species is so similar to "*A. foliolatus*," Gld., that

[1] The shell represented in the figures is from a larger specimen than the animal figure.

it might be considered identical if not for the important differences indicated in the diagnosis.

Mr. Binney places that species without hesitation in subgenus *Lochea*, which has the shell represented by calcareous granules only, but remarks that he had not examined the jaw or granules, and, as the types are probably still preserved in the Smithsonian Institution, this important omission may yet be attended to.

Dr. Gould says, in Binney's Terr. Moll. ii. p. 31, "That this animal belongs to the genus *Arion* there can be little doubt, from the peculiar structure of the tail, as represented in Mr. Drayton's figure, and from the anterior position of the respiratory orifice." He did not examine any specimens with reference to the shell, but figures the dorsal areolæ as peculiarly granulated and indented, an appearance apparently caused, as in our species, when in alcohol, by minute reticular subdivisions. The figure represents the tail as acute, though Dr. Gould describes it as "somewhat truncated at tips exhibiting a conspicuous pit which was *probably* occupied by a mucous gland." As he was not aware of the existence of this gland in his "*Limax*" *Columbianus*, he may have examined specimens of the latter when partly or wholly destitute of the shell (as described by me), and confounded them with Drayton's figure, as alcoholic specimens do not retain all the specific characters. The great similarity of the figure published as of the *Arion* to that of *L. Columbianus* makes it probable that some such confusion has occurred, the only essential difference being the position of the spiracle.

Mr. Tryon places this species in *Ariolimax*, but on what grounds is not stated. This would be justified by the discovery of the shell and generative orifice in alcoholic specimens, but is rendered doubtful by other considerations above pointed out.

Mr. Drayton's *original* figure probably represented *A. Andersonii*, though Dr. Gould's description does not agree wholly with it.

LISINOE DIABLOENSIS. Cp. n. s. Pl. 3, fig. G. 1, 2, 3, 4.

Helix (indet., near *Traskii*), Cp., Proc. Cal. Acad. Sc. III. 260, 1866; 332, 1867 (as perhaps a hybrid).

H. Diabloensis, Cp., Amer. Journ. Conch. IV. 221, 1868.

Arionta? Diabloensis, Cp., ibid. V. 205, 207, 1870.

Sp. ch. Testa depresso-turbinata, infra paullo concava, anfr. vi et dim. ad vii. umbilico amplo, peristomate albo, expanso, satis incrassato, superne declino; colore ex luteo brunnea, intus purpurascens, zonâ fuscobrunneâ supra peripheriam, luteo, infra marginatâ, aufr. tribus visâ, regio inferior pallidior; epidermide nitente, tenuissime malleata rugosa, lineæ incrementi sulcis tenuibus sæpe obliqué insculptis; rugæ obscuræ circum umbilicum volventes. Testa junior non subangulata.

Diam. maj. 0.75 ad 0.95; min. 0.65 ad 0.80; alt. 0.40 ad 0.55; axis spiræ 0.30 ad 0.45 cent. poll.

Animal pallide griseo-purpurascens, corpore semicylindrico, bis lat. testæ æquans longitudine, tota superficies tuberculis parvis ellipticis induta; tentaculæ oculiferæ tertiam partum long. corporis æquantes; pes postice brevis, cuneatus, alt. corporis latior, margine crenato-incisâ. Per testâ visïente, partes molles nigræ perspicuæ sunt.

Hab. Montibus "Diablo" Californiæ prope San Francisco, altitudine circum 2500 ped. supra mare, inter sylvis quercinis et cupressinis, et prope "San Luis Obispo."

Shell depressed-turbinate, below a little concave, whorls $6\frac{1}{2}$ to 7, umbilicus large, peristome white, expanded, somewhat thickened, above descending; color yellowish-brown, paler beneath, with a dark-brown zone above the periphery, margined below by yellowish, visible on three whorls; epidermis shining, finely rugose-malleate, lines of growth often obliquely cut by delicate grooves, obscure revolving ridges around umbilical region. Young shell not subangled.

Animal pale purplish-gray, semicylindrical, its length twice the breadth of shell, its whole surface covered with small elliptic tubercles; eye-bearing tentacles one-third the length of body; foot short behind, wedge-shaped, broader than height of body, its margin crenately incised. Intestines seen through upper whorls.

Hab. "Cedar Mountain," 25 miles southeast of Mount Diablo, California, among oaks and cypresses, thence south to San Luis Obispo, 200 miles.

The first specimen obtained by Prof. Brewer, "east of Mount Diablo," was too imperfect for me to decide on its characteristics, and the sculpture, somewhat resembling that of the *Arionta* group, led me to refer it doubtfully to that, while the form and color suggested hybridity between *A. ramentosa* and the nearest of the *Lysinoë* groups, either *L. mormonum* or *Traskii*, neither of which were known, however, to exist within 90 miles of *ramentosa.* Fresh specimens, lately discovered by the industrious Dr. Yates, among the cypresses of Cedar Mountain, though much smaller, indicate its near alliance with *L. Traskii*, differing as much, however, as several others of the allied species.

Specimens said to come from San Luis Obispo appear to be the same, and are the ones referred to by me in the Cal. Acad. Proc. III. 332, as combining characters of *ramentosa* and *Dupetithouarsi*. I am, however, becoming more and more of the opinion that natural hybrids are so very scarce that shells presenting intermediate characters are to be considered rather *varieties* in which local proximity and exposure to the same influences produce changes simulating those of neighboring geographical groups, as before remarked, concerning some of our most northern and southern forms. Thus we have in this the nearest approach to the sculpture of the *Ariontas* to be found in our *Lysinoes*, as it exists on a belt next adjoining the centre of development of the sculptured group. *L. Dupetithouarsi* often shows a little of the same sculpture.

This form probably occupies the whole of the gap of 160 miles south of Mount Diablo, mentioned previously by me as destitute of any known species, but at an elevation seldom visited by collectors, though the young specimens, also found by Dr. Yates, "at the crossing of the Salinas River above Soledad," indicate that it, like others, may follow down the river banks into the valleys. These have a smaller umbilicus and flatter apex. About two hundred miles southward, the Mount Diablo range combines with the coast range near San Luis Obispo, the Salinas Valley lying between them.

Genus ASSIMINEA, Leach.

Although not a pulmonate mollusc, the species to be described forms a link between these and the branchiate shells, in its power of existing for several days, and even of crawling actively about in a slightly damp bottle, showing nearly as much vitality out of water as the *Alexia* with which it lives, while it cannot exist in fresh water. It is probable that, like *Ampullaria*, etc., it possesses a reservoir for moistening its gills, or a sort of imperfect lung. Its subterminal tentacular eyes are also similar to those of the *Pupillæ*, with only one pair of tentacles.

It will be lucky if some hair-splitting microscopist, ambitious of affixing his name to the species of others, does not find a slight difference in the lingual asperities on which to found a "new genus," although the genus is now admitted to extend from England to India.

ASSIMINEA CALIFORNICA. n. s.? Pl. 3, Fig. II. 1, 2, 3.

? *Hydrobia Californica*, Tryon, Amer. Journ. of Conch. I. 221, pl. 22, f. 11.

Sp. ch. A. testâ parvâ, imperforatâ, nitente, sutura bene impressa anfr. vi. convexis, cito crescentibus, ult. tumido; peristomate acuto, non continuo, callo tenui parietali; colore corneo, ex nigro-brunnescente, operculo pertenui, translucente, aufr. ii. et dim.

Long. 0.14, lat. 0.07, long. spiræ 0.025, aperturæ 0.06, div. 50°.

Animal albescens, tentaculis et caput antice nigro tincto, regio inter tentaculis rufus. Longitudo bis major quam long. testæ.

Habitat. In ripas aquarum salinarum extrinsii San Francisco, Californiæ, inter lapidas, *Salicornia*, etc.

Shell very small, imperforate, shining, whorls 6, rapidly increasing, rather convex, suture well impressed, body-whorl swollen, peristome not continuous, acute, with a slight parietal callus. Color dark horn-brown. Operculum very thin, colorless, its whorls $2\frac{1}{2}$. *Animal* whitish, tentacles and muzzle tinged with black, a rufous patch on top of head. When extended it is about twice as long as shell, the foot ovate.

Inhabits brackish creeks near mouth of San Francisco Bay, and found in great numbers within the city limits under small stones with *Alexia*. The animal crawls actively by a jerking motion, alternately projecting the foot in front of the muzzle and then drawing the shell forward, so as to show the two positions represented in the plate.

The shell closely resembles *Hydrobia Californica*, which is found in similar places at Oakland and Martinez, but, it being rather scarce there, I have not been able to obtain living specimens yet for comparison. Mr. Tryon's description and the dimensions given agree exactly, but Oakland specimens of the shell are thicker, the whorls a little shouldered, and the umbilical region pitted, perhaps from stronger growth. Mr. Tryon's figure, however, does not agree with the dimensions.

It differs from *A.? subrotundata*, Carpenter, of the Str. of Fuca, in all its dimensions and in size. (See Ann. and Mag. Nat. Hist., 1865, p. 28.) Several of our *fresh-water Hydrobrinæ* have been confounded with *H. Californica*.

I believe this is the first of the genus *determined* to inhabit the

United States, as Carpenter's was without the animal, and the genus is only mentioned in one Atlantic coast list, as probably found on Long Island, N. Y., by Sanderson Smith, in the Annals N. Y. Lyc. Nat. Hist. 1870, though it is suspected that some of the New England "*Rissoids*" are congeneric.[1]

I have used the specific name *Californica* as not likely to lead to any confusion, even if Mr. Tryon's species proves to be a true *Hydrobid*, and thus of another family.

EXPLANATION OF THE PLATE.

A. *Alexia setifer.* 1, 2. The animals crawling, with shells of different forms and color. 3. Most usual form of the shell, showing the stripes often observed. 4. Var. *tenuis*, an extreme form. 5. Young, without upper tooth, a form of the shell occasionally found in the adult. 6. Young of very thin variety, showing revolving line of setæ.

B. *Limax Hewstoni.* Natural size. 2. Caudal extremity. 3. Shell. 4. Jaw magnified. 5. Shield from above showing groove, and generative organ anterior to it.

C. *Limax campestris*, var. 2, 3, 4, as in B.

D. *Ariolimax* var. *Californicus.* Natural size of parts. 1. Lateral view of furrows behind shield. 2. Caudal extremity, showing furrows, mucous pore and color of foot. 3. Anterior parts from alcohol, showing generative organs.

E. *Ariolimax niger.* Natural size. 2, 3, 4, as in B.

F. *Arion Andersonii.* Natural size. 2, 3, 4, as in B. 5. Lower surface of locomotive disk, from life.

G. *Lysinoe Diabloensis.* 2. Style of sculpture above. 3. Shell from beneath. 4. Front view of shell. 5. Lower surface of locomotive disk, showing crenations.

H. *Assiminea Californica*, magnified. 2, 3, as in A.

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[1] Mr. Smith's name "Cœcum Cooperi," being pre-occupied for a different Californian species, I may here return the compliment he offers to the memory of my father by naming it CŒCUM SMITHII, Cooper.

DESCRIPTIONS OF TWENTY-NINE SPECIES OF UNIONIDÆ FROM THE UNITED STATES.

BY ISAAC LEA.

Unio Tellicoensis.

Testa lævi, subtrangulari, subinflata, inæquilaterali, postice obtuse angulari, antice rotunda; valvulis crassiusculis, antice parum crassioribus; natibus subprominentibus; epidermide crocata, polita; parum radiata; dentibus cardinalibus parvis, crenulatis, conicis; lateralibus curtis, subcrassis subrectisque; margarita salmonis colore tincta et valde iridescente.

Hab. Tellico River, Monroe Co., E. Tenn. Miss A. E. Law.

Unio Conasaugaensis.

Testa lævi, suboblonga, subinflata, inæquilaterali, postice subbiangulari, antice rotundata; valvulis percrassis, antice crassioribus; natibus subprominentibus; epidermide rufo-fusca, eradiata; dentibus cardinalibus parviusculis, subcompressis crenulatisque; lateralibus curtis, crassis, obliquis rectisque; margarita alba et aliquanto iridescente.

Hab. Conasauga Creek, Monroe Co., E. Tenn. Miss A. E. Law.

Unio lenticularis.

Testa lævi, subrotunda, compressa, lenticulari; subæquilaterali, postice obtuse biangulari, antice rotunda; valvulis subtenuibus, antice crassioribus; natibus prominulis; epidermide vel tenebroso-fusca vel luteo-fusca, obsolete radiata; dentibus cardinalibus parvis, compressis crenulatisque; lateralibus sublongis, lamellatis, corrugatis subcurvatisque; margarita albida et iridescente.

Hab. Tellico River, Monroe Co., E. Tenn. Miss A. E. Law.

Unio Andersonensis.

Testa lævi, triangulari, inflata, ad latere planulata, valde inæquilaterali, postice obtuse angulata, antice oblique rotundata; valvulis percrassis, antice crassioribus; natibus valde elevatis, tumidis recurvatisque; epidermide vel luteola vel fusca, obsolete radiata; dentibus cardinalibus crassis, crenulatis, conicis; lateralibus crassis, curtis subcurvisque; margarita argentea et iridescente.

Hab. Holston River and Clinch River, Anderson Co., E. Tenn. Miss A. E. Law.

Unio flavidus.

Testa lævi, triangulari, subinflata, ad latere planulata, inæquilaterali, postice obtuse angulata, antice rotundata; valvulis subcrassis, antice crassioribus; natibus prominentibus, recurvatis, ad apices minute undulatis; epidermide flavida, radiis interruptis; dentibus cardinalibus parvis corrugatisque; lateralibus curtis, subcrassis subcurvisque; margarita argentea et iridescente.

Hab. Clinch River, Anderson Co., E. Tenn. Miss A. E. Law.

Unio pauciplicatus.

Testa plicata, subrotunda, ventricosa, valde inæquilaterali, postice carinata, antice rotundata; valvulis crassis, antice crassioribus; natibus prominentibus, tumidis, recurvatis, ad apices minute undulatis; epidermide rufo-fusca, eradiata; dentibus cardinalibus crassis, elevatis, sulcatis crenulatisque; lateralibus longis, lamellatis, corrugatis curvisque; margarita argentea et valde iridescente.

Hab. Austin, Texas. Prof. C. G. Forshey, Civil Engineer.

Unio vesicularis.

Testa lævi, elliptica, inflata, valde inæquilaterali, postice et antice rotundata, valvulis crassiusculis, antice crassioribus; natibus prominulis; epidermide tenebroso oliva, obsolete radiata; dentibus cardinalibus parvis, sulcatis, in utroque valvulo duplicibus; lateralibus sublongis, lamellatis subrectisque; margarita albida et valde iridescente.

Hab. Lake Ocheechobee, Florida. Dr. Budd and C. M. Wheatley.

Unio conspicuus.

Testa lævi, elliptica, subinflata, inæquilaterali, postice obtuse angulata, antice rotundata; valvulis crassis, antice crassioribus; natibus prominulis, ad apices undulatis; epidermide rufo-fusca, perradiata; dentibus cardinalibus parviusculis, crenulatis, compresso-conicis, in utroque valvulo duplicibus; lateralibus prælongis, lamellatis, parum curvatis; margarita conspicua, persalmonia et formoso-iridicente.

Hab. Yadkin River, near Salisburg, N. C. C. M. Wheatley.

Unio Yadkinensis.

Testa lævi, oblonga, compressa, valde inæquilaterali, postice subbiangulata, antice rotundata; valvulis crassis; natibus prominulis; epidermide tenebroso-fusca, eradiata; dentibus cardinalibus parviusculis, compressis, corrugatis, in utroque valvulo duplicibus; lateralibus longis, lamellatis, corrugatis subcurvisque; margarita vel salmonea vel purpurea et valde iridescente.

Hab. Yadkin River, near Salisbury, N. C. C. M. Wheatley.

Unio brevis

Testa lævi, subtriangulari, subcompressa, ad latere subplanulata, inæquilaterali, postice obtuse biangulata, antice rotundata; valvulis crassiusculis, antice crassioribus; natibus prominulis; epidermide flavida, eradiata; dentibus cardinalibus parviusculis, subcompressis, in utroque valvulo duplicibus; lateralibus lamellatis, parviusculis obliquisque; margarita vel alba vel salmonis colore tincta et valde iridescente.

Hab. Conasauga Creek, Monroe Co., E. Tenn. Miss A. E. Law.

Unio amplus.

Testa lævi, oblonga, fere alata, inflata, inæquilaterali, postice obtuse biangulata, antice rotundata; valvulis crassis, antice crassioribus; natibus subprominentibus; epidermide rufo-fusca, nitida, obsolete radiata, transverse vittata; dentibus cardinalibus parviusculis, rugosis, compressis; lateralibus prælongis, lamellatis sublongisque; margarita vel alba vel purpurea vel salmonis colore tincta et valde iridescente.

Hab. Irwin's Creek, Micklenberg Co., N. C. C. M. Wheatley.

Unio ligatus.

Testa lævi, ovato-oblonga, subcompressa, inæquilaterali, postice obscure biangulari, antice rotundata; valvulis subcrassis; natibus prominulis; epidermide tenebroso-fusca, polita, obsolete radiata. transverse vittata; dentibus cardinalibus parviusculis, corrugatis et in utroque valvulo duplicibus; lateralibus longis, lamellatis, corrugatis subcurvisque; margarita vel alba vel salmonis colore tincta et valde iridescente.

Hab. Irwin's Creek, Mecklenberg Co.; and Long Creek, Gaston Co., N. C. C. M. Wheatley.

Unio attenuatus.

Testa lævi, lata, attenuata, ad latere subcompressa, valde inæquilaterali, postice subbiangulari, antice oblique rotundata; valvulis crassiusculis, antice parum crassioribus; natibus prominulis, fere terminalibus; epidermide tenebroso-fusca, aliquando nigra, radiata; dentibus cardinalibus parvis, compressis, crenulatis, obliquis, in utroque valvulo duplicibus; lateralibus prælongis, lamellatis subrectisque; margarita alba et valde iridescente.

Hab. Savannah River, Geo., Dr. Barratt; and Beaver Creek, Houston Co., Georgia, Dr. J. Lewis.

Unio differtus.

Testa lævi, elliptica, ventricosa, subæquilaterali, postice obtuse biangulari fere rotunda, antice rotundata; valvulis crassis, antice crassioribus; natibus vix prominulis; epidermide subpolita, luteola et obsolete radiata; dentibus cardinalibus parviusculis, corrugatis, compressis et in utroque valvulo duplicibus; lateralibus longis, lamellatis subrectisque; margarita vel albida vel salmonis colore tincta et valde iridescente.

Hab. Georgia? Major J. LeConte.

Unio strumosus.

Testa lævi, rotundata, inflata inæquilaterali, postice obtuse angulata, antice rotundata; valvulis crassis; natibus prominulis; epidermide tenebroso-fusca vel nigra, eradiata; dentibus cardinalibus subgrandibus, rugosis, in utroque valvulo duplicibus; lateralibus, longis, rugosis et curvatis; margarita alba et iridescente.

Hab. Yadkin River, N. C. C. M. Wheatley.

Unio subparallelus.

Testa lævi, oblonga, subcompressa, ad latere planulata, inæquilaterali, postice subangulari, antice rotundata; valvulis crassiusculis, antice parum crassioribus; natibus prominulis, ad apices concentrico-rugoso-undulatis; epidermide tenebroso-fusca, nitida, radiata; dentibus cardinalibus parviusculis, conicis, rugosis, in utroque valvulo duplicibus; lateralibus prælongis, lamellatis subcurvisque; margarita salmonis colore tincta.

Hab. Irwin's Creek and Fox River, N. C. C. M. Wheatley.

Unio oblongus.

Testa lævi, oblonga, compressa, ad latere planulata; valde inæquilaterali; valvulis parum crassioribus; natibus prominulis; epidermide luteola, micanti, radiata vel eradiata; dentibus cardinalibus parvis, lobatis, corrugatis, in utroque valvulo duplicibus; lateralibus prælongis subrectisque; margarita alba vel purpurascenti vel salmonis colore tincta et iridescente.

Hab. Irwin's Creek, N. C. C. M. Wheatley.

Unio Irwinensis.

Testa lævi, suboblonga, parum compressa, ad latere parum planulata, valde inæquilaterali, postice obtuse biangulata, antice rotundata; valvulis subcrassis, antice crassioribus; natibus prominulis, ad apices undulatis; epidermide olivacea vel fusca, obsolete radiata; dentibus cardinalibus subgrandibus, parum compressis, sulcosis, in utroque valvulo duplicibus; lateralibus longis, sublamellatus subcurvisque; margarita alba vel purpurea vel salmonis colore tincta et valde iridescente.

Hab. Irwin's Creek, N. C. C. M. Wheatley.

Unio curvatus.

Testa lævi, late oblonga, subinflata, ad latere planulata, valde inæquilaterali, postice angulata, antice rotundata; valvulis parum crassis, antice crassioribus; natibus prominulis; epidermide tenebroso-fusca, aliquanto polita, eradiata; dentibus cardinalibus parvis, sulcatis, compressis, in utroque valvulo duplicibus; lateralibus longis, lamellatis subrectisque; margarita pallido-salmonia vel purpurascente et valde irridescente.

Hab. Pfeiffer's Pond, Mecklenberg Co., N. C. C. M. Wheatley.

Unio insolidus.

Testa lævi, oblonga, parum compressa, ad latere parum planulata, inæquilaterali, postice biangulata, antice rotundata; valvulis subtenuibus, antice parum crassioribus; natibus subprominentibus, ad apices undulatis; epidermide pallido-viridi, obsolete radiata; dentibus cardinalibus parvis, compressis; lateralibus longis, lamellatis rectisque; margarita alba et iridescente.

Hab. Abbeville Dist., N. C. Dr. Barratt; and Irwin's Creek, N. C. C. M. Wheatley.

Unio cuspidatus.

Testa lævi, lata, subinflata, ad latere parum curvata, valde inæquilaterali, postice cuspidata, subbiangulari, antice rotundata; valvulis crassiusculis; natibus prominulis, fere terminalibus, epidermide tenebroso-olivacea, eradiata, transverse vittata; dentibus cardinalibus parvis, subcompressis, corrugatis, in utroque valvulo duplicibus; lateralibus longis, lamellatis subcurvisque; margarita alba et valde iridescente.

Hab. Buckhead Creek, Burke Co., Geo. Bishop Elliott.

Unio exacutus.

Testa lævi, prælata, subcompressa, ad latere planulata, valde inæquilaterali, postice exacuta, subbiangulari, antice oblique rotundata; valvulis crassiusculis; natibus prominulis, fere terminalibus, ad apices minute undulatis; epidermide tenebroso-fusca perradiata; dentibus cardinalibus parvis sulcatisque; lateralibus longis, rectis lamellatisque; margarita vel alba vel purpurea et valde iridescente.

Hab. Savannah River at Governor Hamilton's, Geo. Dr. Barratt.

Unio subsquamosus.

Testa lævi, oblongo-elliptica, compressa, ad latere planulata, valde inæquilaterali, postice obtuse biangulari, antice oblique rotundata; valvulis crassiusculis; natibus parvis, prominulis, ad apices rugoso-undulatis; epidermide tenebroso-fusca, subsquamosa, eradiata; dentibus cardinalibus parvis, sulcatis, in utroque valvulo duplicibus; lateralibus prælongis, lamellatis subrectisque; margarita alba et valde iridescente.

Hab. Yadkin River, N. C. C. M. Wheatley.

Unio rostellum.

Testa lævi, lata, compressa, ad latere planulata, valde inæquilaterali, postice obtuse biangulari, antice rotunda; valvulis tenuibus; natibus parvis; epidermide tenebroso-fusca, obsolete radiata; dentibus cardinalibus compressis, crenulatis, in utroque valvulo duplicibus; lateralibus prælongis, lamellatis rectisque; margarita vel albida vel purpurea et valde iridescente.

Hab. Macon, Georgia. I. C. Plant.

Unio infuscus.

Testa lævi, elliptica, subinflata, inæquilaterali, postice obtuse biangulari, antice rotundata; valvulis crassis, antice crassioribus; natibus prominulis, ad apices parum undulatis; epidermide tenebroso-fusca, submicanti, obsolete radiata; dentibus cardinalibus subcrassis, compressis corrugatisque; lateralibus longis, lamellatis, rugosis subcurvisque; margarita vel salmonia vel purpurascente et valde iridescente.

Hab. Fox River and Irwin's Creek, N. C. C. M. Wheatley.

Unio ratus.

Testa lævi, quadrata, subcompressa, ad latere subplanulata, valde inæquilaterali, postice obtuse angulata, antice rotunda; valvulis subcrassis, antice crassioribus; natibus prominulis; epidermide tenebroso-olivacea, eradiata; dentibus cardinalibus parvis, subconicis, sulcosis, in utroque valvulo duplicibus; lateralibus sublongis, lamellatis subcurvisque; margarita purpurescente et valde iridescente.

Hab. Neuse River, N. C. Prof. E. Emmons.

Unio dissimilis.

Testa lævi, sublata, compressa, ad latere planulata, valde inæquilaterali, postice obtuse angulari, antice rotunda; valvulis subtenuibus; natibus prominulis; epidermide tenebroso-fusca, micanti, eradiata; dentibus cardinalibus parviusculis, subcompressis, sulcosis, in utroque valvulo duplicibus; lateralibus prælongis, lamellatis subrectisque; margarita alba et valde iridescente.

Hab. Long Creek, Gaston Co., and Pfeiffer's Pond, Mecklenberg Co., N. C. C. M. Wheatley.

Unio bellulus.

Testa lævi, oblique, tumida, ad latere parum planulata, valde inæquilaterali, postice obtuse angulari, antice oblique rotundata; valvulis percrassis, antice crassioribus natibus pyramidatis, fere terminalibus; epidermide luteola, valde radiata; dentibus cardinalibus subcrassis, rugosis; lateralibus curtis, crassis rugosisque; margarita argentea et valde iridescente.

Hab. Holston River. Dr. Edgar. Tenn. River. Rev. G. White. Mussel Shoals, Tenn. River, Alabama. C. M. Wheatley.

Unio basalis.

Testa lævi, oblonga, subinflata, ad latere subplanulata, inæquilaterali, postice obtuse biangulari, antice rotundata, ad basim recta; valvulis crassiusculis; natibus prominulis; epidermide luteola, radiata; dentibus cardinalibus parviusculis, subcompressis, sulcatis; lateralibus sublongis, lamellatis subcurvisque; margarita vel albida vel purpurascente et iridescente.

Hab. Carter's Creek, near Columbus, Georgia. G. Hallenbeck.

JULY 2.

The President, Dr. RUSCHENBERGER, in the chair.

Sixteen members present.

On a new Genus of Extinct Turtles.—Prof. LEIDY stated that in a more careful study of the fossil turtles of Wyoming, he had determined that the one he had named *Bæna undata* belonged to a different genus. Besides other well marked distinctive characters, like the genus *Platemys*, it possessed an additional pair of plates to the usual number found in the sternum of the emydoids. These plates are intercalated between the hyo- and hyposternals. In *Platemys Bullockii* they are quadrate. In the new genus they are triangular, and the sutures defining them cross the plastron like a prostrated letter X, from which character it was proposed to name the genus CHISTERNON.

On some remains of Cretaceous Fishes.—Prof. LEIDY called attention to some teeth of fishes from the cretaceous formation, which he described as follows:—

OTODUS DIVARICATUS.

The species is indicated by an entire tooth of peculiar character, submitted to my examination by Dr. William Spillman, of Columbus, Mississippi. It was sent to him from Texas, but its exact locality is unknown. It was probably derived from a cretaceous formation. Of known species it resembles most the *Otodus semiplicatus*, Münster, of the chalk of Europe, and has likewise considerable likeness to a tooth from the chalk of France, represented in fig. ii. pl. 76, of Gervais' Paleontologie Francaise.

The crown forms an elongated demicone with the apex slightly bent forward. The enamel at the base is plicated in front and behind. The lateral denticles are conical and divergent outward and anteriorly. The root is thick, strong and notched, and rises posteriorly above the middle of the length of the tooth. Length of crown in front 13 lines; base of same external to denticles of the same width. Breadth of root $15\frac{1}{2}$ lines; thickness 6 lines.

OXYRHINA EXTENTA.

A species founded on a number of teeth obtained from the cretaceous formation of Kansas, by Dr. George M. Sternberg, U. S. A., and from near Columbus, Mississippi, by Dr. William Spillman.

The teeth resemble most those of *Oxyrhina Mantelli* of the English chalk, and differ mainly in the proportionately greater lateral extension of the base of the crown.

Measurements of two Mississippi specimens are as follows:—

Length of crown internally	11 lines.	8 lines.
Breadth " "	16½ "	13 "
Length of tooth at middle	14 "	10 "
Breadth of root "	18 "	14 "

Measurement of two Kansas specimens are as follows:—

Length of crown internally	8 lines.	6 lines.
Breadth " "	15½ "	12 "
Length of tooth at middle	12 "	8 "
Breadth of root "	17 "	13 "

ACRODUS HUMILIS.

Founded on a tooth adherent to a portion of limestone from the New Jersey cretaceous formation. It resembles most nearly the *Acrodus rugosus*, Ag., of the chalk of Maestricht, and the *A. polydictyos*, Reuss, of the Bohemian chalk. The tooth is 8 lines wide, 2¾ lines fore and aft. The anterior and posterior borders are not quite straight; and the extremities are angular. The upper surface is moderately convex. A nearly obsolete ridge crosses the tooth transversely, and from this ridge minute folds are directed forward and backward to end in a reticulation.

This is I believe the first time the genus Acrodus has been noticed in the American cretaceous formation. Prof. Emmons represents the tooth of a species in his report of the North Carolina Geological Survey, p. 244, fig. 97, which he attributes to the miocene. If really an Acrodus tooth, it would be the latest species yet discovered. It might be named ACRODUS EMMONSI in honor of its discoverer.

PYCNODUS FABA.

This species is named from a specimen from the cretaceous formation of Mississippi, discovered by Dr. William Spillman. The fossil consists of a jaw fragment with four large teeth obliquely parallel with each other. They are elongated elliptical, and smooth; and they measure three-fourths of an inch wide, and one-fourth of an inch in the short diameter. On both sides the larger teeth, there are two rows of small teeth.

Mr. NORRIS spoke at some length on his effort now in progress to stock the Delaware with the true salmon (*Salmo salar*). Having procured 12,000 ova from Mr. Wilmot, New Castle, Canada, he placed then on gravel in wooden troughs of running spring water near the town of Easton, Pa. These eggs was taken in November, 1871, by manipulation of the parent fish and fecundated in the usual way, and placed in water almost down to the freezing point. The young fish were, however, plainly visible in the egg when received on the first of April, and struggling to break the shell.

On being placed in water at 52° the ova immediately commenced hatching, and in a week the fry were all out. In seven weeks the yolk sac was absorbed, and they commenced feeding off small particles of curdled milk fed to them daily for a week longer. They were then transported in large tin vessels to the Buskill, which runs through the outskirts of Easton, where a third of them were liberated at the mouth of a cold spring branch, and the remaining two-thirds placed in a small natural pond fed by a copious spring in a meadow above and discharging by a narrow outlet into the creek. Either here or at the mouth of the spring branch mentioned the fry will get such natural food as their instinct will lead them to seek, and thrive far better than if kept in artificial ponds and fed on prepared food.

The law of the salmon, as with the shad and other anadromous fishes, is that it will inevitably seek its native stream in its return from sea impelled by the instinct of reproduction, and although the Delaware is south of the limit of the geographical range of the salmon, it is on the law of nature that reliance is placed for its return to this river. It has been ascertained beyond doubt that one-half of a brood of salmon go to sea when a little over a year old, and the remaining half the following summer. The males of salmon as with shad are fecund a year earlier than the females, and it is not improbable therefore that those that migrate when a year old are males, and those that go to sea the next year are females. Mr. Norris thought the Delaware, on account of its being unobstructed by impassable dams and having a bold current, was a favorable river for trying to acclimatize salmon south of their present habitat. He is sanguine of success, and, even if the solution of this problem should not be favorable, he considers it important that the question should be definitely settled.

Mr. Norris also made some remarks on the effect of food on the external appearance of trout (*S. fontinalis*), as well as on the quality of their flesh—that, when fed in crowded artificial ponds on prepared food, the vermilion spots disappear, and the flesh deteriorates, but that the spots are restored, as well as the flavor of the fish, when placed in large ponds where they can find natural food. He also spoke of the malformation of young trout and salmon on being hatched, the body being curved around the yolk-sac, causing their death in a few weeks.

July 9.

The President, Dr. Ruschenberger, in the chair.

Thirteen members present.

On Artemia from Salt Lake, Utah.—Prof. Leidy directed attention to a bottle containing numerous specimens of a minute crustacean from Salt Lake, Utah, caught on the 22d of June by Mr. C. Carrington, a member of Prof. Hayden's exploring party now in the field. They were received from Prof. Hayden with the remark "that Salt Lake has been supposed, like the Dead Sea, to be devoid of life, but its saltest water contains the most of these little creatures."

The crustacean is the *Artemia salina* which has long been known in Europe, and has been previously found in other localities of this country. The animal has always been viewed with especial interest, in its order, from the fact that it lives and thrives best in a concentrated solution of salt, which would destroy most marine animals. It has not, I believe, been noticed in the ocean, but is found in salt lakes, and salt vats, in which by evaporation the brine has become more concentrated than sea water.

Artemia is furnished with eleven pairs of limbs, which serve both for progression and respiration. The limbs are four jointed, and the joints have leaf-like expansions fringed with long feather-like bristles. The narrow abdomen or tail-like prolongation of the body is six-jointed, and traversed by the intestine. The last joint ends in a pair of processes furnished each with a bunch of bristles like those of the limbs. The head exhibits a median, quadrate, black eye-spot, and in addition is provided with a pair of pedunculate, globular compound eyes. A short narrow pair of inarticulate antennæ project in advance of the eyes.

The head of the male is furnished with a pair of singular organs for seizing the female. These claspers are large double-jointed hooks. In the female they are replaced by a pair of comparatively small horn-like processes. The first abdominal segment bears the ovarian sac in the female; and two cylindroid appendages in the male.

The female of the Salt Lake Artemia ranges from 4 to 7 lines in length; the male from 3 to 4 lines in length. The color is translucent-white and ochreous-yellow, with three black eye-spots, and a longitudinal line varying in hue with the contents of the intestine. The ovarian sac appears orange-colored from the eggs within.

The antennæ end in three or four minute setæ, and are considerably longer in the male than the female. The first joint of the claspers is provided on its inner side just below the middle with a spheroidal knob. The last joint forms a rectangular hook, the angle having an elbow-like prominence. When the clasper is thrown forward, the outer border of the hook is convex; the anterior border straight, slightly, or deeply concave, and the inner or posterior border is sigmoid. The antennæ are longer than in the female, and longer than the first joint of the claspers; and in the female are longer than their homologues. The ovarian sac is inverted flask-shaped, and has a pair of lateral conical or mammillary, finely tuberculated processes. The caudal setæ are longer than in the male, and are eight to each process.

This description is taken from alcoholic specimens. They exhibit considerable variation in size, and to some extent in detail.

Prof. Verrill has described what he views as two species of Artemia distinct from the well-known *A. salina*. One he names *A. gracilis* from near New Haven, Conn.; the other *A. Monico* from Lake Mono, Cal. That from Salt Lake differs from either of them as much as they do from *A. salina*, and with the same propriety may be regarded as a distinct species. I am disposed to view them all as varieties merely of *A. salina*.

Measurements of two specimens of the Salt Lake Artemia are as follows:—

	Females.	Males.
Total length	7 lines.	4 lines.
Length of body	4 "	$2\frac{1}{2}$ " .
Breadth of body with limbs . .	3 "	$1\frac{3}{4}$ "
Breadth of head at eyes . . .	$1\frac{1}{4}$ mm.	$1\frac{1}{8}$ mm.
Breadth of thorax where widest .	$\frac{4}{5}$ "	$\frac{2}{5}$ "
Length of first joint of abdomen .	$\frac{4}{5}$ "	$\frac{2}{5}$ "
Breadth " " " . .	$\frac{3}{5}$ "	$\frac{2}{5}$ "
Length of sixth " " . .	$\frac{4}{5}$ "	$\frac{1}{2}$ "
Breadth " " " . .	$\frac{1}{5}$ "	$\frac{1}{4}$ "
Length of caudle setæ . . .	$\frac{2}{3}$ "	$\frac{2}{5}$ "
Length of antennæ	$\frac{1}{2}$ "	$\frac{4}{5}$ "
Length of claspers of male . .		$1\frac{1}{2}$ "
Breadth " " . . .		$1\frac{1}{4}$ "
Breadth of ovarian sac . . .	$1\frac{1}{2}$ "	
Diameter of eggs	$\frac{1}{6}$	

Remarks on Fossil Shark Teeth.—Prof. LEIDY stated that from time to time he had observed specimens of teeth from various cretaceous formations which were identical in character with those of *Lamna elegans* and *L. cuspidata* of tertiary deposits except that they were devoid of the lateral denticles. He had now in his possession well-preserved specimens of such teeth, unabraded, but exhibiting no trace of the existence of lateral denticles. There were teeth of the *L. elegans* variety found with the skeleton of *Hadrosaurus Foulkii* in New Jersey, and others from the cretaceous of Mississippi and Kansas. There were also teeth of the *L. cuspidata* variety from the cretaceous of Kansas, and one in a block of chalk from Sussex, England. The absence of the lateral denticles in all the cretaceous specimens he thought could hardly be accidental, and suspected that these teeth represented the *oxyrhina* ancestors, of the tertiary *Lamna elegans* and *L. cuspidata*, who lived during the cretaceous era.

July 16.

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

Eight members present.

The following paper was presented for publication:—

"Descriptions of a new recent species of *Glycimeris* from Beaufort, N. C., and of Miocene Shells of North Carolina." By T. A. Conrad.

July 30.

Mr. B. A. Hoopes in the chair.

Six members present.

On leave being granted, Mr. Tryon read the following communication received by him from Dr. Jos. Leidy.

ON SOME NEW SPECIES OF FOSSIL MAMMALIA FROM WYOMING.

Fort Bridger, Uinta Co., Wyoming,
July 24th, 1872.

I arrived at this place on the 15th inst. The country is the most remarkable that I have ever seen. It is an immense basin, the bed of an ancient lake, bounded on the south by the Uinta Mountains, and extending far north to the Wind River Mountains. The deposits of the lake, of the tertiary period, are estimated to be about 8000 feet in thickness. They present the appearance of a succession of terraces or table-lands extending southerly from Green River to the base of the Uintas. The country for the most part is treeless, and, except along the watercourses, nearly a desert. The tertiary deposits consist of strata so little inclined that they appear to be horizontal to the eye. The strata are composed mainly of clays, soft and crumbling or more or less indurated, often mixed with sand. Friable sandstones and indurated marls, often with abundance of fresh-water shells, also frequently occur. The lands are often isolated by broad plains or narrower valleys. These isolated lands are named buttes, and resemble great earthworks or huge railway embankments. Frequently their eroded sides give them the appearance of a vast assemblage of Egyptian pyramids flanking the plains above. Such assemblages of earthworks, pyramids, mounds, piles of truncated cones, &c., rising from a plain, constitute what are named, in various parts of our great West, "bad lands" or "mauvaises terres."

As the buttes crumble away under the effect of the weather, the fossils of their strata become exposed to view.

On the 17th, in company with Dr. J. Van A. Carter and Dr. Joseph K. Corson, U.S.A., I made a trip to the valley of Dry Creek, forty miles from Fort Bridger. Here we encamped and spent three days in exploring the neighboring buttes for fossils. In ascending the buttes bounding the valley I was astonished at the appearance of the country extending from the horizon in the north to the snowy-peaked Uintas on the south. An utter desert, a vast succession of treeless plains and buttes, with scarcely any vegetation and no signs of animal life. Everything parched, abundance of river courses without water, the stones at my feet baked in the soil. An overwhelming silence reigned undisturbed even by the hum of an insect. Truly, I said, this is the wreck of another world which was once luxuriant with vegetation and teemed with animals.

We were successful in finding many interesting fossils. The most abundant vertebrate remains are those of turtles, the shells of which are frequently met with in little heaps of fragments into which they have been reduced after exposure from the wearing of the buttes. Of mammalian remains the most abundant are those of the tapir-like animal I named *Palæosyops paludosus*. We also found a number of more characteristic specimens than I had before seen of the larger species of *Palæosyops major*. Dr. Corson further discovered the remains of a small species which may be named Palæosyops humilis. An upper molar tooth of this animal measures three-fourths of an inch in diameter. We have likewise found some additional remains of *Hyrachyus agrarius*, and better specimens than I before had of the larger *Hyrachyus eximius*. A well-preserved last lower molar of this species measures an inch fore and aft.

We were fortunate in obtaining the remains of two of the largest and most extraordinary mammals yet discovered in the Bridger tertiary deposits. One of these was a tapiroid animal exceeding in bulk of body and limb the living Rhinoceroses, though the head appears to have been proportionally small. Dr. Carter discovered many fragments of a skeleton of the animal, including a whole humerus, portions of jaws, and a much crushed and distorted cranium.

The upper molar teeth have the crown composed of a pair of transverse lobes, with sloping sides and acute summits, separated externally and united internally in a V-like manner. A thick basal ridge bounds the crown in front and behind. A last upper molar measures an inch and a half in the median line fore and aft. The molars in advance are smaller.

The lower molars have a trilobed crown. The anterior lobe, larger than the others, extends across the crown and rises in a prominent peak internally. The acute summit is worn away posteriorly. The middle lobe extends about two-thirds across the crown from the outer side, and is less prominent than the others. The back lobe, second in size, is thickest internally. The fore and aft diameter of the last lower molar is equal to the corresponding upper tooth.

The depth of the lower jaw at the last molar is three and a quarter inches.

The humerus is nearly a foot and three-fourths in length and seven and a half inches in breadth at the condyles.

I propose to name the great pachyderm of the Uinta country, the UINTATHERIUM ROBUSTUM.

If not the most interesting, the most exciting incident of our exploration of Dry Creek buttes was Dr. Corson's discovery of the upper canine teeth, apparently of the most formidable of Carnivores, the enemy of the *Uintatherium*, *Palæosyops*, and other peaceful pachyderms. The teeth resemble in their form those of the Sabretoothed Tiger. The more perfect specimen consists of nearly nine inches of the enameled crown. In its perfect condition the tooth measured upwards of a foot in length, so that it exceeded the canines of the great Brazilian *Machairodus*. The tooth is sabrelike, curved, and compressed conical. Its most remarkable character consists in the lance-head-like form of the terminal three inches. It is thickened at the axis, and impressed and expanded towards the edges, so as to be actually broader in one portion than immediately above. The antero-posterior diameter of the crown near its base is two inches; the thickness over an inch.

These canine teeth terminating in lance-like points must have proved most terrific instruments of slaughter. Their possessor was no doubt the scourge of Uinta, and may therefore be appropriately named UINTAMASTIX ATROX.

On favorable report of the committee, the following paper was ordered to be printed:—

MATERIAL FOR A MONOGRAPH OF THE SPHENISCIDÆ.

BY DR. ELLIOTT COUES, U. S. ARMY.

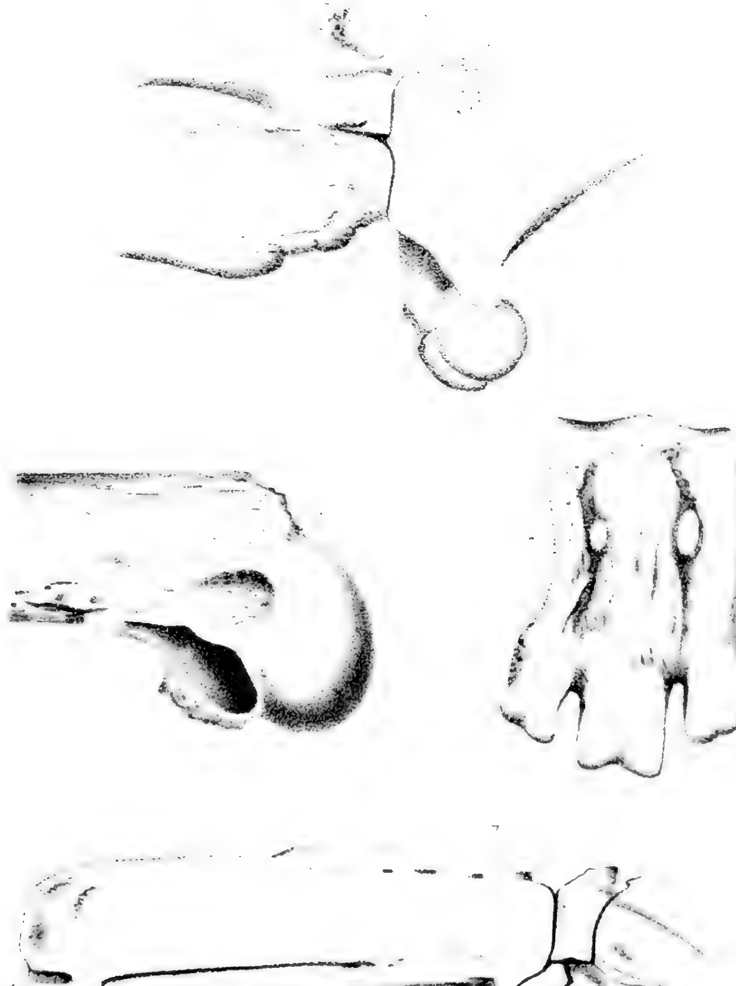
This paper is based chiefly upon the specimens contained in the Philadelphia Academy and Smithsonian Institution, one portion of it representing a descriptive catalogue thereof. The Academy's collection is the largest and most nearly perfect in this country, and has not heretofore been worked up; while that of the Smithsonian is particularly valuable because it contains the types of all the species described as new by Mr. T. R. Peale, in 1848. With this material is collated that in the Museum of the Boston Society, as recently elaborated by the custodian, Prof. Hyatt. Extensive lists of synonyms have been prepared, representing, it is believed, every name, generic or specific, that has been proposed for these birds, with numerous additional references. Some anatomical investigations have been made in an attempt to determine the genera. An annotated list, in chronological order, of the principal authorities upon the subject, from the Linnæan starting-point to the present day, is likewise given.

I. ON THE LITERATURE OF THE SUBJECT.

1766. LINNÆUS, *Syst. Nat.* i. pp. 214, 219. Gives two species, under different genera. One, *Diomedea demersa*, based on Willoughby, 242, Edwards, 94 (black-footed penguin), Clusius, 101 (*Anser magellanicus*), and Brisson, vi. pp. 97, 99, pl. 9 (*Spheniscus*[1] *nævius*) is now the SPHENICUS DEMERSUS auct. It is quoted from the Cape of Good Hope. The other, *Phaeton demersus*, is based upon Edwards, 49 (red-footed penguin), and the *Catarractes*[1] of Brisson, vi. 102; it is the *Eudyptes catarractes* of this paper. In strict interpretation, the species should be called

[1] These names, *Spheniscus* and *Catarractes*, conflict with no Linnæan genera, and so far are tenable. *Spheniscus* holds; but the other is antedated by *Catarractes* of Möhring, and therefore falls, since Möhring's name does not conflict with a Linnæan one. If the very strict rules that some contend for should go in force among the penguins, I hardly know what would become of our nomenclature of the group. The *bouleversement* of the familiar names would certainly be complete.

Coues. On Spheniscidae.



Cones, On Spheniscidae

Eudyptes demersa; but the liability to confusion renders this inexpedient.

1768. Pennant, *Phil. Trans.* lviii. p. 91, pl. 5. Gives an "Account of the different species of the Birds called Penguins," and among other things characterizes the smaller of the two species of *Aptenodytes*, subsequently called *longirostris* by Scopoli, and later named *pennantii* by Gray.

1777. Scópoli. I have not the work at hand, but, as well as I can gather from other sources, Sonnerat's penguins are named as follows: Manchot de la Nouvelle Guinée, *Sonn.* Voy. 180, pl. 113 = *Aptenodytes longirostris*, Scop. (a name that appears to hold good, antedating *pennantii* of Gray). Manchot papou, *Sonn.* 181, pl. 115 = *Aptenodytes papua*, Scop. Manchot à collier de la Nouvelle Guinée, *Sonn.* 181, pl. 114 = *Aptenodytes platyrhyncha*, Scop. The last is *Spheniscus demersus*, var. *magellanicus;* the others are valid new species.

1781. Forster, *Comm. Soc. Reg. Sc. Gotting.* iii. 121. "Historia Aptenodytæ generis avium orbi australi proprii." This article stands *facile princeps* among the writings upon this subject of the last century. It not only marks a great advance upon previous knowledge of the family, but is more satisfactory in every respect than anything that followed for a long period; in fact, it is the real beginning of the exact literature. Placing all the species in the genus *Aptenodytes*, the author divides them into the *Cristatæ*, containing one species, and the *Alophæ*, with eight species. His crested species is *chrysocome*, n. s.; and I agree with Dr. Schlegel that this is not the same bird as Forster's *catarractes*. However his figure may strike us, and however we may interpret his language, Forster certainly meant to indicate two different species; and accordingly we cannot relegate *chrysocome* to *catarractes*, as Gray has done. Forster's crestless species are: *A. patachonica*, n. s., the first recognizable description of the species Gray subsequently called *forsteri; A. papua*, Scop.; *A. antarctica*, n. s.; *A. magellanicus*, n. s., but the collared variety of *demersus*, and the same as the Manchot du Cap de Bonne Espérance, Buff., Pl. Enlum. 382; *A. demersus* (= *Diomedea demersa*, L.); *A. catarractes* (= *Phaëton demersus*, L.); *A. torquata*, n. s., but a variety of *demersus*, the same as *A. platyrhyncha*, Scop.; and *A. minor*, n. s. Thus, of Forster's nine species, six are here named for the first time; seven are valid; and four are valid new species. Most of the species are also figured. Forster does not give *longirostris*, Scop.; this, added to his seven good species, gives us the following list of eight valid and well-determined species, up to date.

1. Diomedea demersa, Linn. 1766.
2. Phaeton demersus, Linn. 1766. [=catarractes, Auct.]
3. Aptenodytes longirostris, Scop. 1777. [=pennantii, Gray.]
4. Aptenotydes papua, Scop. 1777. [nomen ineptum.]
5. Aptenodytes chrysocome, Forst. 1781.
6. Aptenodytes patachonica, Forst. 1781.
7. Aptenodytes antarctica, Forst. 1781.
8. Aptenodytes minor, Forst. 1781.

1782. Bonnaterre, *Ency. Method.* i. p. 67, 68. Figures *Apt. papua* (pl. 17). Names *Apt. gorfua;* it is the same as *Phaëton demersus*, L.

1788. Gmelin, *Syst. Nat.* i. pp. 555–9. This author gathers eleven species, as follows. None of those given additional to Forster's are valid:—

1. A. chrysocome, p. 555. This is based primarily upon Forster, 133, pl. 1, although the author also quotes the Manchot sauteur, Buff. ix., 409, and Manchot huppé de Siberie, P. E. 984, which is *catarractes.* But as the description is applicable to either species, and the prior reference is to Forster, I do not see why Gmelin's bird should not be considered the same as Forster's.

2. A. patachonica, p. 556. This is compounded of equal parts of the two species of *Aptenodytes;* for neither Gmelin nor any of the earlier authors seem to have made the discrimination, although we can, in certain cases, as those of Scopoli and Forster, determine which species they had in view. Thus, Gmelin quotes Forster, 137, pl. 2, and Mill. Ill. pl. 20, both of which are true *patachonica*, Forst. (*forsteri*, Gray); and also quotes Buff., ix. 399; P. E. 975; Sonnerat, Voy. 179, pl. 113; Pennant, Phil. Trans. lviii. p. 91; Pennant. G. of B. 66, pl. 14; and Latham, Syn. vi. 563, No. 2; most of which, when not including both species, are unmistakably the smaller species (*pennantii*, Gray).

3. A. papua, p. 556. Based on Sonnerat and Forster.

4. A. antarctica, p. 557. Forster's species.

5. A. magellanicus, p. 557. Forster's species. Mill., pl. 34, Lath., Syn. vi. 569, are also quoted. It is a variety of *demersus.*

6. A. DEMERSUS, p. 557, is the Linnæan bird. Gmelin makes a variety, β, on Brisson's *nævius* coupled with the *Manchot à bec tronqué* of Buffon, ix. 411; P. E. 1005.

7. A. CATARRACTES, p. 558, stands on the same footing as the Linnæan *Phaëton demersus*.

8. A. TORQUATUS, p. 558, is the same as Forster's bird; the collared variety of *demersus*. Sonnerat, pl. 114, etc.

9. A. MINOR, p. 558 = *A. minor*, Forst.

10. A. CHILENSIS and 11, A. CHILOENSIS, p. 559, are based on Molina's descriptions of a young *S. demersus* in downy plumage, and one of the same species in imperfect feathering.

1790. LATHAM, *Index Ornithologicus*, ii. 878 *et seq*. In this work binomial names are given to the species described under English names in the *General Synopsis*, vol. vi. of the same author. We may also conveniently consider, in this connection, Latham's *General History*, vol. x. p. 381 *et seq*., which brings the subject, so far as this author is concerned, down to 1824. As expressing the author's mature views, we take up the species as given in the latter work, referring also to the earlier ones. There are fifteen of them, as follows:—

1. CAPE PINGUIN, p. 381; Gen. Syn. vi. 566; *Apt. demersus*, Ind. Orn. ii. 879. This is the original Linnæan *Diomedea demersa*. Latham makes a var. A. out of Brisson's *S. nævius*, and a var. B. of the *Pinguin à lunettes* of Pernet, Voy. ii. 17, pl. 7, f. 3. Neither variety stands good.

2. MAGELLANIC PINGUIN, p. 383; Syn. 569; *Apt. magellanicus*, Ind. 880. This is the collared variety of *demersus*.

3. CRESTED PINGUIN, p. 385; Syn. 561; *A. chrysocome*, Ind. 878. This is essentially the same as Forster's and Gmelin's *chrysocome*, but Latham also makes some other quotations (as *Pinguinaria cristata*, Shaw, Nat. Misc. pl. 437, and Planch. Enl. 984), which are probably *catarractes*.

4. RED-FOOTED PINGUIN, p. 386; Syn. 572; *Apt. catarractes*, Ind. 881. The original *Phaëton demersus* of Linnæus.

5. LITTLE PINGUIN, p. 387, pl. clxxx = *A. minor*, Forst.

6. NEW HOLLAND PINGUIN, p. 388. Indeterminable with certainty; no references are given, but the description points to a young *S. demersus*. ("Bill black, upper mandible hooked near the tip, under truncated, legs flesh-colored brown, webs black.")

7. CHILOE PINGUIN, p. 388; Syn., Suppl. ii. 361; *A. chiloensis*, Ind. 881. Same basis as Gmelin's *chiloensis*.

8. PAPUAN PINGUIN, p. 388; Syn. 565; *A. papua*, Ind. 879 = *A. papua*, Scop.

9. ANTARCTIC PINGUIN, p. 389; Syn. 565; *A. antarctica*, Ind. 879 = *A. antarctica*, Forst.

10. PATAGONIAN PINGUIN, p. 390; Syn. 563; *A. patagonica*, Ind. 878. Here, as in Gmelin's case, the quotations of both the species of *Aptenodytes* are brought together, Buffon, Sonnerat, Forster, Miller, Shaw, Pennant, and others being indiscriminately cited.

11. COLLARED PINGUIN, p. 391; Syn. 571; *A. torquata*, Ind. 880. Same as Forster's bird of that name; the collared variety of *S. demersus*.

12. HAIRY PINGUIN, p. 392. No citations. Indeterminable. The bird is unquestionably the young of one of the well-known species, probably *Aptenodytes longirostris*, to judge from the dimensions assigned.

13. WOOLLY PINGUIN, p. 392, pl. clxxxi. No citations. Apparently a "new species," like the hairy penguin, and evidently the young of *Aptenodytes longirostris*.

14. THREE-TOED PINGUIN, p. 393; Syn. Suppl. ii. 361; *Aptenodytes molinæ*, Ind. 881. This is the same as Gmelin's bird, both being based on *Diomedea chilensis* of Molina. It is *Spheniscus demersus*.

Latham's fifteenth species, the "Apterous Pinguin," is the *Apteryx australis*.

1797. GEOFF. ST. HILIARE. *Mill. Mag. Ency.* iii. vi. p. 11. "Sur les Manchots."

1789–1813. SHAW, *Naturalist's Miscell.* A genus *Pinguinaria* is proposed; it is a synonym of *Aptenodytes*. A species *cristata* is described and figured (pl. 437); it is *Phaëton demersus*, Linn. The smaller of the two species of *Aptenodytes* is indicated under the name of *patachonica*, and figured (pl. 409).

? 1811. ILLIGER. Both Gray and Schlegel quote a certain *Aptenodytes fuscirostris*, Ill. among the synonyms of *Spheniscus demersus*. I have not been able to verify the reference, and do not know whether or not it is in the Prodromus, 1811.

1816. VIEILLOT, *Analyse*, etc. A genus, *Eudyptes*, is instituted; the name holds for the crested group, if these are considered worthy of generic rank.

1820–26. VIEILLOT, *Galerie*, etc. *Aptenodytes papua*, Scop. is figured (pl. 299).

1825. STEPHENS, *Cont. of Shaw's Gen. Zool.* Genus *Chrysocoma*, a synonym of *Eudyptes*, V., 1816, is instituted.

1825. WEDDELL, *Froriep's Notizen*, xii. 198. On species of *Aptenodytes*, etc., from the South Georgians.

1832. WAGLER, *Isis.* A genus, *Pygoscelis*, is based upon *Aptenodytes papua*, Scop.

1833. YARRELL, *P. Z. S.* i. 33, 65. On the hairy and woolly penguins of Latham.

1834. BENNETT, *P. Z. S.* ii. 34. Habits of *Aptenodytes.*

1834. MEYEN, *Nova Acta Acad. Cæs. Leop.-Carol.* xvi. supp. i. 110, pl. 21. A species is named *Spheniscus humboldtii*, from Peru; it is a synonym of *S. demersus.* The author, indeed, remarks upon the likelihood of its being the same as P. E. 382. I have seen specimens precisely like the plate here given.

1835. REID, *P. Z. S.* iii. 132. Anatomy of *Apt. patagonica.*

1837. BRANDT, *Bull. Acad. Sc. St. Petersb.* ii. 305. A very important and valuable contribution, like the rest of this eminent naturalist's publications. A new species, *Catarractes chrysolophus* (the first valid new one for half a century!) is described.

1841. HOMBRON and JACQUINOT, *Ann. Sc. Nat.* xii. p. 320. A notable article. Two valid new species are described, viz., *Catarractes adeliæ* and *C. antipodes*, raising the number of known species to *eleven.* A few years subsequently (1846), these species are figured by the same authors (Voy. Pôle Sud, pl. 33), and one of them (*adeliæ*) is made the type of a new genus, *Dasyrhamphus.* (See also *Comptes Rendus*, 1841, xiii. 360, on the same species.)

1842. GLOGER, ——. Institutes the genus *Dypsicles*, type *demersus.* (According to Gray; I have no means of verifying the citation.)

184–. GRAY, *Voyage of the Erebus and Terror, Birds.* In this very acceptable contribution, Mr. Gray figures three of the previously known species, viz., *papua*, *antarctica*, and *antipodes*, in pls. 25, 26, 27 respectively, and describes and figures a new species, *Pygoscelis brevirostris*, pl. 28; this last, however, is identical with *adeliæ*, as the author soon discovered. He also describes another new species, *Eudyptes pachyrhyncha*, p. 17; and the name will stand, if, as Mr. Gray holds, *chrysocome* and *catarractes* Forst., Gm. and Lath., are the same bird; but I cannot agree with him here. I think that these older authors had two species in view, and that their *chrysocome* is what Gray here names *pachyrhyncha.*

1844. LICHTENSTEIN, *Edit. Forster's Descr. Anim.* In this representation of Forster's labors, among other things, two new names are proposed, but neither of them stands. *Aptenodytes palpebrata*, from the Cape of Good Hope, is the original Linnæan *Diomedea demersa*, whilst *A. brasiliensis* is a variety of the same species, equivalent to the old *torquata* or *magellanicus* of Forster.

1844. GRAY, *Am. Mag. Nat. Hist.* xiii. 315. The author carefully distinguishes the two species of *Aptenodytes*, calling one of them *forsteri*, a name anticipated by *patachonica*, Forst.; and the other *pennantii*, which is antedated by *longirostris* of Scopoli.

1844. GOULD, *P. Z. S.* xii. 87. Description of a new species, *Apt. undina;* it is the same as *Apt. minor*, Forst.

1848. PEALE, *Ornith. of the U. S. Expl. Exped.* As ornithologists are aware, the Ornithology of the Wilkes's Expedition was "officially" cancelled by the United States Government, and the edition was recalled as far as possible, on account of the unsatisfactory manner in which the author of the work was considered to have performed his task. But the attempted suppression proved impossible; the work is extant, and must be recognized. In his treatment of the penguins, Mr. Peale shows his familiarity with the birds themselves, but unfortunately some ignorance of ornithological literature. With a copy of his work before us, and all his original specimens, now in the Smithsonian, we find that he has discriminated the species with perfect accuracy; and he gives many new and interesting biographical data. His shortcomings are solely in the matter of nomenclature. We are enabled to make the following determinations:—

A. MAGNIROSTRIS, Peale, = *Sph. demersus*, var. *magellanicus.*

"A. CHRYSOCOME, GM.?" Peale, = *Eudyptes catarractes.*

A. FLAVILARVATA, Peale, = *Pygoscelis antipodes* (H. and J.)

A. LONGICAUDATA, Peale, = *Pygoscelis adeliæ* (H. and J.)

A. TÆNIATA, Peale, = *Aptenodytes papua* of Scopoli, but the name must stand, since Scopoli's is geographically inapplicable. Peale's other names are correct; his *patagonica* is Forster's bird, the true "emperor penguin."

1849. GRAY, *Genera of Birds*, iii. Since the *Spheniscidæ*, like the *Psittacidæ*, the *Picidæ* and some others, form a remarkably definite and somewhat isolated group of birds, it is particularly surprising that such an accomplished ornithologist as Mr. Gray should here and elsewhere dismember the *Alcidæ* for the purpose of wedging the penguins bodily in between different genera of auks. We have already had occasion to speak of this as "a great blemish" upon Mr. Gray's treatment of these two families, and our former opinion is strengthened with the increase of our knowledge upon the subject. In the "Genera," Mr. Gray adopts three genera for the *Spheniscidæ*, giving good characters and faithful illustrations. We believe the division to be a very close approximation to the natural order—in fact, we are not sure that these three genera are not a more truthful expression of fact than the four we are led to adopt in the present paper. Mr. Gray catalogues the species known at that date, but we do not think he is in this matter nearly so successful as in his generic divisions. (See 1871, GRAY, below.) A beautiful colored plate (pl. 176) illustrates *Eudyptes pachyrhyncha*, Gray. The article is one of the few that the student can confidently consult to gain a clear general idea of the subject.

1850–56. BONAPARTE, ——? I do not know where this author has treated of the penguins, and none of the authorities consulted give any reference. According to quotations, he has instituted a genus *Eudyptila* upon *Aptenodytes minor*, Forst., and has renamed the two species of *Aptenodytes* that Gray named *forsteri* and *pennantii*, calling them *imperator* and *rex* respectively. There is no excuse whatever for this.

1858. CASSIN, *U. S. Exploring Expedition*, *Birds*. Uniting Peale's field studies with an accurate determination of the species, Mr. Cassin's article on the penguins is one of special importance. After examination of the original specimens themselves, we find Mr. Cassin's identifications correct throughout; but, for some reason, *Eudyptes catarractes* does not appear, although several specimens were brought home by the Expedition, as shown in the body of this paper.

1859. GOULD, *P. Z. S.* 98. Mentions several penguins in a list of birds from the Falkland Islands.

1860. ABBOTT, *Ibis*. 336. The *demersa* of this author, according to Gray and Sclater, is of the variety *magellanicus*. Gray puts Abbot's *chrysocome* as a synonym of *nigrivestis*, Gould; but as this last is a synonym of *chrysocome*, Forst., the affair seems to odd itself even.

1860. Sclater, *P. Z. S.* 382. In a catalogue of the Falkland Islands' *Avifauna*, the author gives (p. 392) five species of penguins (*pennantii*, *magellanicus*, *chrysolopha*, *chrysocome*, Forst. and *wagleri*, Scl.). He is, we think, perfectly justified in cancelling Scopoli's name "*papua*" on the score of geographical inapplicability, but in proposing to call the species after Wagler, has he not overlooked Peale's prior designation? (For additions and corrections, *cf.* Id. *ibid.*, 1861, 45.)

1860. Gould, *P. Z.* p. 418. Two new species of *Eudyptes* are described. One of them, *E. nigrivestis*, is a synonym of *chrysocome*, Forst. The other, *E. diademata*, is a valid species. Both are from the Falklands.

1861. Gould, *Ann. Mag. N. H.* 218. Notices of his crested species.

1865. Owen, *P. Z. S.* xxxiii. 438. Results of a post-mortem examination of *Aptenodytes* "*patachonica*."

1865. Pelzeln, *Reise Novara*, pl. 5. *Eudyptes* "*chrysocome*" with young, figured.

1867 (originally 1840). Nitzsch, *Pterylography* (*Ray Soc.*, *ed. Sclater*). An important contribution of original and new matter on the pterylosis of the family.

1867. Schlegel, *Mus. Pays-Bas*, *Urinatores*. All the known species of the family being represented in the Leyden Museum, this article is, in effect, a monograph of the *Spheniscidæ;* and it is, in every respect, the most satisfactory treatise upon the subject that has appeared, being as much superior to the contemporaneous literature as Forster's was in its day and generation. As far as the determination of the species is concerned, our own studies bear out Dr. Schlegel's in every single instance; indeed, it seems to us impossible to reach any other conclusion, when any considerable and sufficient amount of material is examined. The present article of ours is so completely an indorsement of Dr. Schlegel's, that the only points of difference are one or two unimportant synonymical determinations among the crested species, which, after all, will probably remain matters of opinion. Dr. Schlegel's analysis of the species is an excellent clue to their determination. He presents five primary sections, the first representing *Aptenodytes*, the fourth and fifth containing, respectively, *S. minor*, and *S. demersus* with its variety *magellanicus*. The third contains the four crested species (divided into that one with the short tail, *catarractes*, and the three with longer tail, *chrysocome*, *chrysolopha*, and *diademata*) in one sub-group, to which *antipodes* is added as a second sub-group. The second includes the three longest-tailed species, *adeliæ*, *papua*, and *antarctica*. The article is open to criticism on the score of the generic determination, we think, for we show, in another place, that there certainly are several well-marked modifications of cranial structure, warranting, if not enforcing, as many generic divisions. But even here the difference between Dr. Schlegel's results and our own is rather apparent than real, for the divisions he makes seem to correspond, in the main, with the genera we find it necessary to adopt. (*Cf. Newton*, *Zool. Rec.* 1867, 124. *Ibis*, 1868, 110.)

1867. Huxley, *P. Z. S.*, 458. The penguins form the fourth of the several third-rate groups into which the author proposes to divide birds, in his celebrated "Classification," and are called "*Spheniscomorphæ*"—a name anticipated by *Squamipennes*, *Nullipennes*, *Impennes*, *Ptilopteri*, and some other designations. Of the nine sets of characters assigned, the fifth, sixth, seventh, and eighth are more or less perfectly diagnostic; the ninth is shared by nearly all swimming and some wading birds; the fourth and first are no more applicable to penguins than to a great many other birds; the third is not likewise particularly pertinent, and the second is untrue, so far as relates to the basipterygoid processes—these being present in some species of the family. The group, it is said, "contains" the single family *Apterodytidæ*, and comprises three genera, *Eudyptes*, *Spheniscus*, and *Apterodytes* [lege Aptenodytes]. It is probable that final determinations will show that Prof. Huxley's views are perfectly sound in this last particular. (V. cranial characters, *infrà*.)

1868. Lecomte, *P. Z. S.* 527. Biographical.

1869. Layard, *Ibis*, 378. On destruction of *E. chrysocome* in the Crozette Islands.

1869. Buller, *Trans. N. Zealand Inst.*, 112. Occurrence of *S. undinas* (sc. *minor*) in New Zealand.

1870. Finsch, *P. Z. S.* p. 332, pl. 25. A new species, *Dasyrhamphus herculis*, is described and figured; it is the young of *adeliæ*, with the throat white, as indeed Mr. Gray had already determined in the case of the British Museum specimen. A specimen in the Philadelphia Academy represents the same thing.

1871. GRAY, *Hand-list*, iii. pp. 98, 99. Mr. Gray retains the *Spheniscidæ* in the unnatural association with the *Alcidæ* that we have already been forced to criticize adversely. The three genera he adopts appear to be well founded, the author here showing the same admirable conservatism that guides his recognition of full genera throughout the work; but we think that some of the species retained under subdivisions of his most extensive genus, *Eudyptes*, are more different from each other than they are from species of the other genera; and in this respect some change seems to be desirable. But in the determination of the species Mr. Gray is certainly wide of the mark; assuredly, there are not nineteen of them, as he gives. The list is much more useful as a guide to one's own research than as a model to be copied. At the same time, the synonymical discriminations are so accurately made that little or no confusion results from the redundancy of species. The only point concerning which we are at issue in the matter is that Mr. Gray relegates *chrysocome*, Forst., to *catarractes*, leaving his *pachyrhyncha* as the tenable name of a certain species, whereas we agree with Dr. Schlegel, that *chrysocome*, Forst., is different from *catarractes*, and is the prior name of what Gray calls *pachyrhyncha*. The following reductions in the list appear to be required:—

No. 10,806 to be united with No. 10,805.

No. 10,804 to be united with No. 10,803.

Nos. 10,802, 10,800, 10,799, 10,797 to be united with 10,790.

No. 10,794 to be united with 10,793, and one of the synonyms of 10,791 to be the name of 10,793. The valid numbers are therefore 10,790, 10,791, 10,792, 10,793, 10,795, 10,796, 10,798, 10,801, 10,803, 10,805, 10,807, 10,808.

1871. HYATT, *Proc. Bost. Soc. Nat. Hist.* This is, we believe, the author's first appearance as an ornithologist; but he shows the trained naturalist here as elsewhere, bringing to bear upon the subject the same qualities that have distinguished him in another department of zoölogy. There is a certain freshness and originality in his treatment of the family that contrast by no means unfavorably with more conventional writings of practised ornithologists, and, in looking from a new stand-point, he has caught sight of some things that persons accustomed to the birds have looked at without seeing. This more than compensates for some slight deficiencies that, under the circumstances, we could not reasonably expect to find supplied. The article modestly professes to be simply a museum catalogue, but it possesses scientific claims of a very high order. The pterylographic data represent a valuable supplement to Nitzsch's earlier notice. So far as we know, Prof. Hyatt is the first naturalist who has attempted any critical discrimination of the various types of the *Spheniscidæ* with a view of determining their precise relationship, and especially their genetic relations to each other and to a probable ancestral stock; and this, we need not add, is work upon a higher plane than the mere identification of species, or preparation of descriptions and synonymy. We must refer to the paper itself for the details that we cannot here enter upon. It will suffice to say here, in heartily indorsing the author's plan of study and concurring in his general conclusions, that he shows better reasons for the genera he adopts than any one has hitherto given, and that our own studies of osteological structure, as far as these go, are emphatic evidence in favor of his views.

1872. GIEBEL, *Thesaurus Ornithologiæ, erster Halbband*, 390. In this work, an alphabetical catalogue of the nominal species, thirty-one in number, that were originally described under "Aptenodytes," is given, with the reference of each to its proper place. The determinations seem to be correct, with few exceptions. As the work has not progressed beyond the letter "A," the remaining names are not accounted for.

II. ON CERTAIN POINTS OF CRANIAL STRUCTURE BEARING UPON THE DETERMINATION OF THE GENERA.

Some authors have rested content with referring all the penguins to a single genus, adopting either the name *Aptenodytes* or *Spheniscus;* and there is some show of reason for this, in the fact that all the representative species are singularly interrelated in various points of form. But this is simply defining a genus upon the identical grounds that indicate the family. Others, going to the opposite extreme, have instituted or adopted a genus for every leading species, though in so doing they have been of course unable to assign characters of more than specific value. To reconcile these conflicting views, and, if possible, to fix this question of the genera with reasonable certitude, has been one object of the present investigation. I found that any division of the species according to the details of external form, as the size, shape, and extent of feathering of the bill, length of tail, presence of peculiar ptilosis, etc., would be, for the reason just alluded to, an elevation of various characters, properly to be regarded as specific, to generic rank; while the ignoring of these would force me to the other extreme of recognizing a single genus virtually equivalent to the family itself. It seemed to me that, if there were true genera among the penguins, the fact would appear from examination of internal structure; and, having a number of skulls at command, I directed my attention to these. As far as my material goes, the results of this investigation are to me highly satisfactory. At the same time, having examined the skulls of only a limited number of species, I cannot fix the generic status of all of them, nor even say how far, if at all, the skulls of the species not examined may show intergradation between the types of structure herewith detailed.

The skulls examined show *three* positively different patterns.

A. The first is that presented by *Aptenodytes pennantii*. The rostrum is much longer than the rest of the skull, attenuate, particularly narrow and acuminate. The nasal opening is correspondingly long and narrow. The upper prong of the nasal bone is anchylosed with the nasal prong of the premaxillary. The palatines are anchylosed with the maxillæ. The zygomata dip downward moderately from the maxillo-jugal suture. The mandible is not abruptly deepened in any part of its length, and shows a long narrow vacuity at the juncture of its symphyseal with the succeeding elements. The angle of the mandible lies directly below a perpendicular let fall from the mastoid. The interorbital space on the top of the skull is broad and smooth, since the rough depressions for the lodgment of the glands are narrow, and terminate before reaching the anteorbital prominences. The temporal fossæ are very shallow, widely apart, and merely separated by a slight bony ridge from the slight depression between themselves and the cerebellar protuberance. The greatest width of the skull is one-third, or less, of its entire length.

B. The second modification is afforded by the crested species (*Eudyptes* proper). (Pl. 4, fig. 1.) The rostrum is shorter or no longer than the rest of the skull, very stout, in particular extremely broad and obtuse. The nasal opening is correspondingly short. The upper prong of the nasal bone is partly or wholly free from the premaxillary. (Fig. 2.) The palatines are imperfectly anchylosed with the maxillæ. The zygomata are extremely curved, looping downward from the maxillo-jugal suture. The mandible is abruptly deepened at its middle into a broad plate, and shows no vacuity between the symphyseal and following elements. The angle of the mandible lies in front of the mastoid plane. The smooth interorbital space is narrow on top of the skull, since the glandular depressions reach the anteorbital prominences. The temporal fossæ are very shallow, widely apart, and merely separated from the depression between themselves and the cerebellar protuberance by a slight bony ridge. The greatest width of the skull is nearly half its length.

C. *Spheniscus demersus* shows a third modification. (Figs. 3, 4.) The rostrum is longer or no shorter than the rest of the skull, very stout, in particular extremely deep, with the apex hooked above, truncate below. The nasal opening is correspondingly short. The upper prong of the nasal bone is almost completely anchylosed with the premaxillary. The palatines are extensively anchylosed with the maxillæ. The zygomata are curved but slightly downward. The mandible is deepened very slightly and gradually, and shows no vacuity between the symphyseal and succeeding elements. The angle of the mandible is below, if not behind the mastoid plane. The smooth interorbital space on top is narrow or reduced to a ridge. The temporal fossæ are extremely deep, meet each other on the median line on top of the skull, and are completely isolated from the depressions on either side of the cerebellar protuberance by a strong flange-like plate of bone. The greatest width of the skull is about two-fifths of its length.

It will be observed that each of these types has its own peculiarities. Thus A stands alone in characters of the rostrum; C is isolated in the singularity of its temporal fossæ; B is peculiar in the dip of the jugal and depth of mandible; and the other characters vary in intensity of expression with each one. But there are in each case other characters that are shared with one other, but not with both the others; and it is these combinations that render the three distinct. I propose to establish genera upon them.

One skull of type B, of an undetermined species,[1] shows, among some peculiarities that I regard as simply specific, the presence of small and slender but perfectly plain basipterygoid processes, of which I see no trace in any other specimen.

As already intimated, I cannot say whether or not these cranial types shade into each other, or whether species not examined do not show something different from either of these three patterns, nor, finally, with which one of the three the unexamined species may agree. It seems to me that the species *minor* agrees so closely in external characters with C that its reference to the genus *Spheniscus* is warranted. For the same reasons, the species *antipodes* seems allied to B. In the uncertainty at present attaching to *papua*, *adeliæ*, and *antarctica*, it may be best to leave these to stand on their own merits in the genus "*Pygoscelis*," which, however, can then only be characterized by the extreme length of the tail and the feathering of the bill, since the form of the bill differs greatly in each of the three. These genera would correspond very nearly with the sections Dr. Schlegel has indicated, and are exactly those of Prof. Hyatt. The latter has shown how difficult it is to define the genera, seeing that they vary with whatever character we take as our guide. On the whole, I think it most probable that no more than three genera will be finally determinable, namely, *Aptenodytes*, *Eudyptes*, and *Spheniscus*, though the second of these may contain subgenera, based upon shape and feathering of the bill, presence or absence of crests, and length of tail.

The cranial characters just described will be readily appreciated by reference to the accompanying figures (Fig. 4), kindly drawn for this paper by my friend, Prof. Morse. It was not thought necessary to give a figure of Aptenodytes, as a beautiful engraving has already been presented in Prof. Brandt's invaluable article. These figures are all of two-thirds size; those representing vertical views show the skull from above, on the one side, and from below (with the mandible removed) on the other side, of the median lengthwise line.

In its general characters the skull conforms to the ordinary pygopodous type. The palate is schizognathous. The inter-

[1] It seems to be *not* one of the crested species, and I suspect that it is "Dasyrhamphus" *adeliæ*, but there is no certainty about this.

orbital septum has a large vacuity; its thickened lower border curves gently forward and upward. The vomer is slight and readily detached. The optic foramina are merged in a large vacuity; the foramina in front of the ear are large and distinct. The mastoid and postorbital are both prominent; the depressions for lodgment of the gland are well marked. The pterygoids are remarkable for their breadth anteriorly, forming somewhat triangular laminæ, instead of irregular cylinders of bone. The palatines are large, very broad posteriorly, and thin. The maxillo-palatines, on the other hand, are very small and simple. The very large and irregular lachrymals are permanently free from surrounding bones, and seem to be usually (but not always) fenestrated with a large foramen. A prominent peculiarity of the skull is the loose connection of the bones of both jaws. The nasals are never entirely confluent with either maxillaries or premaxillaries, and they are sometimes distinct throughout. The posterior ends of the median prongs of the premaxillaries commonly remain distinct from the nasals embracing them, and frequently are not even anchylosed with each other. Traces of the maxillo-premaxillary, maxillo-palatal, and maxillo-jugal sutures are usually very plain; and in the lower jaw, most of the original elements remain more or less distinct throughout life. None of the cranial bones appear to be pneumatic.

An incomplete skeleton of *Aptenodytes pennantii* furnishes the following additional osteological data (Pl. 5; figs. all of nat size):—

All the bones of the wing are flat and solid.

The *humerus* (Fig. 5), about $4\frac{1}{2}$ inches long, has an average width of an inch, and a thickness of about $\frac{1}{4}$ of an inch. It is perfectly laminar, except the globular expansion at its head. This portion lies oblique to the general axis of the bone, the general convexity of the articular surface presenting inward and backward. The whole of this expanded surface is, in effect, the dome roofing over an immense antrum, into which the whole end of one's finger may be thrust. The articular surface is somewhat crescentic in general outline; anteriorly it slopes to the prominence representing the "greater tuberosity," which is directly continuous with the front edge of the bone. Inside this ridge there is a deep groove, and along the inner border of the articular surface lie two fossæ separated by a ridge. But the distal extremity of the bone is still more peculiar—showing a characteristic of the family only shared, to a certain extent, by *Alca impennis*. (Fig. 6). The bone is cut off obliquely, at an angle of about 45°, with a straight edge. The anterior three-fifths of this is occupied with the two facets for articulation with the bones of the forearm. These facets are continuous, and the radial one scarcely shows the particular elliptical shape common among birds. The posterior extremity of this oblique end of the humerus is prolonged far beyond the true elbow joint, furnishing a resting place for the two large anconal sesamoids. The very end is deeply grooved, and another similar groove is impressed upon the bone on the outside, a little higher up. The sesamoids are in these grooves. The structure of the elbow is such as to allow but very restricted motion; the forearm can be flexed out slightly from its usual position of nearly complete extension.

The larger, outer one of the two sesamoids is an irregularly discoidal bone, with a smooth, flat, external face, and curved outer border; its sharpened edge fits in the upper of the two grooves at the extremity of the humerus; the prominence of the humerus that defines this groove abuts against a slight excavation on the outer surface of the sesamoids. The smaller sesamoid lies a little behind and inside the other; it has one flat face applied against the surface of the other, an irregular surface with a central ridge fitting into the extreme groove of the humerus, and a long, curved, postero-external free border. These sesamoids, borne upon the most projecting point of the humerus, afford an extremely powerful leverage for extension of the forearm.

The ulna and radius are similar to each other in general appearance, both being laminar, like the humerus, with a sudden thickening and constriction at the proximal extremity, so that the articular facets are irregularly circular. The distal extremity of the ulna is pretty effectually divided into two facets, a posterior excavation in which the head of the ulnare articulates, and a superior prominence abutting against a surface of the radiale. The distal extremity of the radius shows a single convex articular surface fitting the concavity of the radiale. The outer surface is obliquely impressed for a long distance with a distinct groove for a tendon; the anterior margin of the radius is a straight, sharp crest, more prominent than the opposite edge of the ulna. The two bones of the forearm have very intimate relations to each other only at their proximal extremity, being barely in mutual contact at the wrist; but in consequence of their straightness, their edges lie parallel in the continuity—not presenting the elliptical interspace commonly seen in birds' forearms.

The radiale is not specially noteworthy (Fig. 7), being a simple, somewhat cubical nodule with distal and proximal articular concavity for the metacarpus and radius respectively, another articular face for the protuberance of the ulna, two free faces, and an anterior extremity for tendinous attachment. The ulnare, on the other hand, is of extraordinary, if not unique, shape and size. It develops an immense lamellar expansion of the curious shape shown in the figure, the real body of the bone appearing as a mere process wedged in betwixt the ends of the ulna and metacarpus. If, as I presume, the flexor carpi ulnaris has its customary insertion into this bone, the increase of leverage must be enormous.

The single metacarpal bone is peculiar in several respects. It bears no pollical phalanx, and the crest that ordinarily indicates, in the composition of this bone, the originally distinct radial metacarpal is here obscure, not being differentiated to any considerable degree from the general laminar expansion. The ulnar metacarpal has no convexity; its fusion with the main metacarpal is perfect for nearly its proximate half, and again at the distal extremity—a narrow linear fenestration separating it in the rest of its extent. The head of the bone represents one continuous articular surface for the radiale and ulnare, flat sideways, strongly convex fore and aft. At the distal extremity, however, there are two perfectly distinct articular facets—an oval one for the radial phalanx, and a small circular one for the ulnar phalanx. The bone is nearly three inches long, and rather less than one-third as broad.

The proximal radial phalanx is a straight, flattened, rectangular blade of bone, with four sharp corners, a sharp anterior and posterior border, and an oval articular surface at either end. It is two inches long and half an inch broad. The distal phalanx is simply a flattened spur, with sharp edges, tapering to an obtuse point; it is about half an inch long. The ulnar digit, however, is of unusual size, reaching beyond the end of the proximal radial phalanx. It has a stout head, whence a process is developed, and then tapers regularly to the end. It is less obviously flattened than the other bones of the hand.

The bones of the leg conform closely to the general pygopodous type. The patella, however, is of immense size, and of an indescribable, irregular shape. According to Owen, it develops from two centres—a matter interesting in connection with the presence of two sesamoids in the elbow. The tibia is a bone about eight inches long, and nearly cylindrical in its continuity. It closely corresponds, in general, with the same bone of a loon, for example, except that it does not develop the long apophysis above the knee-joint. There is a considerable protuberance, however, above the plane of the articulation, formed by the extension of two sharp cnemial ridges that meet above, defining a long deep fossa that lies between them. The distal extremity offers nothing peculiar; the osseous bridge for confinement of the flexor tendons is perfect, and the trochlear surface has the usual configuration. The fibula is six inches long, and extremely slender from above the middle downwards. It abuts against the tibia at both ends, and also for about an inch of its length at a place nearly half-way down. Elsewhere, the interspace between the two bones is considerable.

The ankle-joint has a peculiar free, persistent ossicle, about the size and shape of a split pea. It appears to be a sesamoid, and it lies on the posterior aspect of the joint; but owing to an unfortunate inadvertence in the preparation of the specimen, its exact position and relations were not made out.

The tarso-metatarsus (Fig. 8) is the most remarkable bone of the skeleton in several respects, and the one more particularly diagnostic of the family. Penguins afford probably the only instances, among recent birds, of width crosswise being decidedly greater than thickness antero-posteriorly, and more than half the length; and the only case of persistence throughout life of fenestræ marking the composition of the bone of three originally distinct metatarsals. In the present species, the bone is rather under two inches long, from an inch to one inch and a third wide at different points. The front shows two deep grooves lengthwise from one end to the other, and in each of these grooves there is an oval perforation, that would about admit the passage of a goose-quill. Behind, the corresponding grooves are nearly obsolete. The proximal extremity is an uninterrupted articular surface for the tibial condyles, the inner impression being much the more strongly marked. The distal extremity is deeply cleft in two places, the three metacarpal prongs being completely isolated. The central one of these projects beyond the lateral ones. The articular faces have the usual contour; all being grooved perpendicularly, and the lateral ones showing that ordinary but highly interesting kind of obliquity, by means of which the toes, when flexed, are brought side by side, and made to diverge from each other when extended.

In the dried bone, no special surface for attachment of the accessory metatarsal can be recognized. The first digit is extremely small, completely lateral, closely joined with the base of the second toe, and appears in its usual position during life to be turned more or less completely forward. Technically, it may be considered "elevated," though the disparity in size between these and the other toes is so great that it is difficult to say how much, if any, above the plane of the rest it is really situated. It appears to have little or no functional importance, although all its bones are present and morphically perfect. The accessory metatarsal is a straight, slender bone, about half an inch long, irregularly flattened; the proximal phalanx is similar but still smaller, while the distal phalanx is a mere spiculum about a fourth of an inch long.

The other three toes are of ordinary size; the middle one exceeds the outer a little, while the inner is considerably the shortest; all show the normal number of phalanges (3–4–5, from 2d to 4th). The phalanges of each toe, as usual, decrease in length and bulk from first to last, and the corresponding ones of different toes bear to each other the usual relative size. The distal phalanges have enlarged processes for the support of the heavy, blunt claws, and these processes are deeply grooved on each side.

III. ON THE GEOGRAPHICAL DISTRIBUTION OF THE FAMILY.

It is well known that the penguins are entirely confined to the southern hemisphere, and their northern limit of dispersion is probably ascertained with approximate accuracy. Their nearest approach to the equator seems to be on the coast of South America. According to Meyen, the *S.* "*humboldtii*" (*demersus*) is abundant in the harbor of Callao, Peru, lat. 10° S.; while this *Spheniscus* reaches on the other side of this continent to Southern Brazil, and Ascension Island, lat. 8° S. (*Licht.*). Dr. Schlegel places the African limit at 25°, and the Australian at 35° S., properly ignoring the accounts of Sonnerat, whose representations of the occurrence of penguins, as given in his "Voyage," are in all probability erroneous. On the other hand, some species of penguins have been found apparently as far as voyagers have penetrated toward the pole. Such highly antarctic species are the *Pygoscelis adeliæ*, and *antarctica*, named from their habitat, and the *Aptenodytes patachonica*, seen by Peale in lat. 66° 52′.

The Falkland Islands appear to be a centre of the family, no less than half of the known species occurring there.

A number of the species are very extensively dispersed, having, as it were, a circumpolar mode of distribution. Such are some of the crested species, the "papuan" penguin, and especially the *Spheniscus demersus*. This last appears to have the most extensive distribution, both in latitude and in longitude, of any; and since it varies, like other birds, with a change of habitat, this may account for the exceptional number of nominal species that have been established at its expense. As far as is known, two species constitute an exception to the general rule, being confined to a comparatively limited area; these are the *Spheniscus minor* and *Eudyptes antipodes*, inhabiting the Australian region.

As Dr. Schlegel remarks, the precise habitat of each species cannot be given as yet; and this will not be possible without much more information than we now possess, respecting the places where the different species propagate, and especially in regard to their movements, whether irregular and contingent, or periodical, according to season of the year.

CLAVIS SPECIERUM SPHENISCIDINARUM.

CRISTATÆ	—*flavifrons*				E. DIADEMATUS.
	—*nigrifrontes*	—brevicaudata	—parvirostris	—fusco-coerulescens	E. CATARRHACTES.
		—*longicaudatæ*	—magnirostris	—coeruleo-fuscescens	E. CHRYSOCOME.
			—parvirostris	—fusco-coerulescens	E. CHRYSOLOPHA.
ECRISTATÆ	—*flavotinctæ*	—brevirostris			E. ANTIPODES.
		—*longirostres*	—nudipes		A. LONGIROSTRIS.
			—plumipes		A. PATAGONICA.
	—*non flavotinctæ*	—albocoronata			P. TAENIATA.
		—*nigrocoronatæ*	—albogulares	—torquata	P. ANTARCTICA.
				—etorquata	S. MINOR.
			—*nigrogulares*	—nudirostris	S. DEMERSUS.
				—plumirostris	P. ADELIAE.

IV. DETERMINATION OF THE SPECIES.

APTENODYTES PATAGONICA, Forst.

Aptenodytes patachonica, FORST., Comm. Soc. Reg. Sc. Götting. iii. 1781, 137, pl. 2. GM., S. N. i. 1788, 556 (in part: confounds the two species). LATH., Ind. Orn. ii. 1790, 878 (in part: same as Gmelin's).
Spheniscus patagonicus, SCHLEG., Mus. P.-B. livr. 9me. 1866, *Urin*, p. 3.
Aptenodytes forsteri, GRAY., Ann. Nat. Hist. 1844, 315; Handl. iii. 99.
Aptenodytes imperator, BONAP.
Pennant, Gen. of B. pl. 14; T. F. Miller, Ill. Nat. Hist. pl. 20.
Habitat.—Maribus antarcticis.

Maximus inter omnes; maxillâ ultra medium ptilosâ, tarsis antice lateribusque mandibulæ magnâ ex parte ptilosis; rostro pedibusque crassiusculis pro genere Aptenodytis, unguibus maximis obtusissimis: notæo nigro et cœruleo permixto, gastræo albo, gulâ nigricante, ea pictura infrâ cordiforme; lateribus colli flavicantibus, summâ parte flavissimâ, necnon striâ nigra humeris anteducta notatis, rostro pedibusque nigris, lateribus mandibulæ erubescentibus.

Mus. Smiths. No. 15,666, adult, taken January 23, 1840, in lat. 66° 52′ S., long. 150° 25′ E. from Greenwich; H. Eld, U. S. Expl. Exped.: basis of *Peale*, pp. 258, 335, sp. No. 691, and of *Cassin*, pp. 349, 450, sp. No. 681. This specimen, as mounted, stands about 3½ feet high, but appears somewhat overstuffed; wing 14 inches, tail about 3, bill along culmen 3, along gape almost 5, from antiæ to tip of bill 2. The bill is feathered beyond its middle, the antiæ reaching more than half-way from angle of the mouth to tip, and these feathers conceal the maxillar tomia for a great distance. On the under mandible the feathers completely fill the interramal space, and also cover much of the side of the lower mandible, leaving, towards the base, only the expanded and colored edge of the mandible naked. The tarsi are entirely covered with feathers, which furthermore overlie the toes for some distance; but only a part of the tarsus is implanted with feathers, the rest being reticulate with small six-sided plates, as are also the upper surfaces of the toes, except just at the end, where there are 2–3 annular scales. The hallux is minute, relatively smaller than in any other species, and almost perfectly antrorse; the lateral toes are sub-equal to each other, but the 2d is a little shorter than the 4th; the tips of the claws of both overreach the base of the 3d claw. Claws enormously stout and blunt; 2d 1.20, 3d 1.50, 4th 1.25 long. This bird appears to be in perfect plumage; the upper parts are intimately mingled black and blue, but the latter gives the general impression; the black of the throat is short, and ends abruptly with a broad cordiform outline below; the forepart and sides of the neck appear to have been yellower than they are now, but the club-shaped upper termination of this colored area is still very yellow; in the whitish of the sides of the neck stands an isolated black stripe, running upward from the shoulder, stopping abruptly, not reaching the gular black. The wings are entirely white beneath. The under mandible is still richly colored posteriorly; the rest of the bill, and the whole feet and nails, are black.

APTENODYTES LONGIROSTRIS, Scopoli.

Patagonian Pinguin, PENNANT., Phil. Trans. lviii. 1768, 91, pl. 5. LATH., Gen. Syn. vi. 563; Gen. Hist., x. 390; in part: confuses both species.

Aptenodytes patagonica, PENNANT.

Aptenodytes patachonica, GM., S. N. i. 556 (in part; confounds the two species.) Lath., Ind. Orn. ii., 1790, 878 (same as Gmelin's).

Pinguinaria patachonica, SHAW., Nat. Misc. 1799, xi. pl. 409 (nec Forst.).

Aptenodytes longirostris, SCOPOLI; SONN., Voy. N. Guin. 180, pl. 113.

Aptenodytes pennantii, GRAY, Ann. Nat. Hist. 1844, 315; GOULD, P. Z. S. 1859, 98; SCL., Ibid. 1860, 392. Hyatt, Pr. Bost. Soc. N. H. 1871.

Spheniscus pennantii, SCHLEGEL, Urin. M. P.-B. 1866, 3; SCHLEGEL, De Dier. p. 268.

Aptenodytes rex, BONAP.

Woolly pinguin, LATH., Gen. Hist. x. 1824, 292, pl. clxxxi.; young in the down (also, "hairy pinguin," ibid. ?).

Pl. Enlum. No. 975 (shows unmistakably the side of the under mandible entirely naked).

Habitat.—Maribus australibus. Ins. Falklandicis, Kergueleni, Stewartii.

Apt. patachonicæ similis, sed multo minor, rostro artubusque pro staturâ longioribus, tarsis lateribusque mandibulæ omnino nudis, unguibus graciliotibus; notæo nigro et cœruleo permixto, gastræo albo, gulâ nigricante, ea picturâ infra aculeatâ, lineâ flava jugulari media summâ parte furcatâ, picturam nigram gularem inter ramos suos amplectante, deinde per latere utroque colli porrectâ et illic maculam flavissimam formante; rostro pedibusque nigris, mandibulâ nigrâ ex parte erubescente.

Mus. Smiths. No 59,243, in perfect plumage; from the Falkland Islands. Skin a yard long, but somewhat stretched; probably was about 30 inches in life; wing about 12; tail 4; tarsus, measured in front (where all our other measurements of tarsi are taken), 1.50; middle toe and claw 4; culmen of bill 3.25; gape 4.50; from antiæ to tip of bill 2.50. While a much smaller bird than *patachonica* (*Forsteri*), it is thus seen that the wings, tail, and feet are relatively longer, and that the bill, besides being relatively longer, is actually made of equal length, if not absolutely longer, in consequence of the less extent to which the feathers of the front encroach upon the upper mandible, the antiæ falling short of half the distance between angle of the mouth and tip of the bill. Another and yet stronger character is, that the sides of the under mandible are entirely naked, whereas in *patachonica* (*Forst.*) the feathers encroach so much that hindwards only the tomial edge of the mandible remains bare. This difference heightens the seeming greater size of the bill of *pennantii;* it likewise makes the brightly colored area larger, and gives it a different shape. The tarsi of *pennantii* are entirely naked, and not even hidden by the tibial plumes; whereas in *patachonica* (*F.*) the tarsi are largely ptilose, and wholly hidden by feathers, as are also the bases of the toes. The general *pictura* of the plumage is the same; but the neck shows a very noticeable difference, the gular black running far down in a sharp point embraced betwixt the forks of the narrow median anterior jugular line of yellow that after bifurcating mounts on either side of the neck and head, there to form a large very yellow spot, bounded immediately by the dark color of the neighboring parts; and moreover, the isolated black line running up in the whitish of the side of the neck from the shoulder towards the throat, as observed in the Smithsonian specimen of *patagonica*, is not seen here.

I am not satisfied, however, that these precise points of coloration are sufficiently distinctive of the species as compared with its congener. It is probable that the only reliable characters are to be found in the larger size, proportionally shorter members, much more extensively feathered bill, and feathered tarsi, of *patagonica;* and all these points seem to be accounted for by a difference in habitat, *patagonica* being more decidedly antarctic than *longirostris.*

No. 11,976. Mus. S. I. (*Osteological Register.*) From the Falkland Islands, received through Mr. Salvin, with No. 59,243.

No. . . . . Mus. Acad. Philada. No locality given. Bill from forehead 3.75, from nasal feathers 2.75, from gape 5.25. Tarsus, middle toe, and claw together, 6 inches; wing from the shoulder 1 foot. A fine specimen, in perfect plumage. The intense yellow club-shaped spots mount to the very summit of the occiput, being there separated only about one inch from each other. They are bordered behind by a sharp narrow black edging, distinctly defined against the neighboring blue; this black margin nearly meets its fellow on the front of the neck, then passes down along the edge of the blue on each side, widening as it descends beyond the wing where it is finally dissipated.

No. . . . . Mus. Acad. Philada. No locality recorded; in perfect plumage, but the bright tints not so vivid as in the preceding. Bill from forehead 3.75, along side of lower mandible 5 inches.

No. . . . Mus. Bost. Soc. Straits of Magellan, Coll. La Fresnaye. (*Hyatt.*)

PYGOSCELIS TÆNIATA (Peale).

Le manchot papou, SONNERAT, Voy. 181, pl. 115.
Papuan Pinguin, LATH., Gen. Syn. vi. 565, and Gen. Hist. x. 388.
Aptenodytes papua, FORST., Comm. Soc. Reg. Götting. iii. 1781, p. 140, pl. 3. BONNATERRE, Ency. Method. i. 1782, p. 67, pl. 17, f. 3. GM., S. N. i., 1788, 556. LATH., Ind. Orn. ii., 1790, 879. VIEILLOT, Gal. Ois. pl. 299. GRAY, Voy. Ereb. and Terr. pl. 25.
Eudyptes papua, CASSIN, Orn. U. S. Expl. Exp. 1858, 264. Gould, P. Z. S. 1839, 98.
Spheniscus papua, SCHLEGEL, Urin. M. P.-B. iii. 1866, 5.
Eudyptes (*Pygoscelis*) *papua*, GRAY, Handl. iii. 1871, 98.
Pygoscelis papua, HYATT, Proc. Bost. Soc. N. H. 1871, p.
Aptenodytes tæniata, PEALE, Orn. U. S. Ex. Ex. 1848, 264.
Pygoscelis wagleri, SCLATER, P. Z. S. 1860, 392, No. 46.
"*Pygoscelis papuensis*, VAN DER HOEVEN." (*Gray.*)

Habitat maribus australibus. Ins. Falklandicis, Kergulenii, Macquarii. Nec. Ins. Papua, unde patet, nomen Scopolianum ineptum.

Staturâ medius; notaeo cum capite gulâque griseo-nigro, cœruleo-tincto, gastræo albo, vertice transversim albo-lunato, alis albo-marginatis, caudâ elongatâ, cuneatâ, rectricibus sexdecem, exterioribus albo-marginatis.

May be known at a glance, by the white semilune across the crown from one eye to the other, long tail (about as in *adeliæ*), and long slender much feathered bill, approximating to that of *Aptenodytes*.

No. 2282, Mus. Acad. Phila., adult, "Iles Croquets." Stands 25 inches high, but may be stretched. Tail about $5\frac{1}{2}$ inches, the outer feathers white-edged. Middle toe and claw 3.40. Tarsus quite naked; a little over an inch long. Wing 9 inches, the posterior border broadly white. The bill of this species stands quite alone among the penguins, saving *Aptenodytes*, in its length and slenderness and in the length combined with narrowness of the frontal antiæ. Whilst the culmen measures 2.75, the distance from the nasal feathers to the tip of the bill is only about 1.60; the nostrils are completely hidden, and not easy to discover in the dried state. The bill is really longer than it looks, the rictus measuring 5 inches; the progression of the feathers on the bill is a condition essentially similar to that of *adeliæ;* although the bills of the two look so different, this is merely due to the length of the terminal part in *tæniata.* If the terminal portion were cut off an inch, the bill of *tæniata* would be essentially similar to that of *adeliæ.* Sharing other features, especially the very long tail, *adeliæ* and *tæniata* seem to be most closely related species; and despite the difference in the bill, I think that the skulls of the two will be found of a single pattern. Some ornithologist will do good service by noticing the skulls and seeing whether they agree, and if so, how they compare with the three types of cranial structure. I am induced to surmise that the resemblance will be found closest with *Aptenodytes.*

No. . . . Mus. Acad. Philada. No locality recorded. In this specimen, apparently not quite mature, the fore half of the body above is gray, in decided contrast with the blue-blackish of the rest. The coronal crescent is evident. The bill appears to have been clear yellow, with black ridge and tip.

No. . . . Mus. Smiths. Inst. U. S. Expl. Exped., H. Eld, from Macquarie's Island, where Mr. Peale says (l. c.) it was found breeding in abundance, in January, with Crested Penguins.

No. . . . Mus. Bost. Soc., no locality given, Coll. La Fresnaye (*Hyatt*).

Dr. Schlegel quotes the Falklands, voyage of the Astrolabe and Zélée; Mr. Gray, also, Kerguelen's Island.

PYGOSCELIS ADELIÆ (H. & J.).

Catarractes adeliæ, HOMB. and JACQ., Ann. Sc. Nat. 1841, 320.
Dasyrhamphus adeliæ, HOMB. and JACQ., Voy. P. S., Ois. 1846, pl. 33, f. 1.
Eudyptes adeliæ, CASSIN, Orn. U. S. Ex. Ex. 1859, 352, 450, No. 685.
Spheniscus adeliæ, SCHLEG., Mus. Pays.-B. Urin. 9me. livr. 1866, 4.
Eudyptes (Dasyrhamphus) adeliæ, GRAY, Handl. iii. 1871, 99.
Pygoscelis adeliæ, HYATT, Proc. Bost. Soc. N. H. 1871, p. —.

Pygoscelis brevirostris, GRAY, Voy. Ereb. and Terr. Birds, pl. 28.
Aptenodytes longicauda, PEALE, U. S. Ex. Ex. Birds, 1848, p. 261, pl. 70, f. 2; p. 335, No. 696.
Eudyptes herculis, FINSCH, P. Z. S. Lond. 1870, pl. 25. (Juv.)

Habitat.—In maribus antarcticis: Adelia. Victoria.

Staturâ medius, caudâ longissimâ, cuneatâ, rectricibus linearibus, rostro brevi, crasso, recto, obtuso, ultra medium ptiloso, apice adunco, naribus plumis obtectis, palpebrarum marginibus nudis, flavis; notæo fusco, cœruleo-lavato, capite cum gulâ obscurioribus.

No. 15,698, Mus. Smiths., adult in perfect plumage, mounted; from the Antarctic Ocean, lat. 64° 40′ S., long. 103° 4′ E. from Greenwich, U. S. Expl. Exped., T. R. Peale: *type of Aptenodytes longicauda*, *Peale*, *l. c.*, and basis of Cassin's article, l. c. The tail is very long, the central feathers being upwards of 7 inches, though the lateral are only about 2, in consequence of the extreme graduation; all the rectrices are merely narrow linear laminæ, like pieces of whalebone with frayed edges. The tibial feathers cover the tarsus in front, but none grow on the tarsus itself, which is very short—only about an inch. Middle toe and claw 3.00; inner do. 2.25, outer do. 2.50; nails very long, but blunt; webs emarginate. The podotheca is entirely reticulate, except a few annular scales at the ends of the toes. The bill is very short, narrow and deep, and densely feathered beyond its middle. The antiæ reach within an inch of the tip, entirely covering the nostrils; the broad rounded-depressed and decurved culmen runs in a point on the forehead; its chord is 1.50 long. The feathers of the antiæ, and those between the mandibular rami, slope so obliquely and rapidly towards the edges of the bill, that the naked portion of the tomia is only 1.75 inches long, though the whole gape measures 2.50; the feathery extension in the interramal space is within .75 of the tip of the mandible. Depth of bill at base over .90. The short nasal groove is very narrow and oblique, running into the tomia behind the hooked portion, and behind widening into a feathered fossa where the nostrils lie. This specimen, as mounted, now stands a trifle over 2 feet high, but measures about 33½ inches (its length in the flesh was 31 inches—*Peale*). The bill is wholly dark colored—probably it showed some reddish in life; the feet appear to have been flesh-colored. The naked edges of the eyelids are yellow. The upper parts are fuscous, only slightly lightened with penguin-blue, of which each feather shows a trace; the whole head and upper throat are uniform smoky blackish-brown.

No. 15,667, Mus. Smiths., adult, mounted, same locality as the last, and perfectly similar: another example of *Apt. longicauda*, Peale.

No. 793, Mus. Acad. Phila., adult, ♂, "Iles Adelaides." Entirely similar to the foregoing. Tail 6.25 inches. I count 15 rectrices, and probably there were 16; none are white-edged in this species as in *tæniata*.

No. 2191, Mus. Acad. Phila., "New Zealand?" Very similar to the last; but apparently not quite adult, as the bill is weaker, and there are white specks in the dusky part of the throat.

No. 793*bis*, Mus. Acad. Phila., received with No. 693, and from the same locality. An immature bird, in the plumage of "*Dasyrhamphus herculis*." The throat is white to the bill, but there are a few scattered blackish feathers, showing incontestably that this part would have become dark.

Although we repose great confidence in the judgment of the accomplished ornithologist who lately proposed to separate from *adeliæ* a specimen in Count Ercole Turati's collection, yet we cannot hesitate to refer *E. herculis* to this species, even without examining the type. For according to Dr. Finsch's own showing, the only tangible difference lies in the white throat, which is surely a mark of immature plumage, however adult the specimen may otherwise appear. Every one of the black-throated penguins (all the family except *minor* and *antarcticus*) have the throat white at first; and in several cases we have actually traced the change, by insensible degrees. The British Museum examples, with white throat, lately printed by Mr. Gray as "*herculis*," were never suspected to be aught else than young *adeliæ*, before Dr. Finsch's article appeared. Dr. Schlegel reports a precisely similar "individu au premier plumage, de taille moins forte et offrant la gorge blanche, terre Victoria, acquis in 1863;" and we recognize the same condition in this one of the Academy's specimens.

The *Aptenodytes longicauda* of Peale was promptly identified with *adeliæ* by Cassin; and Mr. Gray soon recognized the same species in his *Pygoscelis brevirostris*.

PYGOSCELIS ANTARCTICA (Forst.).

Antarctic Pinguin, LATH, Gen. Syn. vi. 565, and Gen. Hist. x. 389.
Aptenodytes antarctica, FORST., Comm. Soc. Reg. Sc. Gött, 1781, iii. 141, pl. 4. GM., S. N. L. 1788, 557. LATH., Ind. Orn. ii. 1790, 879.
Eudyptes antarctica, GRAY, Voy. E. and T., Birds, pl. 26.
Pygoscelis antarctica, BONAP. HYATT, Proc. Bost. Soc. 1871.
Spheniscus antarcticus, SCHLEG., Urin. M. P.-B. iii. 1866, 5.
Eudyptes (Pygoscelis) antarctica, GRAY, Handl. iii. 1871, 99.

Habitat.—Maribus aust. et antarct. Ins. Falklandicis, Weddelii.

"Taille au dessous de la moyenne. Bec petit. Se distingue de toutes les autres espèces par le blanc occupant non seulement toutes les parties inferièures jusqu'au menton, mais encore les côtés de la tête jusqu'a l'occiput et le bas des freins, et parceque ce blanc n'est interrompu que par une raie noire entourant le devant de la gorge, traversant les joues, et se dirigeant sur le devant de la nuque. Bec noirâtre. Pieds rougeâtres." (SCHL.)

"Length 21 to 22 inches; tail $4\frac{1}{2}$ to $5\frac{1}{3}$ inches; wing $7\frac{1}{2}$ inches; tarsus 29 to 30 lines; middle toe 2 inches; bill (along the side) 27 to 28 lines; from the forehead 18 lines; height $7\frac{1}{2}$ lines." (SCHLEGEL.)

We have not seen this strongly marked species, and we are not aware that there is more than one specimen in the United States. This is in the Boston Society's Museum, and is an adult, from the La Fresnaye Collection; no locality assigned. (*Fide Hyatt.*)

The foregoing description is copied from Dr. Schlegel, who quotes two specimens in the Leyden Museum, from the Falkland and Weddell's Islands (Voyage of the Astrolabe and Zelée).

In the length of tail, feathering of the bill, and some other characters, it seems related to *tæniata* and *adeliæ*, and to be referable to the genus *Pygoscelis*. It forms, with *S. minor*, an exception to the general rule of coloration among penguins, in that the throat persists white.

EUDYPTES ANTIPODES (H. & J.).

Catarrhactes antipodes, HOMBR. and JACQ., Ann. Sc. Nat. 1841, 320. ID., Voy. au Pôle Sud de l'Ast. et Zélée, pl. 33, f. 2.
Eudyptes antipoda, GRAY, Voy. Ereb. et Terr. pl. 27. CASS., Ornith. U. S. Ex. Ex. 1859, 351, 450, No. 684.
Pygoscelis antipoda, BONAP.
Spheniscus antipoda, SCHLEG., Urinatores Mus. Pays-Bas, 9me, 1866, 9.
Eudyptes (Pygoscelis) antipoda, GRAY, Handl. iii. 1871, 99.
Aptenodytes flavilarvata, PEALE, Orn. U. S. Ex. Ex. 1848, p. 260, pl. 70, f. 1; p. 335, No. 695.

Habitat.—Ins. Aucklandicis, Campbelliana.

Staturâ medius; ecristatus, sed plumis capitis elongatis, linearibus; rostro brevi, crassiusculo, recto, apice maxillæ adunco, mandibulæ subtruncato; caudâ brevi, rotundata; suprâ griseo-cœruleus dilutior, infra albus, sed gulâ, necnon lateribus colli summi capitisque infimi brunnescentibus; plumis elongatis genarum flavicantibus, verticis flavicantibus nigro-lineatis, fasciis transocularibus in occiput conniventes flavioribus; rostro pallide incarnato.

No. 15,655, Mus. Smiths., mounted, adult, ♂ in nearly perfect plumage, from the Auckland Is., U. S. Ex. Ex., T. R. Peale: *type of Apt. flavilarvata Peale, l. c.;* basis of *Cass. l. c.* There are no true lateral crests as in the typical species of *Eudyptes*, but all the feathers of the face, and most of those of the crown, are lengthened and linear. The yellow of the cheeks and crown has a dull soiled shade, and that of the crown is sharply streaked with fine black lines, one on each feather; the unlengthened feathers of the hind head, and those over the auriculars and through the eyes, form a well-marked band of much brighter and purer sulphur yellow; the lower parts of the head, and uppermost of the neck, including the throat, have a peculiar brownish cast; and, altogether, the head markings are unique in the family. The under parts are white, up to the slight gular brownish just mentioned; the upper parts are of a pale watery blue, more dilute than on an average among the other species. The head markings, and lengthened feathers of the vertex, together with the points of form here to follow, show how the species is a link between true *Spheniscus* and typical *Eudyptes*. Bill stoutish, straight, tip fairly hooked, but under mandible hardly truncate, nasal sulcus as usual. The antiæ run out pointedly, about $\frac{1}{3}$ of an inch beyond base of culmen, but still do not conceal the nostrils; from their apices, the feathers rapidly retreat, to angle of the mouth, leaving the maxillar tomia entirely bare, while those on the under mandible similarly expose the whole tomia, although between the rami they reach within less than an inch of the end of the bill. Chord of culmen 2.10; depth of bill .85; antiæ to tip 1.75; gape 3.00: the anterior canthus is just over the angle of the mouth. Tail very short (under 2 inches), and much rounded, as in *Spheniscus demersus* or *minor*. The whole length of the bird is somewhat over 2 feet.

Schlegel reports one of the types of the species from the

"Océan Glacial Austral, Voyage de l'Astrolabe et de la Zélée." According to Gray, the British Museum examples are from the Auckland and Campbell's Islands. Judging from Mr. Peale's account, the Aucklands are a headquarters of the species.

The *Aptenodytes flavilarvata* of Peale was long ago referred by Cassin to its proper place.

EUDYPTES CATARRHACTES (Forst.).

Phaëton demersus, L., S. N. i. 219, nec *Diomedea demersa*, ibid. 214. Based on Edw. 49, and Briss. vi. 102.

Aptenodytes catarractes, Forst., Comm. Soc. Reg. Sc. Gött. iii., 1781, 145. Gm., S. N. ii. 1788, 558, No. 7: based on Edw. 48 = Linnæus's and Forster's bird.

Spheniscus catarractes, Schlegel, M. P.-B. 9me. livr. 8.

Eudyptes catarractes, Gray, Handl. iii. 1871, 98.

Pinguinaria cristata, Shaw, Nat. Misc. pl. 437.

——————— "*saltator*, Steph.," (Gray.)

Aptenodytes gorfua, Bonnaterre, Ency. Method. 1782, i. 68.

"*Aptenodytes chrysocome?*" Peale, Orn. U. S. Ex. Ex. 1848, p. 259, 335, No. 693 (testibus specim. ipsis).

? Le manchot happé de Siberie. Planche Enlum. No. 984.

Obs. This species is at once distinguished among the crested ones by the shortness of the tail, which in size and shape rather recalls *S. demersus.* This member is under three inches long, rounded, of fourteen narrow stiffish graduated rectrices. From either *chrysocome* or *chrysolopha* it is also known by its inferior size; and from *chrysocome*, its nearest ally, by the quite blue upper parts, as in *chrysolopha*, the color of the back of *chrysocome* being quite dark.

This appears to have been the earliest described of the crested species, and its synonymy is in such a state of confusion with that of the following, that probably it is now impossible to completely unravel it. Such points as we have been able to determine with some confidence, and which probably are correct, are given in connection with *chrysocome.*

No. 15,658, Mus. Smiths. Inst., Antarctic Ocean, U. S. Ex. Ex., T. R. Peale, mounted, not in perfect plumage. The feathers of the vertex are lengthened and linear, those of the forehead less so; all are blackish. The crests are only indicated by the yellowish superciliary lines of little lengthened feathers. Under-parts white to the bill, but the gular dark beginning to show; upper-parts strongly washed with penguin-blue. Bill brownish-red. Stands 19 inches high, and seems overstuffed; tail under 3, but still the coverts so short that the rectrices noticeably project. Chord of culmen 1.40; gape 1.75; height of bill at base .75; from antiæ to tip of bill 1.00; tarsus under 1.00; middle toe and claw under 2.50.

No. 45,513, Mus. Smiths. Inst., Orange Bay, Antarctic Ocean, U. S. Ex. Ex., J. W. Dyes, Feb. 1839; exactly like the last.

No. 45,512, Mus. Smiths. Inst., Cape Horn, U. S. Ex. Ex., T. R. Peale. Similar, but plumage a little more advanced. The dark gular area is here apparent, while the blackish feathers of the vertex and the yellowish superciliary bundles are a little longer, yet the latter do not form crests.

These three specimens represent the "*Aptenodytes chrysocome?*" of Peale, *l. c.* They appear to have been overlooked, unaccountably, by Mr. Cassin, when he did Mr. Peale's work over again; for the U. S. Ex. Ex. Ornithology contains no allusion to them.

No. . . . Mus. Acad. Philada., "Cape Horn. Presented by Dr. Ruschenberger, 5th Aug. 1857. J. C." Not adult, the throat being only partially blackish, and the crests merely indicated by yellow superciliary lines. It closely resembles three Smithsonian specimens. Chord of culmen 1.60; bill weak; tail barely 3 inches. It may be considered a suspicious circumstance that all these specimens referable to *catarractes* on account of the weak bill, short tail and slight crests, show characters reasonably explicable upon ground of immaturity.

No. . . . Mus. Bost. Soc., adult, Falkland Islands, Coll. La Fresnaye. (*Hyatt.*)

EUDYPTES CHRYSOCOME (Forst.).

Aptenodytes chrysocome, Forst., Comm. Soc. Reg. Sc. Gött. iii. 1781, 135, pl. i. Lichtenstein, Ed. Descr. Forst. 1844, 99. ? Gmelin, S. N. ii, 1788, 555, No. 1. (Quotes Forster and P.E. 984.)

Spheniscus chrysocome, Schl., M. P.-B. ix. 1866, Urin. 6.

Eudyptes chrysocome, Gould, B. Aust., vii. pl. 83 (testibus speciminibus typicis). Scl., P.Z.S. 1860, 392.

Eudyptes pachyrhyncha, Gray, Voy. E. & T. Birds, , pl. 17. Gray and Mitchell, G. of B. iii. pl. 176. Gray, Handlist, iii. 1871, 98.

Eudyptes nigrivestis, Gould, P. Z. S. 1860, 418.

Eudyptes nigriventris! Gray, Handlist, iii. 1811, 98, lapsu.

? ? Planche Enluminée, No. 984.

No. 59,242, Mus. Smiths. Inst., Falkland Islands, lately acquired under the name of "*Eud. nigrivestis*, Gould." Bill 1.70 (chord of culmen); from antiæ to tip of bill 1.10; gape 2.00; tail about 4; wing about 7. The upper parts are very dark, especially the head and neck, which show no blue at all; the crown is jet-black, its feathers moderately lengthened, those of the forehead not reaching the occiput. A narrow pale yellow line runs from near the base of the culmen over the eye, to the occiput, and there forms a curly tuft an inch longer. This specimen certainly shows nothing whatever different from ordinary *chrysocome*, nor does Gould's description (*l. c.*) give any tangible characters. He says, indeed, that his bird is "smaller than *chrysocome*," but the dimensions he assigns (length $21\frac{1}{4}$; bill 2; tail 4; tarsi $\frac{7}{8}$) do not bear out this statement; nor do any of the other characters hold. We judge from the nature of Mr. Gould's remarks that he compared his bird with *chrysolopha*, from which it is different in the respects he mentions. In any event, we fully concur with Prof. Schlegel, in relegating "*nigrivestis*" to *chrysocome*. Mr. Gray admits the species, in the Handlist, but by an unfortunate slip of the pen, or typographical error, it there stands as "*nigriventris*."

No. . . . Mus. Acad. Philada., New Zealand, adult. Bill of immense size; chord of culmen 2.50, greatest depth 1.20; the culminal and tomial portions highly turgid. Upper parts very dark, scarcely washed with bluish, and quite black on the head; frontal and coronal feathers lengthened and linear; crests conspicuous, light straw yellow, reaching about an inch beyond the occiput. Stands about 19 high; tail about 4.50; middle toe and claw 3.75.

No. 1684, Mus. Acad. Philada., adult, Van Diemen's Land, Coll. Gould. *One of the types of chrysocome, Gould, B. A. pl. 83.* Almost exactly like the last specimen, but not quite so heavy; tail about 4 inches. This is unquestionably true *chrysocome*, and Dr. Schlegel therefore is proved in error in assigning "*chrysocome*, Gould," among the synonyms of *chrysolopha*, Brandt.

No. 1343, Mus. Acad. Philada. New Zealand, adult, labelled "*pachyrhynchus*, Gray?" in a handwriting I do not recognize. Essentially similar to, and certainly conspecific with, the foregoing specimens; though it looks larger, this is probably due to overstuffing. Stands 19 inches; tail 4; bill 2. The head is opaque velvety black, but there is considerable blue in the color of the back. The yellow crests are precisely as in the other specimens.

No. . . . Mus. Acad. Philada. Adult; no locality nor donor given. A specimen closely agreeing with the preceding, but the bill is not nearly so heavy, though stout for its length; it measures 1.60 long, by nearly one inch deep. The specimen is labelled "*pachyrhyncha*, Gray," by Mr. Cassin, and is certainly Gray's bird.

No. . . . Mus. Bost. Soc., no locality given, Coll. La Fresnaye. (*Hyatt.*)

This species, if it be different from *catarrhactes*, is to be distinguished by the rather larger size, very stout bill, decidedly longer tail, and prevalent darkness of the back, and especially the head. From *chrysolopha* it may be known by the less development of the crests, darker color, and heavier bill.

It is extremely difficult, if not impossible, to pick out, among the earlier notices of this species and *catarrhactes*, the names and descriptions that respectively apply to these two. Mr. Gray, indeed, throws all the eighteenth century synonymy upon *catarrhactes*, considering that his *pachyrhyncha* represents the original description of the present species; and it would be advantageous to agree with him on this point. But I cannot help thinking that Forster had two different species in view, that he named respectively *catarrhactes* (after Briss.) and *chrysocome* (n. sp.).

It is also Dr. Schlegel's opinion that Forster indicated the two species, so that I hardly see how he (Dr. Schlegel) relegates *chrysocome*, Gmelin and P. E. 984, to *catarrhactes*; for Gmelin quotes Forster, and whatever species Forster's is, that Gmelin's must also be. The Planche Enlum., also, shows a very dark bird. I know that in this matter my judgment is quite as likely to be at fault as Dr. Schlegel's is, but I think that, all things considered, it may be best to accept the synonymy as it is here arranged, letting "chrysocome" mean *chrysocome*, and "catarrhactes" mean *catarrhactes*, in every instance, without attempting an identification upon the vague and unsatisfactory descriptions that the older authors gave.

EUDYPTES CHRYSOLOPHA, Brandt.

Eudyptes chrysolopha, BRANDT, Bull. Acad. Petersb. ii., 324. SCHLEGEL, M. P.-B. Urin. p. 7 (Excl. syn. "*chrysocome* Gould.").

"*Eudyptes chrysocome*, PELZELN" (nec Forst.). Novara Reise, Vögel, p. 140, pl. 5. (*Auct. Schlegel.*)

E. præcedenti simillimus; sed rostro debiliore, notæo paululum clariores cristis lateralibus longissimis, procul ultra occiput porrectis, et plumi, coronalibus omnibus elongatis.

Habitat.—Maribus australibus. Ins. Falklandicis.

No. . . . Mus. Acad., Philada. No locality given. The upper parts are rather lighter colored (bluer) than in *chrysocome* (much as in *catarrhactes*), but the difference is not well marked; the head, however, has a decided bluish cast hardly visible in the opaque black of *chrysocome.* All the coronal feathers are longer, more slender, and stiffer than I have ever seen them in *chrysocome*, extending nearly two inches beyond the occiput, and forming a median vertical black crest connecting the yellow lateral plumes. The longest yellow plumes are full 3 inches in length, and reach over 4 inches behind the eye—about 7 inches from the tip of the bill: they are accompanied to their very ends by a few of the longest black plumes. This is a condition I have never seen equalled in any specimen of *chrysocome*, though the difference after all is not so decided. The bill is no shorter than in some specimens of *chrysocome* (the chord of culmen measuring $1\frac{2}{3}$ inches long); but it is weaker than I have ever seen it in that species, being hardly $\frac{3}{4}$ of an inch deep. The tail is about 4 inches long; middle toe and claw nearly 3.00.

No. . . . Mus. Acad., Phila. No locality assigned. Exactly like the last, but the crests not quite so highly developed, though they are still noticeably longer than in *chrysocome.* The bluish cast of the upper parts, and even of the head, is well marked.

No. . . . Mus. Bost. Soc., Falkland Islands, Coll. La Fresnaye. (*Hyatt.*)

According to Dr. Schlegel, it is this species that is indicated in Gould's Handbook, p. 517, under the name of *Eudyptes* "*catarractes;*" and by Pelzeln, Novara Reise, p. 140, pl. 5, under the name of *Eudyptes* "*chrysocome.*" We do not, however, venture to so assign these names in our synonymy, especially since Dr. Schlegel is certainly wrong in his identification of Gould's "*chrysocome.*"

Although I am able to distinguish the three currently accredited species, in the few specimens examined, yet the distinctions are not of a very satisfactory nature, and I strongly suspect that when specimens enough shall have been compared, the supposed specific characters will melt insensibly into each other, so that, at most, only varietal distinction can be reasonably asserted.

Indeed, I am not sure that differences of age or season or special conditions of plumage may not be the sole basis of the supposed species.

EUDYPTES DIADEMATUS, Gould.

Eudyptes diadematus, Gould, P. Z. S. 1860, 419. Schlegel, Urin. M. P.-B. 1866, 9me, 8. Gray, Hand-list, iii. 1871, 98.

Habitat.—Ins. Falklandicis. Novâ Zealandiâ.

Eud. chrysolophæ et chrysocomæ similis, sed major, notæo obscuriore, fusco vix griseo-cœruleo lavato, plumis superciliaribus necnon frontalibus flavissimis, his nigro-lineatis, illis breviusculis, rectis.

No. 59,241, Mus. Smiths., adult, in perfect plumage, from the Falkland Islands, received under the name of "Eud. chrysolopha." The upper parts are very dark, with barely a trace of dull penguin-blue in some places, in others, as on the head, none at all. (In these respects quite different from its nearest ally, *chrysolopha.*) The intense yellow plumes, very slender, and perfectly straight, reach hardly an inch beyond the sides of the occiput (they are longer, curly, and not so yellow, in the other species); and on the forehead they coalesce to form a large orange spot, with sharp black lines, the terminal half of each feather being black. (In all the other three crested species the lateral bundles of yellow plumes remain strictly separate.) The other feathers of the crown are perfectly black, and not much lengthened. Bill larger and more robust than in the other crested species; nasal groove very strongly impressed, dividing the maxilla into the broad, depressed, culminal part, and the bulging tomial portions; on the under mandible the feathers ascend backwards from their point of extension between the rami, as usual, but do not reach the tomia at all, but retreat to the very angle of the mouth; while the corneous part of the mandible is defined along the line of these feathers by a raised border. Chord of culmen 2.25; gape 2.50; from antiæ to tip of bill 1.75; height of bill opposite base of culmen 1.15; width do. .85; wing nearly 8; tail 5.25; tarsus about 1; middle toe and claw 2.75; whole length of the dried skin, apparently not stretched, $2\frac{1}{4}$ feet.

No. . . . Mus. Acad., Philada. No locality given. Adult; as stuffed, stands 22 inches high; chord of culmen 2.15; gape 2.75, but not quite 1 deep at deepest place; tail about $4\frac{1}{2}$; wing $8\frac{1}{4}$. Similar to the Smithsonian specimen.

No. . . . Mus. Acad., Philada., male, adult, "Isles Croquets;" almost exactly like the preceding; bill not quite so large; stands about $21\frac{1}{2}$ inches high.

No. . . . Mus. Acad., Phila., "Isle Macquarie." Young, or at least imperfect plumage, the throat and sides of the head below the eyes being white, slightly clouded with dusky, indicating the blackish area of the mature state; but the plumes are as largely developed, the forehead is as yellow, and the bill is as large as in the adults above mentioned. It seems to be exactly like spec. No. 3 of Dr. Schlegel's catalogue, and is from the same locality. This concurrence of white throat with intensely yellow forehead is rather in favor of the validity of the species.

These specimens appear to have stood a long time unrecognized in the Academy, the richness of the ornithological department of which only gradually appears. They are unquestionably *diadematus*. We are also pleased to identify with this beautiful species, which seems strongly marked, and is at any rate recognizable on sight by the orange forehead and other characters, a specimen that has lain for some time in the Smithsonian, labelled "*chrysolopha*." It does not appear to be contained in the British Museum. Dr. Schlegel reports three examples at Leyden; two adults, one from the Falklands, the other from New Zealand; and an "individu à gorge et côtés de la tête blancs, du reste au plumage parfait; île Macquarie, au sud de la Nouv. Zéelande."

? A shade of doubt attaches, that this may be an extreme case of *chrysolopha;* for we have in the *Eud. nigrivestis* of Gould, which is not distinct from *chrysocoma*, a state of plumage as dark as that of *diadematus*. But *diadematus* is distinguishable on sight, and no intermediate specimens have been forthcoming.

SPHENISCUS MINOR (Forst.).

Aptenodytes minor, FORST., Comm. Soc. Reg. Sc. Götting. iii. 1781, 147, No. 9. GM., S. N. 1788, 558. LATH., Ind. Orn., ii. 1790, 881. PEALE, U.S. Ex. 1848, Birds, 259, 335, No. 694. GOULD, B. Aust. vii. pl. 84.

Spheniscus minor, TEMM., Man. Orn. i. 113. SCHLEGEL, Urinatores Mus. Pays-Bas, 9me livr. 10. HYATT, Proc. Bost. Soc. Nat. Hist. 1871, p.

Eudyptila minor, BONAP.

Eudyptes (*Eudyptila*) *minor*, GRAY, Handl. 1871, iii. 99.

Aptenodytes undina, GOULD, P.Z.S. 1844, xii. 57.

Aptenodytes s. Eudyptula undina, GOULD, B. Aust. vii. pl. 85.

Eudyptes (*Eudyptila*) *undina*, GRAY, Handl. iii. 1871, 99.

Little Pinguin, LATH., Syn. Birds, vi. 572, pl. 103; Gen. Hist. x. pl. clxxx.

Habitat in littoribus Australiæ australibus, necnon Tasmaniâ, Novazealandiâ.

Minimus inter omnes, rostro brevi, crassiusculo, recto, maxillæ apice adunco, naribus nudis, plumis amotis, cauda brevi, rotundata; supra griseo-cœruleus, infra albus.

No. 15,661, Mus. Smiths., ♀, adult, Boyauf I., N. Zealand, U. S. Ex. Ex., T. R. Peale. One of the types of *Peale*, *op. cit.* pp. 259, 335, No. 694, and of *Cassin*, *op. cit.* pp. 355, 450, No. 687. Stands, as mounted, a foot high; was probably 14 inches long; wing 4.25; tail 1.25; the rectrices scarcely surpassing the tectrices; culmen of bill, 1.25; gape, 1.75; from antiæ to tip, only 1.00; depth of bill at base, .45, its width there .25; tarsus .75; middle toe and claw, 1.66. The feet are wholly reticulate with hexagonal plates; the hullux is completely lateral, the end of its nail barely touching the ground. The color of the feet is now undistinguishable; but the webs and the toes towards their end appear to have been darker than the rest. The bill is much shorter than the head, slenderish, compressed, the hook of the maxilla barely overarching the end of the mandible; the nostrils are entirely unfeathered, and lie in a deep narrow sulcus that runs obliquely into the maxillary tomium at the beginning of its decurvature; the antiæ are acute, but only run out a little beyond the feathers on culmen, falling short of the nostrils. Feathers occlude the interramal space, and retreat in a straight line, obliquely upward and backward, to the angle of the mouth. Thus the bill is most like that of *Spheniscus demersus* in general characters, but somewhat approaches that of *Pygoscelis*. This is one of the only two penguins that never gain a dark throat; the pictura is perfectly simple—blue above, white below; the line of demarcation passes straight through the eye, shoulder, and thigh; a spot at the end of the under surface of the wing is blue, and the border of the wing is white.

No. . . . Mus. Acad., Philada., adult, "New Holland."

No. 1336, Mus. Acad., Philada., ♂, adult, Van Diemen's Land, from the Gould collection.

No. 1338, Mus. Acad., Philada., South Australia, from the Gould collection. A specimen still showing brown down in several places, the general plumage very rich blue. Bill weak, only 1.25 long, and .37 deep at base. (Compare Nos. 1340, 1341.)

No. 1337, Mus. Acad., Philada., from the Gould collection, Van

Diemen's Land. Like No. 1338, but with more extensive patches of gray down about the head, neck, and wings.

No. 1339, Mus. Acad., Philada., from the Gould collection, South Australia. Young, in downy plumage, grayish brown above, white below. Bill one inch long.

Nos. 1340, 1341, Mus. Acad., Philada., adults. Van Diemen's Land, from the Gould collection; *types of S. undina.* These specimens are slightly smaller than average *minor*, bluer than usual but not bluer than No. 1338, for example, and with rather weak bills. The chord of the culmen of No. 1341 is 1 inch, that of 1340 is 1.25, just as in No. 1338, and No. 15661. I cannot distinguish these specimens even as a variety.

Hyatt reports another of the U. S. Ex. Ex. specimens in the Boston Society's Museum, and one from the Coll. La Fresnaye; these, and several quoted by Gray and Schlegel, are all from the one or another of the localities above mentioned, and to which the species seems confined.

We cannot discover, in Gould's *undina*, any specific characters. The bird is one of the bluest of the penguins; and the shade of the plumage, as well as the hue of the bill and feet, varies with age or other changeable circumstances.

SPHENISCUS DEMERSUS (L.).

Manchot du Cap de Bonne Espérance, BUFF., P. E. 382.
Black-footed Penguin, EDW., Birds, pl. 94. f. 2.
Anser magellanicus, CLUS., Exot. p. 101.
Plautus pinguis, KLEIN, Av. p. 147.
Anser magellanicus clusii, WILLOUGHBY, 242.
Lesser pinguin, Phil. Trans. lviii. 37. Sparm. Voy. i. p. 24.
Cape pinguin, LATH., Gen. Syn. vi. 566, and Gen. Hist. 1824, x. 381.
Cape pinguin, var. A., LATH., Gen. Hist. x. 1824, 381; based on *Sph. nævius*, BRISS., and EDW., pl. 94. f. 1.; (= Gen. Syn. vi. 567, No. 5, A.).
Cape pinguin, var. B., LATH., Gen. Hist. x. 1824, 381.; based on *pinguin à lunettes*, PERNET, Voy. ii. 17, pl. 7, f. 3.; ID. p. 243, pl. 15. (= Gen. Syn. vi. 563, B.)
? *New Holland pinguin*, LATH., Gen. Hist. x. 1824, 388 (no citations).
Chiloe pinguin, LATH., Gen. Hist. x. 1824, 388, and Gen. Syn. Suppl. ii. 361. (Based on MOLINA.)
Three-toed pinguin, LATH., Gen. Syn. Suppl. ii. 361, and Gen. Hist. x. 1824, 393; based on Diomedea chilensis, MOLINA.
Spheniscus and *Spheniscus nævius*, BRISS., Orn. vi. 1760, 97, 99.
Diomedea chilensis et *chiloensis*, MOL., Nat. Chili, 1786, 210, 211.

Aptenodytes chilensis et *chiloensis*. Gm., S. N. i. 1788, 559.
Aptenodytes chiloensis, LATH., Ind. Orn. ii. 1790, 881.
Aptenodytes molinæ, LATH., Ind. Orn. ii. 1790, 881 (= three-toed pinguin of LATH., Gen. Syn.).
Diomedea demersa, L., S. N. i. 1766, 214, nec *Phæton dem.* ibid. 219. (Based on Will., Edw., Clus., and Briss., as above cited). Hab. "Cap. B. Spei."
Spheniscus demersus, TEMMINCK. SCHLEG., M. P.-B. 9*me* livr. 1866, Urin. p. 10. GRAY, Hand-l., iii. 1871, 98. HYATT, Proc. Bost. Soc. Nat. Hist. 1871.
Aptenodytes palpebrata, LICHT., Ed. Forst. Descr. An. 1844, 356.
Spheniscus humboldtii, Meyen, Nov. Act. Ac. Cæs. Leop. Car. 1834, xvi. Suppl. i. p. 110, pl. xxi. (Remarks upon the likelihood that it is the same as P. E. 382). Peru. SCLATER, P. Z. S. 1867, 337. (Chili.)

No. . . . Mus. Smiths. Inst., locality unknown, received June 4, 1862, from J. C. Macguire. Immature; entirely white below, with faint traces of a band across the lower throat; upper parts quite blue. As mounted, stands about 19 inches high; probably measured about 24 inches; alar expanse, 18; chord of culmen, 2.10; height of bill at base, .75

No. . . . Mus. Smiths. Inst., received with the last, locality unknown: collected March, 1846. Young bird, in the down, standing 13 inches high as mounted. The bill is weak and much shrunken; a large lozenge-shaped naked space surrounds each eye, and much of the sides of the under mandible, feathered in the adult, is also naked. The down is light smoky-brown, paler below, whitening on the belly.

No. . . . Mus. Acad. Phila., locality unknown. Apparently a youngish bird, the upper parts being brownish with slight bluish gloss. The space between the eye and bill, and an area at base of under mandible, are naked more extensively than usual.

No. . . . Mus. Acad. Phila., locality unknown. An adult, intensely colored. A narrow loral line, and the eyelids, are naked.

No. . . . Mus. Acad. Philada., locality unknown. Adult. Only the eyelids are perfectly naked. The under parts show a great number of the isolated black feathers usually seen in this species.

No. . . . Mus. Acad. Phila., locality unknown.

No. . . . Mus. Bost. Soc., young, Cape of Good Hope, Coll. La Fresnaye. (*Hyatt.*)

SPHENISCUS DEMERSUS, Var. MAGELLANICUS.

? *Le manchot des Hottentots; manchot à bec tronqué:* P. E. 1005 (whether this var., or true *demersus* is uncertain).

Collared pinguin, LATH., Gen. Syn. vi. 571; LATH., Gen. Hist. x. 1824, 391.

Magellanic pinguin, LATH., Gen. Syn. vi. 569; Gen. Hist. x. 1824, 383.

Aptenodytes magellanicus, FORST., Comm. Soc. Reg. Sc. Gott. iii. 1871, 143, pl. 5. LATH., Ind. Orn. ii. 880. Gm., S. N. i. 1788, 557. (Based on FORST., l. c., and MILL., Ill. t. 34.) PEALE, U. S. Ex. Ex. 1848, 258 and 335, No. 692. CASS, U. S. Ex. Ex. 1859, 335, 450, No. 692.

Spheniscus magellanicus, SCLATER, P. Z. S. 1860, 382.

Eudyptes (Pygoscelis) magellanicus, GRAY, Handl. iii., 1871, 99.

Aptenodytes torquata, FORST., l. c. p. 146. Gm., S. N. 1788, 558. LATH., Ind. Orn. ii., 1790, 880.

"*Aptenodytes platyrhynchus*, SCOPOLI." (Manchot à collier, Sonnerat, Voy., 180. pl. 114.)

"*Aptenodytes fuscirostris*, ILLIGER."

Aptenodytes brasiliensis, LICHT., ed. FORST. Descr. Anim., 1844, 355.

Spheniscus magnirostris, PEALE, Orn. U. S. Ex. Ex. 1848, p. 263, pl. 71, f. 1, et p. 335, No. 698, teste spec. typic. ipso! Deinde *S. demersus*, CASS, Orn. U. S. Ex. Ex. 1859, 354, specimen eundem referens.

Spheniscus demersus, ABBOTT, Ibis, 1860, 366.

Sph. demerso similis, sed major, notæo obscuriore, necnon collo antice torquato, fasciâ fuscâ per regionem inter gulam et pectus transductâ.

Habitat cum præcedente.

No. 15,659, mounted, in immature plumage, Tierra del Fuego, U. S. Expl. Exped., T. R. Peale: *type of Apt. magnirostris Peale.* The bill is one of the smallest (of *Spheniscus* proper) we have seen; the rugous parts are shrunken, and much of the bill is yellowish; the upper parts are lighter and bluer than is usual in this variety, and much as in ordinary *demersus*. There is no trace of the dark breast-band or of the lateral stripe; but the cervical half-collar distinctive of *magellanicus* is plainly apparent. This has decided us as to the proper determination of the specimen; and of course, with this identification, comes the reference of Peale's *magnirostris*, and Cassin's "demersus," here instead of to true *demersus*. In fact, we find the specimen labelled "magellanicus?" in a handwriting we do not recognize, and we observe that Mr. Cassin has queried his private No. 683, which refers to his catalogue (*op. cit.* p. 450, No. 683), although there and on p. 354 (*op. cit.*) he lets the name "demersus" stand.

No. . . . 15,669, adult in perfect plumage, mounted, Tierra del Fuego, U. S. Ex. Ex., basis of Peale and Cassin, ll. cc. Bill, and other details of structure, exactly as in *demersus*. Larger: about 27 inches long, standing 24 as mounted; chord of culmen, 2.30; gape 2.90, tomia naked 2.25, antiæ to tip of bill 2.00, depth of bill at base 1.00, width do. .75; nostrils an inch from end of antiæ; wing about 8; tarsus, 1.50; middle toe and claw, 3.00; outer do., 2.66; inner do., 2.00. Darker than average *demersus;* the cervical half-collar and pectoral lateral horse-shoe-shaped water-line both perfect; the perfect white line of the head starts at side of base of bill, runs over eye, curves down behind ear, somewhat expands below it, and then passes forward to the throat where it joins its fellow, thus cutting off the dark collar from the general gular black.

No. 15,656, Mus. Smiths. Inst., same locality and source as the last, is also in adult condition, and perfectly similar to No. 15,669 in color, but smaller; now it stands, as mounted, only about 1½ feet, but seems to have been about 2 feet long.

No. . . . Mus. Acad. Phila. Locality unknown.

No. 1644, Mus. Acad. Phila. Straits of Magellan. Adult.

No. 1514, Mus. Acad. Phila. "Amérique meridionale."

No. . . . Mus. Bost. Soc., adult, Tierra del Fuego, U. S. Ex. Ex. (*Hyatt.*)

AUGUST 6.

The President, Dr. RUSCHENBERGER, in the chair.

Nine members present.

Note on Cottus Grœnlandicus, Fabr.—Dr. GILL communicated the results of certain observations made on *Cottus grœnlandicus*, Fab. (*Acanthocottus grœnlandicus*, Girard), during the past season at the island of Grand Manan, New Brunswick.

Two forms, agreeing in most respects except color, have been always noticed together by those who have been in a position to observe numbers. The most obvious external difference between these consists in the color, one having the flanks downward and the abdomen yellowish, while in the other form the abdomen is spotted with white. Descriptions in several works have been based on only one of these forms, but in Günther's "Catalogue of the Acanthopterygian Fishes" (II. p. 161), under the general term "*Cottus grœnlandicus*," the two forms are mentioned, one being "Var. α. Sides of the belly with large white spots;" the other "Var. β. Sides irregularly marbled;" each was represented in the British Museum by four specimens. No suspicion of any sexual relation of those forms was expressed.

The universal occurrence of these two forms together and in approximately equal numbers led the speaker to suspect that they really represented sexual conditions of the same species. Dissection confirmed the suspicion, and it was found that all individuals with white spots on the abdomen were males, and all without, females. In order to remove doubt, sixteen specimens were dissected, all caught within a couple of hours, at Grand Manan, from the wharf of Mr. Walter McLaughlin.

Six of these had (1) the belly ornamented with very distinct white round spots, and (2) the ventral fins were white, banded with black; all these were furnished with spermaries; (3) the spiny tubercles on the sides were also more numerous, and developed (below as well as above) the lateral line; (4) the spinous dorsal fin was appreciable higher, and (5) several of the median rays (sixth to eleventh) of the pectoral fins were muricated or studded with minute tubercles.

Of the other form, ten specimens were examined and found with well-developed ovaries (the right larger than the left). These were (1) yellowish towards the belly, and with (2) the ventrals yellow, banded with black; (3) the spiny tubercles were, as a rule, less developed, and in one specimen sparsely (2–4) existent below the lateral line; (4) the spinous dorsal was comparatively lower, and (5) all the pectoral rays were perfectly smooth on their inner surfaces.

The intestinal canal from the cæca to the anus, when extended, was about twice as long as the entire fish (including the caudal).

The cæca were counted in five individuals, and in three were nine in number; in one ten; and another eleven.

The rays of the fins were also counted, with the following result:—

MALES.

1. D. x., 16.	A. 13.	P. 18	(6th to 11th muricated).
2. "	"	"	(7th to 11th ").
1. "	14.	"	(5th to 8th ").
1. "	"	"	(6th to 10th ").
1. x. i. 17 !	"	"	(8th to 10th ").

FEMALES.

1. D. ix. 16.	A. 13.	P. 17 (both sides).
1. ix. 17.	"	18.
1. ix. 19.	14.	18.
1. x. 15.	13.	17 (both sides).
1. x. 16.	13.	18.
1. x. 16.	14.	"
1. x. 17.	13.	"
1. x. 17.	15.	"
2. x. 18.	14.	18.

There thus appears to be a considerable range of variation in the number of rays. The most common number is represented by the formula D. x, 16–17, A. 13, P. 18. The number of pectoral rays, as might *à priori* be expected, is the most constant.

There seems to be no valid reasons for the distinction of "*Acanthocottus variabilis*," Ayres, and "*Acanthocottus mucosus*," Ayres, from *Cottus grœnlandicus*, and certainly no distinctive characters have been assigned.

In answer to questions, it was added that no definite relation existed between the numbers of rays of the vertical fins and the number of vertebræ, nor was there any corresponding variation. The most common number of vertebræ in fishes is ten dorsal and fourteen caudal (10 + 14), but the difference in the number of rays in forms thus distinguished is very considerable.

AUGUST 13.

The President, Dr. RUSCHENBERGER, in the chair.

Nine members present.

Mr. THOMAS MEEHAN said he had observed this season that the spawn of the common mushroom (*Agaricus campestris*) radiated from a central point in a manner which he thought had not been recorded by other observers. As usually seen, the mushroom seemed to rise from various points along the mycelium, or underground thread, without any regular order or system. Fungi, like flowering plants, had other modes of propagation besides seeds. As in the potato, we had one system elevating its parts into the atmosphere ending in seeds, and another sending thready stolons under ground terminating in distended stems or tubers—the threads dying away after the tubers were mature—so in the common agarics we have the parts known as the "mushroom" which elevates itself into the atmosphere, and produces reproductive bodies like seeds called spores; and we also have underground white threads starting out from the base of the mushroom which at their terminus bear buds which next year become mushrooms, as the swollen ends or tubers of the potato produce plants. The observations, which he supposed new, referred to the distance which the spawn-threads traversed in one season, and the regular manner in which the mushrooms appeared from the parent of the past year.

In the autumn of 1871, passing over a part of his farm where he had seen no mushrooms in previous years, he found two solitary specimens several yards apart. This season, where these two were gathered last year, there were two exact circles of several dozens of mushrooms, the circles about nine feet in diameter. The mushrooms were wholly confined to a belt of about six inches on the margin of this circle. The diameters in both instances being the same, led to the fair inference that about four feet is the distance travelled in one season by the spawn of the mushroom. Of course, next year, when the spawn starts from the bases of the mushrooms now in the circle, some will go back over the distance traversed this year, and the appearance of circles will be broken up, and it was owing to the fact of only two appearing in this way, that the radiating character could be observed.

In England there are fungi which are known to radiate their threads from a common centre in this way. These destroy the vegetation which they come in contact with on their route, and make brown circular spots known to the common people as Fairy rings. The grass and vegetation inclosed in the mushroom rings were not destroyed as in those instances, but exhibited a slight bluish tint which that beyond the circle did not, which tint was a sign of slight injury. The facts that the mycelium radiated in so exact a circle, terminating in a bud which produced the mushroom; and that this radiation covered a circle nine feet in diameter, he thought novel facts worth recording.

AUGUST 20.

Mr. TRYON in the chair.

Ten members present.

AUGUST 27.

The President, Dr. RUSCHENBERGER, in the chair.

Eleven members present.

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

DESCRIPTIONS OF A NEW RECENT SPECIES OF GLYCIMERIS, FROM BEAUFORT, NORTH CAROLINA, AND OF MIOCENE SHELLS OF NORTH CAROLINA.

BY T. A. CONRAD.

GLYCIMERIS, Klein. H. and A. Adams.

G. BITRUNCATA. Pl. 7, fig. 1. Short, rhomboidal, ventricose, contracted, and obliquely truncated anteriorly; posterior margin oblique, slightly emarginate, cardinal tooth in right valve small, compressed, flattened on the posterior side; pallial sinus widely and obtusely rounded.

Locality. Fort Macon, N. C. A. C. Beals, U. S. A.

This interesting shell was sent to the Academy by Dr. Yarrow, from Fort Macon. I suppose it to be a recent shell, on account of its polish, and part of the unaltered ligament remaining. Two specimens were found. It is the only recent species of GLYCIMERIS inhabiting the coasts of North America. There are five species in the Miocene of Virginia and North Carolina. The genus PANOPŒA is only represented in North America by P. ARCTICA, *Lam.*, which inhabits the Banks of Newfoundland.

DONAX, Lam.

D. IDONEUS. Pl. 7, fig. 2. Shell triangular, elongated, ventricose on the posterior side; anterior side flattened, cuneiform, rounded at the extremity; posterior side acutely rounded at the end, margin very oblique, concave, disk radiated with impressed lines.

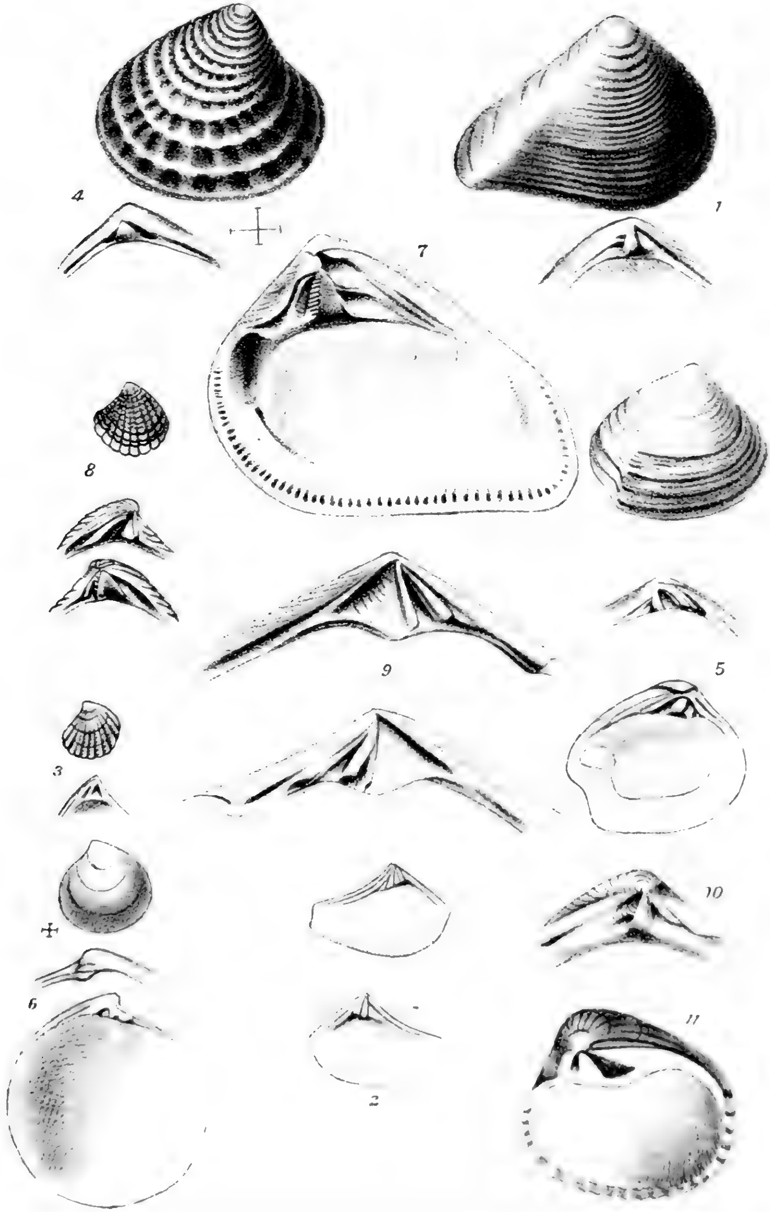
Locality. Coast of North Carolina, probably from a Miocene-bed under the sea. It was found by Dr. Yarrow, U. S. A.

OSTRENOMIA. Conrad.

Shell inequivalved, irregular, substance laminated as in OSTREA, hinge with a triangular cartilage pit; right valve with a deep notch or sinus having an internal raised margin; left valve with an angular bifurcating dentiform process at the base of the cartilage pit; muscular impression one in each valve.

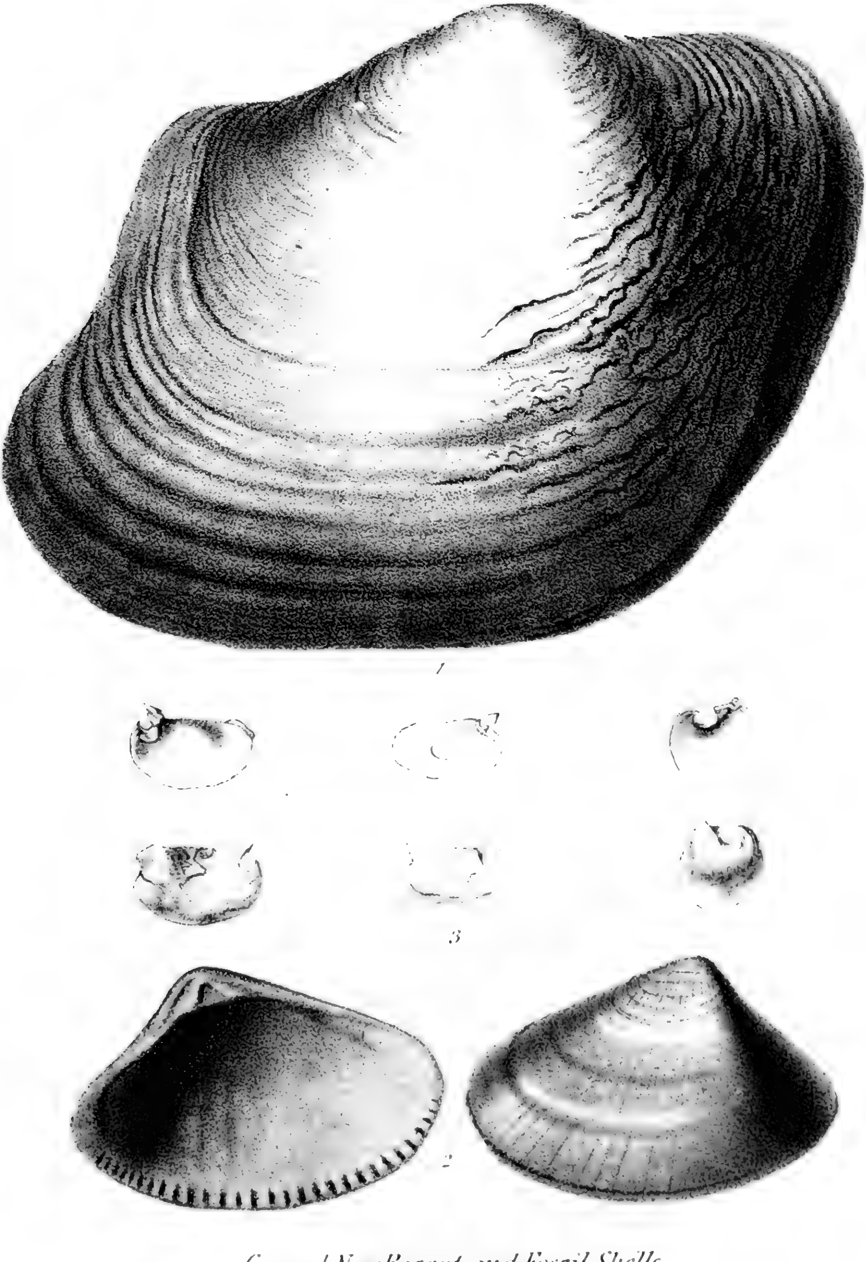
O. CAROLINENSIS. Pl. 7, fig. 3. From the Eocene of North Carolina, where it was found by Prof. Kerr, State Geologist.

Prof. Morse has shown that *Anomia ephippium* is a rover in the first stage of existence, then fixed by a byssus which issues



Conrad Illustrations of Fossil Genera of Shells

Conrad. Illustrations of Fossil Genera of Shells



Conrad. New Recent and Fossil Shells of North Carolina

from a sinus in the front margin of the shell; and I have stated that Pulvinites has a similar mode of growth. Deshayes describes and figures an Eocene Anomia, *A. cazenovei*, in which the supposed law of retardation is conspicuously indicated by the large size of the shell, although still retaining an incompleted foramen, and now we have this character, probably as a permanent one, associated with the hinge and structure of Ostrea, linking the two genera more closely than was heretofore apparent.

Ostrenomia has the same affinity to Ostrea that Pulvinites has to Isognomen, Klein. (Perna, *Brug.*)

September 3.

Dr. Bridges in the chair.

Seventeen members present.

The following papers were presented for publication:—

"Catalogue and Synonymy of the Family Laseidæ." By Geo. W. Tryon, Jr.

"Catalogue and Synonymy of the Family Galeommidæ." By Geo. W. Tryon, Jr.

"Catalogue and Synonymy of the Family Leptonidæ." By Geo. W. Tryon, Jr.

Remarks on the Habits of an Ant.—Prof. Leidy remarked that in his recent visit to Fort Bridger, Wyoming, in many places he observed the nests or hills of an ant, which reminded him of a communication formerly made to the Academy by Mr. Lincecum, on the Agricultural Ant of Texas (1866, 323). The ant-hills consisted of conical piles of gravel from one to two feet in diameter and from six inches to a foot in height, occupying the centre of a bare, circular level several yards in diameter. The mode of formation and object of the circular space were not ascertained. Probably it was the accidental result of the insect feeding on all kinds of vegetation growing within a circumscribed limit. Mr. Lincecum described similar circles, or pavements as he calls them, and stated that the ants allow nothing to grow upon them excepting a certain grass, *Aristida stricta*, from which they collect the seeds when ripe.

September 10.

The President, Dr. Ruschenberger, in the chair.

Twenty-three members present.

The following paper was presented for publication:—

"On the Agency of Insects in obstructing Evolution." By Thos. Meehan.

Remarks on Mineral Springs, &c., of Wyoming and Utah.—Prof. Leidy observed that, in his recent trip to Wyoming and Utah, he had had the opportunity of seeing a few of the mineral springs which are so numerous and varied in character, west of the Rocky Mountains.

In Pioneer Hollow, about fourteen miles west of Fort Bridger, and a couple of miles from the Union Pacific Railroad, there are about a dozen springs within the extent of a mile. These resemble the famous Saratoga Springs of New York. The waters are cool, slightly alkaline, of an agreeable taste, and highly impregnated with carbonic acid. The springs range from a foot to fifteen feet in diameter. Each forms a circular mound or crater from one to three or four feet in height composed of a ferruginous silicious sinter. The waters pour gently over the edge of the craters, which have been deposited very slowly during a long period of time, as the amount of silex in solution in the water is probably exceedingly small. Abundance of a green filamentous alga grows in the springs, apparently a species of oscillatoria. No animal forms were detected in them. The rocks contiguous to Pioneer hollow consist of reddish and yellow indurated clays and sandstones, in nearly horizontal strata. I detected no fossils in them, but suspect from their contiguity that they are of tertiary age.

About twenty-two miles from Fort Bridger, in the same direction as the former, there is an oil spring, the product of which resembles the so-called lubricating oil. Judge Carter is making the experiment of boring to render the spring more productive. The neighboring rocks are highly inclined, and probably are of cretaceous age.

A mile or two north of Salt Lake City there is a warm spring with which a sanitary establishment is connected. The water is strongly saline and is impregnated with sulphuretted hydrogen. Its temperature I found, with an ordinary thermometer, to be 98°. A mile or two further north, on the Utah Central Railroad, there is a similar spring with a higher temperature, which I found to be 128°. The water gushes forth abundantly from beneath a rock and forms a clear pond, with the bottom covered with a bright-green alga. This appears also to be an oscillatoria. Masses of it floating near the edge of the pond were white on the upper or exposed surface. This I suspected to be due to free sulphur, and indeed when the alga was exposed to the flame of a spirit-lamp it gave out an indistinct odor of sulphur, though the result was not so marked as I had anticipated. The water is strongly saline to the taste and is impregnated with sulphuretted hydrogen. No animals were detected in the water—not even microscopic forms. The waters of these springs finally pour into Salt Lake.

Salt Lake, as is well known, is remarkable, like the Dead Sea, for the concentrated condition of its briny water, due to the accumulation of the saline matters by the evaporation of the water which has no river outlet. The many salt springs which empty in the lake must have greatly contributed to the accumulation of the saline constituents. The water of the lake is intensely salt to the taste, and is said to contain a fifth of its weight of salt. This, as well as some other points, I have not been able to test, from my collections not yet having arrived. The much greater extent of the lake in former times is apparently confirmed by the ancient shore lines seen high up on the sides of the neighboring mountains. Two of these ancient shore lines, at different heights, preserve their horizontality and parallel character for miles along the base of the Wasatch Mountains, and form a quite conspicuous feature of the landscape of Salt Lake Valley. They reminded me of the view given in Lyell's Antiquity of Man, of the parallel roads of Glen Roy in Scotland. On ascending to these ledges, behind the position of Camp Douglas, I found that they were hardly recognizable, and the description of the roads just mentioned applies to them so closely that it may be suspected they may have had the same mode of origin. I was informed that similar ancient shore lines are visible on the sides of the mountain islands of the lake.

Salt Lake is usually considered to be destitute of animal and vegetable life. Through the kindness of General H. A. Morrow, in command of Camp Douglas, I was enabled to visit the southwest shore of the lake. I observed a number of water-birds on its surface, among which were gulls and teal, and on the shore I noticed several curlew. Other birds, especially pellicans, were said to be abundant. These birds lead me to suspect the existence of fishes in the lake, though none have yet been noticed. I observed no peculiar aquatic plants growing at the border of the lake, and indeed the part of the shore I visited was entirely destitute of vegetation within reach of the water. The shore swarmed with a small black fly, which from the vast quantities of larva skins lying near, I supposed to have been derived from the lake. Never before did I see such a vast accumulation of any one species of animal. The flies formed thick rows near the water's edge like windrows of hay, and the bushes bordering the shore were loaded with them in such a manner as to remind one of swarms of black aphides. In walking along shore they rose before you in dense black clouds. So far as I could discover, the gulls and curlews appeared to be feeding on them. The remarkable crustacean *Artemia salina* has been abundantly found in the lake, as before indicated in this Academy. (*Proc.* p. 164.)

I also observed floating at the edge of the lake and thrown on shore an abundance of an alga, apparently a species of Nostoc. It was in irregularly globular masses, from the size of mustard-seed to that of a large pea, and was of an olive-green color.

SEPTEMBER 17.

Prof. FRAZER in the chair.

Fifteen members present.

September 24.

The President, Dr. Ruschenberger, in the chair.

Twenty-two members present.

The death of Prof. Edward Parrish was announced.

The following were elected members of the Academy:—

John P. Brock, Henry Leffman, M.D., Thos Sinnickson, Capt. Wm. Prince, U. S. A., Jas. C. Rea, M.D., Sarah P. Monks, John Doyle, and Thos. A. Robinson.

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

CATALOGUE AND SYNONYMY OF THE FAMILY GALEOMMIDÆ.

BY GEORGE W. TRYON, JR.

Family GALEOMMIDÆ, H. & A. Adams.

Genera of Recent Mollusca, ii. 479. 1857.

Genus **GALEOMMA**, Turton.

Zool. Journ., ii. 361, t. 13 f. 1. 1825.

Hiatella, Costa (not of Daudin or Brown), Ann. Sc. Nat., xv. 108. 1828.

Parthenope, Sacchi, Osserv. Zool. viii. 19. 1833.

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1. G. ANGUSTA, Desh. Zool. Proc. 170. 1855.
Sowb. Thes. Conch. iii. 174, f. 10. 1866.
Philippines.

2. G. ARGENTEA, Desh. Zool. Proc. 169. 1855.
Sowb. Thes. Conch. iii. 174, f. 13, 14. 1866.
Philippines.

3. G. AURANTIA, Lam. (*Psammobia*), Anim. s. Vert. v. 515. 1818.
G. Mauritiana, Sowb.
Philippines.

4. G. CHLOROLEUCA, Desh. Zool. Proc. 170. 1855.
Sowb. Thes. Conch. iii. 174, f. 12. 1866.
Philippines.

5. G. DENTICULATA, Desh. Conch. I. Reunion, 18. 1864.
Isl. Bourbon.

6. G. FORMOSA, Desh. Zool. Proc. 170. 1855.
Sowb. l. c. f. 11. 1866.
Australia.

7. G. INDECORA, Desh. l. c. 169. 1855.
Sowb. l. c. f. 15. 1866.
Ins. Masbate.

8. G. INFLATA, Desh. l. c. 170. 1855.
Sowb. l. c. f. 5, 6. 1866.
Ins. Masbate.

9. G. JAPONICA, A. Adams, Ann. and Mag. N. H. ix. 228. 1862.
Japan.

10. G. MACHROCHISMA, Desh. Zool. Proc. 171. 1855.
Sowb. l. c. f. 7, 8. 1866.
Philippines.

11. G. PAUCISTRIATA, Desh. l. c. 170. 1855.
Sowb. l. c. f. 9. 1866.

Philippines.

12. G. TURTONI, Sowb. Zool. Journ., ii. 361, t. 13, f. 1.
Thes. Conch. iii. 172, f. 1–4. 1866.

Europe.

Genus **LIBRATULA**, Pease.
Proc. Zool. Soc. 512. 1865.

1. L. PLANA, Pease. Zool. Proc. 512. 1865.

Pacific Islands.

Genus **THYREOPSIS**, H. Adams.
Zool. Proc. 14. 1868.

1. Y. CORALLIOPHILA, H. Adams, Zool. Proc. 14, t. 4, f. 8, 8 *a*. 1868.

Mauritius.

Genus **SCINTILLA**, Desh.
Zool. Proc. 171. 1855.

1. S. ADAMSI, Desh. Zool. Proc. 179. 1855.
Sowb. Thes. Conch. iii. 177, f. 9. 1866.

Philippines.

2. S. AMBIGUA, Desh. l. c. 168. Sowb. l. c. f. 1–4.

Philippines.

3. S. ANOMALA, Desh. l. c. 181. Sowb. l. c. f. 25, 26.

Philippines and Australia.

4. S. AURANTIACA, Desh. l. c. 179. Sowb. l. c. f. 5.

Australia.

5. S. BORNEENSIS, Desh. Sowb. l. c. f. 10.

Borneo.

6. S. CANDIDA, Desh. l. c. 177. Sowb. l. c. f. 33.

Philippines.

7. S. CROCEA, Desh. l. c. 175. Sowb. l. c. f. 63.

Philippines.

8. S. CRYSTALLINA, Desh. l. c. 177. Sowb. l. c. f. 53.

Philippines.

9. S. CUMINGII, Desh. l. c. 173. Sowb. l. c. f. 36–38.

Panama.

10. S. CUVIERI, Desh. l. c. 174. Sowb. l. c. f. 59, 60.

Philippines.

11. S. DECLIVIS, Sowb. Thes. Conch. iii. 179, f. 39. 1866.

12. S. Deshayesii, Sowb. l. c. 178, f. 50. 1866.
S. Layardi, Desh. (not *Galeomma*).

13. S. faba, Desh. Zool. Proc. 175. 1855.
Sowb. l. c. 177, f. 17.
Hab.?

14. S. flavida, Desh. l. c. 179. 1855.
Sowb. l. c. 180, f. 64. 1866.
Philippines.

15. S. Forbesii, Desh. l. c. 179. 1855.
Sowb. l. c. 176, f. 7, 8. 1866.
Borneo.

16. S. Hanleyi, Desh. l. c. 180. 1855.
Sowb. l. c. 179, f. 22, 27, 28. 1866.
Philippines.

17. S. hyalina, Desh. l. c. 180. 1855.
Sowb. l. c. 179, f. 23, 24. 1866.
Philippines.

18. S. hydatina, Desh. l. c. 177. 1855.
Sowb. l. c. 180, f. 56, 57. 1866.
Philippines.

19. S. hydrophana, Desh. l. c. 178. 1855.
Sowb. l. c. 180, f. 62. 1862.
Philippines.

20. S. incerta, Desh. Conch. Ins. Bourbon 17. 1864.
Mauritius.

21. S. Jukesii, Desh. Zool. Proc. 174. 1855.
Sowb. l. c. 177, f. 42, 43. 1866.
Port Essington.

22. S. lactea, Sowb. Zool. Proc. 517, t. 32, f. 4. 1865.
Borneo.

23. S. Layardi, Desh. (*Galeomma*), l. c. 169. 1855.
Sowb. Thes. Conch. iii. 175, f. 20. 1866.
Ceylon.

24. S. oblonga, Sowb. Zool. Proc. 517, t. 32, f. 3. 1865.
Borneo.

25. S. opalina, Desh. Zool. Proc. 177. 1855.
Sowb. Thes. Conch. iii. 179, f. 41. 1866.
Philippines.

26. S. ovata, Gould. (*Erycina*), Bost. Proc. iii. 252. 1866.
Sandwich Isles.

27. S. OVULINA, Desh. l. c. 174. 1855.
Sowb. l. c. 178, f. 47. 1866.
Philippines.

28. S. OWENII, Desh. l. c. 179. 1855.
Sowb. l. c. 177, f. 18. 1866.
Philippines.

29. S. PALLIDULA, Desh. l. c. 178. 1855.
Sowb. l. c. 176, f. 6. 1866.
Philippines

30. S. PELLICULA, Desh. l. c. 177. 1855.
Sowb. l. c. 180, f. 66, 67. 1866.
Philippines.

31. S. PHILIPPINENSIS, Desh. l. c. 176. 1855.
Sowb. l. c. 179, f. 31, 32. 1866.
Philippines.

32. S. PISUM, Sowb. l. c. 178, f. 54, 55. 1866.
Hab.?

33. S. POLITA, Desh. l. c. 169. 1855.
Sowb. l. c. 175, f. 19. 1866.
Philippines.

34. S. PORULOSA, Desh. l. c. 180. 1855.
Sowb. l. c. 177, f. 21. 1866.
Philippines.

35. S. PUDICA, Desh. l. c. 178. 1855.
Sowb. l. c. 176, f. 12. 1866.
Philippines.

36. S. RECLUSIANA, Desh. l. c. 178. 1855.
Sowb. l. c. 176, f. 13. 1866.
Australia.

37. S. REEVEI, Desh. l. c. 176. 1855.
Sowb. l. c. 179, f. 29, 30. 1866.
Philippines.

38. S. ROSEA, Desh. l. c. 178. 1855.
Sowb. l. c. 176, f. 11. 1866.
Philippines.

39. S. ROSEO-TINCTA, Tryon.
S. rosea, Sowb. (not Desh.) Zool. Proc. 517, t. 32, f. 5, 6. 1865.
Lizard Isles.

40. S. SCINTILLARIS, Desh. l. c. 175. 1855.
Sowb. Thes. Conch. iii. 178, f. 44. 1866.
Philippines.

41. S. SEMICLAUSA, Sowb. Zool. Proc. 577, t. 32, f. 1, 2. 1865.
Borneo.

42. S. SOLIDULA, Desh. l. c. 174. 1855.
Sowb. Thes. Conch. iii. 178, f. 48, 49. 1866.
Philippines.

43. S. SQUAMA, Desh.
Sowb. l. c. 180, f. 65. 1866.
Hab.?

44. S. SPLENDIDA, Desh. l. c. 169. 1855.
Sowb. l. c. 175, f. 14, 15. 1866.
Philippines.

45. S. STRANGEI, Desh. l. c. 181. 1855.
Sowb. l. c. 177, f. 16. 1866.
Moreton Bay.

46. S. STRIATINA, Desh. l. c. 176. 1855.
Sowb. l. c. 179, f. 40. 1866.
Philippines.

47. S. SUCCINEA, Desh. l. c. 176. 1855.
Sowb. l. c. 178, f. 58. 1866.
Philippines.

48. S. TENUIS, Desh. l. c. 176. 1855.
Sowb. l. c. 177, f. 34. 1866.
Philippines.

49. S. THORACICA, Gould, Bost. Proc. viii. 35. 1861.
Ousima.

50. S. TIMORENSIS, Desh. l. c. 174. 1855.
Sowb. l. c. 180, f. 61. 1866.
Ins. Timor.

51. S. TURGESCENS, Desh. l. c. 175. 1855.
Sowb. l. c. 178, f. 45, 46. 1866.
Moreton Bay.

52. S. TURGIDA, Desh. l. c. 175. 1855.
Sowb. l. c. 178, f. 51, 52. 1866.
Philippines.

53. S. VITREA, Desh. l. c. 178. 1855.
Sowb. l. c. 180, f. 68. 1866.
=*S. Cuvieri*, junior? (Desh.)
Philippines.

CATALOGUE AND SYNONYMY OF THE FAMILY LEPTONIDÆ.

BY GEORGE W. TRYON, JR.

Family LEPTONIDÆ, H. & A. Adams.

Genera of Recent Mollusca, ii. 477. 1857.

Genus **LEPTON**, Turton.

Brit. Bivalv. 62. 1822.

Turtonia, Alder, Cat. Moll. Dur. et North. 95, 1848.

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1. L. Adamsi, Angas, Zool. Proc. 910, t. 44, f. 11. 1867.
Port Jackson, Australia.
2. L. anomalum, Deshayes.
Hab.?
3. L. Clementinum, Carpenter, Mazat. Cat. 110. 1857.
Mazatlan.
4. L. Clarkiæ, Clark, Ann. Nat. Hist., 2d ser. 1852.
Forbes & Hanley, Brit. Conch. iv. 255, t. 132, f. 7.
England.
5. L. concentricum, Gould, Bost. Proc. viii. 33. 1861.
Sydney Harbor.
6. L. fabagella, Conrad, Am. Mar. Conch. 53, t. 11, f. 3. 1831.
7. L. firmatum, Gould, Bost. Proc. viii. 33. 1861.
Simon's Bay.
8. L. Japonicum, Adams, Ann. & Mag. Nat. Hist. ix. 228.
Japan.
9. L. lepidum, Say, Jour. Philad. Acad. Nat. Sci. v. 221. 1866.
United States.
10. L. longipes, Stimpson, Kurtz Catalogue.
North Carolina.
11. L. lucidum, Gould, Bost. Proc. viii. 33. 1861.
Hong Kong.
12. L. Merœum, Carpenter.
Monterey, Cal.
13. L. minutum, Fabricius, Faun. Grœn. 412.
Turtonia minuta, Forbes & Hanley, Brit. Conch. ii. 81, t. 18, f. 7 (Animal, t. 0, f. 1).
Mya purpurea, Mont. Test. Brit. Suppl. 21.
England, Greenland.

14. L. NITIDUM, Turton, Conch. Dith. 63. 1822.
Forbes & Hanley, Brit. Conch. ii. 92, t. 36, f. 3, 4.
VAR. *L. convexum*, Alder, Cat. North. et Dur. 93.
Forbes & Hanley, l. c. ii. 102, t. 36, f. 10
Europe.

15. L. PLACUNOIDEUM, Carpenter, Mazat. Cat. 111. 1857.
Mazatlan.

16. L. SQUAMOSUM, Mont. Test. Brit. i. 565. 1803.
Forbes & Hanley, Brit. Conch. ii. 98, t, 36, f. 8, 9, t. 0, f. 6.
L. nitidum, S. Wood, Crag. Moll.
Europe.

17. L. SULCATULUM, Jeffreys, Ann. Mag. Nat. Hist. 3d ser. 34, t. 2, f. 2, 1859.
Europe.

18. L. TRANSLUCIDUM, Souverb. Jour. de Conch. xi. 285, t. 12, f. 6, 1863.
New California.

19. L. UMBONATUM, Carpenter Panama Check List.

Genus **TELLIMYA**, Brown.
Brit. Conch. t. 14. 1147.

1. T. BIDENTATA, Mont. Test. Brit. 44, t. 26, f. 5. 1803.
Forbes & Hanley, Brit. Conch. ii. 75, t. 18, f. 6, 6, a.
Erycina faba, Nyst.
Erycina nucleola, Recluz, Rev. Zool. 331. 1844.
Mesodesma exigua, Lovén.
Norway—England.

2. T. DAWSONI, Jeffreys, Brit. Conch. ii. 216. 1863. V. 178. 1869.
Scotland.

3. T. DONACINA, Jeffreys, Brit. Conch. ii. 216. 1863. V. 178. 1869.
England—Shetland.

4. T. FERRUGINEA, Mont. Test. Brit. 44, t. 26, f. 5. 1803.
Forbes & Hanley, Brit. Moll. ii. 72 t. 18, f. 5.
Amphidesma Goodalliana, Leach, Synopsis.
Amphidesma purpurascens, Lam.
Tellimya elliptica, Bronw. Brit. Conch. 106, t. 42, f. 19.
Tellimya glabra, ibid. 107, t. 42, f. 20, 21.
Tellimya ovata, S. Wood, Crag. Moll.
Erycina Franciscana, Recluz, Rev. Zool. 330. 1844.
Montacuta tenella, Lovén, 197.
Europe.

5. T. JAPONICA, A. Adams, Ann. Mag. Nat. Hist. ix. 225. 1862.
Japan.
6. T. TUMIDA, Carpenter, Philad, Proc. 58. 1865.
Sts. of Fuca to San Diego, Cal.
7. T. TUMIDULA, Jeffreys, Brit. Conch. v. 177. 1869.
Shetland, Hebrides.

CATALOGUE AND SYNONYMY OF THE FAMILY LASEIDÆ.

BY GEO. W. TRYON, JR.

Family LASEIDÆ, H. & A. Adams.

Genera of Recent Mollusca, ii., 473. 1857.

Genus **LASEA**, Leach.

Brown, Brit. Conch., t. xx. 1827.

Poronia, Recluz. Revue Zool., 166. 1843.
Cycladina, Cantraine, Bull. Brux. ii., 399. 1835.

1. L. AUSTRALIS, Souverbie, Jour. de Conch. 287, t. 12, f. 8. 1863.
New Caledonia, Australia.
2. L. INCERTA, Recluz.
3. L. PARREYSII, Phil. Zeit. Mal. 72. 1847.
Australia.
4. L. PHYSOIDES, Lam. Anim. s. Vert. v. 493. 1818.
Port George.
5. L. PURPURATA, Phil. Zeit. Mal. 72. 1847.
Australia.
6. L. RUBRA, Mont. Test. Brit. 83, t. 27, f. 4.
Amphidesma nucleola, Lam. Anim. s. Vert. v. 493. 1818.
Erycina violacea, Scacchi, Cat. 6.
Cycladina Adansonii, Cantraine, Bul. Acad. Brux. ii. 1835
Bornia semilunum, Phil. Moll. Sicil. i. 14, t. 1, f. 16. 1836.
Poronia Petitiana, Chenu, Ill. Conch. t. 1, f. 2.
Cyclas Australis, Lam. Anim. s. Vert. v. 560. 1818.
Iceland, Norway, England to Mediterranean, W. Coast Africa to Cape Good Hope, Canary Islands, Massachusetts to Magellan's Straits, West Coast of North and South America, Singapore, Timor, Java, Australia.

7. L. SCALARIS, Phil. Zeit. Mal. 72. 1847.
Australia.

8. L. SPURCA, Recluz.

9. L. TRIGONALIS, Carpenter, Maz. Cat. 109. 1857.
Mazatlan.

Genus **THECODONTA**, A. Adams.

Ann. and Mag. N. Hist. xiii. 308. 1864.

1. T. SIEBALDI, A. Adams, loc. cit.
Japan.

Genus **KELLIA**, Turton.

Brit. Biv. 57. 1822.

Bornia, Phil. Moll. Sicil. 1, 13. 1836.
Chironia, Desh. Rev. Zool. 356. 1839.
Erycina, Recluz (not Lam.) Rev. Zool. 291. 1844.
Solecardia, Conrad, Proc. Phil. Acad. 155. 1849.

1. K. AUSTRALIS, Desh. Zool. Proc. 183. 1855.
Australia.

2. K. BALAUSTINA, Gould, Bost. Proc. 33. 1861.
Sidney, Australia.

3. K. BULLA, Gould, Bost. Proc. 33. 1861.
Loo Choo.

4. K. BULLATA, Phil. Archiv für Naturg. 51. 1845.
Sts. of Magellan.

5. K. BULLULA, Desh. Zool. Proc. 182. 1855.
Philippines.

6. K. COMPLANATA, Phil. Enum. Moll. Sicil. 1, 14, t. 1, f. 14. 1836.
Mediterranean.

7. K. CONVEXA, Gould, Bost. Proc. 33. 1861.
Cape of Good Hope.

8. K. CORBULOIDES, Phil. Enum. Moll. Sicil. 1, 14, t. 1, f. 15.
Mediterranean.

9. K. CRENULATA, Gould, Bost. Proc. 33. 1861.
Hong Kong.

10. K. CYCLADIFORMIS, Desh. Traité Elém. t. 11, f. 6–9.
Australia.

11. K. DENTICULATA, Desh. Zool. Proc. 182. 1855.
Borneo.

12. K. DUBIA, Deshayes, Zool. Proc. 183. 1855.
Guayaquil.

13. K. GUTTULA, Deshayes, Zool. Proc. 182. 1855.
Philippines.

14. K. GRATA, Deshayes, Zool. Proc. 183. 1855.
Philippines.

15. K. LAPEROUSII, Desh. Guerin's Mag. Zool. 1839.
VAR. *rotundata*, Carp. Jour. de Conch. 137. 1865.
VAR. *Chironii*, Carp. Jour. de Conch. 136. 1865.
Coast of California, northwards.

16. K. MAC-ANDREWI, Fischer, Jour. de Conch. 194, t. 9, f. 1. 1867.
North of Spain; Gironde, France.

17. K. MACRODONTA, Desh. Zool. Proc. 182. 1855.
Philippines.

18. K. MILIARIS, Phil. Archiv für Naturg. 51. 1845.
Magellan's Sts.

19. K. OBLONGA (? Lasea), Carp. Maz. Cat. 109. 1857.
Mazatlan.

20. K. PAPYRACEA, Desh. Zool. Proc. 183. 1855.
Columbia.

21. K. PARVA, Desh. Zool. Proc. 182. 1855.
Philippines.

22. K. PETITIANA, Recluz. Rev. Zool. 175. 1843.
Callao.

23. K. PLANULATA, Stimpson, Shells, N. E. 17. 1850.
Gould, Invert. Mass., 2d edit. f. 393. 1870.
K. rubra, Gld. (not Montagu.) Invert. 1st edit. 60.
Massachusetts.

24. K. PULCHRA, Phil. Zeit. Moll. 149. 1848.
W. America.

25. K. QUADRULA, Gould, Bost. Proc. iii., 252. 1850.
Fiji Isles.

26. K. ROTUNDA, Desh. Zool. Proc. 181. 1855.
So. Australia.

27. K. RUGOSA, Recluz.

28. K. SEMINULUM, Phil.

29. K. SUBORBICULARIS, Mont. Test. Brit. 39, t. 26, f. 6. 1803.
Erycina Geoffroyi, Payr. Moll. Corse, 30, t. 1, f. 3–5.
Erycina pisum, Sacchi. Cat. p. 6.
Bornia inflata, Phil. Enum. Moll. Sicil.
Oronthea Montaguana, Leach.
Tellimya tenuis, Brown, Ill. Brit. Conch. t. 42, f. 12, 13.

Cyclas pustula, Costa.
Cycladina clandestina, Costa.
VAR. *Kellia lactea*, Brown, Ill. Brit. Conch. 106, t. 42, f. 10, 11.
Europe, Canary, Isles, Massachusetts, Aracan (Hanley), *Mazatlan* (Carpenter).

30. K. SUBRUGOSA, Souverb. Jour. Conch. xi. 286, t, 12, f. 7. 1863.
New Caledonia.

31. K. SUBTRIGONA, Jeffreys, Ann. and Mag. Nat. Hist. 42, t. 2, f. 1. 1858. Brit. Conch. ii. 228. 1863.
England.

32. K. TELLINOIDES, Hanley, Zool. Proc. 340. 1856.
Philippines.

33. K. UNDULATA, Gould, Bost. Proc. viii. 33. 1861.
Kagosima.

34. K. ZEBUENSIS, Desh. Zool. Proc. 182. 1855.
Philippines.

Genus **CYCLADELLA**, Carpenter.
Zool. Proc. 270. 1865.

1. C. PAPYRACEA, Carp. Zool. Proc. 270. 1865.
Mazatlan.

Genus **PYTHINA**, Hinds.
Zool. Voy. Sulphur. 70. 1844.

1. P. ARCUATA, A. Adams, Zool. Proc. 47. 1856.
Indian Ocean.
2. P. COMPACTA, Gould (*Kellia*), Bost. Proc. viii. 33. 1861.
Hab.—?
3. P. CUMINGII, A. Adams, Zool. Proc. 47. 1856.
Indian Ocean.
4. P. DESHAYESIANA, Hinds. Voy. Sulphur. 70. 1844.
H. & A. Adams, Genera iii. t. 114, f. 9.
5. P. DESHAYESII, Orb. et Recluz. Rev. Zool. 299, 325. 1844.
So. Australia.
6. P. MACTROIDES, Hanley, Zool. Proc. 340. 1856.
Cape Good Hope.
7. P. NUCULOIDES, Hanley, Zool. Proc. 341. 1856.
Society Islands.
8. P. PAULA, A. Adams, Zool. Proc. 47. 1856.
9. P. PECULIARIS, A. Adams, Zool. Proc. 47. 1856.
Indian Ocean.

10. P. RUGIFERA, Carpenter, Philad. Proc. 57. 1865.
Sts. of Fuca.

11. P. STRIATISSIMA, Sowb. Zool. Proc. 317, t. 32, f. 7. 1865.
Borneo.

12. P. SUBLÆVIS, Carpenter, Mazat. Cat. 112. 1857.
Mazatlan.

13. P. TRIANGULARIS, A. Adams, Zool. Proc. 47. 1856.
Indian Ocean.

Genus **MONTACUTA**, Turton.

Conch. Dict. 102. 1819.

1. M. CHALCEDONICA, Carpenter, Mazat. Cat. 531. 1857.
Mazatlan.

2. M. CONVEXA, Gould, Bost. Proc. viii. 35. 1861.
Simon's Bay.

3. M. COQUIMBENSIS, Hanley, Zool. Proc. 340. 1856.
Coquimbo.

4. M. DIONÆA, Carpenter, Mazat. Cat. iii. 1857.
Mazatlan.

5. M. DIVARICATA, Gould, Bost. Proc. viii. 88. 1861.
Hakodadi.

6. M. ELLIPTICA, Carpenter, Mazat. Cat. 113. 1857.
Mazatlan

7. M. GOULDI, Thomson, Am. Journ. Conch. iii. 33. 1867.
New Bedford, Mass.

8. M. OBTUSA, Carpenter, Zool. Proc. 270. 1865.
Mazatlan.

9. M. SUBQUADRATA, Carpenter, Mazat. Cat. 113. 1857.
Mazatlan.

10. M. SUBSTRIATA, Mont. Test. Brit. Suppl. 25.
Forbes & Hanley, Brit. Moll. ii. 77, t. 18, f. 8, 8a, pl. 0, f. 2.
M. spatangi, Brusina, Contrib. 99.
Norway to Mediterranean.

11. M. TRANSVERSA, Forbes, Rep. Ægean Invert. 192.
Crete and Morea.

12. M. TUMIDULA, Jeffreys, Ann. & Mag. Nat. Hist. xviii. 396. 1866.
Hebrides

Genus **CYAMIUM**, Phil.

Archiv für Naturgesch. i. 50. 1845.

1. C. ANTARCTICUM, Phil. Archiv für Naturg. 50. 1845.
Gregory Bay, Patagonia.

2. C. ELEVATUM, Stimpson (Montacula), Shells of New Eng. 16. 1851.
Gould, Invert. Mass. 2d edit. f. 396. 1870.
Montacuta bidentata (not of Mont.), Gould, Invert., 1st edit. 59. 1844.
Coast of New England.

ON THE AGENCY OF INSECTS IN OBSTRUCTING EVOLUTION.

BY THOMAS MEEHAN.

Since so much which has been learned in regard to the agency of insects in the cross fertilization of flowers, I understand the drift of scientific thought to be in the direction of the general principle, that in the hypothesis of evolution insects play an important part. It does not seem to have occurred to any observer that they may act as an obstruction to any great departure from what we may take as the normal form—that but for them variations would probably often be much greater than they are.

It has fallen to my lot to observe and to place on record in the *Proceedings of the Academy of Natural Sciences of Philadelphia*, the *American Naturalist*, and elsewhere, that art has not so much to do with garden variations as generally supposed; that variations in nature are as great as in horticulture; and that the florist's credit is chiefly due in preserving the form which unassisted nature provided for him. It was at one time part of the essential idea of a species that it would reproduce itself. If any variation occurred in nature, it was taken for granted that seedlings from this variation would revert to the parent form. But it is now known that the most marked peculiarity in variation can be reproduced in the progeny, if care be taken to provide against fertilization by another form. Thus, the blood-leaved variety of the English beech will produce blood-leaved beeches; and, as I have myself found by experiment, the very pendulous weeping peach produces from seed plants as fully characteristic as its parent; and when the double blossomed peaches bear fruit, as they sometimes do, I have it on the authority of a careful friend that the progeny is doubled as its parent was. But I need not refer particularly to this. Any intelligent florist of the present age can testify to the fact, that varieties will reproduce themselves as fully as the original forms from whence they sprung.

I do not think botanists, as such, are so fully aware of these facts as the florists are. They scarcely admit of much inherent variation in form in nature; but look rather to hybridization, and insect agency in connection therewith, to account for the changes when they occur. In order to avoid the possibility of these agencies acting as the sole factors in evolution, I have generally taken a genus consisting of only one species in a given locality, to show how great is the variations in form, where no congenital species could mix with it. I have, for this, chosen *Epigæa repens*, *Chrysanthemum leucanthemum*, and the *Quercus neo-mexicana* (*Q. Gunnissonii?*) of the Rocky Mountains—papers which most of the readers of this will probably remember. Another familiar plant to illustrate this is the common yellow toad flax, *Linaria vulgaris*. In a handful of specimens gathered in an afternoon's walk, I find the following marked variations:—

In regard to the spur, which is generally as long as the main portion of the corolla, some have them only one-third or one-fourth as long; and in one instance the plant bears flowers *entirely spurless*. Dr. James Darrach, a member of the Academy, informs me that he believes he has, in years past, gathered a spurless form, but has neglected to place it on record. Then some plants bear flowers with spurs thick, and others with narrow ones; and while some have spurs quite straight, others curve so as to describe nearly the half of a circle. The lobing of the lower lip is various. In some cases the two lateral ones spread away from the small central one, leaving a free space all around it; at other times they overlap the central one so that it is scarcely seen. Sometimes the small central lobe is nearly wanting—often not more than half the depth of the two large lobes, and at times quite as full, when it may be linear, ovate, or nearly orbicular. The *palate*, as the deep colored process attached to the lower lip may be called, also varies. In color it is pale lemon, but often a brilliant orange. Sometimes it is but about the eighth of an inch in thickness; at others one-fourth, in flowers of the same size. In the case of the shallow flat palate, the attached lobes are patent, or even incurved; while in the thick ones they are very much reflexed. These two forms, when the extremes are selected, are as strikingly distinct as two species often are. Again, the palate is rounded and blunt at the apex; at other times almost wedge-shaped, or at least narrowing to a blunt point. The upper lip varies in proportionate length, sometimes not extending much beyond the palate, sometimes half an inch more; then the margins are sometimes bent down like the wings of a swooping bird; or upwards as in those of a rapidly descending one. Sometimes they are united and turned abruptly up at the apex, like the keel of the garden pea.

And now in regard to the bearing of all these facts on the great scientific questions of the day, we have to note first, that the plant is an introduced weed, with nothing allied to it anywhere, in the localities where we usually find it, with which it can possibly hybridize. The variations must be from some natural law of evolution inherent in the plant itself. Varieties of course may cross-fertilize as well as species; and some of these variations may be owing to one form fertilizing another form; but there can be no avoiding the fact, that at least the first pair of varying forms must have originated by simple evolution.

Now going back to our florists' experience the question occurs, that as varieties once evolved will reproduce themselves from seed, why does not some one of these *Linarias*, which has been struck off into some distinct mould, reproduce itself from seed, and establish, in a state of nature, a new race, as it would do under the florist's care? Why, for instance, is there not a spurless race? It is scarcely probable that the solitary plant, found on this afternoon's walk, is the only one ever produced. Dr. Darrach's recollection shows it is not a solitary case. The humblebee furnishes the answer. They, so far as I have been able to see, are the only insects which visit these flowers. They seem very fond of them, and enter regularly at the mouth, and stretch down deep into the spur for the sweets gathered there. The pollen is collected on the thorax, and of course is carried to the next flower. The florist, to "fix" the form, carefully isolates the plant; but in the wild state a spurless form has no chance. The bee from the neighboring flower of course fertilizing it with the pollen from any of the other forms.

If there were no bees, no agency whatever for cross fertilization, nothing but the plant's own pollen to depend on, there would undoubtedly be races of this linaria, which, again, by natural evolution at times changing, would produce other races; and in time the difference might be as great as to be even though generic. But we see that by the agency of the humblebee the progress of the newly evolved form is checked. The pollen of the original form is again introduced to the offspring, and it is brought back at least half a degree to its starting point.

The conclusion seems to me inevitable, that insects in their fertilizing agencies, are not always abettors, but rather at times conservators of advancing evolution.

October 1.

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

Eighteen members present.

The following papers were presented for publication:—

"Catalogue and Synonymy of the Family Astartidæ." By Geo. W. Tryon, Jr.

"Catalogue of the Family Solemyidæ." By Geo. W. Tryon, Jr.

Notice of a Corundum Mine.—Prof. Leidy remarked that he had visited a corundum mine recently opened on the farm of Mr. George Ball, in the vicinity of Unionville, Chester Co., Pa. The accumulation is perhaps the most extraordinary discovered, and its extent yet remains unknown. Detached crystals of corundum have often been found in the ploughed fields and roadsides of the neighborhood, and also masses or boulders of the same material have been discovered on the surface of the ground or buried in the local drift covering the deeper rocks. In several instances boulders of nearly pure corundum have been found in the locality up to several tons in weight. A company was led to seek for this important mineral, and for the purpose sunk a shaft in a neighboring hill of albite, but without success. Mr. John Smedley, an intelligent farmer, employed by the proprietors of the mine, was led to the discovery of the corundum by noticing the direction of the boulders in the surface drift. Tracing it to the top of the hill, he found it about five feet below the surface.

The corundum, as exposed to view at the bottom of a trench, appears as the crest of a large body or vein lying between a decomposing gneiss and a white talcose schist. The vein appears to extend in a western direction and towards the east turns at an obtuse angle to the northeast. The exposed portion may probably reach twenty or more feet and averages about six feet in depth and five feet in thickness at bottom, and is estimated to contain about fifty tons. How much further the vein extends west and northeast, and how far it reaches in depth and thickness, can only be determined by future mining. It looks as if it promised to be the most valuable deposit of corundum ever found.

The rock on the south side of the vein is the white talcose schist above mentioned. In immediate contact with the corundum it appears to be metamorphosed into the material described a few years ago by our fellow member, Mr. Lea, under the name of Lesleyite. The schist on the declivity of the hill is contiguous to steatite and serpentine.

The corundum is the pure material, and is not emery. The masses are made up of a close aggregation of crystals with the intervals occupied with margarite. Some of the fissures and surfaces of the masses display large and beautiful crystalline plates of margarite, and occasionally unusally fine crystals of diaspore. Some of the crystals of corundum appear to have undergone partial metamorphosis into margarite. The corundum is bluish-gray, of very compact texture, and does not cleave so readily as the North Carolina mineral.

The various specimens of corundum and other minerals found in association with it, presented to the Academy this evening by Mr. Ball, were obtained at the locality described.

OCTOBER 8.

The President, Dr. RUSCHENBERGER, in the chair.

Seventeen members present.

Mr. THOMAS MEEHAN remarked, that as botanists well knew, *Quercus prinoides* seldom grew more than two feet in height. It was one of the smallest of shrubs. In his collections in Kansas, he found oaks in the vicinity of Leavenworth, which made small trees from ten to fifteen feet high, and with stems from one to two feet in circumference. He was entirely satisfied that it is identical in every respect but size with the *Q. prinoides* of the eastern States.

Among trees there are few which produce forms as low shrubs; but the *Pinus Banksiana*, in the East but a bush of five or ten feet, grew often forty feet along the shores of Lake Superior; the *Castanea pumila*, Chinquapin chestnut, when it gets out of the sands of New Jersey into the clayey soils west of the Delaware, often grew as large as many full grown apple trees; while the *Celtis occidentalis*, which in the East is generally but a straggling bush along fence corners, is in Ohio a large spreading tree with enormous trunk, and in Indiana is as lofty and as graceful as an elm.

He also exhibited a section of a stem of *Wistaria sinensis*, and called the attention of members to a curious arrangement of the wood and bark. The vertical section showed by the annual rings of wood that it was about twelve years old. After the eighth year's circle there was a layer of bark, and over this layer two more circles of wood. On a portion of the section another layer of bark had formed between the tenth and eleventh years' circles of wood. The bark seemed to be wholly of liber, the cellular matter and external cortical-layer of the regular bark appeared to be wanting. A longitudinal section showed where these internal layers of bark extended no further upwards, and at this point there was an evident flow of wood from the interior over and down this layer of inclosed bark.

He remarked that this section of wood was taken from a stem which had been led to support itself in an upright position. When the *Wistaria* is permitted to trail along the ground numerous rootlets are formed along its length. He thought from the appearance of the wood, in the specimen presented, that rootlets had partially formed in these erect stems, pushing through the liber, and then instead of penetrating entirely through the bark, and forming perfect rootlets, they remained within the cellular matter, and descending joined with the regular woody layer in forming an annular course of wood. This explanation was the more plausible, he thought, from the fact that woody stems formed on the ground. Where the rootlets went quite through into the earth, the stems were nearly regularly cylindrical; but these upright stems on which rootlets were never seen had an irregular fluted appearance; of course, this explanation does not accord with the formation of wood in ligneous structures as generally understood; but he could not understand how the appearance presented could have occurred in any other way, than as he had supposed.

Attention was called to a twin apple, on the table, with two stems and stem cavities, and two calyx basins a little below which, however, an union had taken place. Mr. Meehan said these phenomena were rather common with various fruits and the mode of production well understood. It was simply the inarching of two fruits at a very early stage of their existence, through two embryonic blossoms having perhaps been produced in juxtaposition from one bud.

Dr. Joseph Carson said that he thought the variety exhibited, the winesap, had a tendency to pair young buds and thus bring forth these united twin fruit. He had once known a tree of them which produced a large proportion of the fruit of this character. He had seen perhaps a peck of them which had been gathered at one time from the tree.

October 15.

The President, Dr. Ruschenberger, in the chair.

Twenty-one members present.

Remarks on Fossil Mammals from Wyoming.—Prof. Leidy directed attention to the collection of fossils, from the vicinity of Fort Bridger, Wyoming, presented this evening by Dr. J. Van A. Carter, Dr. Joseph K. Corson, U. S. A., and himself. Among them are the more characteristic remains noticed in a letter sent by him to the Academy last July, published August 1st, and subsequently in the Proceedings, page 167. Some of the fossils were referred to a huge pachyderm with the name of UINTATHERIUM ROBUSTUM. Of this animal Drs. Carter and Corson found together a number of parts of the same skeleton, consisting of the back portion of a cranium retaining parts of both temporal fossæ, the occiput and the occipital condyles; parts of the upper and lower jaws containing the back molars; a mutilated humerus; a proximal and a distal extremity of a femur; and a calcaneum and an astragalus. These were found 10 miles from Dry Creek Cañon, about 50 miles from Fort Bridger. In Dry Creek Cañon Prof. Leidy found a mutilated atlas and the body of an axis, evidently of the same animal.

Ten miles distant from the locality in which the former remains of *Uintatherium* were found, Dr. Corson discovered the large canines, originally referred to *Uintamastix atrox*. While it was suspected that they might pertain to *Uintatherium*, no evidence was found to sustain the opinion, and from their resemblance to the canines of the great Brazilian sabre-toothed tiger *Machairodus*, they were referred to a carnivore with the name just stated.

Prof. Marsh has since published a notice, dated Sept. 27th and appearing in the October number of the American Journal of Science, of a skull from Wyoming, under the name of *Dinoceras mirabilis*, which appears to be the same as *Uintatherium robustum*. The skull he observes is entire and is 28½ inches long. It is provided with three pairs of horn cores and huge decurved canine tusks. The top of the skull is deeply concave and has around its lateral and posterior margins an enormous crest. This description will apply to our cranium, as does also that of the molar teeth to those in our upper jaw specimens. The description of the canines equally well applies to those referred to *Uintamastix atrox*, so that it would appear that this and *Dinoceras mirabilis* are the same as *Uintatherium robustum*.

Some of the fossils belong to PALÆOSYOPS MAJOR, a large tapir-like animal. Of this we have a number of fine specimens, including a cranium, the face and parts of the jaws of a second individual, and several rami of lower jaws with well preserved teeth of others. These were discovered by Drs. Carter and Corson in Dry Creek Cañon. The genus was originally noticed in the Proceedings of this Academy for 1870. It was founded on a few teeth and was supposed to be an even-toed pachyderm. From more complete material its true position as an odd-toed pachyderm was recognized, and its characters more fully given in Prof. Hayden's Preliminary Report of the U. S. Geological Survey of Montana, etc., published in the beginning of this year. The last August, Prof. Marsh published a notice, in the American Journal of Science, of some fossils from Wyoming which he ascribes to two genera under the name of *Palæosyops* and *Limnohyus*. From the notice it would appear he has overlooked the description of *Palæosyops* in the Report just named, for he intimates the reference of the genus to the perissodactyls as if previously unknown and suggests the reference to it of specimens in which the "last upper molar has two inner cones," though it is distinctly stated in the above Report that "the last upper molar of *Palæosyops* has but a single lobe to the inner part of the crown." Upon the latter character Prof. Marsh proposed the genus *Limnohyus*, which, under the circumstances is untenable, but might with propriety be applied to the animal with molars like those of *Palæosyops*, except that the last upper one has two inner cones to the crown. In this view, a specimen in the collection, of a last upper molar tooth, which I had ascribed to *Palæosyops humilis* on account of its comparatively small size, would belong to *Limnohyus*.

Remarks on Chipped Stones from Wyoming.—Prof. LEIDY further called attention to a multitude of chipped stones, which he had collected about 10 miles northeast of Fort Bridger. He observed that he had noticed in many places in the vicinity of Fort Bridger, covering the plains and ravines at the base of the foot hills of the Uintas, great quantities of sharply fractured stone fragments. They are frequently mingled with the rounded pebbles of the drift from the Uintas, but in other places are thickly strewn over the ground without being mingled with the drift. Many of the fragments are broken in such a manner that it is difficult to be convinced that they are not of artificial origin. Mingled with the more evident accidental flakes there occur great numbers of stone implements of the rudest construction, such as those exhibited on the table. A few are also found of the finest finish. Between these and the stone spawls of accidental origin there occurs such a gradation of form as to render it doubtful at times when nature ceased her labor and where primitive man commenced with his.

The materials of the splintered stones consist of jaspers, quartzites, some of the softer rocks of the tertiary strata, and less frequently of black flint, identical in appearance with that of the English chalk. The latter material I nowhere found in position, but have been informed by Prof. Hayden that it occurs in the cliffs of Henry's Fork of Green River.

The accidental flakes probably had their origin through the agency of frosts, and from the concussion of stones descending from the declivities. In experimenting on some weather-worn slabs of jasper from the buttes of Dry Creek, I found that moderate blows of a hammer would send off sharp spawls, reminding one of the ancient flint knives.

The splintered stones appear greatly to differ in age; while some appear perfectly fresh as if recently broken from the parent block, others are dull and worn, and many so deeply altered by exposure as to look very ancient. In some of the old looking specimens, the jasper originally black or brown has become whitened to the depth of half an inch or more.

Prof. LEIDY further remarked as follows:—I may take this opportunity of referring to one of the simplest of stone implements yet in use among the Indians of Wyoming. During my stay at Fort Bridger the Shoshones made a visit to the post, and encamped on Black's Fork in its vicinity for a week. They comprised about 800 persons with about 80 lodges and 1000 horses. Being the first time I had had a chance of seeing a tribe of Indians, I felt much interest in observing them. While wandering through their camp I noticed the women engaged in dressing buffalo skins with a stone implement, the only one of the material I discovered in use among them. It was a thin segment from a quartzite boulder, made by a single smart blow with another stone and with no other preparation. Several specimens I exhibit to the Academy, obtained by my friend Dr. Carter, who ascertained that the instrument was called a Te-sho-a. By an accident I learned that it was not a recent instrument incidental to the place and circumstances. While on an excursion after fossils, I noticed on the side of a butte some weathered human bones, which had fallen from a grave above. With them I found some perforated tusks of the elk and one of the stone teshoa. As the grave was an old one, which had become exposed by the wearing away of the edge of the butte, it made it probable that the teshoa did not belong alone to the present generation.

The tusks of the elk are used by the Shoshones as ornamental trophies. They form another evidence of the early relationship of man, as I observe in a recent number of the American Journal of Science, that similar ornaments were found together with flint knives, in association with a human skeleton, in a cavern of Broussé-roussé, in Italy.

Remarks on the Action of Wind and Sand on Rocks.—Prof. LEIDY then directed attention to some specimens of quartzite and jasper, which he observed illustrated the eroding and polishing effect of the conjoint action of wind and sand. They were collected by him from one of the buttes of Wyoming. In some situations the stones, firmly imbedded in the hard clay of the buttes, and exposed to an almost incessant action of winds and sand, are all much worn and highly polished. He remarked that many of the sandstone cliffs and other rocks of the West, which were supposed to owe their eroded, cavernous, and often fantastic appearance to the action of water, he thought was largely due to the conjoined action of winds and sands.

The death of Prof. John Frazer was announced.

OCTOBER 22.

Mr. VAUX, Vice-President, in the chair.

Twenty-two members were present.

The death of Constant Guillou was announced.

OCTOBER 29.

The President, Dr. RUSCHENBERGER, in the chair.

Thirty-five members present.

The following gentlemen were elected members:—

J. O. Schimmel and Dr. John F. Bransford, U. S. A. Dr. Geo. M. Sternberg, U. S. N., was elected a Correspondent.

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

CATALOGUE AND SYNONYMY OF THE FAMILY ASTARTIDÆ.

BY GEORGE W. TRYON, JR.

Family ASTARTIDÆ, H. & A. Adams.

Genera of Recent Mollusca, ii. 483. 1857.

Genus **ASTARTE**, J. Sowerby.

Mineral Conch., t. 137. 1816.

Crassina, Lamarck, Anim. s. Vert. v. 554. 1818.
Tridonta, Schumacher, Essai d'un Nov. Syst. 146. 1817.
Mactrina, Brown, Brit. Conch. 1827.
Nicania, Leach, Jour. Phys. lxxxviii. 465. 1819.

A. BIPARTITA, Philippi, Enum, Moll. sicil i. 32, t. 3, f. 21. 1836.
Mediterranean.

A. BOREALIS, Chemnitz, Conch. Cab. vii. t. 39, f. 412. 1784.
Astarte arctica, Gray, App. Capt. Parry's Voyage. 1824.
Astarte cyprinoides, Duval, Rev. Zool. 278. 1841.
Astarte plana, Sowerby, Min. Conch. t. 179, f. 2.
Astarte compressa, Macgillivray, Moll. Aberd. 261. 1842.
Crassina corrugata, Brown, Ill. Brit. Conch. 96, t. 40, f. 24.
Astarte lactea, Brod. & Sowerby, Zool. Jour. iv. 365. 1828.
Sowerby, Thes. Conch. ii. 781, t. 167, f. 21–23. 1855.
Astarte semisulcata, Leach, Ann. Philos. xiv. f. 204.
Sowerby, Thes. Conch. ii. 781, t. 167, f. 16. 1855.
Astarte lactea, Gould (not Brod.), Invert. Mass., 1st edit. 80, f. 47. 1841.
Northern Seas.

A. CASTANEA, Say, Jour. Philad. Acad. ii. 273. 1822.
Sowerby, Thes. Conch. ii. 782, t. 167, f. 14, 15. 1855.
Astarte crassidens, Brod. et Sowb. Zool. Jour. iv. 1828.
Venus sulcata, Montagu (not Da Costa), Test. Brit. 131. 1803.
British America to New Jersey.

A. COMPRESSA, Montagu, Test. Brit. Suppl. 43, t. 26, f. 1. 1808.
Venus Montagui, Dillwyn, Des. Cat. 1817.
Astarte striata, Gray, App. Beechy's Voyage, t. 44, f. 9.
Astarte multicostata, Macgillivray, Moll. Aberd. 260. 1843.
Astarte globosa, Moller, Index Moll. Groënl. 20. 1842.

Astarte compacta, P. P. Carpenter, Proc. Philad. Acad. 57. 1865.

Venus Montacuti, Turton, Conch. Dict. 243. 1819.

Crassina convexiuscula, Leach, Brown, Brit. Conch. 96, t. 38, f. 7. 1844.

Crassina obliqua, Brown, Brit. Conch. 97, t. 38, f. 6. 1844.

Astarte Banksii, Leach, App. Ross' Voyage. 1819.

Sowerby, Thes. Conch. ii. 781, t. 167, f. 8. 1855.

Astarte multicostata, J. Smith.

Astarte uddevallensis, J. Smith.

Astarte propinqua, Landsborough.

Northern Seas of Europe, Asia, and America.

A. CREBRICOSTATA, Forbes, Ann. Nat. Hist. xix. 98, t. 9, f. 4.

Sowerby, Thes. Conch. ii. 780, t. 167, f. 10. 1855.

Astarte Warhami, Hancock.

Crassina depressa, Brown, Brit. Conch. 96, t. 38, f. 2. 1844.

VAR. *Astarte elliptica*, Brown, Ill. Brit. Conch. 96, t. 38, f. 3. 1844.

Sowerby, Thes. Conch. ii. 779, f. 167, f. 4. 1855.

Astarte semisulcata, Möller (not Leach), Moll. Grœnl. 19. 1842.

Crassina sulcata, Nilson, Nov. Act. Holm. 187, t. 2, f. 1, 2. 1822.

Crassina ovata, Brown (not Smith), Edin. Jour. t. 1, f. 8, 9.

Venus incrassata, Brocchi, Coq. Foss. Subapp. ii. 557, t. 14, f. 7.

Astarte Gaviensis, James Smith.

Astarte Portlandica, Mighels, Proc. Bost. Soc. Nat. Hist. 129. 1843.

Bost. Jour. Nat. Hist. iv. 320, 345, t. 16, f. 2. 1843.

Astarte quadrans, Gould, Invert. Mass. Edit. i. 81, f. 48. 1841.

Sowerby, Thes. Conch. ii. 782, t. 167, f. 51. 1855.

Northern Europe and America.

A. FLABAGELLA, Conrad, Proc. Phil. Acad. iii. 24, t. 1, f. 3. 1846.

Tampa Bay, Florida.

A. FLUCTUATA, Carpenter, Proc. Calif. Acad. iii. 209. 1866.

California.

A. INTERMEDIA, Sowerby, Thes. Conch. ii. 779, t. 167, f. 11. 1855.
Northern Europe.

A. LONGIROSTRA, D'Orb. Voy. Amer. Merid. 576, t. 83, f. 21–24. 1846.
Malouin Isles.

A. LUNULATA, Conrad, Foss. Tert. Form. 44, t. 21, f. 8.
A. bilunulata, Conrad, Adams, Genera. ii.
Southern Coast United States.

A. LUTEA, Perkins, Proc. Bost. Soc. Nat. Hist. xiii. 151. 1869.
New Haven, Conn.

A. OBLONGA, Sowerby, Thes. Conch. ii. 781, t. 167, f. 19. 1855.
Hab.—?

A. ROLLANDI, Bernardi, Jour. de Conchy. C. vii. 386, t. 13, f. 1. 1858.
Petrapolowski.

A. PULCHELLA, Jonas, Philippi, Abbild. t. 1, f. 12.
Spitzenbergen.

A. SULCATA, Da Costa, Brit. Conch. 192. 1778.
Sowerby, Thes. Conch. ii. 778, t. 167, f. 1–3. 1855.
Crassina Danmoniensis, Lamarck, Anim. s. Vert. Ed. Deshayes, vi. 360.
Crassina Scotica, Turton, Conch. Dith. Brit. 130, t. 11. f. 3, 4. 1822.
Venus crassatella, Blainville.
Venus Petagnæ, Costa, Cat. Syst. 34. 1829.
Astarte undata, Gould, Invert. Mass. 80. 1841.
Sowerby, Thes. Conch. ii. 779, t. 167, f. 12. 1855.
Astarte latisulca, Hanley.
Astarte Mortoni, Adams.
Astarte fusca, Poli, Test. Utr. Sicil. 49, t. 15, f. 32, 33. 1791.
Sowerby, Thes. Conch. ii. 783, t. 167, f. 24. 1855.
Astarte incrassata, Philippi, Enum. Moll. Sicil. i. 38. 1836.
Astarte subæquilatera, Sowerby, Thes. Conch. ii. 781, t. 167, f. 13. 1855.
Northern Europe to Mediterranean ;
New England, northwards.

Subgenus GONILIA, Stoliczka.

Pal. Indica, 278. 1871.

A. BIPARTITA, Philippi, Enum. Moll. Sicil. i. 32, t. 3. f. 21. 1836.
Mediterranean.

Subgenus GOODALLIA, Turton.

Conch. Dith. 77. 1822.

Parastarte, Conrad, Proc. Philad. Acad. 288. 1862.

A. TRIQUETRA, Conrad, Proc. Philad. Acad. iii. 24, t. 15, 16. 1846.
Tampa Bay, Fla.

A. TRIANGULARIS, Montagu, Test. Brit. 99, t. 3, f. 5. 1803.
Sowerby, Thes. Conch. ii. 782, t. 167, f. 9. 1855.
Mactra minutissima, Montagu, Test. Brit. Suppl. 37. 1808.
Astarte minuta, Nyst.
Astarte pusilla, Forbes, Report Ægean Invest. 144.
Cyclina undata, Conti.
England to Mediterranean ; Canaries.

Genus **GOULDIA**, C. B. Adams.

Panama Shells, 275. 1851.

Thetis, C. B. Adams (not Sowerby), Proc. Bost. Soc. N Hist. ii. 9. 1845.

G. AUSTRALIS, Angas, Proc. Zool. Soc. 459. 1870.
Port Jackson, N. S. Wales.

G. CERINA, C. B. Adams, Proc. Bost. Soc. N. Hist. ii. 9. 1845.
Jamaica.

G. DILECTA, Gould, Bost. Proc. viii. 32. 1861.
Kagosima.

G. FASTIGIATA, Gould, Bost. Proc. viii. 282. 1861.
North Carolina.

G. GUADALOUPENSIS, D'Orb. Moll. Cuba, ii. 289, t. 27, f. 24–26. 1853.
West Indies.

G. MACTRACEA, Lindsley, Am. Jour. Science, 233. 1848.
Gould, Invert, Mass. Edit. ii. f. 442. 1870.
New England ; South Carolina.

G. MARTINIENSIS, D'Orb. Moll. Cuba, ii. 288, t. 27, f. 21–23. 1853.
West Indies.

G. MODESTA, H. Adams, Zool. Proc. t. 19, f. 14. 1869.
Gulf of Tunis.

G. PACIFICA, C. B. Adams, Panama Shells, 275. 1851.
H. & A. Adams, Genera, iii. t. 115, f. 7, *a. b.*
Panama; Mazatlan.

G. PARVA, C. B. Adams, Proc. Bost. Soc. Nat. Hist. ii. 9. 1845.
Jamaica.

G. PFEIFFERI, Philippi, Zeit. für Malak. 133. 1848.
Cuba.

G. VARIANS, Carpenter, Mazat. Cat. 83. 1857.
Mazatlan.

Genus **MIODON**, Carpenter.

Ann. Mag. Nat. Hist. xiv. 424. 1864.

1. M. PROLONGATUS, Carpenter, loc. cit.
Straits of Fuca to Monterey, Cal.

Genus **CRASSATELLA**, Lamarck.[1]

Prodr. Syst. 1799.

Ptychomya, Agassiz (*fossil*), Etud. Crit. 3d liv. 1842.
Paphia, Roissy (not Lam. or Fabr.), Moll. vi. 346. 1805.

C. ADELINÆ, Tryon, Proc. A. N. S. 1872.

C. ANTILLARUM, Reeve, Zool. Proc. 44. 1842.
Conch. Icon. sp. 8. 1843.
C. rostrata, Chenu Ill. Conch.
Isl. Margarita, (W. I.?)

C. AURORA, Adams and Angas, Cool. Proc. 426, t. 37, f. 15. 1863.
Tasmania.

C. BANKSII, Adams and Angas, Zool. Proc. 427, t. 37, f. 16. 1863.
Tasmania.

C. BELLULA, A. Adams, Zool. Proc. 95. 1852.
New Zealand.

C. CASTANEA, Reeve, Zool. Proc. 42. 1842.
Conch. Icon. spec. 3. 1843.
Australia.

C. COMPRESSA, Adams and Reeve, Voy. Samarang, 82, t. 23, f. 10. 1850.
Corea.

[1] I think that a considerable reduction of species is necessary in this genus; but, unfortunately, I have not enough specimens at hand to make satisfactory comparisons. The species appear to vary so much in form, sculpture, and color, that identification, in many cases, is entirely arbitrary.

C. COMPTA, A. Adams, Zool. Proc. 95. 1852.
China Sea.

C. CONCINNA, A. Adams, Zool. Proc. 95. 1852.
China Sea.

C. CORBULOIDES, Reeve, Zool. Proc. 45. 1842.
Conch. Icon. sp. 9. 1848.
Hab.—?

C. CORRUGATA, Adams and Reeve, Voy. Samarang, 82, t. 23, f. 7. 1850.
Soloo Islands.

C. CUMINGII, A. Adams, Zool. Proc. 90, t. 16, f. 1. 1852.
Moreton Bay, E. Australia.

C. DECIPIENS, Reeve, Zool. Proc. 42. 1842.
Conch. Icon. sp. 4. 1843.
C. Kingicola, Reeve (not Lamarck), Conch. Syst. 63, t. 44, f. 3. 1841.
Australia.

C. CONTRARIA, Gmelin, Syst. Nat. 3277. 1790.
Coast of Guinea; Canary Islands.

C. DIVARICATA, Chemnitz, Reeve, Conch. Icon. sp. 18. 1843.

C. DONACINA, Lamarck, Anim. s. Vert.
Reeve, Conch. Icon. sp. 19. 1843.
Australia.

C. ESQUIMALTI, Baird, Zool. Proc. 70. 1863.
Vancouver's Island.

C. GIBBOSA, Sowerby, Zool. Proc. 56. 1832.
Reeve, Conch. Icon. sp. 1. 1843.
W. Còast South America.

C. JUBAR, Reeve, Zool. Proc. 44. 1843. Conch. Icon. sp. 11.
Australia.

C. KINGICOLA, Lamarck, Anim. s. Vert. v. 481. 1818.
Reeve, Conch. Icon. sp. 5. 1843.
Australia.

C. LÆVIS, A. Adams, Zool. Proc. 64. 1852.
Laguayra.

C. LAPIDEA, Reeve, Zool. Proc. 48. 1843. Conch. Icon. sp. 7.
Philippines.

C. NANA, Adams and Reeve, Voy. Samarang, 81, t. 23, f. 2. 1850.
Eastern Seas.

C. OBESA, A. Adams, Zool. Proc. 90, t. 16, f. 2. 1852.
New Zealand.

C. OBSCURA, A. Adams, Zool. Proc. 94. 1852.

China Sea.

C. ORNATA, Gray, Griffith's Cuvier, t. 22, f. 6. 1834.
Reeve, Zool. Proc. 46. 1842.
Conch. Icon. sp. 17. 1843.

Hab.—?

C. PALLIDA, Adams and Reeve, Voy. Samarang, 82, t. 23, f. 9. 1850.

China.

C. PICTA, Adams and Reeve, Voy. Samarang, 82, t. 23, f. 6. 1850.

Philippines.

C. PULCHRA, Reeve, Zool. Proc. 43. 1842.
Icon. sp. 16. 1843.
C. sulcata, Blainv. (not Lam.) Malac. t. 73, f. 4. 1825.

Australia.

C. RADIATA, Sowerby, Tankerville Cat. App. 2. 1825.
Reeve, Conch. Icon. sp. 12. 1843.

Singapore.

C. ROSTRATA, Lamarck, Anim. s. Vert. v. 482. 1818.
Reeve, Conch. Icon. sp. 10. 1843.

Ceylon.

C. SPECIOSA, A. Adams, Zool. Proc. 94. 1852.

Bay of Campeachy.

C. SUBRADIATA, Lamarck, Anim. s. Vert. v. 482. 1818.
Reeve, Conch. Icon. sp. 15. 1843.

South Seas.

C. SULCATA, Lamarck, Anim. s. Vert. v. 481. 1818.
Reeve, Conch. Icon. sp. 6. 1843.

Australia.

C. TRIQUETRA, Reeve, Zool. Proc. 46. 1842.
Icon. sp. 14. 1843.

Hab.—?

C. TRUNCATA, A. Adams, Zool. Proc. 95. 1852.

China Sea.

C. UNDULATA, Sowerby, Zool. Proc. 56. 1832.
Reeve, Conch. Icon. spec. 2. 1843.

Puerto Portrero, Central America.

C. ZIC-ZAC, Reeve, Zool. Proc. 45. 1842.
Icon. sp. 13. 1843.

Philippines.

Genus **ACTINOBOLUS**, Klein.

Meth. Ostracol. 147. 1753.

Cardiocardites, Blainv. Dict. Sc. Nat. xxxii. 326. 1824.
Azaria, Gray, Syn. Brit. Mus. 1840.

A. ABYSSICOLUS, Hinds, Voy. Sulphur, 65, t. 19, f. 3. 1844.
Reeve, Conch. Icon. Cardita, sp. 37. 1843.
Sts. of Malacca.

A. ACULEATUS, Poli, Test. Utr. Sicil. ii. 23, f. 23. 1795.
Reeve, Conch. Icon. sp. 17. 1843.
Cardita squamosa, Cotiez. & Mich. Gal. des Moll. ii. 159.
Cardita nodulosa, Reeve, Zool. Proc. 1843. Icon. sp. 44.
Cardita squamifera, Deshayes, Mag. Zool. t. 10. 1831.
Reeve, Icon. Cardita, sp. 14. 1843.
Mediterranean.

A. AJAR, Adanson, Hist. Nat. Senegal, t. 16, f. 2. 1757.
Reeve, Conch. Icon. sp. 23. 1843.
Cardita lacunosa, Reeve, Conch. Icon. sp. 31. Zool. Proc. 1823.
Senegal.

A. AMABILIS, Deshayes, Zool. Proc. 102, t. 7, f. 8, 9. 1852.
New Zealand.

A. ANTIQUATUS, Linnæus, Syst. Nat. xii. 1138. 1767.
Reeve, Conch. Icon. sp. 30. 1843.
Cardita turgida, Lamarck, vii. 22. 1819.
Cardita bicolor, Lamarck, vi. 23. 1819.
Ceylon.

A. AUSTRALIS, Quoy (not Lam.), Voy. Astrol. ii. 480, t. 78, f. 11–14. 1834.
Cardita Quoyi, Deshayes, Zool. Proc. 103. 1852.
Cardita tridentata, Reeve (not Say.), Conch. Icon. sp. 22. 1843.
Australia, New Zealand.

A. BELCHERI, Deshayes, Zool. Proc. 101. 1852.
Philippines.

A. BIMACULATUS, Deshayes, Zool. Proc. 102, t. 17, f. 4, 5. 1852.
New Zealand.

A. CANALICULATUS, Reeve, Zool. Proc. 1843. Icon. sp. 40.
Philippines.

A. CARDIOIDES, Reeve, Zool. Proc. 1843. Icon. sp. 49.
Philippines.

A. CASTANEUS, Deshayes, Zool. Proc. 102, t. 17, f. 11. 1852.
Australia.

A. COMPRESSUS, Reeve, Zool. Proc. 1843. Icon. sp. 46.
Valparaiso, Chili.

A. CONRADI, Shuttleworth, Jour. Conch. v. 173. 1856.
Cardita incrassata, Conrad (not Sowb.), Am. Mar. Conch. 39, t. 8, f. 2. 1831.
Tampa Bay, Fla.

A. CORBIS, Philippi. Enum. Moll. Sicil. 11, 48. 1844.
Mediterranean, Canary Isles.

A. CORBICULÆFORMIS, Deshayes, Cog. Ile Reunion, 21.
Mauritius.

A. CRASSUS, Gray, Zool. Beechey's Voyage, 152, t. 42, f. 4.
Reeve, Conch. Icon. sp. 34. 1843.
Acapulco.

A. CRENULATUS, Deshayes, Zool. Proc. 102. 1852.
Borneo.

A. CUMINGII, Deshayes, Zool. Proc. 132, t. 87, f. 15. 1852.
Borneo.

A. CUVIERI, Broderip, Zool. Proc. 55. 1832.
Reeve, Icon. sp. 24. 1843.
Central America.

A. DIFFICILIS, Deshayes, Zool. Proc. 103, t. 17, f. 16, 17. 1852.
New Zealand.

A. ELEGANTULUS, Deshayes, Zool. Proc. 101, t. 17, f. 6, 7. 1852.
Chinese Seas.

A. ELONGATUS, Philippi, Archiv für Naturg. 54. 1845.
Pacific Ocean.

A. FERRUGINOSUS, Adams and Reeve, Voy. Samarang, 76, t. 21, f. 21. 1850.
Philippines.

A. FLABELLUM, Reeve, Zool. Proc. 1843. Conch. Icon. sp. 47.
Valparaiso.

A. FLAMMEUS, Michelin, Mag. Zool. t. 6. 1830.
Reeve, Conch. Icon. sp. 38. 1843.
Hab.—?

A. GRACILIS, Shuttleworth, Jour. de Conch. 173. 1856.
Porto Rico.

A. GUNNII, Deshayes, Zool. Proc. 101. 1852.
Van Dieman's Land.

A. INCRASSATUS, Sowerby, App. Tankerville Cat. 1825.
Reeve, Conch. Icon. sp. 11. 1843.
Cardita rubicunda, Menke, Moll. N. Holl.
Australia.

A. JUKESII, Deshayes, Zool. Proc. 101, t. 17, f. 14. 1852.
Australia.

A. KOREËNSIS, Deshayes, Zool. Proc. 101. 1852.
Corea.

A. LATICOSTATUS, Sowerby, Zool. Proc. 195. 1832.
Reeve, Conch. Icon. sp. 36. 1843.
Cardita angisulcata, Reeve, Zool. Proc. 1843. Conch. Icon. sp. 41.
VAR. *Cardita tricolor*, Sowerby, Zool. Proc. 194. 1832.
Central America.

A. MARMOREUS, Reeve, Zool. Proc. 1843. Conch. Icon. sp. 12.
Australia.

A. MALVINÆ, Orbigny, Voy. Am. Mer. 580, t. 84, f. 4, 6.

A. MEGASTROPHUS, Gray.

A. NITIDUS, Reeve, Zool. Proc. 1843. Conch. Icon. sp. 27.
Cardita ovalis, Reeve, Ibid. 1843. Icon. sp. 28.
Philippines.

A. PHILIPPII, Tryon.
Cardita Australis, Philippi (not Quoy), Abhandl. Naturf. Ges. Halle, 21. 1858.
Philippines.

A. PREISSII, Menke, Moll. Nov. Holl. 38.
Reeve, Conch. Icon. sp. 39. 1843.
Australia.

A. PROCERUS, Gould, Bost. Proc. iii. 276.
Rio Negro, Patagonia.

A. PURPURATUS, Deshayes, Zool. Proc. 100, t. 17, f. 12, 13. 1852.
New Zealand.

A. ROSTRATUS, Gmelin.

A. SEMEN, Reeve, Zool. Proc. 1843. Icon. sp. 43.
Bolivia.

A. SOWERBYI, Deshayes, Zool. Proc. 103. 1852.
Swan River, W. Australia.

A. SPURCUS, Sowerby, Zool. Proc. 195. 1832.
Reeve, Conch. Icon. sp. 32. 1843.
Peru.

A. SULCATUS, Brug. Ency. Meth. No. 3. 1789.
Reeve, Conch. Icon. sp. 35. 1843.
Chama antiquata, Poli, Test. Utr. Sicil. ii. t. 23, f. 12, 13. 1795.

Mediterranean.

A. TANKERVILLII, Wood. Index Test. Suppl. 57. 1828.
Reeve, Conch. Icon. sp. 29. 1843.
Chama Australis, Wood. Index Test. Suppl. 6. 1828.

Australia.

A. TEGULATUS, Reeve, Zool. Proc. 1843. Conch. Icon. sp. 48.

Valparaiso.

A. TUMIDUS, Broderip, Zool. Proc. 56. 1832.
Reeve, Conch. Icon. sp. 26. 1843.
A. varius, Brod. Zool. Proc. 56. 1832.
Reeve, Conch. Icon. sp. 25. 1843.

Puerto Portrero, Isle Plata, Gallapagos.

A. THOUARSII, D'Orbigny, Voy. Amer. Merid. 579, t. 84, f. 1–3. 1846.

Malouin Isles.

A. ZELANDICUS, Deshayes, Zool. Proc. 101. 1852.

New Zealand.

Genus **CYCLOCARDIA**, Conrad.

C. BOREALIS, Conrad, Am. Mar. Conch. 39, t. 8, f. 1. 1831.
Reeve, Conch. Icon. sp. 33. 1843.
Cardita vestita, Deshayes, Zool. Proc. t. 17, f. 10. 1852.

Northern Coast United States.

C. NOV-ANGLIÆ, Morse, Rep. Peabody Acad. Science, 76. 1869.

New England.

C. VENTRICOSUS, Gould, Boston Proc. iii. 276. 1850. (= *borealis.?*)

Puget's Sound.

Genus **PLEUROMERIS**, Conrad.

Am. Jour. Conch. iii. 12. 1867.

P. TRIDENTATUS, Say, Jour. Philad. Acad. v. 216. 1826.
(Not of Reeve, Icon. Cardita, sp. 22 = *C. Australis*, Quoy.)

Northern Coast United States.

Genus **MYTILICARDIA**, Blainville.

Dict. Sciences, Nat. xxxii. 326. 1824.

M. CALYCULATA, Linnæus, Syst. Nat. Edit. xii. 1138. 1767.
Reeve, Conch. Icon. Cardita, sp. 1. 1843.

Cardita sinuata, Lamarck, Anim. s. Vert. vi. 25. 1819.
Mediterranean Sea.

M. CRASSICOSTATA, Lamarck, Anim. s. Vert. vi. 24. 1819.
Reeve, Conch. Icon. sp. 7. 1843.
Cardita Tridacnoides, Menke, Moll. Nov. Holl.
Australia, Philippines.

M. CUMINGIANA, Dunker, Zeit. Malak. 223. 1860.
Japan.

M. DISTORTA, Reeve, Zool. Proc. 1843. Icon. sp. 13.
Red Sea.

M. ESSINGTONENSIS, Deshayes, Zool. Proc. 100. 1852.
Australia.

M. EXCAVATA, Deshayes, Zool. Proc. 101, t. 17, f. 1–3. 1852.
Sydney, N. S. Wales.

M. EXCISA, Philippi, Zeit. für Malak. 91. 1847.
Sandwich Isles.

M. FABULA, Reeve, Zool. Proc. 1843. Icon. sp. 50.
Isle of Alboran.

M. GIBBOSA, Reeve, Zool. Proc. 1843. Icon. sp. 21.
Hab.—?

M. LEANA, Dunker, Zeit. Mal. 223. 1860.
Japan.

M. MURICATA, Sowerby, Zool. Proc. 195. 1832.
Reeve, Conch. Icon. sp. 18. 1843.
Crescent and Rapa Islands, Pacific Ocean.

M. PICA, Reeve, Zool. Proc. 1843. Conch. Icon. sp. 8.
Philippines.

M. RADULA, Reeve, Zool. Proc. 1843. Conch. Icon. sp. 2.
Hab.—?

M. RUFESCENS, Lamarck, Anim. s. Vert. vii. 24. 1819.
Reeve, Conch. Icon. Cardita, sp. 19. 1843.
Cardita Senegalensis, Reeve, Zool. Proc. 1843. Conch. Icon. sp. 16.
Senegal.

M. TERETIUSCULA, Philippi.

M. UMBILICATA, Deshayes, Zool. Proc. 100. 1852.
Australia.

M. VARIEGATA, Bruguiere, Encyc. Meth. 407, t. 233, f. 6. 1789.
Reeve, Conch. Icon. sp. 3. 1843.
Chama calyculata, Dillwyn, Desc. Cat. 217. 1817.

Cardita aviculina, Lamarck, Anim. s. Vert. vi. 26. 1819.
Delessert, Illust. t. 11, f. 10.
Australia, Indian and Chinese Seas.

Subgenus BEGUINA, Bolten.
Mus. Bolt. 1798.

M. GUBERNACULUM, Reeve, Zool. Proc. 1843. Icon. sp. 9.
Zanzibar.

M. SEMIORBICULATA, Linnæus, Syst. Nat. Edit. xii. 1138. 1767.
Reeve, Conch. Icon. sp. 10.
Cardita phrenetica, Lamarck. Anim. s. Vert. vi. 24. 1819.
Philippines.

M. VOLUCRIS, Reeve, Zool. Proc. 1843. Conch. Icon. sp. 20.
Hab.—?

Subgenus GLANS, Mühlfeldt.
Entwurf, 68. 1811.

M. NAVIFORMIS, Reeve, Zool. Proc. 1843. Icon. sp. 45.
Valparaiso.

M. TRAPEZIA, Linnæus, Syst. Nat. Edit. xii. 1138. 1767.
Reeve, Conch. Icon. sp. 15. 1843.
Chama muricata, Scacchi, Cat. 5.
Cardita squamosa, Lamarck, Anim. s. Vert. vi. 23. 1819.
Mediterranean.

Subgenus THECALIA, H. and A. Adams.
Genera of Recent Mollusca, ii. 489. 1857.

M. CONCAMERATA, Chemnitz.
Reeve, Conch. Icon. Cardita, sp. 42. 1843.
Cape of Good Hope.

M. MACROTHECA, Adams and Angas, Zool. Proc. 39. 1864.
So. Australia.

Genus **CARDITAMERA**, Conrad.
Foss. Shells, 12. 1837.

Lazaria, Gray, Syn. Brit. Mus. 1853.

C. AFFINIS, Sowerby, Zool. Proc. 195. 1832.
Reeve, Conch. Icon. Cardita, sp. 6. 1843.
Cardita Californica, Deshayes, Zool. Proc. 100. 1852.
Central America to Gulf of California.

C. FLORIDANA, Conrad, Fossil Shells, 12. 1837.
Cardita gibbosa, Reeve, Zool. Proc. 1843. Conch. Icon. sp. 21.
Hab.—?

C. GRACILIS, Shuttleworth, Jour. de Conch. v. 173. 1856.
Porto Rico.

C. PECTUNCULUS, Bruguiere, Encyc. Meth. 412. 1789.
Reeve, Conch. Icon. sp. 4. 1843.
Madagascar.

C. RADIATA, Sowerby, Zool. Proc. 195. 1832.
Reeve, Conch. Icon. sp. 5. 1843.
E. Columbia, Panama.

C. SUBQUADRATA, Carpenter, Ann. Mag. Nat. His. xv. 178. 1865.
Sts. of Fuca to San Diego, Cal.

CATALOGUE OF THE FAMILY SOLEMYIDÆ.

BY GEORGE W. TRYON, JR.

Family SOLEMYIDÆ, H. & A. Adams.

Genera of Recent Mollusca, ii. 482. 1857.

Genus **SOLEMYA**, Lamarck.

Hist. Nat. Anim. sans Vert. v. 488. 1818.

Solenomya, Menke, Syn. Meth. Edit. i. 1828.
Solenymya, Swainson, Man. Malacol. 366. 1840.
Stephanopus, Scacchi, Osserv. Zool. 5. 1833.

1. S. AUSTRALIS, Lamarck, Anim. s. Vert. v. 489. 1818.
Blainville, Malacol, t. 79, f. 1. 1825.
So. Australia.

2. S. BOREALIS, Totten, Am. Jour. Sci. xxvi. 366, f. 1. 1834.
S. velum, Conrad (not Say), Am. Mar. Conch. t. 66, f. 16. 1831.
Northern United States.

3. S. PUSILLA, Gould, Proc. Bost. Soc. Nat. Hist. viii. 27. 1861.
Hakodadi.

4. S. TOGATA, Poli, Test. Utr. Sicil. ii. 42, t. 15, f. 20. 1795.
S. Mediterranea, Lamarck, Anam. s. Vert. v. 489. 1818.
Mediterranean.

S. VALVULUS, Carpenter, Ann. Mag. Nat. Hist. xiii. 311. 1864.
Cape St. Lucas.

6. S. VELUM, Say, Jour. Philad. Acad. ii. 317. 1822.
Gould, Invert. Mass. 2d Edit. 48 f. 371.
Northern United States.

NOTES ON THE GENUS POLORTHUS, Gabb.

BY WILLIAM M. GABB.

In 1834, Dr. S. G. Morton, in his "Synopsis of the Organic Remains of the Cretaceous Group of the United States," described a species under the name of *Teredo tibialis;* mentioning a former edition of the same work, when he says he "referred this species to *T. antenautæ*, Sby." (*Min. Conch.*, vol. i. p. 231, pl. 102). Sowerby's shell is from the London clay, and Morton was correct in separating the American species, which is Cretaceous. But while correcting one error he fell into two others, not less grave. He included all of the tērediform tubes found in New Jersey under the one name, and figured as the type of the species a shell which I believe is not only not a *Teredo*, but is *Cephalopod.* There are at least two species mentioned by Morton (*Syn. Cret.*, p. 69); and for the one figured and described, the specific name must be retained. For the other I proposed the name of *T. irregularis* in 1860 (*Jour. Philad. Acad.*, 2d ser. vol. iv. p. 393, pl. 68, fig. 19).

In 1861, while examining Dr. Morton's specimens, I was struck by some peculiarities in the tubes, which, on further study, induced me to propose the above generic name, and suggest the relationship of the genus to *Vermetus.* Since then the matter seems to have been forgotten, until recently my friend, Dr. Stoliczka, in his able work on the Fossils of India (*Pal. Indica*, vol. iii. p. 14), quotes the name doubtfully and at second hand for the Smithsonian Check List, and in the *Pholadidæ.* This last fact has determined me to call attention to the genus in a more explicit manner than the original imperfect notice, in the Proceedings of the Academy, 1861, p. 366.

P. tibialis, Morton, is the species for which the name was first proposed. At the time I described the genus, I was in receipt of a fine series of specimens of my *Gastrochæna Americana*, from the "Ripley Group" of Tennessee, sent me by Prof. Safford, the State Geologist, and I found that the two forms were congeneric, although I have never yet seen the apex of the latter species.

The generic characters are as follows: Shell tubular, growing singly or in clusters, nearly straight. Interior divided into chambers by two entirely different sets of septa. In the young state, the septa are cup-shaped, as in *Orthoceras*, but, unlike that genus, they are not perforated by a small siphonal opening. Instead, the middle of each septum is prolonged into a tapering tube with an elliptical cross section, the apex of which tube enters the base and nearly, or completely, fills the interior of its predecessor. Extreme apex unknown. In the space immediately succeeding the last septum, there is a saddle-shaped, continuous muscular (?) scar, which rises on the sides corresponding with the broad part of the funnel-like siphonal tubes, and is deeply depressed on the sides corresponding with the ends of the ellipse. Beyond this stage, the shell continues as a nearly straight tube, increasing very slowly in diameter and, at irregular intervals, is hermetically closed by convex septa, having their convex face reversed; that is to say, placed towards the broader, or newer portion of the tube. The structure is microscopically prismatic, the prisms being placed transversely as in *Inoceramus*. Both the walls and the septa are made up of numerous layers of shell substance, no structural difference existing between the several parts.

P. tibialis grows in masses of tubes bearing a strong superficial resemblance to *Teredo*, which resemblance misled Dr. Morton in his generic reference. But, even apart from its internal structure, the analogy fails, since it never occurs perforating wood or other hard substances. The spaces between the shells are filled only with sand. This free mode of growth, and my not being acquainted at the time with the peculiar characters of the apical portion, induced me to refer my genus to the *Vermetidæ* on account of the septa in the larger portions of the tube; a character not unlike that of *Vermetus* and *Cæcum*. Latterly, through the kindness of my friend, Dr. Joseph Leidy, I have been enabled to study better specimens than any heretofore examined, and thus discovered the anomalous character of the young shell.

P. Americanus seems to be solitary in its habits; at least, no masses of this species have ever been obtained. In external form it is not unlike the tube of *Gastrochæna*, and I thus described it at first. The Tennessee specimens, preserved in a soft matrix, show that internally it has the same imperforate septa, convex towards the broader end of the tube, and placed at irregular distances.

The structure of the young shell places this genus, as the type of a new family, POLORTHIDÆ, among the *Cephalopods*, and it only remains to determine what are its nearest relations. Its simple-edged septa confine it to the group, of which the modern *Nautilus* may be taken as a type. But the complex nature of its septa has no analogy among the modern genera, even geologically speaking. We must look for its relations among the palæozoic forms, such as *Endoceras*, *Actinoceras*, and more especially *Beatricea*. In fact, it seems in some respects to be intermediate between the last, as described by Hyatt[1] and the two former; and again to connect both groups with the *Orthoceridæ* proper. In *Orthoceras* we have direct communication from one chamber to the next. In *Endoceras*, *Actinoceras*, and the allied genera, the position of the siphon is occupied by a shelly tube which seems to have allowed no such communication beyond its own walls. In *Beatricea* the central column is described as consisting of a chain of small hollow chambers, not continuous either with each other or with the encircling chambers. In *Polorthus*, unlike *Orthoceras*, the tubes are not membranous, but shelly. They can be compared in their enveloping character to the column of *Beatricea*, of which Hyatt says, "the central chambers are imperforate, generally deeply concave, and set upon one another like a pile of Chinese teacups." By elongating these "teacups" into a series of laterally compressed cones, we have the column of *Polorthus*, with the difference that in the latter each cone is soldered to, or more properly, is a continuation of one of the outer septa. The nature of the matrix is such that I have not been able to demonstrate, beyond a doubt, the character of the apex of these cones, but I believe it to have been perforated by a minute slit; a fact which would connect *Beatricea* with *Endoceras*. On the other hand, while the base of each cone, where it leaves the transverse septum, is *apparently* closed completely by the next cone fitting tightly into it; there is at least a rudimentary, if not a real connection between the outer chamber and the interior of the column, thus showing a nearer connection between *Polorthus* and *Orthoceras* than between the latter and the other two quoted genera.

The muscular scar visible on the casts of the interior just above the last of the septa is not without its analogy. I have found such impressions in all the modern species of *Nautilus*, but more especially in *N. pompilius*,[2] where it consists of two broad scars

[1] Amer. Jour. Sci., 1865, p. 261.

[2] See Waagen, Ueber die Ansatzstelle der Haftmuskeln beim Nautilus

like those of an oyster, connected by a faint polished line, marking the mantle margin.

Having pointed out what I believe to be the relations of this remarkable fossil, it yet remains for me to remark on the anomalous circumstances connected with the manner of growth of the shell in its later stages.

After growing to a length of nearly an inch, the animals (at least of *P. tibialis*) seem to have congregated into colonies. Thenceforward the septate character, above described, ceases. The tube increases gradually in diameter as it grows in length, and at distances varying without any determinate system, from a quarter of an inch to two inches apart, the tube is hermetically closed by arched septa, with their convex faces *towards* the mouth of the tube; or in a reversed position to that of the primary series. The tube consequently could have been of no further use as a float, like that of the other chambered cephalopods, and would have been really disadvantageous to its occupant, was it not permanently anchored as we see it actually was. The colonies must consequently have resembled a highly magnified view of a bryozoon or a coral.

EXPLANATION OF PLATE 8.

Fig. 1. View of a mass of *P. tibialis*, natural size.
" 2. One tube, slightly magnified: *a*, muscular scar; *b*, secondary septa.
" 3. An unusually large tube, abnormally bent, natural size: *a*, one of the secondary septa.
" 4. Magnified view of end of a tube: *a*, surface markings of the species (*P. tibialis*); *b*, end view of muscular scar on the cast; *c*, internal cast of the last chamber and part of the mould of the central tube.
" 5. Side view of the end of another specimen: *a*, *a*, parts of the shell; *b*, *b'*, muscular scar, *b* seems to correspond with the broad muscle of Nautilus; *c*, *c*, primary septa; *d*, side view corresponding with *c*, fig. 4.
" 6. Top view of a secondary septum broken through at *a*.
" 7. End view of one of the primary septa.
" 8. *P. Americanus*, natural size.

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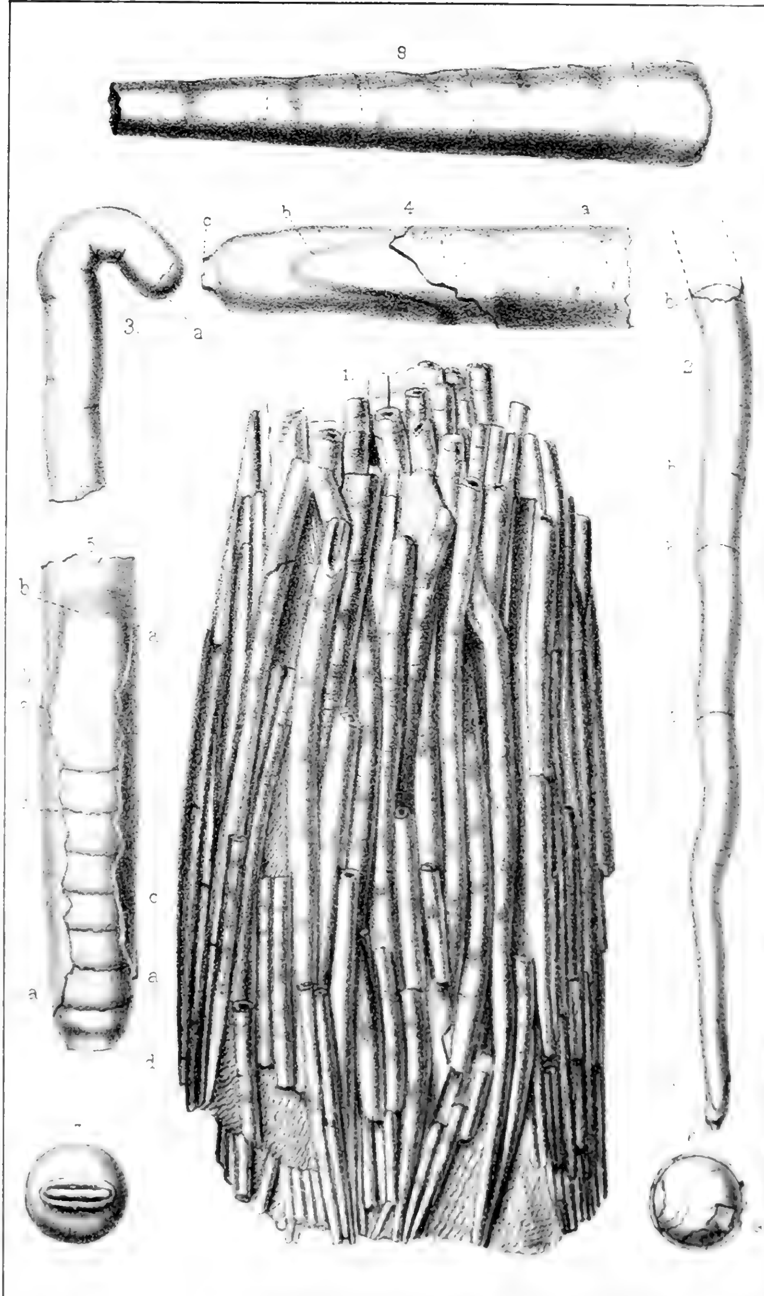
und der Ammoniden; Palæontographica. Band 17, 1870, p. 185, pl. 39 and 40.


8
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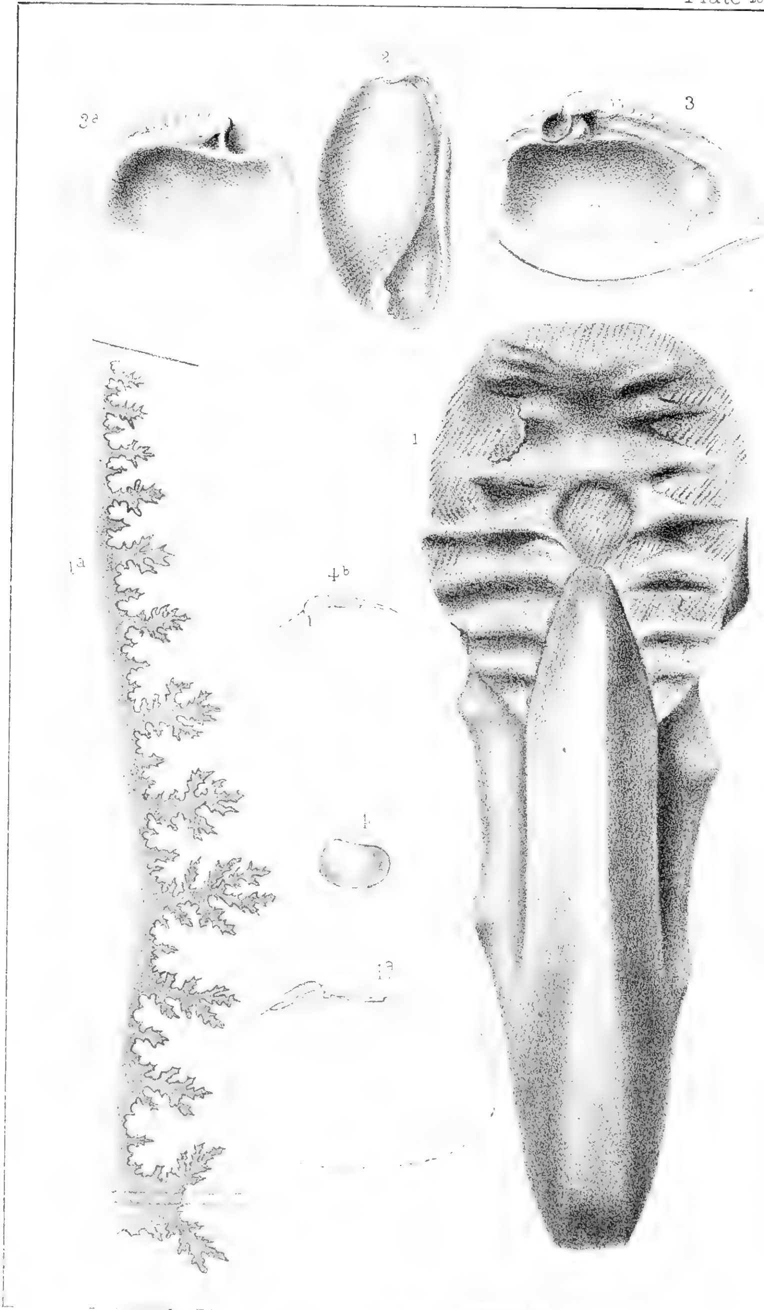
Gabb. Mexican Fossils and Genera of Mollusca.



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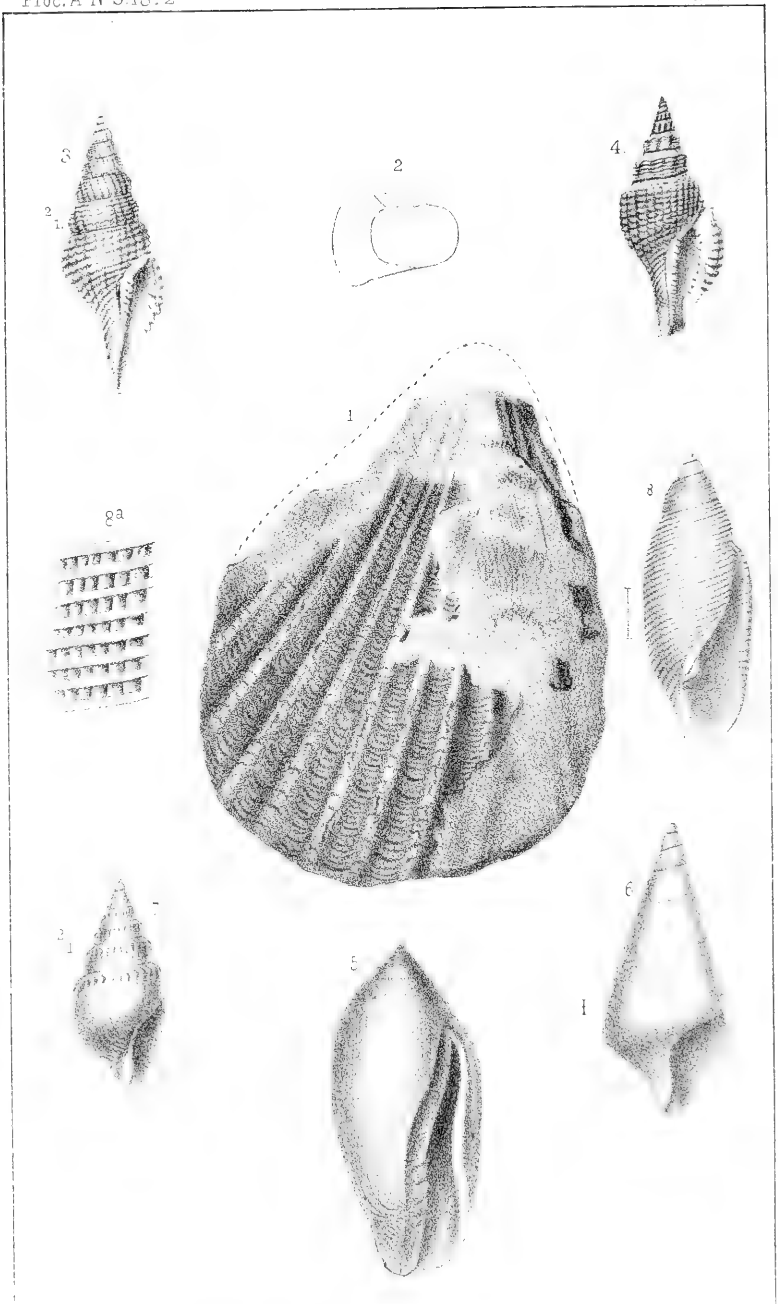

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NOTICE OF A COLLECTION OF CRETACEOUS FOSSILS FROM CHIHUAHUA, MEXICO.

BY WILLIAM M. GABB.

A SMALL collection of Cretaceous fossils has recently been submitted to me for examination by my friend, Dr. J. P. Kimball, who collected them near the centre of the State of Chihuahua, at a place called Nugal, in the midst of a silver mining region. In fact, the doctor represents the argentiferous veins as lying in the cretaceous limestone.[1]

The fossils are of the more interest, since they are another link in the chain of evidence, to prove an extension of the cretaceous sea completely across Northern Mexico.[2] They are of the same group, from which I have already described one series, collected by my old friend and colleague, Aug. Rémond, at Arivechi in Sonora; and the two localities are only separated by the crest of the Sierra Madre, which probably showed its summits as a string of islands in the ancient ocean.

Collected incidentally during a journey made for an entirely different purpose, and in a region infested by Apaches, it is not strange that the series is meagre. Fortunately, it is full enough to give us an undoubted key to the exact member of the formation.

The following is a list of the species identified. In addition to these, there is a *favositiform* coral, and one or two other forms too imperfect for recognition.

Hippurites Texanus, Roem.
Ostrea bella, Conrad.
Exogyra costata, Say.
E. arietina, Roem.
Neithea Texana, Roem. sp.
N. occidentalis, Conrad.
Lima Wacoensis, Roem.
L. Kimballi, Gabb, *n. s.*
Inoceramus, two species, *indet.*

[1] See Silliman's Journal, Nov. 1869, p. 378.
[2] Palæontology of California, vol. ii. p. 257 *et seq.*

Globiconcha? sp. indet.
Pleurotoma Pedernalis? Roem. sp.
(*Fusus id.* Roem.)

A shell agreeing perfectly with Roemer's figure in Kreid. Texas, in size, form, and sculpture; but on which the lines of growth distinctly indicate the sinus of Pleurotoma.

Ammonites Guadalupæ, Roem.

Ammonites Guadalupæ, Roem., pl. 9. fig. 1, and pl. 10, figs. 1, 1*a*.
Kreidebildungen von Texas, p. 32, pl. 2, fig. 1, 1*a*, 1*b*.

Roemer's figure represents a larger specimen than the one before me, and one which exhibits only the more mature form of the shell. The present fine example is 4.7 inches in its greater diameter, and gives us some additional characters. It wants almost entirely the dorsal ornamentation figured in Kreid. Texas; the dorsum being broad, nearly flat, and rounded on the margin. The umbilical row of nodes is well developed, but the outer lateral row is barely discernible; their place being occupied, on the older parts or the shell by faint undulations, which show a tendency to form a series of bifurcate ribs extending outward from the above-mentioned nodes. In the still younger stage, as exhibited by the inner whorls, the shell is flattened discoidal, very similar to *A. placenta* or *A. Pedernalis*, without tubercles, or with no more than are often shown by these species. The dorsum is then very compressed laterally, and is truncated and bi-carinate, so that young specimens of this shell, except for the wider umbilicus, could readily be mistaken for either of the above, but more especially the latter species, which also occurs in the same rocks.[1]

Roemer's figure of the septum seems to have been drawn from a weathered specimen. The differences between the details of his lobes and mine are not more than I have frequently observed in individuals of other species.

LIMA KIMBALLI, Gabb, *n. s.*, pl. 11, fig. 1.

This fine large species is represented by but a single mutilated specimen, of which, while much of the outline is destroyed, the surface is pretty well preserved, and is so characteristic that I have ventured to name it.

It is equivalve, compressed, very oblique, elongated, posterior

[1] See Pal. California, vol. ii. p. 258, pl. 35, figs. 1, 1*a*.

side prominent and broadly rounded; ears unknown. Surface marked by about twelve or thirteen prominent, nearly equal ribs, rounded, or subangular, with broad, regularly concave interspaces, wider than the ribs. Whole surface crossed by very fine lines of growth.

Length, about three inches; greatest width 2.2 in., thickness through both valves, .5 in.

Besides the mollusca, Dr. Jos. Leidy has decided a single shark tooth in the collection to belong to the common *Galeocerdo falcatus* of the chalk, found in England as well as America.

EXPLANATION OF THE PLATES.

Plate 9, fig. 1. Ammonites Guadalupæ, side view.
" 10, " 1. *Id.* front view, showing the change of the dorsum. Fig. 1*a*. Septum.
" 11, " 1. Lima Kimballi.

NOVEMBER 5.

The President, Dr. RUSCHENBERGER, in the chair.

Thirty-three members present.

The following paper was presented for publication :—

"Description of some new genera of Mollusca." By Wm. M. Gabb.

Mr. JOSEPH WILLCOX stated that having felt much interest in the subject of corundum, he had frequently visited the localities of that mineral in Pennsylvania; and that during last April he visited many corundum localities in Lowns Co. Ga., and in Clay and Macon Counties in North Carolina. Mr. Willcox exhibited a specimen lately obtained from near Unionville, Pa., the central portion of which was corundum surrounded by chlorite. The exterior part of the corundum was so mixed with chlorite, that there appeared to be an alteration of one of the substances into the other. Mr. Willcox said he had frequently found in several localities in North Carolina, round specimens of chlorite, the central portions of which were corundum, which corresponded in shape to the surrounding mass of chlorite. These nodules of corundum were from one-quarter inch in size to three inches. In some of the specimens the lines were well defined between the corundum and chlorite, while in others these two substances were so mixed as to appear to pass into each other by insensible degrees.

Mr. Willcox said he had never seen a specimen of this character from any corundum locality in Pennsylvania before. Mr. Willcox also exhibited specimens of crystals of corundum from Laurens District in South Carolina; one of which was partly altered into margarite, and another was wholly converted into the latter substance.

Mr. THOMAS MEEHAN, referring to the cylindrical production presented by Prof. Leidy, said he thought he could confirm Prof. Leidy's suspicion that it was not of vegetable origin, but was wholly mineral. There was not only the peculiarity in the apparent concentric layers, referred to by Prof. Leidy, but also an entire absence of any trace of medullary rays which he thought never wholly obsolete in woody petrifactions. But beyond this the diameter of what appeared to have been the pith cavity was far beyond what usually occurred in Dicotyledonous structures of the age which this, by the number of circles, ought to be. Although he believed the suggestion had not been made before, he had reason to believe that the pith cavity decreased in diameter with the age of the wood. Thus in the case of the strong shoots which in this country formed the ultimate trunk of the *Paulownia imperialis*, the pith occupied a space in the centre of from one-quarter to three-quarters of an inch in diameter according to the strength of this shoot; but in some trees about twenty-five years old, he had seen cut down, the pith cavity was nearly obliterated. It was scarcely credible that any dicotyledonous shoot of one year's growth ever had a pith as thick as this.

But besides these incongruities he had been able to trace the origin of similar formations. In central New York, he had seen on a farm a large number of hollow cylindrical substances from one-quarter to one inch or more in diameter which appeared like pieces of large clay pipe stems. There were many successive circular layers as in this specimen. Informed by the farmer that they came in the muck obtained from a swamp near by, he examined the spot, and found in many instances the central portion was occupied by decaying wood and roots. In time these rotted completely away, and left the structure a hollow tube. The mineral substance around this woody matter appeared to be carbonate of lime, and as the swamp was very wet in winter, and partly dry in summer, he supposed the varying temperature of the water at different seasons of the year, or perhaps actual periodical dryness, would give the appearance of annual rings to the deposit, which formed around the woody core.

He would suggest that probably this piece had been formed in a similar manner, and that after the woody centre which had formed the nucleus of the cylindrical mass had decayed and disappeared through the ends, the crystallized silicious matter had formed in its place.

Notice of Donation of Fossils, etc., from Wyoming.—Prof. LEIDY directed attention to the specimens of fossils and other specimens from Wyoming Territory, presented this evening.

The fine specimen consisting of a nearly complete dorsal shell of a Trionyx, was found on the buttes of Dry Creek, about ten miles from Fort Bridger. It was discovered by Maj. R. S. La Motte, commander of the fort, and was kindly presented by him to the Academy. The shell is about 16½ inches long and nearly as broad. Before comparing it with the specimen of *Trionyx guttatus* it was supposed to be the same, but certain characters appear to indicate it as a distinct species, which may be named *Trionyx uintaensis*. The fore and back parts of the carapace are truncated as in the existing *T. muticus*. The back truncation is slightly sinuous, and extends the width of the last two pairs of costal plates. In *T. guttatus* the corresponding border is convex and exhibits a deep median and two deep lateral sinuses. The specimen possesses only six pairs of vertebral plates.

Of the other fossils a number pertain to a large land tortoise, previously described under the name of *Testudo Corsoni.* There are two specimens consisting of nearly complete ventral shields, broken into many species. One of these was found at Grizzly Buttes and presented by Dr. Corson; the other was found at Dry Creek, by Mrs. Anna Carter, the wife of Dr. Carter, and was presented by her to the Academy. The specimens exhibit some variation in conformation though they are supposed to pertain to the same species. The anterior lobe of the shield has the episternals much prolonged and truncated. The posterior lobe at the extremity presents a wide and deep angular notch. The surface of the shield posteriorly is deeply concave. The length of the plastron is about two feet.

A third specimen of a ventral shield less perfect than the others, has associated with it the median portion of a dorsal shield or carapace. The specimens were found by Dr. Corson on Grizzly Butte. These would appear to indicate that the specimens formerly described and supposed to pertain to a large Emys, for which the name of *E. Carteri* was proposed, really belong to the same animal. The error was committed on account of the large costal capitula, which accord in their proportions with those of living terapenes.

Among other specimens presented are some large cylindrical masses of agate, obtained from the buttes in the vicinity of Carter Station on the Union Pacific R. R. They simulate, in their form and concentric structure, fossil wood, which they however appear not to be, but are rather of the character of siliceous concretions. Some of them contain an axis of clear white chalcedony, and others are occupied along a central cavity by large yellow crystals of calcite.

November 12.

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

Twenty-three members present.

The death of Maj. Gen. Geo. G. Meade, U.S.A., was announced.

November 19.

The President, Dr. Ruschenberger, in the chair.

November 26.

The President, Dr. Ruschenberger, in the chair.

Twenty-one members present.

The following gentlemen were elected members:—

C. P. Sinnickson, C. P. Krauth, Joseph Hazard, Francis Garden Smyth, M.D., John J. Thompson, J. Euen Loughlin, M.D., Thos. M. Chatard, Geo. A. Koenig, Gideon E. Moore, Ph.D.

The following were elected correspondents:—

J. W. Powell, of Washington, D. C., Capt. C. M. Scammon, of San Francisco, Cal.

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

DESCRIPTION OF SOME NEW GENERA OF MOLLUSCA.

BY WILLIAM M. GABB.

THE following diagnoses of new genera are published in advance of a more extended paper on West Indian mollusca, now in process of preparation. The amount of material embodied in that paper is so great, that circumstances will not permit me to illustrate the numerous new species, and I avail myself of the present means of explaining, by figures, the generic descriptions, which are not always clearly intelligible from verbal descriptions.

PTEROPODA.

Fam. LIMACINIDÆ.

PLANORBELLA, Gabb, pl. 11, fig. 2.

Shell minute, vitreous, sinistral, apex sunken as in *Planorbis*.

This genus, from its sinistral character, is evidently allied to *Limacina*, from which its planorbiform mode of growth distinctly separates it. The type *P. imitans*, were it dextral, might be mistaken for a very young specimen of *Planorbis trivolvus*, so nearly does it copy the form of that shell.

GASTEROPODA.

MURICIDÆ.

METULELLA, Gabb, pl. 11, fig. 3.

Shell fusiform, canal more or less produced; inner lip covered with a thickened plate, continuous posteriorly with the outer lip. Interior of both inner and outer lips strongly denticulated or transversely striated. Surface cancellated or costate.

This genus is more distinctly fusiform than *Metula*, and has the additional character that the inner lip is covered throughout its length by a series of prominent denticles, *not* necessarily corresponding with the covered-up surface ribs.

Type *M. fusiformis*.

TURRIDÆ.

GLYPHOSTOMA, Gabb, pl. 11. fig. 4.

Shell like *Defrancia*, but with the inner lip strongly cranulated or transversely rugose.

This genus has the same relation to *Defrancia* that *Metulella* bears to *Metula*. The inner lip of *G. dentifera*, the only known species, is thickened, and is crossed by a number of prominences, intermediate in character between teeth and transverse folds. At the same time, they are wholly unlike the one fold of *Borsonia*, or the two or three of *Cordiera*. A better comparison would be with the teeth of *Cypræa*.

BUCCINIDÆ.

ECTRACHELIZA, Gabb, pl. 9. fig. 2.

Shell acuminately oblong, spire elevated (always truncated in the only species known). Surface compressed near the suture. Inner lip encrusted; columella sinuous, short; outer lip produced in advance. This genus seems to be allied in many of its characters to *Cominella* and *Truncaria*. Like them, it is compressed adjoining the suture. It shows no trace of umbilicus, as seen in most of the Buccinidæ, but its most distinctive character is in its obliquely sub-truncated columalla, which does not reach to the anterior end of the shell. It differs from *Truncaria* in having no fold on the columella and in the outer lip not being emarginate posteriorly. In *E. truncata*, the apex is truncated at all ages, shells of less than half an inch long having lost several of their apical whorls, and it is rare to find more than two entire volutions in any specimen.

OLIVIDÆ.

PLOCHELÆA, Gabb, pl. 11, fig. 5.

Shell olive shaped, suture nearly obsolete, as in *Ancillaria*; aperture linear, deeply and obliquely notched at the base, as in *Dibaphus*. Outer lip thickened internally, in the middle; inner lip incrusted and having several transverse folds, of which the upper are the smallest; columnella strongly recurved at the base.

From its form and general appearance, I am inclined to consider this genus as belonging to the *Olividæ*, although its details of character are strikingly like that of *Dibaphus*. It seems to form, in a manner, a connecting link between the true *Olives* and the genus *Monoptygma* Lea (not of Adams, Sowerly, etc.) The folds are placed in a reverse order to those of *Mitra*.

I have before me specimens of *Dibaphus edentulus* and *Mauritia Barclayi*, the typical species of their respective genera. There is no possible room for doubt that *D. edentulus* is at least sometimes supplied with mitra-like folds. My specimen has seven or eight, well developed. Consequently *Mauritia* is synonymous with *Dibaphus;* and it seems to me that the genus should be placed rather with the Mitres than with the Cones. The differences between the present genus and *Dibaphus* are small, and it is possible that the two should be placed side by side, although I strongly suspect that the resemblances are those of imitation rather than of true relationship.

Type *P. crassilabra.*

EULIMIDÆ.

Iopsis, Gabb, pl. 11. fig. 6.

Shell eulimoid, polished, spire elevated, suture nearly obsolete, apex dextral; no umbilicus; columella slightly twisted and produced into a short lip-like canal, not emarginated.

The ivory-like structure, obsolete suture, and whole general appearance of this little shell prove its close relationship to *Eulima*, while its faintly twisted columella, extended to such a degree as to produce a short though not notched canal, distinguishes it from the other genera of the family. It resembles in form a miniature *Io*, from which circumstance the name is derived. I have noticed in some species of true *Eulima* a slight tendency to expansion of the lip in advance, on the columellar margin.

I. fusiformis.

STROMAIDÆ.

Orthaulax, Gabb, pl. 9, figs. 3, 4.

Shell rounded fusiform, canal moderate, straight and regularly tapering; adult shell enveloped over the whole spire by an extension of the inner lip; posterior canal fissure like, formed by the continued edge of the outer lip and running directly to the apex. Outer lip apparently sharp and simple; anterior notch oblique and broad.

The discovery of this genus fills an important break in the Rostellarias, uniting the true genus *Rostellaria*, with Conrad's fossil from *Calyptraphorus.* Unlike both of these genera the canal is not styliform, but robust and comparatively short, and its terminal notch is formed by an almost rectangular truncation of the anterior part of the outer lip. Like *Rostellaria* it has a straight posterior canal, prolonged, however, further than is common in that genus. The canal is similar in structure to that of *Calyptraphorus*, being formed by a squamose plate, but in the latter genus it curves over backwards, behind the spire, which it ascends to about half its height, and then bends down to near the suture of the body whorl. Unlike the first, and like the second, of its congeners, it has the whole spire enveloped in a plate, which might more probably be described as a posterior extension of the body whorl, carrying the suture to the extreme apex. The lines of growth ran from the top of the spire to the anterior end of the shell. It carries none of the tubercles seen in *Calyptraphorus* and *Tessarolax*, and seems, unlike most of the other genera of the family, to have had a simple outer lip, neither thickened, digitate, nor notched.

O. inornatus.

DOLOPHANES, Gabb, pl. 11, fig. 7.

Shell elongate oval, spire elevated; with a minute, imperforate umbilicus; aperture semi-oval, inner lip acute, sinuous; anterior end of the aperture terminating in a short, not emarginate canal.

The first impression produced on looking at this little shell, is that it is probably a *Melania*. It is however undoubtedly marine, and it has a grouping of characters which ally it so closely to *Struthiolaria*, that I am convinced that it is a nearly related genus. Its spire is very like that of many of the species of the *Strombidæ*, and, in the details of its mouth, it differs only from *Struthiolaria* in having a thinly encrusted inner lip, an acute outer lip and an obsolete umbilicus, instead of the thickened margins and no umbilicus of that genus.

D. melanoides.

ACTÆONIDÆ.

ACTÆONIDEA, Gabb, pl. 11, fig. 8, 8 a.

Shell oval, elongate; aperture narrow, outer lip simple; columella slightly encrusted, bearing one large transverse fold in the middle and truncated in advance. Ornamented by revolving ribs.

This genus is an *Actæon* except that it has a single large fold on the middle of the inner lip, and the columella is truncated as in *Achatina*.

A. oryza, Gabb.

BULLIDÆ.

CYLICHNELLA, Gabb, pl. 10, fig. 2.

Shell sub-cylindrical, spire sunken; mouth narrow behind, widened or advance; columella with two folds.

This genus has the external form of *Cylichna*, but it has two distinct folds. The upper one is sharp and prominent like that of

Actæon, while the lower is more oblique and winds around the columella more like that of *Cylichna*.

C. bidentata. d'Orb.

Bulla bidentata, d'Orb. La Sagra's Cuba, pl. fig. 13, 16.

Utriculus bidentatus, Chemn. Mar. Conch., vol. 1, p. 388.

ACEPHALA.

CORBULIDÆ.

BOTHROCORBULA, Gabb, pl. 10, fig. 3, 3 a.

Shell like *Corbula* in every respect, except that it has a deep lunular pit under the beaks penetrating and almost passing through the hinge plate.

I have carefully examined almost all of the living and many fossil species of *Corbula*, and can find in none the slightest trace or rudiment of a lunuli; while this shell has it deeper than I have even seen in any other form, except in *Here* of the *Lucinus*.

B. viminca, Guppy, sp.

Corbula viminca, Guppy, Quart. Journ. Geol. Soc. Lond., v. 22, p. 293, pl. 18, fig. 11.

ANATINIDÆ.

NEÆROMYA, Gabb, pl. 10, fig. 4, 4 a, 4 b.

Shell thin, translucent, in shape approaching *Pholadomya*, ends closed; hinge with a prominent tooth in the right valve, articulating behind a smaller similar one in the left valve; an anterior and posterior lateral tooth in each valve. Mantle margin without sinus.

This genus, in its thin character and minute hinges, is closely allied to *Pholadomya*, *Thetis*, and *Neæra*, but differs from all in details of the hinge. *Neæra* has no cardinal tooth, but, in its place, a cartilage pit in each valve. It has a single posterior tooth, while this genus has the anterior equally well developed. In having corresponding teeth in both valves, it differs from *Thetis*, while its well specialized hinge and its closed ends distinguish it from *Pholadomya*.

N. quadrata, Gabb.

December 3.

The President, Dr. Ruschenberger, in the chair.

Twenty-five members present.

Joseph Willcox made the following remarks about some glacial scorings lately observed by him in St. Lawrence County, N. Y. Between the village of Rossie and Morristown, on the St. Lawrence River, a distance of eighteen miles, the country is generally a level plateau. The hard potsdam sandstone, alternating with calciferous sandstone, underlies a soil so thin that in many fields the use of the plow is impracticable; and fence posts are rarely placed in the ground.

Over this territory rounded boulders of granite are scattered in great profusion; though no outcrop of this rock is visible for many miles. The sandstone is frequently exposed to view to the extent of many yards, and on its surface the glacial marks made by the boulders of granite during their passage are exhibited in great perfection. An examination made with a pocket compass applied in three places at intervals of several miles determined the course as N. N. East with little variation. No glacial marks were observed on the calciferous sandstone, as this rock is disintegrated with too much facility to retain impressions of this character for a long period of time.

For a distance of thirty miles north of the St. Lawrence, between that river and Rideau Lake, the country is level and characterized by the absence of streams of water. The only rocks observed in position were the calciferous sandstone and limestone. Though rounded boulders of granite were abundant, none of the rocks were sufficiently durable to retain the glacial marks. On the north shore of Rideau Lake, in Burgess, is the remarkable locality for apatite (phosphate of lime).

This mineral is found in the Laurentian rocks; generally in gneis, but occasionally in limestone. It is nearly always associated with black mica (biotite). About 100 tons per week of apatite are mined, which is all shipped to Europe.

December 5.

MEETING OF THE CONCHOLOGICAL SECTION.

Dr. W. S. W. Ruschenberger, Director, in the chair.

A communication was read from Hon. J. A. Lapham, of Milwaukee, Wis., dated November 26, and accompanied by a drawing of a very large specimen of *Busycon perversum*, measuring 12.5 inches in length. This shell was found in connection with ancient (Mound-Builder's) relics in excavating the street grades in the city of Milwaukee. A similar shell was obtained some years ago at Fond du Lac. The species is living on the Florida coast.

A letter was read from the Chicago Academy of Sciences, dated November 30, acknowledging receipt of several hundred named species of shells presented to that Institution by the Conchological Section.

The Conservator's Annual Report was read. (See Reports of Officers and Committees of the Academy.)

The officers for the ensuing year were then elected.

Director	W. S. W. Ruschenberger, M.D.
Vice-Director . . .	Geo. W. Tryon, Jr.
Recorder . . .	S. R. Roberts.
Treasurer . . .	W. L. Mactier.
Secretary . . .	Rev. E. R. Beadle.
Conservator . .	E. J. Nolan, M.D.

December 10.

The President, Dr. Ruschenberger, in the chair.

Twenty-six members present.

Jos. Willcox made the following remarks:—

Having lately visited many mineral localities in Canada, I desire to place them on record, as many of them are not mentioned either in the Geological Report of Canada, or in Dana's Mineralogy. I was accompanied by Mr. Charles D. Nims, of Philadelphia, Jefferson County, New York, who has frequently visited Canada for the purpose of procuring mineral specimens.

At the Falls of Ottawa River at Grand Calumet Island.—Black mica (phlogopite), pyroxene, hornblende, serpentine, tremolite.

The following localities are all in the Province of Ontario:—

At Arnprior.—Calcite (dog tooth spar).

Near Packenham.—Hornblende.

In Bathurst.—Pyroxene, scapolite, sphene, apatite, peristerite.

Two miles southwest of Perth.—Bronze mica (phlogopite), having beautiful hexagonal marks on the cleaveage planes.

Near Otty Lake, in North Elmsley.—Apatite, pyroxene, black mica (biotite), zircon, red spinel—chondrodite.

In Burgess.—Apatite, black mica (biotite).

Near Bob Lake, twenty miles northwest of Perth, the best crystals of apatite are found.

Near the St. Lawrence River, six miles southwest of Brockville, large octahedral crystals of iron pyrites, some of them 4 inches in diameter.

All of these minerals are well crystallized, except the peristerite and chondrodite, and most of them are found in splendid specimens.

I am indebted to Prof. B. Silliman for the examination of the above-mentioned micas.

Remarks on Fossils from Wyoming.—Prof. LEIDY directed attention to some fossils recently received from Dr. J. Van A. Carter, of Fort Bridger, Wyoming. He characterized them as follows:—

1. PALÆOSYOPS JUNIOR.—Intermediate in size to *P. paludosus* and *P. humilis.* Founded on portions of a lower jaw agreeing in character with the corresponding parts of *P. paludosus* but smaller. Space occupied by the last premolar and the true molars, 4 inches. Antero-posterior diameter of last premolar, 8 lines; of last molar, 17½ lines.

2. UINTACYON EDAX.—A remarkable animal, probably marsupial. Indicated by the greater part of a ramus of the lower jaw resembling in its form the corresponding part in the Fox. Number of incisors unknown. Fang of canine indicates a tooth proportionately as large as in the latter animal. Molar series following close upon the canine, and consisting of eight teeth! First premolar with a single fang, but lost. Second premolar nearly like that in the Fox. Third, anomalous in form as a lower tooth and probably so altogether. The crown is conical, and is inserted by three fangs, of which the odd one is external to the others. The remaining teeth holding the relative proportions of those in the Fox. Fourth premolar with a conical crown and with a thicker heel than in the latter. The fifth premolar and the fore part of the crown of the first molar are lost. The back of the crown of the first molar and the succeeding tooth nearly resembling those in the Fox. The last molar is a small tooth as in the latter, and is inserted by a single fang. Space occupied by the molar series, one and a quarter inches; that of the true molars is half an inch. Breadth of first molar, one-fourth inch; of second molar, two lines; of last molar, one line.

3. UINTACYON VORAX.—Apparently a larger species, indicated by a lower jaw fragment containing the second molar, part of the first one, and the socket of the last. Space occupied by the true molars about eight lines; breadth of second molar, three lines.

4. CHAMELEO PRISTINUS.—Indicated by a lower jaw fragment containing eight teeth in a space of five lines. In every respect it agrees in character with the corresponding part in living species of the genus.

Remarks on Silver Ore from Colorado, by Geo. A. König.—I had an opportunity, lately, to test a silver ore from Coinload, Colorado, and was astonished at the beautiful crimson and flesh-colored incrustation, which was obtained by treating the ore with the point of the inner flame on charcoal. The crimson was most intense in a zone immediately following the yellow incrustation of lead, it went gradually through different shades of flesh-color into the white incrustation produced by the teroxyd of antimony. The ore was composed of Galena and antimoniferous ruby silver. After a number of experiments with pure ruby silver from Andreasberg, pure Galena, and pure sulphide of antimony, I found that a crimson color could only be produced by the presence of all three compounds, or an alloy of silver, lead, and antimony; and that it appeared only just before the silver button had become nearly pure. Now, if we consider that silver alone, when kept in fusion by a strong oxydizing flame, deposits a brown coating in the immediate neighborhood of the button, that lead produces an incrustation of plumbic oxyd, which is of a dark yellow color while hot and a lighter yellow in the cold, and lastly, that antimony gives rise to a copious white coating, at some distance from the flame, of antimoni teroxyd, it seems striking that the three metals together should produce a *crimson* incrustation. A mechanical mixture of the three oxyds—brown, yellow, and white, cannot be supposed to bring about a crimson color. Also the fact, that only then this color appears, when the silver is nearly pure is suggestive of a peculiar chemical combination, formed of the oxydized metals as soon as these are brought into a certain quantitative relation.

At the same time it must be inferred that the volatility of silver is increased to a considerable amount when this quantitative relation is reached. This latter reflection might throw, perhaps, some light upon the inaccuracy of the cupelling assay in certain cases, where the loss of silver is larger than usually.

It seems to me of some interest to investigate into the nature of this crimson-colored compound, and I hope to be able to lay before the Academy some positive results regarding it, at an early date. The observation of crimson-colored incrustations from silver ores containing lead and antimony is not new. Prof. Richter mentions them in the last edition of "Plattner's Probirkunst vor dem Loethrohr," Leipzig, 1865, page 84. But as to the real cause, there has no publication been made, so far as my knowledge goes.

The death of Samuel Emlen Randolph was announced.

December 17.

Dr. J. L. LeConte in the chair.

Nineteen members present.

Prof. Cope made some remarks on the Geology of Wyoming, especially with reference to the age of the coal series of Bitter Creek. He said that the discovery of the Dinosaur *Agathaumas sylvestris* had settled the question of age, concerning which there had been much difference of opinion, in favor of the view that they constitute an upper member of the Cretaceous series. In the sections made, he had succeeded in tracing the line of demarcation between these and the lower beds of the Green River epoch, and had found the leaf beds of the former to be immediately covered by deposits of mammalian remains, with an interval of a few feet only. In the same way, the close approximation of the Evanston cretaceous coal to tertiary strata was determined by the finding of numerous mammalian and reptilian remains in the lower part of the Wahsatch beds of Hayden, or even in the sandstones overlying the coal. Here two species of *Bathmodon* were found, corresponding with the nearly allied genus *Metalophodon* from the Bitter Creek locality. So far as is yet known, the *Bathmodontidæ* are diagnostic of the Green River formation, and, on this and other grounds, the Wahsatch beds of Evanston were regarded as belonging to it. A further extension of the Green River formation was found at a point 400 miles westward (*see* Proc. Am. Philos. Soc., July, 1872), near Elko, Nevada, where fishes and insects occur in thin shales. Some of the former are nearly allied to species from the fish beds of Green River.

He added that exception had been taken to his claiming the final determination of the cretaceous age of the Bitter Creek coal strata (*see* Silliman's Journal, 1872, Dec., p. 489); his critics presuming that he was unacquainted with previous publications on the subject. It was, however, his knowledge that previous authors had expressed either adverse or doubtful opinions respecting it, that induced him to print the short preliminary notes that had appeared. He was well aware that Messrs. King and Emmons had considered the lower part of these beds as cretaceous, and the *upper as tertiary* (*see* Exploration 40th Parallel, III. p. 458), on stratigraphic grounds. Since the cretaceous was represented in different parts of the country by clays, sands, glauconite, chalk, limestone, and sandstone, he thought that palæontological evidence was needed to complete the demonstration. This had not been produced for the locality in question, but the nearest point (Hallville) had been called Tertiary by Mr. Meek, and Prof. Lesquereaux (Hayden's Survey of Terrs., 1870, p. 306) had considered the fossil flora of Point of Rocks, forty miles westward, as of "unknown age," and those of Evanston as *miocene*. Hayden himself is well known to regard the strata as of uncertain or transitional age. Palæontological determinations of cretaceous age of the Bitter Creek series were very indefinite up to the publication in question. But first he would remark, that his critic was doubtless uninformed as to the geography of Wyoming, when he cited Prof. Marsh's determination of the cretaceous age of the coal of Brush Creek, a locality from 150 to 200 miles distant. So with the determinations from Weber River (Coalville) 200 miles, and Evanston and Sulphur Creek 150 miles distant, on the opposite side of the Bridger Basin. He did not regard these as determinations affecting the age of the Bitter Creek Beds any more than they did of the Eocene coal of Osino, 200 miles west of them.

The only approximations to the point were made by Mr. Meek. In King's Survey of the 40th Parallel (l. c. 462), Mr. Meek's nearest points of investigation were the shell beds of Sulphur Creek (Bear River); of these he says, "While I am, therefore, willing to admit that facts may yet be discovered that will warrant the conclusion that some of these estuary beds should be included rather in the Cretaceous than in the Tertiary, it seems to me that such evidence must either come from included *vertebrate* remains, etc." This is not very conclusive, and acknowledges in advance the importance of the determination of vertebrates from the same neighborhood (Evanston), and from Bitter Creek, above described. Secondly, in Hayden's Survey, 1870, p. 298, the only determination of the age of coal of the Bitter Creek area is *tertiary* (Hallville). Thirdly, in Hayden's Survey Montana, etc. (1871, p. 375), Mr. Meek enumerates *three species* from this region (Point of Rocks) as cretaceous, *every one with question* as to the determination, which, therefore, decides little as to the age of the beds. In the same way all his Coalville species are marked with question. In his earliest investigation in connection with Mr. Engleman, in Capt. Simpson's Report (1860), he expressly states that the age of the Bitter Creek coal series is *unknown*.

Thus it seems that a knowledge of the literature of the geology of the Bitter Creek coal, shows: I. The Messrs. King and Emmons on stratigraphic evidence referred the lower part to the cretaceous and the upper to the tertiary. That on Palæontological grounds, II. Mr. Lesquereaux regards them as tertiary; III. Mr. Meek's evidence is doubtful;[1] and, IV. Dr. Hayden has believed in a transition series.

Hence it appeared to the speaker, that the explorations directed by Dr. Hayden during the past season had contributed largely to our knowledge, proving the existence of an interruption between the cretaceous and tertiary formations; less it is true than that which exists elsewhere, and similar to that insisted on by Clarence King's survey in the region of Bear River and the Wahsatch country.

Prof. Cope defined a genus of Saurodont Fishes from the Niobrara Cretaceous of Kansas, under the name of Erisichthe. He stated that it agreed with *Portheus* and *Ichthyodectes* in the absence of nutritious dental foramina on the inner face of the

[1] This gentleman has stated in a letter to the writer that the Bitter Creek Beds constitute a "new zone."

dentary bone, and especially with *Portheus* in the irregular sizes of the teeth. The crowns are, however, compressed and knife-like, and closely similar to those of *Saurocephalus*. The typical species was called *Erisichthe nitida*, and was stated to have been discovered in the cretaceous formation of Kansas, near to the Solomon River, by Prof. B. F. Mudge. The enamel of the teeth is smooth and glistening, and their outline acuminate and rather elongate. In the anterior part of the jaw are two teeth much larger than the others, separated by a small tooth. The posterior of these is much compressed, while the anterior is oval in section, with one angular edge. Length of the restored skull between one and two feet.

It was added that the *Portheus angulatus*, Cope, probably belongs to the genus *Erisichthe*, and that it differs from *E. nitida* in its greater size and other features. The genus was further stated to be abundant in certain formations of the Southern States, and in the English chalk. Isolated specimens of large teeth from the latter had been referred to the genus *Saurocephalus* in the Poissons Fossiles, which could not be distinguished from those of the genus newly described.

December 24.

The President, Dr. Ruschenberger, in the chair.

Ten members present.

December 31.

The President, Dr. Ruschenberger, in the chair.

Twenty members present.

The following reports were read, and referred to the Publication Committee:—

THE LIBRARIAN'S REPORT.

The Librarian respectfully reports that the number of additions to the library from January to December, 1872, inclusive, amounts to 1488.

Of these 250 were volumes, 1230 pamphlets and parts of periodicals, and 8 maps and charts; 1135 were octavos, 310 quartos, 20 duodecimos, 15 folios, and 8 maps.

They were derived from the following sources:—

Societies 706, Editors 139, Authors 188, Wilson Fund 67, Isaac Lea 12, Imperial Botanical Garden of St. Petersburg 11, Thomas

Meehan 10, Chilian Government 9, Geological Survey of India 9, Treasury Department 7, Publishers 7, Dr. Charles Schaffer 6, Capt. R. H. Wyman 6, S. S. Haldeman 5, Publication Committee 5, Dr. Finsch 5, Geological Survey of Italy 4, New York State Library 4, F. V. Hayden 4, Minister of Public Works, France, 3, Department of the Interior 3, Geo. W. Tryon, Jr., 2, Dr. Jos. Leidy 2, Prof. Geo. H. Cook 2, Jos. Jeanes 2, Gen. C. B. Comstock 1, D. W. Dawson 1, Commissioner of Fisheries, New Jersey, 1, J. M. Maisch 1, F. A. Walker 1, Dr. H. C. Wood 1, Chief of Engineers U.S.A. 1, War Department 1. Two hundred and sixty-two were purchased.

Two volumes and forty-seven pamphlets were received through the Conchological Section, and eight volumes through the Microscopical and Biological Section.

These additions were distributed to the several departments of the library as follows: Journals 1035, Geology 112, General Natural History 58, Conchology 60, Botany 46, Medicine 30, Entomology 28, Physical Science 27, Ornithology 15, Mineralogy 14, Bibliography 12, Politics 12, Anatomy and Physiology 10, Ichthyology 7, Helminthology 6, Voyages and Travels 6, Herpetology 4, Chemistry 4, Mammalogy 2.

During the year 157 volumes have been bound, and 30 volumes are now in the hands of the binder.

Twenty-eight applications have been received from members for books required by them in the pursuit of their studies, and not to be found in the library. Twenty of these have been received, and the others have been ordered.

In common with nearly all the other departments of the Academy the library is suffering from want of room. The difficulty of properly arranging the journals and periodicals, especially, is becoming daily greater in consequence of the regularity with which large exchanges are received from corresponding societies at home and abroad. In many instances it has become necessary to place the older volumes of a series out of view at the back of the cases to make room for the current numbers. It is not possible to do this, however, where the volumes are large and the book-cases shallow, so that the necessity for additional room is becoming daily more pressing.

All of which is respectfully submitted,

EDWARD J. NOLAN, *Librarian.*

REPORT OF THE CURATORS.

The Museum of the Academy continues in its usual condition, and the more perishable departments are in a fair state of preservation. While several remain in a state of comparative confusion, others are in an advanced condition of arrangement. The conchological cabinet, which now numbers upwards of 21,000 species, is reported to have nearly one-half of the collection systematically arranged and properly labelled.

Mr. James A. Ogden, one of the members of the ornithological committee, informs us that during the past year, the entire collection of birds has been carefully examined, and those which were found infested were submitted to the heating process. He also assures us that the collection is now in good order. Further, several families have been arranged, and about 1400 specimens labelled.

Several hundred duplicate bird skins were presented to the Chicago Academy of Sciences, according to a special vote of our Academy.

The donations and additions to the collections and Museum of the Academy during the year are as follows:—

Mammals.—The skeleton of a Whale, *Megaptera bellicosa*, Cope, from St. Barts, W. I., was presented by Wm. S. Vaux, and I. Lea. Dr. Ruschenberger presented a skull, a skeleton, and a mounted skin of a Japan Dog. Dr. H. Rand presented four skulls of Monkeys, and Dr. H. C. Chapman, the skull of a very old Horse. Several mammal skins from the West Coast were presented by George Davidson.

Birds.—Mr. James A. Ogden, of the ornithological committee, submits to us the following list of donations:—

Skins of *Haliaetus leucocephalus*, two *Mormon cirrhata*, two *Hæmatopus niger*, *H. palliatus*, and *Mergulus Cassinii*, from the West Coast of North America, presented by George Davidson.

Ardea ludoviciana, *Larus argentatus*, and *Mergulus alle*, from North Carolina, presented by Dr. H. C. Yarrow, U.S.A.

Pelecanus fuscus and two *Querquedula discors*, from St. Martins, W. I., presented by Dr. R. E. Van Riggersma.

Eight species of birds, from San Domingo, presented by Wm. M. Gabb.

An albino *Pipilo erythrophthalmus*, from Georgia, presented by Bayard King.

Three skins of *Sturnus vulgaris*, two *Lanius rufus*, *Cinclus aquaticus*, two *Sitta europæa*, *Chrysomitris pinus*, *Mecistura caudata*, *Parus atee*, *Muscicapa griseola*, *Passer montana Fringilla montifringilla*, *F. cœlebs*, *Coccothraustes vulgaris*, three *Erythraca familiaris*, *Regulus cristatus*, from Switzerland, and *Troglodytes ædon* from this State. Presented by the ornithological committee.

Ten nests with eggs, from Illinois, presented by Mrs. Wm. Turner.

Reptiles and Fishes.—Small collections of reptiles were presented as follows: From Central America, by George Davidson; ten species, from Florida, by T. J. Kochersperger; and from Wyoming Territory, by Dr. Leidy. A collection of reptiles and fishes, from St. Domingo, was presented by Wm. M. Gabb.

A flying fish, *Exocetus obtusirostris*, from off the Cape de Verd Island, was presented by Dr. A. L. Gihon, U.S.A. One species of fish from the Raritan River, was presented by A. H. Smith, and one from Michigan, by J. V. Lemoyne.

Osteological and Ethnological Specimens.—A male and female skeleton of Indians, from a mound on San Miguel Island, the most western of the St. Barbara Islands, were presented by George Davidson. An Indian skull, together with fragments of pottery and stone implements, from the vicinity of a shell mound at Cedar Keys, Florida, were presented by H. J. Smith. An Indian skull, from a mound near Melton, Indiana, was presented by Clarence S. Bement. A collection of flint chips, from Crow Creek, Wyoming, was presented by E. L. Berthoud, and an antique pestle, from Gloucester, N. J., by Joseph S. Lodge.

Invertebrates.—The special donations and additions to the conchological cabinet, will be given in the Report of the Conservator of the Conchological Section. A collection, from Santa Barbara, California, was presented by George Davidson. A collection of crustaceans, corals, gorgonias, and sponges, from St. Domingo, by William M. Gabb. A collection of shells, starfishes, and corals, from North Carolina, by Dr. H. C. Yarrow, U.S.A. Several Cirrhipeds, and Holothurians, from the Isle of Shoals, by Mrs. C. Pennock. A huge Lobster, from our coast, by G. W. Bugbee. A Scorpion and a Mygale, from Florida, by T.

J. Kochersperger; and specimens of the seventeen year Locust, by S. L. McAllister.

Fossils.—A large collection of remains of mammals and reptiles, from the Bridger Tertiary formation of Wyoming Territory, has been presented by Dr. J. Van A. Carter and Dr. Joseph K. Corson, U.S.A. Among these are the types of the species described or noticed by the writer in the present volume of the Proceedings. The fine specimen of a Turtle, from the same locality, described under the name of *Baptemys wyomingensis*, has likewise been obtained for the Academy through exchange. A nearly complete plastron of the *Testudo Corsoni* from the same locality was presented by Mrs. Dr. J. Van A. Carter. A fine dorsal shield of *Trionyx uintaensis*, was likewise presented by Major Robert S. La Motte, commander at Fort Bridger. Another rich collection of fossils, presented to the Academy during this year, consists of 350 species of mollusks, from Santa Domingo, received from our generous fellow-member and able geologist, William M. Gabb, on condition that he shall have the privilege of withdrawing the specimens for study if necessary. Mr. Gabb has also presented seven species of fossil shark teeth from St. Domingo; a mass of stalagmite with shells, from the cave of San Lorenzo, St. Domingo; and several fossil foot-prints in redshale, from the valley of the Little Schuylkill River.

The following collections were also presented: Twenty-two species of fossil mollusks, corals, and crinoids, from the carboniferous limestone of England, a vertebra of Ichthyosaurus, and six do. of Plesioasaurus, from the Lias of England, by Clarence S. Bement. Dicotyledinous leaves in red sandstone from the cretaceous formation near Fort Harker, Kansas, from Dr. B. E. Fryer, U.S.A.

Fresh-water shells, from Crow Creek, Wyoming, from E. L. Berthoud. Jaw fragment of *Eschrichtius Davidsonii*, Cope, from San Diego, Cal., from George Davidson.

Two vertebræ of Macrosaurus, a tooth and three coössified vertebræ of Mosasaurus, and a fragment of a large limb bone, from the marl of Woodstown, N. J., from S. Shortledge, of Kennett Square, Chester County, Penn. Two species of fossil fishes, from Verona, Italy, from Mr. Harrison.

In addition, Dr. Thomas N. Penrose, U.S.N., presented a large slab of stone with a section of an Orthoceratite mounted as a screen, and well-illustrating the chambered arrangement of the shell.

Plants.—Mr. Thomas Meehan presented two hundred species of plants, from Colorado, and the fruit of *Larix leptolepis*, of Japan. Dr. George Englemann, of St. Louis, presented seven species of Lemna, from the vicinity of Mexico. Mr. John B. King presented a small collection of Cuban mosses. Dr. Leidy presented a collection of plants from Wyoming. Several specimens were presented by C. W. Zuremba and T. H. Streets.

Minerals.—The following specimens were presented:—

Realgar and euchroite, from Hungary; fluor, Hartz; erythrite, Saxony; calcite, Cornwall, E.; willemite, jeffersonite, and two calamines, Franklin, N. J.; Allanite, Orange Co.; and three brown tourmalines, St. Lawrence County, N. Y.; cuprite, Cornwall, E., from Clarence S. Bement.

A fine large apophyllite with stilbite, from Poonah, Hindostan, from Wm. S. Vaux.

A fine large amethyst with fluor, from Thunder Bay, L. S., from E. W. Clark.

Phlogopite, scapolite, hornblende, New York; cummingtonite and zoisite, Ducktown, Polk County, Tenn.; massive chrysolite, and corundum, Franklin, Macon County, N. C., from Joseph Willcox.

A fine large crystallized jeffersonite, from Franklin, N. J., from Joseph Willcox and S. B. Howell.

Zincite, Franklin, and hornblende, Andover, N. J., from S. B. Howell.

Group of muscovite crystals, from Chester County, from I. Lea. Corundum with talcose schist, from Unionville, Chester County, from George Ball. Stilbite, from Frankford, from John Bartlet. Floatstone, from Oregon, from E. Goldsmith. Two cannel coals, from West Virginia, from B. S. Lyman.

By purchase and exchange there were also obtained ruby and sapphire corundum, from Macon County, N. C.; corundum with chlorite, crystallized red copper, and bournonite.

The Curators regret to state, that during the past year several valuable minerals have been stolen from the Museum. It may be added that in consequence of the present great extent of the latter, and the want of proper labelling and numbering, with a catalogue of the collections, we are unable in many instances, to discover depredations and their extent. It is to be hoped that in a short time the Academy will feel the importance of appointing a paid curator and assistants, whose duty it shall be as early as possible, to put the Museum in complete order of arrangement, to number all its specimens, and prepare a catalogue of the same.

Respectfully submitted by

JOSEPH LEIDY,
Chairman of Curators.

REPORT OF THE BOTANICAL COMMITTEE.

To the President and Members of the Academy:—

The Committee on Botany respectfully report, that during the year good collections of plants have been contributed by Dr. Gibbons from California, T. Meehan from Colorado and Western Kansas, Prof. Davidson from California, Dr. Leidy from the Uinta Mountains, and Professor Asa Gray, a large package chiefly of tropical rubiaceæ. The American plants have added largely to the value of the herbarium, in regard to botanical geography, and by furnishing specimens in varying conditions of growth, besides in a few cases adding to the number of species in the already pretty full collection.

The Committee are desirous of bringing the general herbarium nearer completeness. In order the better to ascertain its deficiencies, the work of preparing a catalogue of species has been commenced. Rough lists have been prepared of the first twenty-three volumes, serving as indices to each volume temporarily; and it is hoped that the whole one hundred and twenty-seven volumes will be thus far finished by the next year.

THOMAS MEEHAN, *for the Committee.*

RECORDING SECRETARY'S REPORT.

The Recording Secretary respectfully reports that, during the year ending November 30th, 1872, there have been elected thirty-nine members and four correspondents.

The announcement has been made of the death of the following members and correspondents:—

Fourteen members, namely: Wm. W. Gerhard, M.D., Dr. Wm. Stimpson, John Farnum, Maj. Sydney S. Lyon, John G. Moore, T.

Clarkson Taylor, Prof. Edward Parrish, Mr. Chas. Wilson Peale, Mr. James H. Orne, Prof. John F. Frazer, Dr. Mifflin Wister, Constant Guillou, Maj. Gen. G. G. Meade, U.S.A., and S. Emlen Randolph.

One correspondent, namely: Sir Roderick J. Murchison.

Two resignations of membership have been accepted.

The number of papers contributed and ordered to be printed in the Proceedings of the Academy during the year, has been twenty-seven, as follows:—

F. B. Meek	1	Geo. W. Tryon, Jr.	7
E. D. Cope	3	T. Hale Streets, M.D.	1
O. Finsch	1	Thomas Bland and W. G. Binney	1
Thomas Meehan	2	John G. Cooper	1
E. L. Berthoud	1	Isaac Lea, LL.D.	1
T. A. Conrad	2	Theo. Gill, M.D.	1
Elliott Coues	2	Wm. M. Gabb	3

Five papers ordered to be published in medical journals, as follows:—

Joseph Leidy, M.D.	1	Albert Frické, M.D.	1
James Tyson, M.D.	1	Jos. G. Richardson, M.D.	2

All of which is respectfully submitted,

Samuel B. Howell,
Recording Secretary.

REPORT OF RECORDER OF BIOLOGICAL AND MICROSCOPICAL SECTION.

Read before the Section December 2d, 1872, and directed to be forwarded to the Academy as the Report of the Section for the current year.

The closing business year of 1872 leaves our Biological and Microscopical Section in a much more healthy and vigorous condition than did its immediate predecessor. In spite of the gloomy forebodings, which twelve months ago threatened our department with complete and speedy extinction, we can this evening look back to a better record, of real scientific work accomplished during the past year, than even warm friends of a Microscopical society dared at one time to hope was within the bounds of possibility. When we remember that our eminently honorable and useful parent Academy of the Natural Sciences, with her far larger membership, and wider claims upon the scientific world for support, has on a few untoward occasions even found it difficult to convene the quorum requisite to transact her ordinary business, we may well feel encouraged to persevere in thus meeting together, although the paucity of our number sometimes might otherwise be enough to dishearten the most earnest seeker after truth among us.

Prominent in the list of triumphs during the past year, stands of course our Exhibition of microscopes and microscopical apparatus, given in Horticultural Hall, to the American Medical Association, on the evening of May 7th, and witnessed with warmly expressed satisfaction, not only by the members of the National Convention and their ladies, but also by hundreds of the inhabitants of Philadelphia, whose awakening interest in the wonders and beauties of microscopy, as well as their enjoyment of the results attained by microscopic investigation, formed a gratifying feature of the occasion. At this exhibition one hundred and six instruments, adjusted to a classified collection of objects, illustrating most of the different applications of the higher magnifying powers, to researches in Medicine, Natural History, Botany, Chemistry, etc., were arranged upon our tables. The display of microscopes is said to have been the largest ever gathered together for a similar reception in America, and it excited much admiration among both visitors and citizens. There is no doubt that such demonstrations of downright facts, in regard to the advancement of our knowledge of nature, either with or without the aid of the microscope, will lead to a more and more just appreciation of the inestimable value an Academy for the study of the natural sciences has to the community at large, and thus contribute in some measure towards creating that much needed disposition, among merchants and business men, to foster such an institution, by subscribing the comparatively trivial amount of pecuniary endowment necessary for its successful operation and support.

Among the more or less elaborated papers and oral communications, presented before the section during the past year, may be enumerated Dr. Henry C. Chapman's remarks upon Embryology, profusely illustrated by charts and drawings, and his comments this evening upon the Polycystina, etc ; Dr. Albert Frické's valuable contribution to the medical history of our recent Equine epidemic; Dr. J. H. McQuillen's description of Salivary calculus and Oral Microzoa; Dr. Isaac Norris' paper on the History and value of Polarized light as applied to the microscope; Dr. J. G.

Hunt's dissertation on the Preparation and preservation of Tissues; Mr. Joseph Zentmayer's discourse upon Erectors and a new Erecting prism; Dr. Jas. Tyson's article on Urinary microscopy, and his interesting oral communication upon Practical Histology in Germany; and Dr. Jos. G. Richardson's papers on Certain Human Parasitic Fungi, and their relations to disease, and upon a new method of preserving Tumors and some urinary deposits during transportation.

Discussions upon the various subjects thus brought under the consideration of the members, have been remarkable for their unusually practical and useful character; indeed, so eminent have they appeared in this respect, that reports of our proceedings have always been warmly welcomed by the Editors of The Philadelphia Medical Times, in whose interesting columns they, as well as several of the papers read before the Section, have from time to time been published.

All of which is respectfully submitted,

Jos. G. Richardson, *Recorder.*

REPORT OF CONSERVATOR OF CONCHOLOGICAL SECTION.

The Conservator of the Conchological Section respectfully reports that the donations to the Cabinet, during the past year, have been as follows:—

Beadle, Rev. E. R. *Helix Schrammi*, from St. Martins, W. I.

Bland, Thos. *Bulimus aureolus*, from West Indies.

Conrad, T. A. *Ancylus*, from Trenton, N. J., and twenty-seven species of *Unionidæ*, from the vicinity of Raleigh, N. C., determined for the Section by Mr. Lea.

Dall, W. H. Nine species of *Acmæa*, types of new species.

Gabb, Wm. M. Small collection of terrestrial and marine mollusca, from St. Domingo.

Jewett, Col. E. Two species, from Charlotte Harbor, Fla.

Newcomb, W. *Carelia extincta*, n. s. from Sandwich Islands.

Pennock, Mrs. Caroline. Egg-cases of *Fusus Islandicus*, *Purpura lapillus*, from Isle of Shoals, off Portsmouth, N. H.

Pease, W. Harper. Six species of marine mollusca, from Central Pacific Ocean, types.

Summichrast, Dr. Species of *Cylindrella*, from near Tehuantepec.

Yarrow, Dr. H. C. A small collection of marine shells, from Fort Macon, N. C.

Forty-four species of West Indian *Helices*, new to the collection, were purchased from Mr. Thos. Bland.

Thirty-eight species not heretofore in the collection of the Academy, from the Island of Mauritius, were presented by the following gentlemen: Wm. S. Vaux, 13 species; Isaac Lea, 5; Wm. M. Gabb, 5; Benj. Smith Lyman, 4; S. R. Roberts, 2; Chas. F. Parker, 5; and Geo. W. Tryon, Jr., 4.

The Committee on the arrangement of the Collection have been working industriously, and report that during the year the arrangement of the Land and Fresh-water shells has been completed, as well as that of the *Nerites*, *Neretinas*, *Harps*, *Astartes*, *Carditas*, and a portion of the *Veneridæ*. The amount of work done exceeds that of any previous year, as the following statement will show: Number of species determined during 1872, 2862; number of labels written, 4898; number of specimens cleaned and mounted, 19,932. The total number of species determined by the Committee to date is 6893; total number of labels written, 12,067; total number of specimens mounted, 40,873.

Our system of exchange has been during the past year discontinued, in consequence of the great and increasing difficulty of obtaining desiderata except by purchase. This is owing to the nearly complete condition of many portions of the collection. It may be mentioned, as an illustration of this fact, that out of 913 species recently received for examination from the Island of Mauritius, but thirty-eight species, reported above, could be found new to the collection.

All of which is respectfully submitted,

Edward J. Nolan, *Conservator.*

At an adjourned meeting held January 7, 1873, the following were elected members: Chas. Macalester, Wm. B. Bement, Richard H. Townsend, M.D., Wm. Logan Fox, Dr. Chas. A. Siegfried, U.S.N., and Mrs. Caroline Pennock.

Jabez Hogg, F.L.S., was elected a Correspondent.

The election of Officers, for the year 1873, was held in accordance with the By-Laws, with the following result:—

President . . .	W. S. W. Ruschenberger, M.D.
Vice-Presidents . .	Wm. S. Vaux, Jos. Carson, M.D.
Recording Secretary .	Samuel B. Howell, M.D.
Corresponding Secretary	Edward D. Cope.
Librarian . . .	Edward J. Nolan, M.D.
Treasurer . . .	Wm. C. Henszey.
Curators	Jos. Leidy, M.D., Wm. S. Vaux, Geo. W. Tryon, Jr., Edward D. Cope.
Council	Isaac Lea, Robt. Bridges, M.D., Edward S. Whelen, Isaac Hays, M.D.
Publication Committee .	Jos. Leidy, M.D., Wm. S. Vaux, Geo. W. Tryon, Jr., Edward J. Nolan, M.D., W. S. W. Ruschenberger, M.D.

ELECTIONS FOR 1872.

The following are the names of Members and Correspondents of the Academy of Natural Sciences elected during the year 1872.

MEMBERS.

April 30.—Dr. G. Stiles, Passmore Williamson, Mr. and Mrs. Bloomfield H. Moore, Alfred D. Jessup, Wm. F. Miskey, Wm. G. Freedly, F. B. Gowan, E. Burd Grubb, Thos. R. Dunglison, M.D., John Thompson.

May 28.—Jos. W. Miller, D. Shepherd Holman, P. P. Morris, Joseph H. Ogden, Joseph E. Gillingham, Dr. T. M. Drown.

September 24.—Jas. C. Rea, M.D., Sarah P. Monks, John Doyle, Thos. A. Robinson, Capt. Wm. Prince, U.S.A., Thos. Sinnickson, Henry Leffman, M.D., John P. Brock.

October 29.—Dr. John F. Bransford, U.S.N.

November 26.—C. P. Krauth, Joseph Hazard, Dr. George A. Koenig, Thos. M. Chatard, Gideon E. Moore, J. Euen Loughlin, M.D., Francis Garden Smyth, M.D., C. Perry Sinnickson, John J. Thompson.

CORRESPONDENTS.

May 28.—E. Riviere, of Menton, France.

October 29.—George M. Sternberg, U.S.A., of Fort Barancas, Florida.

November 26.—J. W. Powell, of Washington, D. C.; Capt. C. M. Scammon, of San Francisco, Cal.

CORRESPONDENCE OF THE ACADEMY.

For 1872.

January.—George S. Brady, acknowledging receipt of notice of election as correspondent.

Astor Library, New York;

American Antiquarian Society, Worcester;

Académie Royale des Lettres et des Beaux-arts, Bruxelles;

Bibliotheca Universitatis, Lugduno-Batavi;

Batavian Society of Experimental Philosophy, Rotterdam;

Naturforschende Gesellschaft of Basel, Switzerland;

Naturforschende Gesellschaft in Zürich;

Schlesische Gesellschaft für vaterlandische Naturkunde;

Bataafsch Genootschap der Proefondervindelijke;

Wijsbegeerte te Rotterdam; severally acknowledging receipt of publications.

Institut Royal Météorologique, Utrecht;

L'Observatoire Central Physique, St. Petersbourg;

Aerztliche Verein in Frankfurt-am-Main;

Jardin Imperial de Botanique, St. Petersbourg;

Physikalisch oekonomische Gesellschaft zu Königsburg; with publications.

Linnean Society, London;

Société Hollandaise des Sciences, Harlem;

Académie Royale des Sciences, Amsterdam;

Königlich Bayerische Akademie der Wissenschaften, München; acknowledging receipt of publications and forwarding others in return.

February.—Dr. W. Boeck, acknowledging receipt of notice of election as correspondent.

B. F. Sands, regarding preparations to be made for the observation of the transit of Venus across the disk of the Sun in 1874.

Smithsonian Institution, Washington;

Société D'Histoire Naturelle, Bern;

Academie Royale des Sciences, Lisbon;

La Société des Sciences physiques et naturelles, Bordeaux;

Schweizerische Gesellschaft, Bern;

Naturforschende Gesellschaft zu Görlitz; acknowledging receipt of publications.

Société Entomologique de France, Paris;

Société Entomologique de Russie, St. Petersbourg;

Physikalisches Central-Observatorium, St. Petersbourg;
Société de Physique et de Histoire Naturelle, Geneva;
Kiralyi magyar termeszettudomanyi tarsulat, Pest;
Naturforschende Gesellschaft, Bern; with publications.
Société Royale des Sciences, Upsal;
Académie Royale des Sciences, des Lettres et des Beaux-arts, Bruxelles;
Kaiserliche Akademie der Wissenschaften in Wien; acknowledging receipt of publications and forwarding others in return.

March.—Prof. S. F. Baird, with photographic pictures of fishes and other marine animals.

Royal Society of London;
Société des Sciences Naturelles de Neuchatel; acknowledging receipt of publications.

Naturhistorische Verein in Passau; with publications.

April.—Notice of the death of M. François-Jules Pictet de la Rive.

Naturforschende Verein in Brünn; acknowledging receipt of publications.
L'Académie Royale Suedoise des Sciences, Stockholm;
Dorpater Naturforscher Gesellschaft; with publications.
Société Royale des Sciences, Upsal; acknowledging receipt of publications and forwarding others in return.

May.—Naturhistorischer Verein in Augsburg; with publications.

June.—Campbell Carrington, with specimens.

Société Hollandaise des Sciences, Haarlem; with publications and acknowledging receipt of others.

July.—Zoological Society of London;
Société Nationale des Sciences Naturelles de Cherbourg; acknowledging receipt of publications.

August.—Chas. W. Zaremba, with specimens of Prunus fragrans and an application for a new diploma as correspondent.

September.—Naturwissenschaftliche Verein zu Bremen; acknowledging receipt of publications.

Gesellschaft Naturforschender Freunde zu Berlin;
Magyar Tudományos Akademia, Pest; with publications.

October.—J. E. Harris, with inquiries as to the whereabouts of Rafinesque's collection of shells.

Smithsonian Institution, Washington;
American Geographical Society, New York;
Essex Institute, Salem;
U. S. Surgical Library, Washington;
Yale College, New Haven;
Geological Society of London;
Society of Arts, Manufactures, and Commerce, London;
Royal Society of Edinburgh;
Leeds Philosophical and Literary Society;
Philosophical Society of Glasgow;

Society of Belfast;

University of Aberdeen;

Zoologisch-botanische Gesellschaft, Wien; severally acknowledging receipt of publications.

Universidad de Chile, Santiago;

Királyi Magyar termeszettudományi tarsulat, Pest;

Physikalisch-medicinische Societät in Erlangen; with publications.

Naturforschende Gesellschaft in Frankfurt-am-Main;

Kaiserliche Akademie der Wissenschaften in Wien; acknowledging receipt of publications and forwarding others in return.

November.—Edward Sang, with Table of Logarithms for examination.

Lyceum of Natural History of New York; acknowledging receipt of publications.

December.—E. A. Papineau, regarding the Society's publications on Entomology and Ornithology.

Lyceum of Natural History of New York; acknowledging receipt of publications.

Académie Royale des Sciences, Amsterdam;

Société Hollandaise des Sciences, Haarlem; with publications.

Linnean Society, London; sending publications and acknowledging receipt of ours.

Number of letters received, 1872	101
" of correspondents elected	4

Which is respectfully submitted,

EDWARD D. COPE,
Corresponding Secretary.

Dec. 31, 1872.

ADDITIONS TO THE LIBRARY, 1872.

JOURNALS AND PERIODICALS.

SWEDEN.

Stockholm. K. Svenska Vetenskaps Akademiens Handlingar, Ny Följd Sjunde Bandet, Andra Häftet. Attonde und Nionde Bandet, 1868–70. From the Society.

Ofversigt af K. Vetenskaps Akademiens Forhandlingar. Tjugondesjette und Tjugondesjunde Argangen, 1870–71. From the Society.

Upsal. Nova Acta Regiæ Societatis Scientiarum Upsaliensis, Seriei Tertiæ, Vol. VII. Fasc. 1 and 2, and Vol. VIII. Fasc. 1, 1869, 1870, and 1871. From the Society.

Bulletin Meteorologique mensuel de l'Observatoire de l'Universite d'Upsal. Vol. I., Nos. 1–12; Vol. III., Nos. 1–12, 1871. From the Observatory.

NORWAY.

Throndjem. Det K. N. Videnskabernes Selskabs Skrifter i det 19de Aarhundrede. From the Society.

DENMARK.

Kjobenhavn. Tillaeg til Aarboger for Nordisk Oldkyndighed og Historie. Aargang, 1870–71. Udgivet af det K. N. Oldskrift Selskab, 1870–71. From the Society.

Videnskabelige Medelelser fra Naturhistorisk Forening i Kjobenhavn for Aarett 1868 and 1871. From the Society.

Oversigt over det K. Danske Videnskabernes Selskabs Forhandlingar og dets Medlemmers Arbeider in Aaret 1871. From the Society.

Memoires de la Société Royale des Antiquaires du Nord. Nouvelle Serie, 1870–71. From the Society.

RUSSIA.

Dorpat. Archiv für die Naturkunde Liv-Ehst und Kurlands herausgegeben von der Dorpater Naturforscher Gesellschaft. 1ste Serie; 5er Band, 1ste Lief., 6es Band, 2te und dritte Schluss-Lief, 1870. From the Society.

Sitzungsbericht der Dorpater Naturforscher Gesellschaft. 3er Band, 2es Heft., 1870. From the Society.

Moscow. Bulletin de la Société Impériale des Naturalistes de Moscou. Année 1870, No. 3 to 1872, No. 1. From the Society.

Nouveaux Memoires de la Société Impériale des Naturalistes de Moscou. Tome XIII., Livr. III., 1871. From the Society.

St. Petersburg. Mémoires de l'Académie Impériale des Sciences de St. Petersburg. 7e Série. Tome XVI., No. 9 to Tome XVIII., No. 7. 1870–71. From the Society.

Bulletin de l'Acad. Impériale des Sciences de St. Petersburg. Tome XVI., Nos. 2–6, Tome XVII., Nos. 1–3. From the Society.

Repertorium für Meteorologie herausgegeben von der K. Akad. der Wissenschaften. Band II., No. 2, 1872. From the Society.

20

Jahresbericht des physikalischen Central Observatoriums für 1870. From the Observatory.

Annales de l'Observatoire Physique Central de Russie. Années 1867–68. From the Observatory.

Horæ Societatis Entomologicæ Rossicæ. T. VII., No. 4. Tome VIII. No. 2, 1871. From the Society.

HOLLAND.

Amsterdam. Jaarboek van der K. Academie van Wetenschappen. 1869–70. From the Academy.

Processen-verbaal van de gewone vergaderingen der K. Akademie van Wetenschappen, Afd. Natuurkunde van Mei, 1869 to April, 1871. From the Academy.

Verslagen en Mededeelingen der K. Akademie van Wetenschappen. Afd. Natuurkunde. 1869–71. From the Academy.

Haarlem. Natuurkundige Verhandelingen van de Hollandsche Maatschappij der Wetenschappen te Haarlem. Derde Verg. Deel I., 1872. From the Society.

Niederländische Archiv für Zoologie herausgegeben von Emil Selenka. Band I, 1es Heft. 1871. Purchased.

Archives Néerlandaises des Sciences Exactes et Naturelles, publiées par la Société Hollandaise des Sciences à Harlem, 1871. Tome VI., Livr. 1–5. From the Society.

Hague. Annalen der Sternwarte in Leiden. 2er Band, 1870. From the Observatory.

Rotterdam. Nieuwe Verhandlingen van het Bataafsch Genootschap der Proefondervindelijke Wijsbegeerte te Rotterdam. Tweedie Reeks: Tweedie Deel, Eerste Stuk., 1870. From the Society.

Utrecht. Nederlandsch Meteorologisch Jaarboek voor 1869, 1870, 1871. Uitgegeven door het K. Nederlandsch Meteorologisch Institut., 1870. From the Society.

Verhandlingen der K. Akademie van Wetenschappen. 12de Deel, 1871. From the Society.

GERMANY.

Augsburg. Einundzwanzigster Bericht des naturhistorischen Vereins in Augsburg. Veröffentlicht in Jahre 1871. From the Society.

Bamberg. Neunter Bericht der naturforschenden Gesellschaft zu Bamberg, Jahrg. 1869–70. From the Society.

Berlin. Sitzungs-berichte der Gesellschaft naturforschender Freunde zu Berlin, im Jahre 1871. From the Society.

Berliner entomologische Zeitschrift. 16er Jahrg. 1872, 1es Vierteljahrsheft. From the Publishing Society.

Wochenschrift des Vereines zur Beförderung des Gartenbaues in den K. P. Staaten für Gartnerei und Pflanzenkunde. Nos. 1–52, 1871. From the Society.

Monatsbericht der K. Academie der Wissenschaften zu Berlin. Sept. 1871–July, 1872. From the Society.

Archiv für Naturgeschichte. 37er Jahrg. 1871, 2es Heft. to 1872, 1es Heft. From the Editor.

Zeitschrift der deutschen geologischen Gesellschaft, XXIII Band, 3 Heft. to XXIV Band, 1es Heft. From the Society.

Zeitschrift für die gesammten Naturwissenschaften, Bands 3 and 4, 1871. From the Editor.

Bonn. Verhandlungen des naturhistorischen Vereines der preussischen Rheinlande und Westphalens. 28er Jahr., 1und 2 Häfte ; 29er Jahrg., 1ste Häfte, 1872. From the Society.

Braunschweig. Archiv für Anthropologie. 5er Band, 1stes–3es Vierteljahresheft, 1871. Purchased.

Bremen. XV. Jahresbericht des schwedeschen heilgymnastischen Institutes in Bremen, 1872. From the Institute.

Verein für die deutsche Nordpolarfahrt, 1870. From Dr. Finsch.

Abhandlungen herausgegeben vom naturwissenschaftlichen Vereine zu Bremen, III. Bd. 1 and 2 Heft., 1872. From the Society.

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Brünn. Verhandlungen des naturforschenden Vereines. IX Band, 1870. From the Society.

Cassel. Malakozoologische Blätter. Bd. 18 Bg. 11 to Bd. 20 Bg. 3. Purchased.

Darmstadt. Notizblatt des Vereins für Erdkunde. III. Folge, X. Heft. 1871. From the Editor.

Dresden. Sitzungsberichte der naturwissenschaftlichen Gesellschaft Isis in Dresden. Jahrgang 1871 und 1872. From the Society.

Novorum Actorum Academiæ Cæsareæ Leopoldino-Carolinæ Germanicæ Naturæ Curiosorum. Tomi 35. 1870. From the Society.

Durkheim. XXVIII. und XXIX. Jahresbericht der Collichia, eines naturwissenschaftlichen Vereins der Rheinpfalz, 1871. From the Society.

Frankfurt, A. M. Jahresbericht über die Verwaltung des Medicinalwesens die Krankenanstalten und die œffentlichen Gesundheitsverhaeltnisse der Stadt Frankfurt, A. M. XXII. and XIII. Jahrg. 1868–9. From the Society.

Nachrichtsblatt der deutschen malakozoologischen Gesellschaft, 1869, 1870, 1871. Purchased.

Festschrift herausgegeben zur Feier des 50 Jährigen Jubiläums des naturforschenden Gesellschaft zu Freiburg i. B. 1871. From the Society.

Abhandlungen herausgegeben von der Senckenbergischen natürforschenden Gesellschaft. 8en Bandes, 1es und 2es Heft. From the Society.

Bericht über die Senckenbergische naturforschende Gesellschaft, 1870–71. From the Society.

Der zoologischen Garten. XII. Jahrg. 1871, Nos. 7–12; 1872, Nos. 1–6. From the Editor.

Gorlitz. Abhandlungen der naturforschenden Gesellschaft zu Gorlitz. 14er Band, 1871. From the Society.

Göttingen. Nachrichten von der K. Gesellschaft der Wissenschaften und der Georg-Augusts Universitäts aus dem Jahre, 1871. From the Society.

Hannover. Einundzwanzigster Jahresberichte der naturhistorichen Gesellschaft zu Hannover, 1870–71. From the Society.

Heidelberg. Verhandlungen des naturhistorisch-medizinischen Vereins zu Heidelberg. Band VI., I. From the Society.

Innsbruck. Zeitschrift des Ferdinandeum. 3es Folge; 6es Heft., 1871. From the Society.

Königsberg. Schriften der k. physikalisch-okonomischen Gesellschaft zu Königsberg. 10er Jahrg., 1869; 1es und 2e Abth.; 11er Jahrg., 1870; 1es und 2e Abth., 1871. From the Society.

Leipzig. Abhandlungen der mathematisch-physischen Classe der K. sächsischen Gesellschaft der Wissenschaften. IX. Band; No. VI.; X. Band, Nos. I. and II., 1871. From the Society.

Berichte über die Verhandlungen der k. s. Gesellschaft der Wissenschaften zu Leipzig, 1871. 1–4. From the Society.

Jahrbücher für wissenschaftliche Botanik herausgegeben von Dr. N. Pringsheim. 8er Band; 3es Heft., 1872. Purchased.

Zeitschrift für wissenschaftliche Zoologie. Von Siebold und Kolliker. 21er Band, 4es Heft., 1871 to 22 Bd.; 4es Heft., 1872. Purchased.

Journal für Ornithologie, XIX. Jahrg. Heft. 4, 1871, to XX. Jahrg. Heft. 4, 1872. Purchased.

Archiv für Anatomie, Physiologie, und wissenschaftliche Medicin. Jarhg., 1871, Heft. III. to Jahrg. 1872, Heft. II. Purchased.

Luxembourg. Publications de l'Institut Royal Grand-Ducal de Luxembourg. Tomes XI. and XII. From the Society.

München. Annalen der k. Sternwarte bei München. XVIII. Band. XI. Supplement Band zu den Annalen der Münchener Sternwarte. From the Observatory.

Almanach der k. b. Akademie der Wissenschaften für das Jahr. 1871. From the Academy.

Sitzungsberichte der mathematisch-physikalischen Classe der k. b. Akademie der Wissenschaften. Heft. I. and II., 1871. From the Society.

Neubrandenburg. Archiv des Vereins der Freunde der Naturgeschichte in Meklenburg. 25 Jahrg., 1872. From the Society.

Offenbach, A. M. Elfter und zwölfter Bericht über die Thätigkeit des Offenbacher Vereins für Naturkunde im Vereinsjahre 1869–71. From the Society.

Passau, 1871. Neuenter Jahresbericht des naturhistorischen Vereines in Passau über die Jahre 1869 bis 1870. From the Society.

Pest. Ertekezesek a természettudomány ok Köreböl Kiadja a Magyar Tudományos Akadémia. 3–7 ; Szam., 1870, VII.–XI., 1871. From the Society.

A Magyar Tudomanyos Akadémia Ertesitöje Negyedik Evfolyam. 13–18. Szam. Otödik Evfolyam. 1–9. Szam. 1870–71. From the Society.

Magyar Tudomanyos Akademiai Almanach, 1871. From the Society.

Természettudományi Közlöny Havifoly'oirat Közérdekü ismeretek terjesztésére Kiadja A. K. M. Termes. Tarsulat. II. and III. Kotet 10 dik–28 dik. Füzet., 1870–71. From the Society.

Regensburg. Flora oder allgemeine botanische Zeitung herausgegeben von k. b. botan. Gesellschaft in Regensburg, 1871. From the Society.

Repertorium der periodischen botanischen Literatur vom Beginn des Jahres 1864. An VII. Jahrg. 1870. From the same Society.

Correspondenz-Blatt des zoologisch-mineralogischen Vereines in Regensburg, 1871. 25er Jahrg. From the Society.

Stettin. Entomologische Zeitung. Herausgegeben von dem entomologischen Vereine zu Stettin. 32er Jahrg. 1871. From the Society.

Stuttgart. Würtembergische naturwissenschaftliche Jahreshefte. 27er Jahrg. 1871. From the Society.

Neues Jahrbuch für Mineralogie, Geologie und Palæontologie. Jahrg. 1871, 6es Heft. to 1872, 2es Heft. From the Editor.

Vienna. Mittheilungen der anthropologischen Gesellschaft in Wien. 1 Band, Nos. 12, 13, and 14. Sept., Oct., and Nov., 1871. From the Society.

Denkschriften der k. Akademie, der Wissenschaften, mathem-naturw. Classe, Einunddreissigster Band. From the Society.

Sitzungberichte der K. Akademie der Wissenschaften. Mathematisch-naturwissenschaftliche Classe. 62 Band ; 1e Abth. III.—V. Heft. 2e Abth, IV. and V. Heft. ; 63 Band ; 1e and 2e Abth ; I.—V. Heft ; 1870–71 ; 64 Band, 1ste Abth, I.—V ; Heft. 2e Abth, I.—V. 1871. From the Society.

Verhandlungen der k. k. zoologisch.-botanischen Gesellschaft in Wien. Jahrg. 1871. XXI. Band. From the Society.

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Jahrbuch of the same. XXI. Band No. 2 to XXII. Band No 2. From the Society.

Jahrbücher der k. k. Central-Anstalt für Meteorologie und Erdmagnetismus. Neue Folge. VI. Band. Jahrg. 1869. From the Directors.

Würzburg. Verhandlungen der physikal-medicinische Gesellschaft in Würzburg. Neue Folge. 11 Band. 3 Heft. to III. Bd.; 2 Heft. From the Society.

SWITZERLAND.

Basel. Verhandlungen der naturforschenden Gesellschaft in Basel. 5er Theil, 3es Heft., 1871. From the Society.

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Erlangen. Sitzungberichte der physicalisch-medicinischen Societät zu Erlangen. 3 Heft., 1871. From the Society.

Geneva. Mémoires de la Société de Physique et d'Histoire Naturelle de Genéve. Tome XXI., 1re Partie. From the Society.

Lausanne. Bulletin mensuel des Observations Météorologiques de Lausanne. Faites au Predu-Marche, Maison Forney par J. Marguet. From the Author.

Bulletin de la Société Vaudoise des Sciences Naturelles, 2e Série. Vol. XI. Nos. 66 and 67, 1871–72. From the Society.

Neuchatel. Bulletin de la Société des Sciences Naturelles de Neuchatel. Tome IX., Premier Cahier, 1871. From the Society.

St. Gallen. Bericht über die Thätigkeit der St. Gallischen naturwissenschaftlichen Gesellschaft während des Vereins Jahres 1870–71. From the Society.

Zurich. Vierteljahrschrift der naturforschenden Gesellschaft in Zurich. 15er Jahrg. 1es–4es Heft., 1870. From the Society.

BELGIUM.

Bruxelles. Annuaire de l'Academie Royale des Sciences, Belles-lettres, et Beaux-Arts de Belgique, 1871. 37me Année.

Mémoires of the same. Tome 38.

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Bulletins of the same. 39me Année 2me Série. Tomes 29, 30, and 31, 1870–71. From the Society.

Bulletins de la Société Malacologique de Belgique. Tome VII. Année 1872, Pp. 1–22. From the Society.

Annales de la Société Malacologique de Belgique. Tome V. Année 1870. From the Society.

Société Malacologique de Belgique Bulletin des Séances. Pp. XXV. to XL. From the Society.

Société Malacologique de Belgique, Procés-Verbal, 1872. Pp. XLI.—LXXXII. From the Society.

FRANCE.

Angers. Mémoires de la Société Nationale d'Agriculture, Sciences, et Arts d'Angers. Tomes 12, 13, and Tome 14, No. 1, 1871. From the Society.

Same. Tome 4me. Nos. 2 and 3. Tome 5me. No. 1, 1872. From the Society.

Mémoires de la Société Académique de Main-et-Loire. Tomes 25 and 26, 1871. From the Society.

Auxerre. Bulletin de la Société des Sciences Historique Naturelles de l'Yonne. Anneés 1871 and 1873. 25e and 26e Volumes. From the Society.

Cherbourg. Mémoires de la Société des Sciences Naturelles de Cherbourg. Tomes XV. and XVI. From the Society.

Bordeaux. Actes de l'Académie Impériale des Sciences, Belles-Lettres, et Arts de Bordeaux. 3e Série. 31e Année, 1869; 1870, 4e trim. From the Society.

Actes de la Société Linnéenne de Bordeaux. Tomes 18 to 27, 1852–72. From the Society.

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Paris. Bulletin mensuel de la Société d'Acclimatation. 2me Série. Tome VIII., No 11, 1871, to Tome IX., No. 10, 1872. From the Society.

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Journal de Conchyliologie. 3e Série. Tome XI., No. 4, to Tome XII., No. 4. From the Editor.

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Annales des Sciences Naturelles. 5me Série. Zoologie, Tome XV., No. 2 to Tome XVI., No. 6. Botanique, Tome XIV., No. 1, to Tome XV., No. 1. Purchased.

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Bolletino Meteorologico ed Astronomica del Regio Osservatorio dell Universita di Torino. Anno V. and VI., 1871 and 1872. From the Observatory.

Venezia, 1869–70. Atti dell R. Istituto Veneto di Scienze, Lettere, ed Arti dal Nov., 1869 all' Ottobre, 1870. Tomo 15. Serie Terza, Disp. Seconda. From the Society.

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Belfast. Third and Fourth Annual Report of the Flax Extension Association. 1870–71. From the Society.

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Transactions of the Royal Society of Edinburgh. Vol. XXVI. Parts II. and III. For the Sessions 1870–71. From the Society.

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Leeds. Philosophical and Literary Society. The Annual Reports for 1870, 1871, 1872. From the Society.

Report of the Proceedings of the Geological and Polytechnic Society of the West Riding of Yorkshire. 1870, 1871, 1872. From the Society.

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Journal of the Royal Geological Society of Ireland. Vol. III., Part 1. New Series. 1870–71. From the Society.

Journal of the Chemical Society. Aug., 1871, to July, 1872. From the Society.

Trübner's American and Oriental Literary Record. Nos. 76–84. From the Publishers.

The Food Journal. Nos. 24–35. From the Editor.

The Ibis. 3d Series. Vol. II., Nos. 5–7. 1872. From the Wilson Fund.

The Transactions of the Linnean Society. Vol. XXVII., Part 3 to Vol. XXVIII., No. 2. From the Society.

Proceedings of the Linnean Society of London. Session 1871–72. Pp. 1–112. Additions to the Library and List of the same. From the Society.

The Journal of the Linnean Society. Zoology. Vol. XI., Nos. 49–54. Botany. Vol. XL., Nos. 54–56. Vol. XIII., Nos. 65–67. From the Society.

The Intellectual Observer. Vols. I.–XII. 1862–68. Purchased.

Report of the Forty-first Meeting of the British Association for the Advancement of Science. 1871. Purchased.

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The Quarterly Journal of the Geological Society. Vol. XXVIII. Nos. 1–4. From the Society.

Publications of the Palæontological Society. 1870 and 1871. From the Wilson Fund.

The Journal of Botany, British and Foreign. Edited by Barthold Seeman. Vols. 1–7, and No. 108, Dec., 1871. Purchased.

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Philosophical Transactions of the Royal Society. Vol. CLX., Part II. Vol. CLXI., Part I. London, 1870–71. From the Society.

The Annals and Magazine of Natural History. Vol. VII., No. 38, to Vol. X., No. 59. Purchased.

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Notes and Queries. Parts 38–58. 4th Series. From the Editor.

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The Monthly Microscopical Journal. Vols. I.–VII., 1871–72. From the Microscopical and Biological Section.

Transactions of the Zoological Society of London. Vol. VIII., Part 2. 1872. From the Society.

Proceedings of the Scientific Meetings of the Zoological Society of London for the year 1871, Parts 2 and 3. 1872, Part 1, January to March. From the Society.

Catalogue of the Library of the same. 1872. From the Society.

The Journal of the Royal Asiatic Society. New Series. Vol. V., Part 2, 1871. From the Society.

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Annual Report of the Boston Society of Natural History. 1871–72. From the Society.

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Cambridge. Annual Report of the Trustees of the Museum of Comparative Zoology for 1871. From the Directors.

Proceedings of the American Academy of Arts and Sciences. Vol. VIII., pp. 137–408. From the Society.

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GENERAL INDEX.

ADDRESSES

DELIVERED ON

LAYING THE CORNER-STONE

OF

AN EDIFICE

FOR THE

ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA,

October 30, 1872.

PHILADELPHIA:
COLLINS, PRINTER, 705 JAYNE STREET.
1873.

NEW HALL

FOR THE

ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA.

THE corner-stone of a new building for the Academy of Natural Sciences of Philadelphia was laid, Wednesday, October 30, 1872, at the southeast corner of Race and Nineteenth streets. The digging of the cellar of the north wing was commenced July 9, 1872.

At half-past eleven o'clock A.M. many of the officers and members of the society assembled at the hall, northwest corner of Broad and Sansom streets, and walked together to the site of the new building.

At twelve o'clock, noon, Dr. RUSCHENBERGER, President of the Society and Chairman of the Building Committee, addressed the assembled crowd in substance as follows :—

LADIES AND GENTLEMEN :—

We have assembled to-day to manifest our satisfaction that, through the intelligent liberality of a comparatively few of our fellow citizens, we are enabled to commence the erection, on this spot, of a new building adapted to the purposes of the Academy of Natural Sciences of Philadelphia. The want of a sufficiently capacious edifice has embarrassed, and in some degree retarded, the progress of the institution during many years. The citizens of Philadelphia and of the State of Pennsylvania have a wide-spread interest in the success of this enterprise, although that interest is not universally recognized or admitted.

The completion of the entire edifice, one wing of which we have commenced to build, and the arrangement in it of the collections now belonging to the institution, will be as palpable evidence of educational progress, in one department of the exact sciences, as can be presented; and it will be so estimated by those who may come here from abroad, in the summer of 1876, to determine our intellectual advancement during the hundred years of our national existence.

The object of the society is to acquire exact knowledge of all created things, within the narrow limits of man's capability to investigate, and to give freely to the whole world the knowledge which may result from its labors. Its constant effort is to remove the veil which conceals from us the facts of the Creation in order that all may perceive and recognize their wonderful wisdom and beauty. Attainment of precise truth is the extremely difficult task assumed by this, and every society formed for the cultivation of the natural sciences. Yet, under an erroneous and wide-spread notion that the pursuit of truth on this line is in some indefinite manner detrimental to society, it has been and is still opposed by very many intelligent people.

Truth is a unity, vastly multiple in constitution, but no one of its parts is inconsistent with another. Every absolutely established truth, be it great or small, must be in perfect accord with all that has been or ever will be ascertained by man. The criterion of truth in natural science is its harmony with all that is absolutely known. Every scientific assumption which is not true, however plausible it may appear on presentation, will prove to be discordant. In God's creation there is no conflict or contradiction of parts. When accurately interpreted the perfect harmony of their relations will be manifest. The book of nature is entirely free from error; it contains no misstatement of any kind. Surely such a book may be studied without perverting the mind from truth or establishing a preference for what is not reality.

Seeking the truths of nature demands an extensive workshop, in which to collect and arrange conveniently for use the numerous implements employed in the work. The implements consist in collections of all those natural objects which have been described properly classified and labelled, ready for study and comparison with those supposed to be new—that is, not previously described—and also an extensive collection of books in which are recorded the results of investigations made by naturalists in all parts of the world; for he who would add to the stock of knowledge in any department of science needs to be acquainted with what is known already in it, or he may find himself laboring to discover what has been ascertained. A museum and library, chemical apparatus and microscopes, constitute the machinery necessary to facilitate and guide his labors. Such a museum and library and laboratory, in such condition as to be utilized by the naturalists, require large space, and this demand for space increases with the progress of our knowledge.

The Academy now possesses more than 6000 minerals; 700 rocks: 65,000 fossils; 70,000 species of plants; 1000 species of zoöphytes; 2000 species of crustaceans; 500 species of myriapods and arachnidans; 25,000 species of insects; 20,000 species of shell-bearing mollusks; 2000 species of fishes; 800 species of reptiles; 31,000 birds, with the nests of 200, and the eggs of 1500 species; 1000 mammals and nearly 900 skeletons and pieces of osteology. Most of the species are represented by four or five specimens, so that, including the archæological and ethnological cabinets, space is required now for the arrangement of not less than 400,000 objects, besides the library of more than 22,500 volumes.

Besides space enough in our workshop to appropriately arrange this vast number of implements, room is desired for a separate and distinct arrangement of all objects necessary to illustrate the natural history of the State of Pennsylvania, as well as a suitable room in which lectures on the natural sciences may be delivered.

To set up this great museum and library, laboratory and lecture room, we have a plot of ground, measuring little more than an acre, for which we are indebted to the liberality of members of the society and individual citizens. No substantial encouragement has been yet received from the government of this city, nor from that of the State of Pennsylvania.

In this respect, the policy of some of the State Legislatures is more encouraging. Massachusetts has given liberal aid to the Boston Society of Natural History; to the Museum of Comparative Zoology, at Cambridge; and to the Institute of Technology. New York maintains a museum of natural history, at Albany, by annual appropriations, and has given eighteen acres of land, valued at four millions of dollars, and five hundred thousand dollars besides, to establish a natural history museum at Central Park, in the city of New York.

The institutions thus aided are of great value but no one of them as a whole equals ours in scientific importance or intrinsic worth, or is better entitled to public favor.

I mention these facts in no spirit of envy or detraction. We are all gratified to know that the number of laborers in the vast field in which we work is everywhere increasing. The encouragement extended to them by State governments implies that the cultivation of the natural sciences is becoming more and more wisely appreciated, and more widely diffused.

I will detain you no longer.

Rev. E. R. Beadle, D.D., was introduced to the audience and said, substantially, that Philadelphia had been facetiously designated as "a dining station on the road to New York;" but he doubted whether that was all that can be truthfully said about Philadelphia. He referred to the hospitals for the sick, asylums for children, retreats for the aged and indigent, and the neat and comfortable domiciles provided for working people, as well as to the schools, colleges, university, and expressed his belief that, although not yet finished, Philadelphia is doing very well. The building of the Academy of Natural Sciences is one of the works yet to be done. He alluded to the popular ignorance of even the simplest matters which influence the life, happiness, and comfort of humanity, and said that a workshop is wanted in which young people may be taught to recognize the properties and uses of natural objects—to distinguish what is fact from what is not—and be trained to apply such knowledge intelligently for the benefit of themselves and of mankind.

Prof. J. Aitken Meigs, M.D., of the Jefferson Medical College, was next introduced and delivered the following address:—

Three-score years, heavy-laden with the endless series of changes, the thrilling narrative of private joys and sorrows, hopes and fears, the extraordinary record of national triumphs and social defeats, and the wondrous history of the great achievements and miserable failures that go to make up the life-history of two generations of men, have been forever engulfed in the illimitable ocean of the past, since the occurrence of that event the happy development of which you this day celebrate.

In this brief period—comprised within the life-time of some who now hear my voice—the most remarkable historical events have occurred, and many surprising scientific discoveries and important industrial applications of them have been made. Indeed, by means of intellectual inquiry and its handmaid, applied science, the social and industrial condition of the world, during this short interval, has been completely revolutionized.

Look at Philadelphia as it appeared at the commencement of 1812, as it has been pictured, in truth, by a medical worthy of that time. A city whose inhabitants numbered 111,120, or less than one-sixth of its present population, occupying an area not one-half of that over which it now stretches its huge proportions; a city which contained 25,814 dwelling-houses, 6955 public buildings, stores, manufacturing establishments, etc.; 42 churches, 11 insurance offices, 4 banks, 2 hospitals, a university, an Academy of Fine Arts, a museum of natural history, and 2 theatres in which performances were occasionally given; a city in which 51 printing-offices, employing 153 hand-presses, were in operation; a city boasting of 8 daily, 9 weekly, and several semi-weekly newspapers having a combined circulation of about 61,000 copies per week—such, in brief, was the city of Penn sixty years ago.

Neither in this country nor in Great Britain, at that time, had railroads and steamboats been put into operation. Electricity, the modern Puck, had not yet learned the art of "putting a girdle round about the earth in forty minutes." The telegraph had not been invented. Communication between distant points was slow and uncertain. Instead of a few minutes, as is now the case, weeks were required for the transmission of intelligence from Philadelphia to the Gulf of Mexico. Our city was then two months distant by sail from Europe, and six from California, instead of being, as at present, within eight or nine days of the former, and but seven days' ride by rail from the latter. The steam-plow, the reaping-machine, and the screw-ship were not in existence. The printing-press and the spinning-jenny were worked by hand instead of by steam. The photographic art was not known. The old-fashioned tinder-box and brimstone-match had not yet been replaced by the lucifer match, and oil, instead of gas, was an universal means of illumination. In short, a thousand mechanical and chemical influences which are incessantly changing the aspect of our present civilization were then utterly unknown.

Come back with me, in imagination, to the period of time just mentioned. It is the evening of the last day of the week, near the close of January, and the nipping air sweeps eagerly up this broad thoroughfare from the icy river below. Let us cross over and take refuge from the wintry blast in yonder quaint-looking house at the northwest corner of Second and High streets. From the imposing array of many-colored bottles, seen through the dimly-lighted window, and the inevitable sign of the pestle and mortar surmounting the doorway, you gather, at a glance, that it is the shop of a druggist. Let us enter, for this is one of the centres of the literary and scientific gossip of the town. Passing through an atmosphere odorous with the emanations of camphor, rhubarb, and musk, we find ourselves in a little room at the rear, and in the presence of a group of men gathered around a table and engaged in earnest conversation. At the further end of the room stands a young man, who, with animated countenance and impressive gesticulations, appears to be addressing the others upon a subject of some importance. The lineaments of his face bear the stamp of an earnest, ingenuous, and benevolent mind; and now, as he ceases speaking, and his face falls again into its accustomed repose, it assumes an unmistakably reflective character. This is the proprietor of the store—one John Speakman, a native of Bucks county, and a member of the religious society of Friends. That young gentleman sitting at the right of the table is Jacob Gillians, a dentist by profession, and an ardent lover of the natural sciences. The individual by his side, bending over the table, with his eyes intently fixed upon the speaker, is John Shinn, Jr., a manufacturing chemist from New Jersey. In front of the latter, and upon the opposite side of the table, sits a native of France, Nicholas J. Parmantier, by name, who follows the occupation of a distiller and manufacturer of cordials. That man yonder, apparently older than his comrades, and whose broad and massive brow clearly betokens a mind given to profound thought, is Dr. Gerard Troost, a Hollander of Bois-le-Duc, a man of large attainments in mineralogy and chemistry especially, and at one time a *protégé* of the King of Holland. In the gentleman at the near end of the table, who appears to be recording the remarks of the chairman, you perceive another physician, Dr. Camillus M. Mann, an Irish refugee, who having boldly but unsuccessfully struck, in 1798, for the liberty of his native land, has fled from its shores to cast his lot with the dwellers in the New World.

In this outline picture, thus hastily sketched, behold the men who, with slender pecuniary means, but with admirable prevision and indomitable will, laid broadly and deeply the foundations of the Academy of Natural Sciences of Philadelphia, on the evening of Saturday, the 25th day of January, 1812. I say broadly and deeply, and I say it advisedly, for, from the scanty memoranda of the early meetings of the Academy which have been preserved, we gather that the founders considered ignorance of the laws of nature to be the prolific parent of many of the evils to which man is subjected, and they, consequently, recognized fully the necessity of improving the condition of mankind by seeking to enlarge the bounds of knowledge, and imparting what they thus acquired to others.

Furthermore, they clearly perceived, as we learn from the early minutes of the society, that the operations of nature demand unprejudiced, attentive, and severe scrutiny: and, in order that they might aid each other by a comparison of observations, they also declared that their discussions must be free.

Freedom of scientific thought and discussion, the cultivation of the natural sciences exclusively, and the diffusion of this kind of knowledge among the people, were the principles which guided Speakman and his associates in their great undertaking. Indeed, the founders of the Academy (under which honorable title must also be included that eminent naturalist, Mr. Thomas Say, who became one of their number a few months after their first meeting) were evidently penetrated with the restless spirit of scientific inquiry which was then so rife in Europe. The fact, moreover, of living, as they did, in that memorable quarter of a century which witnessed the great American and French revolutions, and the famous though short-lived Irish rebellion, could not fail, in the case of such young, enthusiastic, and reflective minds, to impress them strongly with ideas of political freedom and the necessity of establishing this freedom upon the enduring rock of the enlightenment of the people.

Mr. Gilliams was born in the closing year of our revolutionary war, and Mr. Say four years later; while Dr. Troost, the first President of the Academy, was ushered into the world in the very year made memorable by the declaration of American Independence. He was eighteen years of age, therefore, when the French Revolution terminated with the death of Robespierre. Having received his medical diploma from the University of Leyden, he practised pharmacy for a short time in Amsterdam and at the Hague. Afterwards he travelled extensively in France, Italy, Germany, and Switzerland, and became the pupil and companion of the celebrated Abbé Rene Just Haüy, with whom he studied crystallography. In Paris he became the associate of many of the most eminent scientific men of the day, and was elected in 1810 a correspondent of the Museum of Natural History of France. Two years later we find him in Philadelphia assisting in founding the Academy. Of Dr. Mann we simply know that in 1798 he was old enough to take an active part in the Irish rebellion, and that before coming to this country he also had spent some time in France seeking aid for his compatriots. Mr. William Maclure, who joined the Academy in June, 1812, and who acted as its second president for more than twenty-two years, was born in Scotland in 1763. Endowed with an eminently philanthropic and benevolent mind, and believing that knowledge and intelligence are the true sources of human happiness and prosperity, he used the large wealth of which he was happily possessed, to foster institutions of learning and to disseminate knowledge as much as possible. He travelled much in his own country, in France, Spain, the United States, and Mexico. We are told by his biographers that he "visited these countries while in a state of political revolution, that he might be near to extend assistance to the poor and suffering." Now a moment's reflection will show, I think, that these men, in the course of their studies and travels, could not avoid being impressed by the spirit of free inquiry in science and politics by which they were everywhere surrounded. In view of the facts just presented, and from what we know of the lives and opinions of the originators of the Academy, and of the motives which actuated them in banding together for the cultivation of natural knowledge, it appears to me not inappropriate to regard the Academy as, in reality, an outgrowth of that great intellectual and democratic movement which, during the latter half of the eighteenth century, swept over Europe and a part of America, and was characterized by an extraordinary activity in the study of nature, coupled with a growing demand on the part of the governed classes for larger social and political privileges. So correct does this idea appear to me that I am led, in this connection, to refer briefly to the condition of science in Europe in the latter part of the eighteenth and the beginning of the present century, when the first feeble and apparently insignificant attempts were made to rear, in Philadelphia, a temple of the natural sciences.

To the student of history it is well known that in France, under the administrations of those famous cardinals—the far-seeing Richelieu and the astute Mazarin—a powerful impulse was given to the highest branches of learning. From the hour that Louis XIV. ascended the throne, however, this impulse began slowly to be arrested by the gradual inauguration of a policy fatal alike to the intellectual and mechanical interests of the country. Mathematics, astronomy, the mechanical and inventive arts, anatomy, physiology, theoretical and practical medicine—all fell more or less rapidly into decay. With the death of Louis in 1715, the intellectual decadence of France was complete. Her great men, one after another, had passed away, until at last she was without literature, science, and arts. With the appearance of a new order of literary and scientific men, in the middle of the eighteenth century, she began at length to emerge from this stagnant condition. In 1735 Newton's "Treatise on Fluxions" was translated into French by Buffon. Three years later Voltaire made the people of France acquainted with the philosophy of Newton in a manner so clear and forcible as to cause it to supersede that of Descartes. He also gave popularity among his countrymen to the writings of Locke, from which, according to Buckle, Condillac drew the materials of his system of metaphysics, and Rousseau his theory of education. In 1749 attention was strongly directed to the study of natural history by the celebrated Buffon, who, in that year, commenced the publication of his famous work on that subject, and in glowing language advocated the unity of the human race, and endeavored to show how climate and other physical conditions influence the geographical distribution of animals. In 1751 a popular account of Bacon and his philosophy was contributed by D'Alembert to the Encyclopedia. In 1754 Condillac, who Cousin declares was the only metaphysician produced by France in the eighteenth century, published his famous treatise on Sensations. Four years afterward appeared the remarkable essay of Helvetius on the Mind. These works undoubtedly gave a powerful impetus to the study of the natural sciences at the close of the last century. For their authors, with great ability and with much logical acumen and fulness of illustration, maintained most peremptorily, as Locke had done more than a century before, that all our knowledge is really due to the study of the external world. Under the influence of the leading principle thus forcibly inculcated, some of the ablest intellects of France began to devote themselves, with extraordinary activity, to the study of the phenomena of nature. The laws of the radiation and conduction of heat were worked out by Prevost and Fourier; electrical phenomena were investigated by D'Alibard and Coulomb, while Malus and Fresnel, by their researches upon double refraction and the polarization of light, extended the bounds of our knowledge of optics. At the same time Lavoisier, by investigating with great ability the laws of oxidation, placed chemistry upon a strictly scientific basis, and, in conjunction with Berthollet, De Morveau, and Fourcroy, laid down, for the first time, a systematic chemical nomenclature. Meanwhile, geology was also cultivated with eminent success by Buffon, Rouelle, Desmarest, Dolomieu and Montlosier; while astronomy, both physical and mathematical, was materially advanced by La Grange's discovery of the periodical inequalities of the planets, and by the publication of the "Mechanique Celeste" of Laplace, in which was clearly presented to the world for the first time the famous "nebular hypothesis"—an hypothesis which is steadily approaching the character of a demonstration with every new discovery in astronomical science, and which has not only anticipated, but has also paved the way for, the co-ordinate doctrine of evolution in biology. In 1762 Daubenton gave a new interest to palæontology by applying, for the first time, the principles of comparative anatomy to the study of fossil bones. In this epoch, also, the illustrious Cuvier gave to both geology and palæontology an eminently philosophical character by practically associating the study of the earth's strata with the fossil remains found therein. This greatest of all descriptive anatomists did much for philosophical natural history by showing that the classification of animals must be based upon the comprehensive study of their organs rather than their external characters. Histology, botany, and mineralogy likewise found zealous investigators during this remarkable intellectual period. While Bichat with scientific skill and industry was demonstrating that the study of the organs of an animal must be subservient to the study of the tissues composing them, and while Adanson, Duhamel de Monceau, Desfontaines, and especially Jussieu were bringing to light many of the important facts concerning the structure and physiology of the vegetable kingdom, Romé de Lisle and Haüy were as actively engaged in studying the structure of minerals and applying the principles of geometry to the elucidation of their forms.

Turning, now, to Great Britain, we find that science, though not so actively cultivated, during this period, as in France, was by no means neglected. In 1753 was founded, at the cost of the government, the British Museum, which for many years has been so largely instrumental in promoting natural science in the United Kingdom. Between the years 1759 and 1804, the science of thermotics was greatly advanced by Black and Leslie, who, with much breadth of mind and industry, not only demonstrated the laws of specific and latent heat, but made possible the recognition of those remarkable doctrines, the development of which has stamped the science of the present century with its distinctive character. I allude to the indestructibility of force and the correlation of the forces as modes of motion. At this time, many of the fundamental facts of chemistry were discovered. Carbonic acid gas was isolated and studied in 1757 by Black. The discovery of oxygen was announced in 1774 by Priestley, together with a description of some of its important properties. A year later he made known the fact that the air is composed of oxygen and nitrogen; and in 1776 he made physiology his debtor by proving that the change in color which the blood undergoes in passing through the lungs is due to the absorption of oxygen—an important and fundamental fact in the chemistry of respiration. From 1799 to 1812, chemical science was also promoted by Sir Humphry Davy, whose great achievement—the decomposition of the fixed alkalies by galvanism—constituted a new era in this science. In 1808, just four years before the founding of the Academy, Dalton gave another impetus to chemical philosophy by announcing, as deductions from the atomic theory, the well-known laws of definite combining proportions—laws which have done so much to perfect the analytical and synthetical processes of the chemist. Another remarkable discovery of this period—the composition of water—was made in 1783, by Watt and Cavendish, independently of each other.

In the early years of the present century, optical science received a powerful impulse from the labors of Dr. Thomas Young, who made the important discovery of the interference of light, and gave to double refraction a rational theory by advancing a plausible hypothesis of the propagation of light through an elastic medium in a manner not contradictory to any of the well-known facts and laws of dynamics.

Geology, too, was not without its zealous cultivators. In 1788 Hutton published his celebrated "Theory of the Earth," in which, according to Lyell, may be found the germ of the metamorphic theory. Scientific geology in England owes its existence to William Smith, who, between the years 1790 and 1815, made a laborious examination of different strata in Great Britain, and finally published the first complete geological map that ever appeared. In 1807 was formed the London Geological Society, the members of which early began with untiring industry to collect the facts relative to the structure of the earth's crust. Owing to the assiduous and intelligent labors of John Hunter, comparative anatomy, in the last quarter of the eighteenth century, became, for the first time, in Great Britain, a science of importance. In astronomical science many important facts were discovered and recorded. Maskelyne, in 1790, published an admirable catalogue of the stars, while Sir William Herschel, between 1799 and 1820, may be said to have recreated astronomy and enlarged our views of the immensity of space by his astounding discoveries.

In the mean time, science was steadily though less rapidly unfolding its fair proportions in various parts of Europe. The integral calculus and analytical mechanics were greatly improved between 1727 and 1783 by Euler, the celebrated Swedish geometer. In Germany, astronomy was cultivated from 1779 to 1815 with signal industry and success by the physician Olbers, who, besides discovering several of the asteroids, published an improved method of calculating the orbits of comets. During this period, Werner, in Germany, and Pallas, in Russia, made many important contributions to geological science. By the publication, in 1774, of his short but very remarkable "Treatise on the Characters of Minerals," Werner accomplished for the terminology of mineralogy what the "Philosophia Botanica" of Linnæus had done for that of botany nearly a quarter of a century before. Moreover, his celebrated "Classification and Description of Mountains," which appeared in

1787, did much to give to geology the rank of a positive science. In the mountain ranges of Siberia, Pallas discovered the general law of the succession of the granitic, schistose, and calcareous rocks—a discovery which has given birth, as Cuvier affirms, to all modern geology. In 1808 Berzelius, by the publication of his admirable "System of Chemistry," greatly enlarged the boundaries of chemical science. His vast analytical labors did much to place the atomic theory upon a sure foundation. In Italy, near the close of the last century, electrical science was measurably promoted by the labors of Galvani and Volta. The former, in 1791, made known his curious researches upon the influence of electricity upon muscular motion; while the latter, about the same time, invented his well-known electric pile, by which he showed that a disturbance of electrical equilibrium was produced by the mere contact of different bodies, and that the electrical current circulated in one constant direction through a circuit composed of different conductors. Between 1753 and 1812, anatomy, physiology, and general natural history were cultivated with much success in Europe by Linnæus, Pallas, Spallanzani, Camper, Blumenbach, Felix d'Azara, and others. In addition to his "System of Nature," "Botanical Philosophy," and other valuable contributions to the literature of botanical science, Linnæus, in 1753, published the "Species Plantarum," in which, for the first time, was adopted the happy idea of distinguishing species by adding a simple descriptive word to the generic term. Camper and Blumenbach, in addition to their other labors, cultivated ethnology with much zeal. Blumenbach, especially, by the publication of his "Decades Craniorum," laid the foundation of the science of human craniography. It was during the great scientific epoch now under review that the illustrious Humboldt entered upon his wonderful career of extensive travel and varied scientific research. In the ten years immediately preceding the founding of the Academy, he had already published valuable works on the physical geography, geology, zoology, comparative anatomy, and ethnology of the northern part of South America and Mexico, together with important memoirs on the astronomical observations and barometric measurements made by him in conjunction with his fellow-traveller, Bonpland, during their five years' exploration of little-known regions of the New World. These works, together with the "Aspects of Nature," which first appeared in 1808, did more, perhaps, than the writings of any other scientist of that period to call attention to the study of natural phenomena.

Such, briefly, was the scientific outlook in Europe at the close of the first decade of the nineteenth century. What was the condition of science at that time in the New World? Meagre indeed. Franklin, that "mighty genius," as Mirabeau styled him, had been resting in his grave full twenty-two years when our Academy was born, and science in Philadelphia—I may say in America—lay sleeping with him. From the time that he had experimentally identified lightning with the electric fluid no great scientific discovery had been made in the United States. The American Philosophical Society, which he was instrumental in creating, had been in existence forty-three years, and had published in all that time but six volumes of its Transactions. The College of Physicians, founded in 1787, had issued, in 1793, the first and, up to 1812, the only volume of its publications. In addition to these institutions, two medical societies of but little importance, one botanical association known as the Linnæan Society, the Philadelphia, Loganian, and Friends' Libraries, with two small circulating libraries, were the only available aids to the literary and scientific student. Strictly scientific works were scarce, and scientific men but few in number. Between 1739 and 1803, James Logan, Dr. John Clayton, John and William Bartram, and Dr. Benjamin S. Barton had published various more or less valuable works on botany. The celebrated David Rittenhouse, whom Renwick, his biographer, pronounced as "second to Franklin alone in point of scientific merit, and the equal, in point of learning and skill, as an observer, to any practical astronomer then living," had, some years prior to his death, in 1796, contributed many valuable papers on astronomical, philosophical, and mathematical subjects to the early volumes of the Transactions of the American Philosophical Society. In a later volume of these Transactions, Mr. Maclure, who has been called the pioneer of American geology, published an account of a geological survey of the United States made by himself in 1809. In ornithology a new era may justly be said to have been established in 1808 by the publication of the first volume of Alexander Wilson's magnificent work on American birds, the fifth and sixth volumes of which appeared in 1812.

The mass of the people of Philadelphia were then, as they are now, but little interested in purely scientific studies. The few persons who directed their attention to such inquiries, having neither cabinets nor books in the special departments of natural science at their command, were forced to contend with many difficulties.

Amidst such inauspicious surroundings, and upon the eve of a war with Great Britain, the founders of the Academy began their great work, which, long ago, would have perished in the bud, had it not been for the important principles involved in the attempt. For it often happens in the affairs of men that the importance of the objects to be accomplished gives to the efforts made in their behalf a degree of perseverance which becomes the guarantee of ultimate success.

Did the time permit, I would fain dwell upon the trials and difficulties experienced by the resolute men whose labors we this day commemorate. I might interest you with details of their early meetings held at Mr. Speakman's residence, and of the subsequent sittings which took place at the house known to the citizens of that day as "Mercer's cake shop," where the title, "Academy of Natural Sciences," was first adopted; I might describe to you the little room over the milliner's shop in Second, near Race Street, in which the present magnificent museum and library of the Academy were begun by the donation of books and dried plants, a few stuffed birds, some shells and insects, and a handful of artificial crystals, all presented by the members themselves; I might tell you how, as the museum increased, it was found necessary to move it to the larger accommodations afforded by a house in the neighborhood; how a collection of minerals was purchased for the Academy by Mr. Speakman, who advanced the money from his own private means; how public lectures were delivered on mineralogy by Dr. Troost, on entòmology by Mr. Say, and on botany by Drs. Waterhouse and Barnes, to large audiences of ladies and gentlemen; how, in July, 1815, the cabinet and library, now considerably increased, were moved to a building expressly erected for them on a vacant lot in the rear of Mr. Gilliams's residence on Arch Street; how the war with Great Britain which broke out in 1812, and continued during the first three years of the society's existence, interfered very seriously with its progress by interrupting, to a considerable extent, intercourse with Europe, and thus almost entirely preventing the importation of much-needed scientific books; how several of the members were drawn away from their quiet pursuits to act as volunteers in defence of the city; and how, finally, notwithstanding the zealous efforts that had been made to advance the interests of the Academy and obtain for it the public support it deserved, the list of its members at the end of three years contained but twenty-five names. In 1820 the society numbered one hundred members and one hundred and ninety correspondents, and began, for the first time in its career, to be favorably recognized by the cultivators of natural knowledge in Europe as well as America. The lot and building at the southeast corner of Twelfth and Sansom streets having been purchased with funds supplied by Mr. Maclure and other members, the Academy moved to this locality in May, 1826. Thirteen years afterwards the collections had increased so much as to require still larger space for their accommodation. Accordingly, the present site at the southwest corner of Broad and Sansom Streets was secured, and a large and commodious edifice erected through the munificence mainly of its large-hearted president, the late Mr. William Maclure. The building was enlarged in 1847, at the expense of another benefactor of the Academy, the late Dr. Thomas B. Wilson; and again in 1855, by means of a fund raised by subscription among the members and their friends. In this building the sessions of the Academy have been held for the last thirty-two years, during which time its utility as an educational institution, and as a centre of scientific research, has been steadily increasing.

Thus slowly and laboriously advancing, encountering many obstacles, now succumbing to them and anon overcoming them, constantly embarrassed by the want of funds, deriving no assistance from either the State or municipal government, except exemption from taxation, and obtaining but little aid outside of the immediate circle of its members, the Academy, after the lapse of little more than half a century, has become famous in the great republic of science, has achieved an enviable reputation not only in this country, but in the Old World, as a chief focus of scientific activity in the United States. As such, as the champion of education of a special kind, as the earnest promoter of natural knowledge, it deserves the respect and hearty support of the citizens of Philadelphia.

Listen, I pray you, to what the society has been able by its own unassisted efforts, to accomplish in the brief period comprised within the limits of a single human life.

It has gathered into its museum more than 400,000 specimens of natural history, many of them unique, and not to be replaced by any expenditure of money, time, or labor. It has created a grand library, containing nearly 23,000 volumes, many of which are not to be found in any other library in the United States. Of some of them duplicates cannot be procured at any price. This library, which is one of reference exclusively, is of incalculable value to men of science in this country. It is constantly consulted not only by persons residing in this city, but also by students from all parts of the United States; not only by its own members, but by many others engaged in scientific research; for the society, true to the principles of its founders, true to their desire to diffuse knowledge as much as possible, has never refused permission to any respectable persons to consult its treasures freely.

The Academy, early recognizing the importance of contributing to the common stock of knowledge any discoveries in natural science made by its members, issued, in May, 1817, the first number of a journal of its transactions. The first series of this journal terminated in 1842, and consisted of 8 octavo volumes, of 2912 pages, containing 237 papers contributed by 56 authors, and illustrated by 161 plates. In 1841 another publication known as the "Proceedings," was commenced. Up to the present time, 22 volumes, each averaging 400 pages, and containing the verbal, and many of the written, communications made at the meetings of the society, have been published. In 1847 a second series of the "Journal" was begun in quarto form. Seven volumes of 2820 pages in the aggregate, and containing 116 articles, contributed by 50 authors, and illustrated by 318 well-executed lithographic plates, have appeared. In 1865 the Academy, through its conchological section, commenced the publication of another serial, the "American Journal of Conchology." Of this, seven volumes have been issued, containing in the aggregate 2500 pages of printed matter, illustrated by 150 plates, many of them colored, besides about 1000 wood engravings. These publications are exchanged with about 200 scientific and philosophical institutions located in the United States and South America, in Europe, Asia, and Liberia. While serving as a medium for the dissemination of a large amount of technical knowledge hitherto unknown or unrecorded, they have acquired for the Academy and its students, a world-wide reputation, and, by giving to Philadelphia a definite scientific character and position, have enhanced our national respectability abroad. They have shown that our city has its representatives of mind as well as of wealth, that it is alive to the intellectual as well as the material needs of mankind.

The beneficial efforts of the Academy have not been confined to the collection of books and specimens and the publication of learned papers. It has, also, as its archives show, aided, both by judicious counsel and pecuniary means, many scientific expeditions, whether projected under the patronage of government or conducted by private individuals. In this way it has assisted in developing the topography, meteorology, natural history, and ethnology of many parts of this country, of the islands of the South Sea, of the frozen Polar zone, and the burning African land. By means of a sum of money annually donated by the children of the late Augustus E. Jessup, for many years a member of the Academy, it has supported a number of young men while devoting their time and energies to the acquisition of a practical knowledge of the natural sciences.

To bring together the appliances necessary for scientific study, to give to the world the important results of its toilsome, protracted, and self-denying labors, to aid in their researches those who have given evidence that they possess the rare ability and the willingness to become the interpreters of nature, to inculcate a taste among the people generally for the natural sciences by exhibiting its rich collections for many years, without charge—such has been the work of the Academy, such its noble mission.

When we reflect that the institution is supported entirely by donations and the annual contributions of its members, very few of whom possess large means; when we consider that since its formation not more than five hundred citizens of Philadelphia have enrolled themselves in the list of its members; when we recall the fact that it possesses no estate yielding revenue, that for many years it struggled under the burden of a heavy mortgage upon its building, and that, until this debt was extinguished in 1859, by the generous act of Dr. Wilson, its legitimate income was not more than sufficient to defray its current expenses; and when we remember that the classing, labelling, and arranging of the specimens have voluntarily been done by a few of the members, the most of whom have been able to give to this work and to their studies only the leisure moments snatched from their daily vocations, we may well be astonished at the results it has accomplished —results which compare favorably in many respects with those achieved by similar institutions, which for many years have been sustained by the kingly governments of Europe. By fostering science it has proven itself a benefactor of mankind. For the labors of scientific men, though often but little heeded when first promulgated, or looked upon as curious, and, it may be, as useless speculations, are really not lifeless germs. Like seed fallen by the wayside, though neglected for a while, they nevertheless spring up in due time and blossom and bear fruit; like the tiny brooks which feed the mighty river upon whose bosom the commerce of a great nation is ultimately to be borne, they find, at length, a marvellous expression in the practical affairs of every-day life.

To appreciate properly the efforts of the Academy we should contemplate for a moment what science has done for mankind, especially during the last sixty years.

Look for a moment at savage man, who finds in his material wants, the first incentive to the employment of his powers of observation in the acquisition of natural knowledge. Inferior to many of the lower animals in the keenness of his senses, he has, vastly more than they, felt the pressure of the external world upon him. The necessity of obtaining subsistence, providing shelter against the weather, and means of defence against his enemies, arouses his dormant intellectual energies. He begins to observe how sunshine, rain, and wind affect the growth of the plants around him, especially those supplying him with a portion of his daily food; how the germinating seed is developed into a plant; how the plant blossoms and bears fruit. He learns to distinguish nutritive from poisonous plants, observes the effects of fire and of natural forces, scans the starry heavens with eyes brimful of superstitious wonder, and learns at length to couple the motions of the heavenly bodies with the ever-recurring changes of the seasons. Thus, face to face with the unalterable facts, the inexorable laws of nature, his reason enters feebly upon that career of inquiry which, though its immediate and pressing object is simply the amelioration of his physical condition, is destined, after long ages, to place him in possession of those classified groups of facts and principles which we denominate mathematics, physics, chemistry, geology, botany, biology, social, political, and moral science.

Science, thus created, has rescued savage man from the bondage of ignorance and gross superstition, and, by giving him command over the primal forces of nature, has elevated him in the economic, social, and moral scale. It has benefited him by improving agriculture, developing and utilizing the staples of commerce, and increasing and cheapening the means of transportation. It has bridged the ocean and made its waves a means of conveyance from one hemisphere to the other, thus bringing distant nations face to face, as it were, and enabling them to exchange their handicrafts quickly and profitably. It has thrown huge bridges—wonders of engineering skill—over impassable rivers, and covered the earth with an endless net-work of railways. The classic fable of Mercury, cast from Olympus, becoming the messenger of the gods, it has practically realized by drawing from heaven the electric fluid and compelling it to act as the letter-carrier of man along thousands of miles of telegraphic wire. Nay, *mirabile dictu*, it has bound together the two hemispheres with mighty submarine cables, along which our scientific Hermes speeds with his letter-bags at the rate of 19,000 miles in a second of time. It has introduced, as motive power, thousands of steam-engines into mills, mines, and factories, with the most extraordinary industrial and financial results. By inventing a multiplicity of apparatus for accomplishing, in a simple and effective manner, a great—I had almost said an endless—variety of purposes, it has increased the facilities of production, simplified and cheapened many manufactures, remodelled the arts, and made labor so easy and rapid that it is now possible to perform an amount of work which no combined manual effort could hope to accomplish. Constantly discovering new raw materials, it is constantly adapting them to the material wants of life. It has taught us to bleach and to dye, to spin and to weave, to decompose and recombine, and in various ways to modify and to call into existence the hidden, useful properties of the numberless substances that nature gives to man for his convenience and comfort. It teaches us how to irrigate and manure barren soils into fruitful fields, how to transform the wild currant into the sweet grape, how to convert its juice into wine, and this into ether; how to transform a caterpillar into a silk-worm, and to weave into velvet the silk which it spins.

Diving into the bowels of the earth, it brings forth coal and iron. From the former it distils, on the one hand, a brilliant light, and, on the other, a magnificent series of dyes rivalling in gorgeousness the colors of Tyre. The latter it converts into steel, and forges this into bars, and even, as if to show its amazing dexterity, hammers it into laminæ rivalling the leaves of a book in thinness and flexibility. It bleaches rags to whiteness, and gives to the calico-printer indigo and ultramarine dyes. From refuse soap-suds it reclaims important fatty matters; from the leaflet of the pine tree it obtains cloth capable of being woven into various articles of dress. It has transformed pulverized bones and the sewage of cities into manure, the refuse of the gas-works into ammonia, ether, and flavoring extracts; and old rags into clothing, paper, and many ornamental articles.

But the acquisition of natural knowledge, while adding directly to the resources of our material civilization, has conferred upon man practical benefits of another character. The proper application of our advanced knowledge of the laws and conditions of life, both in health and disease, has done much not only to mitigate individual suffering and to prolong individual life, but it has also enabled whole communities to protect themselves, more effectually than in former years, from the ravages of epidemic disease.

Though often foot-sore and weary in this long and solemn march called the progress of science, though often bruised and broken in his struggles with a stern and unrelenting nature, man at length rises to the realization of the fact that he cannot live by bread alone. His mental efforts, directed to the improvement of his material condition, have given rise to intellectual wants, to the irrepressible desire to understand the mystery of nature, to know, in the language of Goethe's "Faust:"—

> "To know what the world contains
> In its innermost heart and finer veins,
> To see all its energies and seeds,
> And deal no more in words but in deeds."

Perplexed and amazed in the midst of the knowledge which he has so laboriously wrested from rock and tree, from river and cloud, he obstinately questions the universe about him, interrogates the consciousness within him as to the meaning of creation, the significance and purpose of man in the order of that creation, whence he comes and whither he goes. To nature he says, in the words of Shelley's "Alastor,"

> "I have loved
> Thee ever and thee only ; I have watched
> Thy shadow, and the darkness of thy steps,
> And my heart ever gazes on the depths
> Of thy deep mysteries. I have made my bed
> In charnels and on coffins, where black Death
> Keeps record of the trophies won from thee ;
> Hoping to still these obstinate questionings
> Of thee and thine."

But these questionings, these yearnings of the soul, meet with a vague and evasive response. Loving the light and seeking it, the student of nature comes out of the search baffled and sad, but not discouraged. In his attempts to penetrate the outward semblance of the numberless objects that engross his attention, and attain the inner and hidden meaning, he finds himself suddenly confronted with the unknown and the unknowable, discovers imperfections in his knowledge that cannot be remedied, and feels that the aspirations of his soul cannot be realized. Beyond the sensual phenomena of nature, behind this veil of Isis, he beholds forces which dreamily waver before him, and which continually elude his eager grasp. Thus he awakens to a painful consciousness of the limitation of his faculties, and to the recognition of a Power vastly superior to himself—a Power "past finding out." In this consciousness, and in the feelings of helplessness and dependence engendered by it, lies the germ of the religious idea—the essence of natural religion. Thus out of the philosophy of nature is evolved the philosophy of spirit, as the flower is developed from the stem. Though unable to grasp the secret idea of nature, though unable to understand the reason and the object of the eternal and infinite play of matter and force around him, he, nevertheless, constantly rises in his pursuit of natural knowledge to grander and still grander conceptions of the universe, to more and more philosophical views of himself as part of that universe. He rises to the recognition of fixed order and immutable law in the moral as well as in the intellectual and physical worlds. He fashions for himself a new morality, based upon a more exact acquaintance with the laws of his organization and his relations to the animate and inanimate nature about him.

Through the earnest and untiring efforts of its members, aided by the wise munificence of many generous patrons of science in this city, the Academy is to-day enabled to lay the corner-stone of a larger edifice, and thus to inaugurate a new and still brighter era in its existence. Assisted by the liberal and continued support of the citizens of Philadelphia, it is destined, in its efforts to promote and popularize knowledge, to become more than ever the pioneer of advanced science, more than ever a great school for the higher culture of the mind, more than ever the exponent of that intellectual revolution which is, at the present time, slowly but surely changing the aspect of society.

Professor H. C. Wood, Jr., M.D., of the University of Pennsylvania, was introduced, and delivered the following address:—

Ladies and Gentlemen: Standing here to-day on this platform in presence of some of my masters in science, there comes upon me a flood of reminiscences from the past, and in the uncertain twilight of the future I seem to see a vision fair and fruitful, though misty and uncertain in its outline.

The tiny doors which close the cells where memories sleep are flung wide open, and scenes of the long-ago come upon me as sharp and clear as though in the light of the present. It seems but yesterday, when, a lad of some ten summers, leading my little brother by the hand, with eager, anxious heart, I rang the front-door bell of a house in Arch Street, near Fourth, and asked for one of those who now sit upon this platform. Well do I remember the disappointment of the final answer to my entreaties that I was too young to be given tickets to the Academy of Natural Sciences. Childish griefs and childish joys, though they seem to us trifles light as air, are yet real as life, and the impression of the choking disappointment of that hour time will not efface.

Again I see myself, now in advancing youth, armed with a letter of introduction, ascending the steps of a modest dwelling in Sansom Street, wondering, as I ring, how strange it is that so great a man should live in so small a house. Little then did I know the truth of the saying of the prose poet, Ruskin, "That the world pays least for its best work."

The word of the master of the little house had, however, power enough to unlock that chamber of mysteries of my childish fancy, the Library of the Academy, and, astonished, in my joy, I roamed at will and fastened as I wished on the books that crowned the walls. But another step was wanted. I could not handle the rare treasures locked in the museum cases. I could but flatten my nose against the panes in my efforts to see the specimens. One auspicious morn, however, the keys were given me, and now at last I could touch and handle and taste to my heart's content. It seemed as though the veritable keys of knowledge had been put in my possession, and I had but to walk in and pluck the golden fruits of the orchard.

There comes to me to-day also a vision of the future. I see no longer the homely face of the old Academy, beautified by the thoughts of its usefulness and by the glamour of old association. A new building rises before me, higher and wider in its scope, grander and nobler in its architecture, than the old building that we love, but yet cold and barren in its very newness.

It is to realize this vision that we are here to-day. It is to witness the first beginning of the new life of our loved institution that we are assembled. The trustees, in their faith rather than in their knowledge, in their weakness rather than in their strength, have gone forward, and it rests with the citizens of Philadelphia to decide what measure of success shall crown their efforts.

I know that there are some who see but little value in the study of natural science; who in their folly cry out *Cui bono?* With such to-day I will not pause to reason; if the noonday blaze of this the nineteenth century cannot penetrate the thickness of their intellectual darkness and prejudice, what could the rushlight of my best efforts do? I can only say with reverent feeling, God pity the man and God help the nation that, blinded by its avarice for present material gain, can see no place for the quiet student of God's work.

See yon orchard, with its golden fruit of plenty. Could it be foreseen, or did the little rootlet know, that, working so silently and yet so faithfully in the darkness under ground, it was preparing for such a bounteous harvest? So it is with the scholar in his quiet room; in his most abstruse and apparently most profitless study, he is gathering the knowledge, the power, that perhaps other men shall ripen into the richest material fruit.

There has been made recently, in this city, and indeed there is still being made, an effort to put the University of Pennsylvania on a wider footing. Far be it from us to-day to dampen the ardor or throw aught in the way of those who are carrying out this work; but none the less is it true that there is a culture deeper, higher, and more profound than any university can give.

This is the self-culture of the true scholar, for which a university at best can but lay the foundation. The highest culture must be forever self-culture. A man may be aided by others up to a certain point; into the unknown he must travel alone. Aye, more than this, before he reaches that unknown he must for himself trace out the obscure, unfrequented paths which mark the outlying regions of uncertainty in knowledge.

It is to afford opportunity for this self-culture that the Academy exists. There are but few men whom destiny has marked for such a course. The study halls of the Academy must always be for the few—but the work of the few is the life of the nation. I must assert, then, the pre-eminent claims for such institutions as our Academy. Talk of your universities—of the large crowds that haunt their doors—of the annual overflow of vigorous trained young talent wherewith they bless surrounding regions. Why, our old Academy is the gymnasium in which men train themselves for professorships in the universities.

There is a class of medical men who, in their early professional life, study deeply the natural sciences, and who often through life add to the practical duties of their profession investigations of natural history. I do not remember a single great name of such a character in Continental Europe. Yet in the British Islands, the brightest lights of the profession—the Hunters, Coopers, Brodies, Reids, Bells, Beales, Pagets, etc.—the foremost medical thinkers, leaders, and practitioners of their days, have been of this character—students of natural history who have applied the methods and facts of their sister science to their profession, and thereby climbed to their proud pre-eminence. In our own city the names of Rush, Morton, Harlan, Wood, and some about us, mark our origin. And, indeed, it is chiefly through such men that the great renown of our city, as a medical centre, was acquired. Speaking for this class of men, I would say to the citizens of Philadelphia, as they value the fair name of their city; as they respect and honor that profession into whose keeping they place all that is dearest to them; as they hope for skilful rescue when life is in peril, to see to it that men of this character are not deprived of their opportunities for culture and growth.

For myself, I wish to say to-day, that whatever of value I may have achieved in the past, or whatever of value, little or great, I may achieve in the future, as a medical investigator, is largely due to the lessons of close observation, of patient comparison, of cautious deductions, learnt in the close aisles and dusty by-rooms of the old Academy—the only institution which I ever have or ever will claim as my *Alma Mater*—the veritable mother of my intellectual life.

A few weeks before the lamented Professor Frazer's death, a prominent business man of this city told me that he called on him in reference to a grandson who rebelled against learning Greek or Latin. Mr. —— asked the Professor, "Is there any use in his learning these things?" "Where is he to live?" was the reply. "In Philadelphia." "Ah, in Philadelphia! Why, then it makes little difference whether he is an ignoramus or not."

There was deep truth in the Professor's sarcasm. It has seemed in the past as though our city was willing to settle down to be the far-famed paradise of mediocrity—a dead level, unbroken alike by abysses of gross ignorance or masses of high culture.

There has, however, come into this old city of ours, I am most happy to believe, a new life. Arousing herself from her lethargy of years, like a giant refreshed by sleep, she is marching forward in all her interests; stretching out the arms of her commerce to grasp at once the Occident and the Orient, pouring forth from multitudinous workshops products of a continent, sending her sons to drag out the untold treasures of the neighboring mountains, she is multiplying her wealth with almost magical rapidity. Her educational interests, awakened by the hum of universal labor, are forgetting their feeble steps in this the day of their rejuvenation, and it's well that our cherished institution now steps forward to the changing music of the times.

Not long since there came to a neighboring city a man of years and said to its citizens: I have nothing to give but my time and my reputation, but if you will find me the means I will found a museum that shall far eclipse the famous Academy of Natural Sciences of Philadelphia; and the citizens of that city, scarcely a third the size of ours, gave him $362,000, and the legislature of a State scarcely as large as a corner of Pennsylvania gave him

$190,000, and the museum is arising in grand proportions, and the fame of it is filling the whole earth. To-day we come before the citizens of Philadelphia not with empty hands. With a library, with a collection that it would take half a million of dollars to gather up; with funds sufficient for future support, this institution only asks a habitation—a house in which it may display its riches.

Trustees of the Building Fund of the Academy of Natural Sciences, we labor, it is true, under that strange curse which seems rooted in the very groundwork of human nature. We are no citizens of a foreign land. We are but prophets without honor in our own country. And yet I say, go forward.

Only with faith and vigor let us work, and it must be that success will crown our enterprise; that ere long we shall raise our jubilant voices under roofed arch tree, in spacious halls and lighted galleries—voices jubilant for labor past, for good works done, for hopes extinguished in fruition.

Dr. Ruschenberger then laid the corner-stone, depositing in it copies of the daily papers of the city, papers relating to the history of the Academy, the by-laws of the Academy, and the number of the Proceedings of the Academy of Natural Sciences of Philadelphia last published.

Rev. Dr. Boardman delivered a prayer, after which the assemblage dispersed.