PROCEEDINGS

OF THE

ACADEMY OF NATURAL SCIENCES

OF

PHILADELPHIA.

1871.

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 of Broad and Sansom Streets.
1871.

HALL OF THE ACADEMY OF NATURAL SCIENCES,
PHILADELPHIA, April 9, 1872.

I hereby certify that printed copies of the Proceedings for 1871 have been presented at the meetings of the Academy, as follows:—

Pages	9 to 40	May	2, 1871.
"	41 to 56	"	9, 1871.
"	57 to 88	June	6, 1871.
"	89 to 120	July	11, 1871.
"	121 to 136	"	18, 1871.
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"	217 to 232	November	28, 1871.
"	233 to 243	December	12, 1871.
"	245 to 276	January	16, 1872.
"	277 to 324	February	13, 1872.
"	325 to 340	March	19, 1872.

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

PHILADELPHIA
COLLINS, PRINTER.

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.

NEW SERIES.

PART I. 1871.

JANUARY 3, 1871.

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

Twenty-four members present.

The following paper was presented for publication:—

"Notes on the Natural History of Fort Macon, N. C., and vicinity. No. 1." By ELLIOTT COUES.

PROFESSOR O. C. MARSH, of Yale College, exhibited a tooth of a new species of *Lophiodon*, from the Miocene of New Jersey, which was the first indication yet discovered of remains of the Tapiridæ on the Atlantic coast, or of the genus *Lophiodon* in this country, east of the Rocky Mountain region. The tooth, which was in a perfect state of preservation, was the first true molar of the left upper jaw. It measured across the crown seven lines in antero-posterior diameter, and eight and one-quarter lines in transverse diameter. This would indicate an animal intermediate in size between *L. occidentalis* and *L. modestus* of Dr. Leidy. From the latter species it may readily be distinguished by the enamel of the crown, which is smooth and not wrinkled. As this species is evidently distinct from any described, Professor Marsh proposed for it the name *Lophiodon validus*. The specimen was found in the miocene marl of Cumberland County, New Jersey, and appa-

rently at about the same horizon as the *Elotherium Leidyanum*, and *Rhinoceros matutinus* Marsh, from Monmouth County, in the same State.

JANUARY 10.

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

Thirteen members present.

JANUARY 17.

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

Twenty-five members present.

JANUARY 24.

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

Eighteen members present.

Mr. THOMAS MEEHAN presented a fruit of a pear, which presented the external appearance of an apple, gathered from a Tyson pear tree growing in the garden of Dr. Lawrence, of Paris, Canada. Dr. Lawrence had a Rhode Island greening apple near the pear tree, and some of the latter interlaced with it. The pear tree was full of blossoms last spring, but only those interlacing bore fruit. They had all the appearance of apples, so much so, that many who had seen them had supposed there must have been some mistake as to Dr. Lawrence gathering them. Dr. L. had, however, when he first saw them, obtained Mrs. Lawrence's aid in separating the branches, so that there should be no mistake. The specimens had been sent to Mr. Meehan, who regarded them as apples; but on cutting them open, found the seeds to be of the pear. The granular matter characteristic of the pulp of the pear also existed in the carpels, but none in the pulp, which was wholly fibrous, as in the apple; the insertion of the stalk, also, was that of the pear. Instead of the cavity being funnel-form, as in the apple, it was campanulate, as if the stem had been pushed in, carrying the epidermis and pulp with it. He had no doubt that the fruit had the pedicle, carpellary walls, and seeds of the pear, with the granular pear-pulp wanting; but with the fibrous pulp and epiderm of the apple.

As to the law of its production, he disliked speculation, but it would seem that there were two ways in which it might be produced—either by a natural evolution of form, independent of sexual influence, which plants at times exhibited, or by cross-

fertilization with the apple. In the latter case, if found true, it would have an important bearing on the question often mooted, whether cross-fertilization effected change immediately in the fruit impregnated, or that change only appeared after the germination of the impregnated seeds. In the case of varieties of Indian-corn, we know the change is immediate; and it was generally believed some *cucurbitaceous* plants furnished similar facts; but he thought it had not been known in other plants, especially in the case of species as distinct as were the apple and the pear.

JANUARY 31.

Mr. JOS. JEANES in the chair.

Twenty-two members present.

The report of the Biological and Microscopical Section was presented.

Twenty members not being present when the election of committees was in order, the committees elected in 1870 were continued for 1871.

The election of members was postponed until the next business meeting.

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

NOTES ON THE NATURAL HISTORY OF FORT MACON, N. C., AND VICINITY. (No. 1.)

BY ELLIOTT COUES.

During two years' residence in this locality, I paid some attention to the zoology and botany of the vicinity, and the information obtained may be of some value to others besides myself. The present paper, in which mammals, birds, and reptiles are noticed, may be followed by one or more treating of the fishes, insects, marine invertebrates, and plants.

I. MAMMALS.

Lynx rufus, Raf.

Occasional.

Vulpes virginianus, Rich.

Putorius vison, Gapper.

Lutra canadensis, Sabine.

These three, but especially the mink, are common, and, with the first-named and the following species, represent the fur-bearing animals of the immediate vicinity which are of commercial consequence.

Procyon lotor, Storr.

Syn. *P. lotor* var. *Mexicana*, St. Hilaire, Voy. Venus, I, 1855, p. 25, pl. 6.—*P. Hernandezii*, Wagler, Isis, xxiv, 1831, p. 514.—*P. Hernandezii* var. *Mexicana*, Baird, Mamm. N. A. 1857, p. 212.—*P. nivea*, Gray, Mag. Nat. Hist., I, 1837, p. 580 (Albino).—*P. psora*, Gray, Ann. Mag. N. H. x, 1842, p. 261 (mutilated).—"*Procyon gularis*, Smith, Int. Mamm. Jard. Nat. Lib., xiii, 1842, 222" (fide Baird).

A common animal, in the wooded portions of the vicinity.

Residing for several years in different Southern States, where the Raccoon is either common or very abundant, I became familiar with its variations in size, color, etc., and feel sure that these are as great as those differences held to distinguish a western from the eastern form. Although I do not assign the above synonymy from direct comparison of specimens from the different localities (as I saw none in New Mexico, Arizona, or California), I am confident it is correct, provided *P. Hernandezii*, etc., do not differ from *lotor* in any other points than those given in descriptions of

the authors above quoted. As Mr. Allen[1] holds, and probably has shown, all the features believed to distinguish the western raccoons may be discovered in examination of sufficiently extensive series of eastern ones. Dr. Gray's two species are not different, according to that author's subsequent admission.

Cariacus virginianus, Gray.

Common, almost to be called abundant in wooded portions of the main land near the coast, and said, upon good authority, to occur in the wooded part of the Banks. During the autumn and winter, venison is not much more expensive than beef, a fact attesting the above statements.

? Balæna cisarctica, Cope.

An individual, which I rather suppose than know to be of this species, was taken in May, 1869, off Shackleford. It measured about forty-five feet in total length. The fishermen called it a "right whale." Besides this kind, they spoke of two others, that they occasionally captured, under the names of "Scrag" and "Humpback" (*Agaphilus* sp? and *Megaptera* sp?). They usually take two or three each spring. Remains of whales, as the jaw-bones, shoulder-blades, humeri, and especially vertebræ, are strewn abundantly along the beach.

Delphinus Sp.

At least one species of porpoise is very abundant in and about the harbor, and I think that a second, smaller and darker than the other, is of frequent occurrence. They are to be seen at all times, but are most abundant in spring and fall, during the migration of the fish upon which they prey; and in April and May, during the pairing season, they become especially conspicuous in their amatory gambols. The sexual act is frequently witnessed, and may be recognized at a distance by the reversed position of one of the pair, and the smoothing of the surface of the water by the wasted emissions. The great voracity of the porpoises is evident in their pursuit of schools of fish, some of which are often driven out of the water, only to fall back into the open jaws of the pursuers. The animals are sometimes taken for their oil, in nets made especially for the purpose, but are not

[1] Bull. Mus. Comp. Zool., No. 8, pp. 182-3.

often molested, and usually show entire fearlessness of the nearness of man.

Remains of some cetacean (not a whale), about seventeen feet long, were cast upon the beach during a storm in October last, but identification was impossible, owing to the advanced stage of decay.

Lasiurus cinereus, Allen.

Occasional specimens, in summer.

L. noveboracensis, Gray.

Very abundant in summer, and appearing to live mostly in and about the fort itself, as far as the eastern extremity of the island is concerned; other suitable hiding-places not being in plenty.

Scalops aquaticus, Fischer.

Occasional traces of this animal's presence in the loose soil between the sand-hills and the marsh.

Sciurus carolinensis, Gmelin.

Very abundant in all the wooded vicinity.

Mus decumanus, Pallas.

M. musculus, Linn.

Everywhere about the fort and other settlements.

Fiber zibethicus, Cuvier.

Common.

Lepus sylvaticus, Bach.

One specimen from the neighboring island of Shackleford—the only one I ever saw in the vicinity. I scarcely think that it occurs on Borden, where the next species abounds.

L. palustris, Bach.

The most abundant and characteristic mammal of the island.

I gave some account of this species, in the Proceedings of the Boston Natural History Society for 1869 (p. 89), and have little to add to what there appears, or may be gathered from Audubon's and Bachman's article.

The animal sometimes reproduces in April, more commonly in May, and thence during part of the summer; I do not know whether more than one litter is reared, but think such is the case. The nest is a snug, pretty affair, in a tussock of rank grass or

weeds, or little shrubby patch, in a dry situation. It is sunk a little in the ground, then arched over, with an opening on one side; built of dried grasses, mixed with a few leaves, and warmly lined with the animal's own fur. All those I have seen were so far from water as to be out of reach of any possible rise of the tide.

This appears to be the most distinct of the several species closely related to the foregoing; and is in fact distinguishable on sight, as some of the others are not.

Didelphys virginiana, Shaw.

Syn. *D. californica*, Bennett, P. Z. S., i, 1833, p. 40.—*D. breviceps*, Id., ibid.—*D. pruinosa*, Wagner, Suppl. Schreber, iii, 1843, p. 40.

Abundant in the wooded portions of the vicinity.

Having made this animal a special study, I am in position to offer remarks which cannot be reasonably questioned. Although my investigations were rather anatomical than zoological, I did not neglect the latter portion of the subject. The more specimens I examined, the more I was struck with the variations that depend upon sex and age, as well as those that different individuals corresponding in these conditions present. An examination of these points in the natural history of a single animal, may give results of general application. And yet, in calling attention to the variability of the opossum, I do not wish to be understood as supposing that the animal is not as constant as many or most others; for I believe it to be no exception to a general standard or average in this respect. I doubt that one could study any mammal as closely as I have the opossum, without being similarly impressed. The following paragraphs are mainly confined to consideration of external characters. I can affirm that not one of the characters assigned to the supposed species above cited, is not to be found in specimens of *D. virginiana* from the same locality; that the differences indicate individual peculiarities; and that even upon striking an average of preponderance of certain characters, common to each in various degree, no results will be obtained warranting the separation of the opossums from the southwest as even a geographical race or variety. The assertion is made, it should be understood, upon consideration of descriptions only, without direct comparison of specimens.

Professor Baird remarks (Mex. B. Survey, vol. ii, pt. ii, p. 33), that "although there are some differences in the skulls of the *D.*

virginiana [and of *D. californica*], yet I am unable to establish on them any specific characters. In fact, the variation in the thickness and length of the muzzle in different specimens, in addition to other points, are so great, as readily to convey the impression of many more species than really exist." This is certainly true, and, I think, is speaking within bounds. The author's tables of measurements of skulls of *D. virginiana* show a difference of nearly an inch and a half in total length, in only four specimens; yet this scarcely represents extremes between the largest old males and the smallest young (though full-grown) females. I have skulls before me upon which a person so minded might base very specious *generic* characters. The lateral measurements of the skull are variably proportionate to the longitudinal ones. The muzzle is sometimes tumid, at others regularly conic. Sometimes the interparietal crest forms a high arch, at others is only a direct backward and upward prolongation of the face. This crest may be only a fourth of an inch, or more than half an inch above the expanded surface of the parietals, and when so large it may be partially detached, appearing like an osseous lamina developed in the fascia separating the masseteric muscles. Generally, it is in direct proportion to the size and strength of the individual, and is usually smallest in the female. The zygomatic arch is very variable in amount of outward curvature. The ramus of the lower jaw may be nearly upright, or slope backward so far as to overreach the condyle. It appears to vary with age. The long lower border of the jaw-bone may form a slight regular curve, or a strong irregular one. In two specimens before me, the difference in total length of this bone alone is a full inch, and the smaller of the two is that of the older animal, as shown by the stronger ridges and deeper depressions for muscular attachments, and the much-worn teeth. The difference in length between two canine teeth (both unworn) is a fourth of an inch; the possessors of these were both adult animals. In general, the tusks of the male are longer and stronger than those of the female. It is unnecessary to cite further details. Elimination of all these and other accidental variations shows how very different a skull should be, to furnish specific characters.

The length of the tail, compared with the length of the body, appears to have been relied upon in some instances; but, for several reasons, it is difficult to predicate anything upon this

character. In the first place, it is impossible to always measure the tail from the same point. There is no visible point of separation of tail from body; the latter narrows regularly and gradually into the former, so that we cannot say where one ends and the other begins. Measurement from the end of the fur is usually supposed to be meant; and about where the true fur ends the scaly plates begin. But it will be quite safe to allow for a variation of at least two inches in this regard. I have certainly seen so much difference as this, as well as I could judge. This refers to external measurements of the animal in the flesh; the dried, especially if skinned, tail can afford no data whatever. Finally, appeal to the vertebræ themselves is not infallible, for these may vary. The first coccygeal vertebra (as I hold it to be) resembles the others in physical characters, but is really a part of the sacrum, being anchylosed therewith. At the extremity of the tail, one vertebra or more may be lost without evident trace. The terminal dozen or more bones have no neural canal, nor any noticeable parts beyond the impervious centra by which they articulate; they resemble the internodes of a digit. The tail is singularly liable to ulceration upon injury, when one or more bones may exfoliate from the end, and the subsequent cicatrix be scarcely recognizable.[1] I met with one such case. It would not be safe to base a specific difference upon less than three or four inches in length of tail; and this should be taking age for age of the animal, of course, and be only declared of specimens measured in the flesh. In color, the opossum's tail is usually in largest part whitish or flesh-colored, blotched with a dark livid or blackish hue toward the base. The degree of blotching and the shapes of the dark spaces vary with almost every individual. Sometimes most of the tail is dark colored; sometimes there is almost no pigment in the scales. Absolutely nothing can be predicated of this feature.

The ears of this creature are very thin and membranous, and

[1] It is also highly probable that the coccygeal vertebræ normally vary one or two in number, that is to say, we may find 21, 22, 23 bones, without any having been lost by accident or disease. This, however, is an opinion of mine, not an observation. Some small long-tailed animals vary more than this; *e. g.*, Mr. Allen says (Bull. Mus. Comp. Zool. No. 8, p. 228) that *Hesperomys leucopus* may have from 24-5 to above 30 caudal vertebræ. Other *Muridæ* appear to vary quite as much.

mostly naked, reminding one of the texture of a bat's wing. In color, they are like the tail; usually dark, blotched or rimmed with flesh-color; but they may be wholly blackish or mostly whitish; it is impossible to base any character upon their coloration. The general shape of the conch may be called pyriform (base uppermost) or subcircular; but it is not easy to see what the shape really is, unless the ear is pressed out flat. From their texture, they shrink and shrivel in drying. I have never seen a Virginian opossum with so pointed an ear as "D. californicus" is represented to possess in pl. iii. of the Mexican Boundary Survey; but if, as I presume, the drawing was made from a dried specimen, it is not trustworthy in this point, for indeed the true shape of the ear could have been only guessed at. The ears, like the tail, are peculiarly subject to disease; and may ulcerate away entirely, as I have observed in animals kept in confinement; and this, too, without appreciable general ill-health.

The general body colors are amongst the most variable features. The variation is largely a matter of individual difference; but there are certain things that influence it in a general way; especially age. The opossum grows gray with age, as a rule; half-grown ones seen at a little distance give the impression of a blackish animal; old ones, of a whitish animal. The paws are particularly variable. Generally, they are among the darkest parts, and are often quite blackish; frequently, they are as pale as any other parts. Not to go into tedious particulars in this connection, I may say, in short, that I have seen no points of coloration adduced for *D. californica* that might not be easily matched out of a dozen individuals of the Eastern species, with a single exception. To the best of my recollection, I have not seen a specimen of *Virginiana* with paws completely black to the nails.

Under the circumstances, it seems most probable that a second species of *Didelphys* remains to be determined, if occurring within our limits.

II. BIRDS.

The list is restricted to those species that came under personal observation on the unwooded portion of the island itself, and on the waters of the immediate vicinity; for an exhibit of the strictly littoral and maritime bird fauna, as distinguished from that of

the locality at large, seemed to promise the more of real interest. At the same time it should be remembered, that any of the *Passeres*, &c., of the wooded main land adjoining, not here noted, may occasionally stray into the shrubbery of the sand-bars. The catalogue of the water birds is believed to be pretty full. Aside from these, and excepting a few maritime land birds like the *Ammodrami* for example, the bird-fauna of the locality appears to differ from that of the State at large, mainly in the absence during the breeding season of species that, like the robin and meadow-lark, pass the summer as well as other seasons in higher parts, and perhaps, also, in a rather earlier arrival in spring, and later departure in the fall, on an average, of the migrants.

Turdus migratorius.

Spring and fall, especially March and November; some winter; none observed in summer.

Turdus pallasii.

Spring and fall, occasional, in the shrubbery; spec. in Nov. As elsewhere[1] noted, this species migrates earlier in the spring and later in the fall than its nearest allies; and I have no doubt that it winters in this vicinity.

Turdus aliciæ.

Like the last, but later in coming; specs. in April and May.

Mimus polyglottus.

Resident; common; but not so abundant as it is inland, and especially somewhat further south.

Mimus carolinensis.

Resident; common; but most numerous during the migration.

Anthus ludovicianus.

Abundant, in flocks, from early in November till April.

Thryothorus ludovicianus.

Common; resident; mates in March; nests and lays in April; young obtained May 9.

Telmatodytes palustris.

Abundant, particularly during the migration. It continues in plenty through part of November at least, and I think that some

[1] Coues and Prentiss, Smithsonian Report for 1861, p. 404

may winter here. No nests were observed, and I doubt that any breed in this locality, although it is a common summer bird in Virginia swamps, and I found it breeding in the same latitude (about 35° N.) in the West.

Cistothorus stellaris.

One specimen, October 11, 1869, the only time that I ever saw the bird alive.

Geothlypis trichas.

The most abundant and characteristic of its family, in summer; and I presume, but do not feel sure, that some pass the winter here. They arrive in numbers during the latter part of March and early in April, when many of them have not acquired their full dress. They begin to sing almost immediately, and many nest in April. Young birds may be seen early in May, along with the first broods of the Carolina wren, and from that time until August. The species remains plentiful through part of November.

Parula americana.

Only occasional during the migration (one spec. in September).

Dendroeca coronata.

Very abundant in winter; complementing the yellow-throats at that season. They arrive late in October; become more numerous the following month, and remain until the last of March or early part of April, frequenting the shrubbery in flocks with the savanna sparrows. None were observed to have gained their full plumage before leaving.

Dendroeca discolor.

Arriving late in April, these birds become very numerous in May, when nearly every patch of juniper and clump of bushes has one or more in full song, and continually foraging for winged insects, which they catch in the air with great adroitness. The greater number pass north to breed, but many remain during the summer, especially in thinly wooded sandy tracts of the neighborhood.

Dendroeca striata.

Occasional, in the shrubbery, during the migration.

Dendroeca palmarum.

Rather frequent, particularly late in the fall, in low shrubbery, with the sparrows.

Progne purpurea.

Common, March to October; as many as can find accommodation breed about the fort.

Hirundo horreorum.

During the migration only; then abundant.

Hirundo bicolor.

Abundant during the migration. Numbers made their appearance January 11, 1870, on a warm day, though there had been ice a half inch thick two days before. They almost immediately disappeared during some blustering weather, but reappeared in greater numbers than before on the 20th, and were occasionally seen from that time until the regular migration took place, in April.

Cotyle riparia.

During the migration.

Vireo novæboracensis.

Common summer resident of the shrubbery, April—October.

Vireo olivaceus.

Occasionally seen, during the migration.

Pyranga æstiva.

Frequent, in summer.

Chrysomitris tristis.

Common, in flocks, from November to April. Here it spends much of its time on the ground, feeding apparently in greatest part upon the seeds of *Cenchrus tribuloides*.

Passerculus savanna.

The characteristic sparrow; very abundant everywhere outside the marsh itself, from October to May; none remain through the summer. Its numbers do not perceptibly decrease until the middle of April, when the greater part move northward; but loiterers are seen through most of May. Their earliest connected notes are heard late in March; and they are in full song and

plumage before they leave. Some straggle back in September; more arrive in October, and the full complement appears with the first cold weather of November.

Zonotrichia albicollis.

Only occasional, in winter and during the migrations; although very abundant on the neighboring mainland.

Melospiza melodia.

Common; resident; but most numerous from October to April, as most of them pass northward for the summer.

Melospiza palustris.

Common; resident, I think, as I saw them after May, although I did not observe them through either of the two summers. They seemed most plentiful in November, when many were singing. The ordinary chirp of this species is totally different from that of the last. A timid bird, courting the seclusion of the thick bushes that border the marsh, it forms a sort of connecting link between the two last species that frequent open grassy places and sparse shrubbery, and the two next, that are confined to the marsh itself.

Ammodromus caudacutus.

Living side by side with the next, and with the same general habits and manners, the sharp-tailed finch nevertheless has some obvious peculiarities, as compared with the seaside. As the two species spring up together from the reeds, the sharp-tailed is recognized at a glance by its inferior size, and its general yellowish appearance, closely resembling, in these respects, the *Coturniculus passerinus*, the place of which it appears to fill in the marshes. Seen at the same hasty moment, the seaside looks more like the marsh sparrow; but the general impression received is of a gray, instead of a rufous bird; and its nearest approach, in color, is to the *Poospiza Belli*. The difference in plumage between spring specimens, in full dress, of the sharp-tailed, and the young of the same, in the fall, is striking, and greater than has usually been mentioned; it consists chiefly in the paleness or almost want of the orange-buff that marks the highest condition. There is also a remarkable difference between the two species of *Ammodromus*, in the time of the vernal moult. The seaside finches were all found in full feather, and with highly

developed sexual organs, from the beginning of April; while the sharp-tailed remained in moult through the same month. This, of itself, is a good indication of some notable difference in the time, and probably the places, of breeding. I do not think that any of the sharp-tailed finches breed hereabouts; and it was not until May, when they appeared to be about leaving, that I found any with excited organs, or in perfect plumage. At that date the seasides were mating and nesting, if not already incubating. In the fall, when both species are again together, it is only during a part of the season that they are found in equal numbers. This is during the warm days of October, when they loiter in troops about the bushes around the edges of the marsh, as well as among the reeds. Previously, in September, there are few of the sharp-tailed to be seen; and on entering the marshes in November, the seasides will be found scarce or altogether wanting, while the former are still abundant. These observations, which I made very carefully, are mutually explanatory, and point to the fact that these two species, so closely allied, so often found together, and so commonly spoken of in identical terms, have really a different range of habitat (one being more northerly than the other), migrate independently of each other, moult at separate seasons, and breed more or less apart.

Ammodromus maritimus.

More numerous, on an average, than the last, and more truly characteristic of the locality, as it breeds here in great numbers. In April it retires from the interior of the marsh, to place its nest among the bordering bushes, a little above high-water mark. It begins to sing when mating, and is afterwards, during the incubating, particularly earnest and persevering about it. Each pair usually claims some particular copse, and the male has his favorite singing post, to which he continually resorts. The simple song is something like that of the yellow-winged sparrow, beginning with a few slow notes, then a rapid trill, finally slurred till it sounds like the noise made by some of the grasshoppers. The nest and eggs are now well known. The young in September are somewhat differently streaked from the adults, and appear to constitute Audubon's *A. macgillivrayi*.

The comparison that has been drawn between the actions of the Ammodromi and of Sandpipers seems somewhat forced, and

a more natural one might be traced in the Nuthatches, Titmice, and even Woodpeckers. They climb the reeds with remarkable ease, sliding up and down, skipping from one to another, and hanging in every attitude except head downwards; they are doubtless much aided by the somewhat stiffened tail. On the ground, they are unmistakably sparrow-like, and always proceed by hopping; the flight does not differ noticeably from that of their several near allies. It is irregular and very quick, and they never remain long on wing. They are rather difficult to procure in large numbers, independently of the miry nature of the places they inhabit; as they are not often, comparatively, seen at rest, and it is quite a knack, only acquired by practice, to shoot at them on wing with any certainty of killing. A collector will do well to take a score of them in a morning's walk, even when they are most abundant.

Comparing the Fringillidæ of this seacoast locality with those of inland places of the same latitude, the distinctive features are seen in the *Ammodromi*, and in the great abundance of *Passerculus*, together with the absence or only casual occurrence of several species elsewhere abundant. Thus, I never saw a Chipping Sparrow, Yellow-winged Sparrow, Bay-winged Bunting, or Snow-Bird, on the island.

Pipilo erythrophthalmus.

Common; summer resident, breeding; and just possibly a few spend the winter here, though I do not think I saw any between November and March.

Cardinalis virginianus.

Common; resident; breeds (in May and subsequently).

Icterus spurius.

Moderately common, from the latter part of April, through a portion of September; breeds.

Dolichonyx oryzivorus.

During the migrations only; in spring, not abundant, mostly in early May, when many are in full dress, and singing volubly; in fall, very common, beginning to arrive late in August, and continuing through October.

Agelæus phœniceus.

Resident; abundant. They become more numerous during the

latter part of January, begin to sing in March, get restless in early April, when they come into full feather, but continue in flocks for a week or two longer. The greater number then pass off northward, and those that remain begin to pair. They breed sometimes by the single pair, sometimes in companies with the jackdaws, and have their first eggs early in May; though other batches may be found throughout June and part of July. I estimated that a narrow strip of brushy ground about two miles long contained about a hundred pairs. The young begin to flock about the middle of July; there may have been about a thousand in the tract just mentioned, before they were reinforced, in August, by new-comers from the north.

Sturnella magna.

Very abundant, in flocks, from October to April, when they pass north, or at any rate to higher grounds inland. I saw none breeding, and do not think I ever observed a pair during the summer.

Quiscalus major.

The characteristic species of the family, and very abundant. I judge it to be resident, though it is much less common during December and January, and may move off altogether during the extreme of the season. It does not seem to be authenticated as occurring beyond the Middle States; and, however far north it may occasionally stray in summer, it is essentially a bird of the South Atlantic and Gulf States. It is strictly maritime, and its food differs from that of most of its allies, much as that of the fish-crow does, in comparison with that of *C. americanus*. It feeds on molluscs, aquatic insects, fiddler-crabs, and small fry, which it catches expertly by wading in the water and striking with its bill, in a manner reminding one of a heron. It frequents the muddy flats at low tide, and for similar animal food, and is dispersed through the marsh in gleaning for seeds that form part of its fare. The sexes mingle in flocks, often of large size, up to some time in April, when they break up in pairs, several associating together in the same copse, and placing their nests close together in a sort of rookery, frequented also by the redwings and the green herons. The nests are bulky and inartistic, composed chiefly of interlaced twigs and intertwined grasses, generally with the addition of a few dried leaves as lining or wadding;

I saw none with either mud or horsehair. The laying season is at its height the third or fourth week in April; I did not find more than six, nor fewer than three, eggs in a nest. They measure on an average $1\frac{1}{4}$ by a little over $\frac{3}{4}$ inch; and have the usual shape and curious zigzag markings, on a pale bluish-green ground color. On leaving the nest, the young are curious-looking objects—clear brown above, pale gray or almost white below, with a naked space about the eyes, and fluffy tufts of down on the head. They appear early in June, and by the first of August both old and young are flocking. The young rapidly change after leaving the nest, the brown acquiring a greenish-black cast, the gray of the under parts becoming brown. Both sexes undergo a change in the early fall, after rearing of the young is over, and again in the spring. The moult begins on the head, and progresses backward, the quills and tail-feathers being renewed last. When in perfect plumage, the male is a splendid-looking bird; its large fan-shaped tail, with the lateral feathers placed slantwise, giving it a jaunty air, and serving to steady its flight. A fuller account of this interesting species will be found in the "Ibis," 1870, p. 367.

Corvus ossifragus.

Very common, and resident, though less numerous in summer, and not to my knowledge breeding in the immediate vicinity, probably through lack of suitable woods. They frequent the sea beach, contending with the turkey-buzzards and herring-gulls for the refuse from the fort, and scatter over the marsh, often in company with the last species, feeding upon various animal substances gathered from the shoals and mud-flats, such as shell-fish, fiddler-crabs, and aquatic worms.

Tyrannus pipiri. (*T. carolinensis.*)

Common summer resident, April to September; breeds. This is the only one of the family that appears to regularly visit the island, though four or five species at least are common in the woods of the adjoining land.

Ceryle alcyon.

Occasional, at any season.

Chordeiles virginianus.

Very common, from April to October; breeds, and is especially numerous in August.

Coccygus erythrophthalmus.

Frequent, during the migration.

Colaptes auratus.

Rare or occasional (one specimen taken October 10, 1870).

The *Picus querulus*, although not actually observed on the island, may be here noticed, as one of the characteristic species of the South Atlantic States, and an abundant bird of the pine swamps of the neighboring mainland, where it is resident. It is easily distinguished from our other *Pici* proper, at any reasonable distance; first by its different note, and next by the greater blending of its colors, producing a grayish appearance at a distance where the other species still look definitely black and white. The sexes are exactly alike, except that the ♀ lacks the red over the auriculars, and of the same size; average measurements give $8\frac{1}{2}\times15\times4\frac{1}{2}$; tail $3\frac{1}{2}$.

Falco sparverius.

Frequent; apparently resident.

Accipiter cooperi.

Frequent; apparently resident.

Accipiter fuscus.

Specimen in September.

Circus hudsonius.

Very common; resident.

Pandion haliaëtus.

Common, especially in spring and fall.

Haliaëtus leucocephalus.

Frequently observed at different seasons.

Strix pratincola.

Occasional; specimen taken in the marsh in daylight.

Brachyotus palustris.

Frequent, about the marsh.

Cathartes aura.

Abundant; resident; more numerous in summer than in winter: believed to breed in the neighboring pine swamps.

Cathartes atratus.

This species was observed in summer too frequently to be considered as merely a straggler, though it is far less abundant here than on the coast of the next State southward. Numbers were seen *March* 22d, 1870 (their first appearance that year); and in *November* of the same year I saw many near New Berne, N. C.

Zenædura carolinensis.

Resident; abundant; begins to flock in August, and so continues until April.

Ortyx virginianus.

Casually on the island, which is not entirely suited to its wants; plentiful in the vicinity.

Charadrius virginicus.

Common during the migration, particularly in October and November.

Aegialitis vociferus.

Abundant, especially during the migration, but observed at all seasons, and probably resident, though not known to breed.

Aegialitis semipalmatus.
Aegialitis melodus.

These two species come and go together, and are usually found in company; but the first named much outnumbers the last. They become very plenty in April, and so continue through that month and the next, after which none are to be seen until the latter part of August. In September and October they are again plentiful, and remain in scarcely diminished numbers until cold weather, frequenting all the water-edges with several other small waders. Before leaving in the spring, they come into perfect dress, with very brightly colored bill and feet, and the brilliant ring around the eye. All the colors are duller in the fall, although even at that season adults are easily distinguished from the birds of the year. The two species are easily told apart at any distance by the paleness of *A. melodus*, which closely resembles the winter condition of the sanderling.

Aegialitis wilsonius.

The characteristic species of the family; summer resident; breeding abundantly.

Iris brown; no conspicuous coloring of the edges of the eyelids; bill wholly black; legs pale flesh-color, sometimes with a livid, at others with a yellowish, tint. Shade of the upper parts intermediate between that of *melodus* and of *semipalmatus*; ♂ with a perfect black pectoral collar and bar across the vertex, the nape and cervix strongly tinged with rufous, as in the western species; ♀ with the bars plain grayish-brown, and with little rufous; young, like the female, but duller and grayer. When newly hatched, the down of the upper parts is curiously variegated with brown and black; the under parts are pure white; the bill and feet are as in the adult.

None of these Plovers winter here. They come from the south late in March, with constant increase during April; a part pass further north in May, but many remain to breed. Excepting a few stray sandpipers, they are the only waders of the beach during June and July. Before pairing and resorting to the sand-dunes to breed, they frequent the beach, sand-shoals, mud-flats, and scant-herbaged salt meadows indifferently, in flocks of considerable size, keeping much among themselves; their size, longer legs, and large black bill render them conspicuous among their congeners; they are rather shyer than the rest, and their note is decidedly different. In those opened were found gravel, insects, soft substances apparently both animal and vegetable, and fragments of small molluses, particularly the fragile young of the *Solen ensis*.

Some account of their nidification, and a description of the eggs, will be found in the *American Naturalist* for September, 1869. This occasion is taken to repeat that the usual number of eggs is three, not four.

Squatarola helvetica.

Abundant during the migration, particularly in October. Here they frequent the water-edges, and the flesh is hardly so good as when they feed over uplands.

Strepsilas interpres.

Very common during the migration, and some probably winter. In May, just before they leave, very perfect specimens may be procured. They begin to return the last of August, and soon become abundant. Many of the old birds at this time retain much of their spring attire, and are thus readily distinguished from the young.

Gallinago wilsonii.

Common during the migration, and often in winter; but are somewhat uncertain. They frequent the marsh, &c.; but rarely, if ever, the more open ground about the harbor.

Macrorhamphus griseus.

Very abundant during the migration, and perhaps some winter, as they may be taken in December. They occur in large flocks on the sand-bars and mud-flats, as well as on the salt meadows; and afford excellent shooting. They are not so common in the spring, and the passage is more rapid.

Pelidna americana.

Very abundant, April and May, and September to November; some may remain all winter. A large part of them attain their perfect dress before leaving in the spring; and it is partly retained by many during the full migration, when, however, most of them are in plain gray plumage. The vernal change begins early in April, soon after the main body arrives from the south. Even in spring they are often found exceedingly fat; and in the fall their corpulence seems only limited by the capacity for expansion of the skin. In examining a great number, I found a variation of a third of an inch in the length of the bill; but this is always considerably over an inch long, and never quite straight. They seem to prefer muddy flats to the beach, and are among the most snipe-like of the sandpipers.

Actodromas bonapartei.

Common, during the migration, associating in flocks with several other species. The larger size, and conspicuously white rump, mark it at once from *Ereunetes*, and the next species, its most frequent companions.

This little species is liable to be found in sandy and muddy places throughout North America, east of the Rocky Mountains. It breeds in Labrador, where, in July and August, it is one of the most abundant shore birds; and in various parts of British America. I found it migrating through Kansas in May.

Actodromas minutilla.

Extremely abundant, April and May, and August to October, both on the beach, in flocks with the next, and also in muddy meadows.

[May 2,

The beach and marsh are cleared of all their sandpipers about the first of June; and, for some six weeks, scarcely a straggler of any sort is to be seen. But about the middle of July—a few days before or after the 15th—a few of this and the next species reappear, and in August the numbers are materially increased, still in advance of the main body of September arrivals. It is an open question about these July birds. It seems improbable that they should have gone so far north as the most southern places where we know of their breeding, and have raised a brood, in the short six weeks of their disappearance. Probably they are either those that left in the van of the spring migration, or those that did not accomplish a complete migration, from whatever cause.

Ereunetes pusillus.

Extremely abundant, as elsewhere along the Atlantic coast, during the migrations; here, chiefly from early April to June, and from August (see above) through October. They show as decided preference for the beach as the least sandpipers do for muddy flats.

Calidris arenaria.

Very abundant at all times, excepting during the three summer months. The greater number pass north early in May, but a few linger until June. Some arrive late in August, and most of them in September. After October they are conspicuous by their light color, appearing almost white at a distance. The vernal change commences in April, but the process is slow, and few completely ruddy birds are seen here. Up to a short time before their departure, they continue in compact flocks; but in May, are more dispersed, and the prospective pairs are seen chasing each other over the sand, the males, puffed up to nearly twice their usual size, going through a variety of odd motions, and piping in excited tones.[1]

[1] In this bird, with no external trace of a hallux, the accessory metatarsal is present, without, however, bearing even a rudimentary phalanx, and without causing any protuberance of the metatarsal envelope. It is a small oval or somewhat reniform ossicle, slightly twisted on itself, and deeply sulcate along the middle, lying in the fossa between the three prongs of the metatarse, where it is ligamentously bound down. It lacks the usual roughened surface of opposition with the principal bone. Independently of morpholo-

Symphemia semipalmata.

Resident, but less common during the colder months; very abundant at other times, and one of the few waders that regularly breed here. Numbers arrive from the south in March and April; a part of them proceed further north, and the rest, in May, scatter over the marshes to breed. In August the ranks are again recruited by the numbers hatched here, and in September by others returning. The large size, variegated color, and restless, noisy disposition combine to render it one of the most notable birds of the vicinity in summer.

Gambetta melanoleuca.

Gambetta flavipes.

Both common during the migration—the first named the more abundant.

Rhyacophilus solitarius.

Only observed in April and May, and September and October, and not abundant.

Tringoides macularius.

Summer resident, arriving late in March, becoming very abundant in April, and the greater number passing north in May; but the young are common in July.

Limosa fedoa.

Abundant during the migrations, particularly in the fall. Possibly some may breed in the vicinity, but I am not sure of this. Some appear in August, many more in September, and they continue plentiful about the harbor until December.

Numenius longirostris.

Resident; abundant during the migrations, and rather common at other times. I observed it in February, and at irregular intervals through the summer, when it is sparingly dispersed over the marshes, in all probability breeding.

Immense flights of curlew sometimes occur in October and

gical considerations, its presence is not readily accounted for; but it seems to be a sort of trochlear ossicle, for the guidance if not the increased action of the flexor tendons. This bone, in a more or less rudimentary condition, may perhaps be discovered in more three-toed birds than are now believed to possess it.

March. Some flocks that I witnessed must have contained thousands of birds. These were not the species just named, but whether *hudsonicus* or *borealis* was not ascertained.

Recurvirostra americana.

I scarcely think that this is a regular, and it certainly is not, according to my observations, a common migrant here. The only time I identified it with certainty, was on the 12th of September, when a flock of six was seen.

Ardea herodias.

A resident species, common on the marshes at all seasons. This and the Bittern are the only species of the family that I observed in winter. I do not know that it breeds in the immediate vicinity, but such is probably the case.

Herodias egretta.

Only observed late in summer, and through autumn, when moderately common, and generally seen in small flocks.

Garzetta candidissima.

Apparently a summer resident, though not observed breeding. I first saw it early in May, when it appeared to be migrating, but individuals were obtained at various times during the summer. They were oftenest in flocks of considerable size. Old birds killed in July still had lengthened plumes on the head and breast, but the former were not recurved, and the dorsal ones were wanting. Except in these respects, the birds of the year were like the adults. They remain until October at least, and probably later.

Butorides virescens.

Summer resident, and very abundant, arriving late in March and early in April, and remaining until October. They breed in colonies with the jackdaws, placing the nests in the thick shrubbery that covers part of this end of the island. The nests are rather large and frail platforms of loosely interlaced twigs, built on dense beds of small branches, or saddled in a crotch, or swung like hammocks upon a mass of climbing vines. The birds begin to lay the second or third week in April, but some do not fill the nest until after the first of May. The complement is usually five or six; but I have found only four, and in one instance *seven*—the latter number probably being the maximum. The old birds

shed their dorsal plumes during the period of incubation; the young, for some time after quitting the nest, show traces of down here and there, particularly about the head.

Botaurus lentiginosus.

I think that the Bittern will prove a resident species here, though I have only observed it from September to May. It is quite common in the fall; thus, I have shot two or three, and seen as many more in an afternoon's walk in October. Singular as it may seem, viewing the abundance of the bird, and its wide distribution over North America, a complete history has not yet appeared. The earlier accounts are defective, and not entirely accurate. Perhaps the best notice we have is Mr. Endicott's, in the *American Naturalist*, iii, p. 169.

Rallus crepitans. (= *R. longirostris*, Bodd.)

This is probably the most abundant, and it is certainly one of the most characteristic birds of the locality. It should properly be classed among the resident species, although its numbers are greatly diminished during December to February, and it may entirely disappear in very cold weather. Its ranks are largely recruited in March, and little or no decrease is perceptible until November. It becomes very noisy in April, and the marshes resound with its harsh cries until the next autumn. The laying season is at its height during the latter part of April, and through a portion of May; but eggs may be procured nearly all summer. A full account of its nidification, with other particulars, will be found in the *American Naturalist*, iii, p. 600. I have nothing to add to what is there given, but I would now increase the number stated as an average nest-complement of eggs, to nine or ten. The largest number found in a nest was twelve, although there is no certainty, in such a case as this, that all were deposited by the same bird.[1]

[1] Embryos about one-half developed, taken May 14, afforded the following tracts of the downy plumage. Pteryla capitis continuous, though weak, and running uninterrupted into prolongation of both spinal and ventral. The strong pt. spinalis commences as a single band on the median line over the coccyx, divides after passing the pelvis into two slightly divaricating bands, that approach but do not join on the cervix, and run uninterrupted to the nape—inclosing a narrowly lanceolate space on the back, and a linear one on the hind neck; but this is very narrow, and would probably

Porzana carolina.

During the migration only, in April, May, and part of August to October; then common.

P. noveboracensis.

One individual observed April 12th, under circumstances that left no doubt of the identification.

The numbers of wild-fowl that throng the sinuosities of the coast in winter are simply incalculable. Immense flocks cover the waters of the harbor; and yet these are said to be inconsiderable compared with those upon the land-bound reaches of water a little removed from the coast. Aside from the natural conditions determining this influx of the Anatidæ, such as congenial latitude, convenient feeding-grounds, and an abundant supply of food, we may attribute a part of the number of water-fowl to the incessant and systematic persecution they suffer somewhat further north. Here they are comparatively free from annoyance, their destruction not being attempted methodically, nor usually with any considerable degree of skill. A few of the species appear in the early fall, but the great flight does not fairly set in until the cold weather of November. The numbers are full the following month, and continue undiminished through the winter. The decrease is

disappear soon, by fusion of the two branches on the upper half of the neck behind. The pt. humeralis is completely isolated by apteriæ from surrounding tracts; it is short but wide and strong, and lies parallel with the spinal. The pt. femoralis is doubled; an inner and outer row of feathers are entirely separate, and both of them are strong. The under or upper band arises over the extremity of the pelvis, and runs with slight obliquity to the front of the knee; the outer arises from the side of the coccyx, and runs parallel with the other along the lower edge of the outer aspect of the thigh to the crus; it is there almost continuous with the ventral tract, and is but slightly separated at its origin from the caudalis; but is as widely separated from the other femoral tract as this last is from the spinal. The pt. cruris is as yet only indicated by a few sparsely distributed follicles, with the feathers beginning to protrude along the anterior and posterior borders; the pt. alaris is in the same condition, and the caudalis but little more advanced. The ventral pteryla is double throughout; its branches are separated from each other on the neck, by as much space as they are from the spinal tract; and rather abruptly divaricate on the breast, inclosing a broad oval space, finally approaching gradually as they pass backward. The anal circlet of feathers is just perceptible, but that around the oil-gland is not visible.

1871.]

very great in March, and few are found later. I do not know that more than one species is resident.

Bernicla canadensis.

A few geese may come in October, but they are not plenty for a month subsequently. Some are to be seen in April, but the greater number depart in March. I think that occasionally a pair may remain to breed in the vicinity, as I have seen a brood in domestication, said to have been raised from the egg; a statement that bears weight from the impossibility of procuring young birds in any other way. But such instances are doubtless exceptional. Geese may be procured, in season, for a dollar, or even less, apiece; a fact of itself attesting their abundance.

Bernicla brenta.

Common in winter, and seen until April 6. This and the last were the only geese observed; nor did I ever hear the gunners allude to any white ones, though I should judge that *A. hyperboreus* would also occur in winter.

Anas boschas.

Very common.

Anas obscura.

Common.

Dafila acuta.

Common. Among the earlier October arrivals.

Chaulelasmus streperus.

Common.

Mareca americana.

Common.

Querquedula discors.

Nettion carolinensis.

Both teals are very common, and are among the first to arrive, and the last to leave; flights occurring in September, and sometimes even in August.

Aix sponsa.

Resident; abundant; breeds on the island.

The Anatinæ, as a group, are outnumbered in the harbor by the Fuligulinæ, and none of them are so numerous as some of the sea-ducks. The reverse is said to be the case on the inland waters.

[May 2,

Bucephala americana. (= *B. clangula?*)

Bucephala albeola.

Fulix marila.

Fulix affinis.

Aythya americana.

Of these the two last named are apparently the most abundant. The canvas-back I have never seen here.

Oedemia perspicillata.

Very common. Early in November, 1870, before the complement of general wild-fowl was made up, these were perhaps the most abundant ducks on the harbor, mixed with a number of the next species. By far the larger proportion were females and young. The young males at this season almost exactly resemble the females; having the two whitish spots on each side of the head, and bill wholly black, the place of the future black spot in the bill being indicated by a slight corrugation of the skin. But they are generally distinguishable by the presence of a few perfectly black feathers about the head, and by the rather more turgid bill.

Oedemia americana.

Common. The female and young are distinguished from those of the last by the different number of tail-feathers, different shape of bill, and the continuously whitish sides of the head; otherwise the resemblance is very close. Both are known as "black ducks," and by a probable further confounding with *A. obscura*, are pronounced good eating by those who do not intend to eat them.

Mergus serrator.

Very abundant. I should judge this to be the most numerous of all the family in this vicinity. They are always on the harbor from October to April, and a few both earlier and later; and are not much molested, being unacceptable even to not over-fastidious people. The distribution of their colors, showing large pure white areas, marks them out at any distance; the Bucephalæ being the only ducks to which they bear any special resemblance.

Pelecanus fuscus.

A few observed at irregular intervals through the summer months.

Sula bassana.

Several were seen during foul weather, in February and March, both years; but the species is not a common, if indeed a regular, winter visitor.

Graculus floridanus.

Cormorants may be seen at intervals the whole year, and are common except during the warmer months. There are two species; but I did not succeed in ascertaining their times of arrival and departure. The summer birds are all, without doubt, the *G. floridanus*, to which species a full-plumaged specimen, captured in the spring of 1869, belonged; and the winter ones are in all probability

Graculus dilophus.

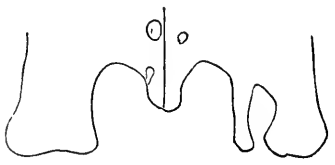
Very common in winter. Judging from the light brown appearance of most individuals observed at this season, they were chiefly young birds.

Puffinus fuliginosus.

A specimen taken May 21, 1870, in fine plumage, but injured in one of the webs; this disability probably accounting for its exceptional occurrence. It was caught by hand near the shore, and kept alive for some time. Placed on a level surface, it could with difficulty stand upright, and on endeavoring to walk, sprawled with the use of its wings and by hooking itself along with the sharp point of the bill—not, however, grasping with both mandibles. I was before ignorant of this method of assisting locomotion on land, but can readily believe it to be a habit of birds of this family, and a means of approaching and leaving the places where many of the petrels are known to breed. The bird showed some spirit, snapping with all its strength; but was perfectly silent.[1]

[1] Length 18, extent 40, wing 12, tail 4, bill $1\frac{3}{4}$, tarsus $2\frac{1}{4}$, middle toe and claw $2\frac{3}{3}$.

Some points in the coloration of this specimen might lead one to suppose it to be a state of *P. major*. The accompanying cut (of natural size) shows a great irregularity in the contour of the posterior border of the sternum.



Larus smithsonianus.

Winter resident; very abundant; the characteristic and only common bird of the family throughout that season. I have been repeatedly assured that some of the "sea-gulls," as this species is called in distinction from the smaller kinds, remain all summer, but have never seen any at that season, and doubt the statement, except perhaps in its application to diseased or otherwise disabled individuals. Some, however, certainly linger longer in spring than would have been anticipated, being seen almost until June. There is little falling off in their numbers in March; but most of them pass northward early in April, about the time that the Terns and *Chroicocephali* make their appearance. A few arrive in September, but they are not plentiful until the latter part of October. In consequence of being rarely molested, they become quite familiar, often mixing with the tame geese about the fort, and permitting themselves to be approached within a few feet; still, as a rule, they show that they have an excellent idea of gunshot range. Three styles of these gulls are easily distinguished. The birds of the year are smoky-brown (becoming grayer towards spring), and differ in this respect from the young of any other species occurring here. The birds hatched the previous summer but one are pale grayish, with the blue of the mantle showing in irregular patches, the primaries wholly black, and the rectrices either the same or white with a terminal black bar. The birds in their third year are in perfect plumage, but show the dusky streaking of the head and hind neck characteristic of the winter plumage. The bills of the birds of the first class are black; of the second, flesh-color, black-tipped; of the third, yellow, with or without the orange spot at the angle of the gonys. Most of the old birds regain their nuptial dress before leaving. They are rather silent during the winter, being rarely heard except when quarrelling for food; but in April, before they move off, the air resounds with their hoarse cries. Among the substances found in the stomach were the remains of a marsh-hare, though I hardly think that the animal could have been captured alive.

L. delawarensis.

Spring and fall; common, and *probably* also a winter resident, although I did not identify it at that season.[1]

[1] In winter the head and hind neck of this species are definitely *spotted* with blackish. In the case of the last species, and of, probably, the whole 1871.]

Chrœcocephalus atricilla.

Extremely abundant, in spring and fall. They appear the last of March or early in April, and become plentiful during the latter month. They remain so late, and are absent so short a time during the summer, that I think some breed near by, though I found none actually nesting in the vicinity. Probably only two years, instead of three, as in the case of the larger *Lari*, are required for them to assume the perfect plumage. The majority of the spring birds are in full attire, but among them a large number of the conspicuously brown birds of the preceding year are always seen. A few return in August, many more in September, and by the last of this month their number defies computation. It is no exaggeration to say that I have seen a thousand rise at the same moment from a single sand-bar where they were resting and pluming themselves after feeding. They fish in companies often of numbers but little inferior, following the shoals of small fry about the harbor, continually descending upon them, and rising on wing again after a moment's half-submergence. At such times they are in pursuit of the small fish that form the principal food of the blue-fish, and their presence is an unfailing guide. At this season the brown birds greatly outnumber the others. The adults are mostly moulting when they return, and retain traces of the spring plumage—seen in a slight glow of the under plumage, carmine tint in the dusky of the bill, red mouth, and slate about the head—at least until October, when the renewal is completed. The young of the year are quite definitely brown, etc., and bear little resemblance to the parents; but they may always be distinguished from any other gull by the length of the tarsus in comparison with the toes, and by the downward curvature of the end of the bill, which is sufficient to bring the tip nearly on a level with the angle at the symphysis. The birds thin

race of "herring-gulls," as *argentatus*, *occidentalis*, etc., the same parts are *streaked* with lighter dusky. In the gulls without black on the primaries, as *glaucus*, *glaucescens*, *leucopterus*, etc., this winter marking takes the form of obscure *clouding* with grayish. These distinctions hold good with all the species of the family with which I am acquainted, and, moreover, the *darkness* of the plumage of the young of the year, in all, is correspondingly graduated from smoky-brown to pale gray. Similarly, the primaries and tail-feathers of the "white-winged" gulls above mentioned are, for the first year, gray like the general plumage; while those of the others (including *marinus*) are black.

off in November, and few are seen after this month. I am not sure that *any* remain all winter.

Chrœcocephalus philadelphia.

Extremely abundant, but only in spring and fall, being strictly migrants here. They appear about the first week in April with the last species, generally remain through most of May, and return in September, remaining until the end of November. But this general statement may be somewhat qualified in detail by some observations that have interesting bearing, unless I wrongly interpret them. In 1869, from the beginning of April until the 22d, the birds were here in great numbers, and with a marked preponderance of old full-plumaged individuals. Without any change in the weather, or other assignable cause, they suddenly disappeared, presumably having moved northward. For a week or ten days scarcely one was to be seen; when they became more numerous, if possible, than before, and so continued through the greater part of May. This last lot was almost entirely composed of birds of the previous year, as shown by the plumage, there being hardly a black-headed one among them. I should judge, therefore, that the old birds migrate in advance of the young, and also that they move the more hurriedly of the two. It is probable, moreover, that only these adults were going to breed that year, although it is pretty certain that some gulls, at least, reproduce before gaining their perfect plumage. In the fall few black-headed ones are ever seen, the hood being lost before they reach this latitude; but even at this season the old and young are readily distinguished by other marks. Many return in September, and then the earliest ones to come are the young. I verified the same general observations through four migrations that I witnessed. This year (1870) there were few—almost no—birds in part of October, after the September young appeared to have passed on; but as I write (Nov. 18) the harbor is covered with thousands of old ones in their winter dress. They appear at a little distance almost pure white, and are beautifully conspicuous among the other gulls and the terns with which they associate.

Audubon is certainly mistaken in representing the female of this species with a brown hood. The sexes are not distinguishable by any outward marks. If there is a United States gull with the head of the color shown in the plate just alluded to, it must

belong to a species that has escaped the notice of later ornithologists.[1]

Thalasseus regius.

This tern certainly breeds somewhere in the vicinity; for, although I did not find any nests, I saw it constantly through two summers, and occasionally noticed birds so young that they were still receiving attentions from their parents; while in June and July small flocks were often noticed pursuing so straight a course for long distances, that I had no doubt they were passing directly between their nests and their feeding-places. It commonly arrives from the south early in April, and through this and the next month is more abundant than at other times until the fall—a part, I presume, passing further north. It becomes numerous again in September, and so continues until the end of November. I cannot say whether or not any remain all winter, but think that, if observed at that season, it will be an exceptional case. It is more wary than any of the other terns, and is always the first to rise among the miscellaneous troops that fleck the sand-bars. It is conspicuous by its size and bright red bill; and the young are easily distinguished by the smaller size, yellow instead of red bill, and spotted plumage. The old birds lose the black pileum in September, the crown then becoming white, bordered behind by the long, loose blackish feathers of the occiput, and a few other dark ones on the sides of the head. The bill in winter is not so vivid in color as in summer, and much shorter. All the changes of the old are finished by October; but the young remain blotched, and with mere traces of the pearl-blue mantle, all the fall. I took one old bird with the feet curiously mottled with yellowish and black, and yellow claws—probably a pathological state, although the bird appeared perfectly healthy. These are vigorous, spirited birds, showing good fight when captured, and strong enough to bite pretty severely. Their voice is loud and raucous, though still without the deep guttural intonation of that of the shear-waters.

Thalasseus acuflavidus.

Chiefly a migrant, but also a winter resident, sparingly; none observed to pass the summer here. It becomes numerous early in April, with the last, and remains through part of May; returns

[1] Qu. *Larus capistratus* of Bonaparte's Synopsis.

in September (a few probably somewhat earlier), and is very common until December. A large number shot in the middle of September were in the same condition of plumage as *T. regius* was at the same time. The species may be marked out among its allies by its size, its singularly trim shape, conspicuously black, *long* bill, yellow-pointed, and a general *whiteness;* the mantle being paler than in any of the others. Specimens, even in the fall, frequently show a rosy blush of the under plumage, much like that generally supposed to characterize *T. elegans* of the California coast.

The difference in the pattern of the coloration of the primaries of this bird, that was noted in my "Review" as separating the species (or whatever it is to be considered) from the European *T. cantiacus*, has not failed in a single instance that has come to my knowledge. No reliance, however, can be placed upon the yellow tip of the bill as a character; this varies from *nothing* (in immature specimens) up to a third, or nearly, of the total length of the bill, and no two specimens show exactly the same line of demarcation between the yellow and the black. Specimens, as usual in this family, differ much in size, and particularly in the length and stoutness of the bill. The feet are always black, as in *T. regius*.

Sterna hirundo.

Very common, but only during the migration. Arriving from the south early in April, they all pass on during the following month. They are abundant again in September and October, perhaps a little earlier and later, but I identified none except during these months. In the spring they are scarcely to be told with certainty, unless shot; but in the fall they are conspicuous by the fact that they retain the black pileum, at least as long as they remain here. It has been stated, upon eminent authority, that this species never loses the black on the head; and, although I do not confirm this from examination of specimens taken in the depth of winter, my observations until the end of October support it, and I do not remember to have seen in any museum a Wilson's tern without the feature in question. Numbers shot here in September had completed the winter plumage, and were newly feathered, except on the crown, where the black looked worn and faded, but was still unmixed with white, except a few specks on the extreme front. I presume that the change on this part of

the body is very gradual. At this season the feet were simply orange-yellow, not vermilion, and the bill was dusky-shaded throughout. Some of the year's young had nearly perfect wing and tail feathers; but the mantle showed dusky mottling, with some blackish areas upon the wing-coverts; while younger still were marbled and otherwise beautifully variegated with gray, light brown, &c. In all the young, the feet were yellowish, more or less obscured; and the bill mostly black, with yellow or orange on the basal part of the under mandible; it was smaller than that of the old, not so horny, and more obtuse.

Sterna Forsteri.

Chiefly migrant, but also winter resident. Compared with the last, there is, I think, a difference in the migrations, &c., something like that I have endeavored to show in the case of the *Ammodromi*, this being the more northerly species of the two, migrating earlier in the spring and later in the fall, and wintering where *S. Wilsoni* does not; of the breeding I can say nothing from personal observation. A few Forster's terns come back in August; they become abundant the following month, and there is little or no decrease of their numbers until December, when a part go further south, to return the latter part of March, and the rest remain. It is one of the most plentiful terns on the harbor in October and November, when it may be distinguished at any reasonable distance with ease; Wilson's tern being the only one at all resembling it, and this being marked in the manner just indicated. Forster's at this season has the crown white, the occiput blackish, and a remarkably distinct black transocular fascia, better marked than in any other species of ours. In this plumage it is unquestionably *S. havelli*, Aud., as I pointed out some years since. The bill is nearly as in summer, but not so bright; the feet are orange instead of red. This plumage was finished in all of a number of old birds shot the second week in September. The young of the year can also be distinguished from the young of *hirundo* at ordinary gunshot range. The whole head is white, faintly washed with brownish, except the transocular fascia, which is pure black, and very sharply defined; but nearly all the feathers of the crown have dusky bases, that will increase during the fall and coming winter, until the condition above noticed is attained. The eye-stripe is $1\frac{1}{3}$ inch long and about $\frac{1}{2}$ an inch wide, reaching from the lores

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through the eyes to and over the auriculars. The blue mantle only partly appears at this time, being lightly washed over with gray and clear brown; the rectrices are heavily dusky, as in *hirundo* at the same season, but the dark color is on opposite webs in the two species. The wing-feathers are new and perfect, and more hoary-silvery than those of *hirundo* of the same age; but the pattern of coloration is exactly duplicated. The feet are yellow, more or less obscured with dusky.

Sterna antillarum.

Summer resident, from early in April until October; and, except at the height of the influx of the other kinds, the most abundant tern of all. It breeds here in great numbers. Referring again to an article in the American Naturalist for September, 1869, for an account of its nidification, I have only to add here—

A tern shot May 17, had then an egg ready to be laid; but most of the eggs are deposited towards June, and during the fore part of that month. The first young birds I noticed were flying June 20th; but this was early for them, the broods not being fairly on wing until the middle of July. During all of May and June, indeed, there are plenty of immature birds about; but these, it should be observed, are of the last summer's broods, rendering the conclusion obvious that at least two years are required to assume the perfect dress. These birds have the bill black, no black cap or white crescent, slaty auriculars and occiput, dark bar along the front edge of the wing, imperfectly colored primaries, and slightly forked tail; thus not possibly to be confounded with birds of the season, which are curiously variegated with gray-brown, and white, and show no pearly blue. The yearlings were in plenty with the adults at the breeding-grounds; but whether or not they were paired and had eggs too, was plainly impossible to determine, as terns' eggs are almost never identified as to the exact parent, when numbers of the birds are breeding together. The usual number of eggs, I may repeat, is two, not three, and often only one is laid; they do not average over $1\frac{1}{4} \times 1$ inch. The black tip of the bill of this species varies from *nothing* to a fourth of the length of the bill. The distinctions between the species and *S. minuta* are constant and perfectly satisfactory.

Hydrochelidon fissipes.

Migrant only; very abundant. This tern differs somewhat from the rest, in its times of migrating and other particulars. It is not very common, comparatively, in spring, and passes north swiftly and silently. The first spring I saw none until May 15th, and had begun to think that I had missed them, or that they were migrating inland, when they became plenty, but only for a week or ten days. All that I saw were in perfect spring dress. They return in the van of all the terns, about the second week in August, when many are still black, but by far the greater number in the plumage of the young. They remain until October—not later, I think—and during September are as common as any of the others. Although they flock with the rest over the harbor, and on its sand-bars, they also frequent the marsh, where they flutter about for hours, busy catching insects—chiefly grasshoppers, I think—in a manner that reminds one of night-hawks similarly engaged; and, in fact, the two birds are frequently associated together at such times.

Haliplana fuliginosa.

Concerning this species I can offer nothing beyond the record of the appearance of a flock *March* 16, 1869, during a southwest gale. I have seen none since, and can as little account for this as for their isolated appearance on that occasion. If, as is most probable, the gull-billed, arctic and roseate terns pass this point, they escaped me altogether.

Rhynchops nigra.

These birds I have only noticed late in the summer, and during the autumn, though I presume that they pass by in the spring; none breed here, to my knowledge. In September they become plentiful, and so continue until the latter part of November, some doubtless remaining later. In examining large numbers of specimens, I find a great difference in size, and particularly in the bill. Some individuals are fully a third heavier than others. The bill varies over an inch in length, and especially in the length of the under mandible. Sometimes the difference between the two mandibles is hardly a third of an inch; at others, over an inch. The oblique striæ on the under one are sometimes obsolete. In high condition, the bill is bright red (vermilion) and black; otherwise, orange and black, or even mostly dusky, only yellowish at base.

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The young in the fall are curiously variegated with dusky and whitish above—few specimens being exactly alike. The note of this species is instantly distinguished from that of any of our other species of this family by its deep guttural intonation, more like the croaking of some herons than the cries of the gulls and terns. The bird also differs from its allies in going in true flocks, as distinguished from the gatherings, however large, in community of interest, that occur with the gulls and terns. The birds move synchronously, which is not the case with any of the others. They feed chiefly by night, or at any rate in the dusk of evening, at which time, in passing over the harbor, one may hear their hoarse notes on every hand, and see the birds gliding swiftly along just over the water, either singly or in small flocks. During the day-time, when the gulls and terns are busy fishing, the skimmers are generally seen reposing on the sand-bars, and they never drop on their prey like their allies. Their mode of feeding is not exactly made out, but it is believed they skim over the surface with the body inclined downward, the bill open, and the under mandible in the water, so that they really take their prey in a manner analogous to the feeding of whales.

Colymbus torquatus.

Abundant winter resident, from the latter part of September until May. The greater part, however, do not arrive until some time in October, and a few linger through a portion of May. I took one full-plumaged bird alive in the latter part of June; but it had evidently been prevented from migrating by sickness, and died shortly afterward.

Podiceps cristatus.

Occasional, in winter. (Specimen, January 29, 1870.)

Podilymbus podiceps.

Frequent, in winter.

III. REPTILES.

I am indebted to my friend Mr. J. A. Allen, of Cambridge, Mass., for identification of some of the specimens.

Sauria.

Cnemidophorus sexlineatus, D. & B.

Very abundant on the islands and sandy parts of the adjoining mainland. They appear usually early in April, and may be

found until cold weather in October. In spite of their remarkable agility, they are one of the animals oftenest found in the stomach of the larger snakes.

Alligator mississippiensis.

Of common and regular occurrence in the swamps of the adjoining land, and *said* also to occur in the woody, marshy part of the island.

Ophisaurus ventralis, Daud.

One of the most abundant and characteristic reptiles of the island. The first examples noticed each year were taken the third week in March, and this is probably the usual time of their appearance. Like the smaller lizard, they are out until the cold weather of October. They avoid the wetter parts of the island, and are especially numerous in open grassy places, as about the fort, where they may be almost daily taken during the summer. They appear rather inactive, if not sluggish, make little or no resistance when captured, and readily become tame. With an average length of a foot and a half, specimens were taken ranging from a few inches to nearly a yard; and the tints vary greatly, the variation being apparently a matter of individual peculiarity.

Ophidia.

Caudisona horrida (*Linn.*), Cope, Pr. A. N. S. Philada. 1859, 338, and Smiths. Cont., Jan. 1861, 122.

Common in the vicinity, and certainly occurring on the islands as well, though not obtained there. One specimen measured upwards of five feet in length.

Ancistrodon contortrix, B. & G.

Common, chiefly in low, moist places.

Nerodia sipedon, B. & G.

Rather uncommon here, according to my observations. One specimen was taken in the open sea, swimming among the breakers.

Ophibolus getulus, B. & G.

Common. Females with eggs taken in July. One specimen, nearly 6 feet long, presented a different pattern of coloration from that usually seen; one set of branches of the series of bifurcations of the yellow lines being defective, giving the snake the appear-

ance of being obliquely banded, without perfect distinction of the black hexagons along the back.

Bascanion constrictor, B. & G.

Very common.

Lepotophis æstivus, Holbr.

Of frequent occurrence, particularly in thick bushy places.

TESTUDINATA.

Malacoclemys palustris, Ag.

Very abundant.

Chelonia midas, Schw.

Common.

Besides the foregoing, three other species, not determined, were noticed, one of which is called "chicken-turtle," and another is a *Cistudo*.

No species of batrachian was noticed on the island during my residence. On the mainland, and also on Shackleford, two species of *Rana* (undetermined), and a *Hyla*, were observed. The toad (*B. lentiginosus* = B. americanus?) is very abundant on the mainland. Great numbers were observed in the ditches, March 27, 1869, and within a few days of the same time the following year, copulating and very clamorous. Probably, then, this is their usual time of spawning.

(To be continued.)

FEBRUARY 6.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-one members present.

PROF. LEIDY stated that he had recently received a small collection of fossils for examination from Prof. J. D. Whitney, who obtained them from California. The specimens are as follows:—

A fragment of an inferior molar, apparently of *Mastodon americanus*. Of this specimen Prof. Whitney remarks that it was obtained from a depth of 80 feet beneath the basaltic lava of Table Mountain, Tuolumne County, Cal., where it was found in association with remains of human art.

A much worn lower molar of a large horse, probably the *Equus pacificus*. From 16 feet on Gorden Gulch. The triturating surface of the crown measures $13\frac{1}{2}$ lines fore and aft, and 10 lines transversely, inclusive of the cementum.

Two equine molar teeth, which, according to the accompanying label, were obtained 350 feet below the surface, at Soulsbyville, Tuolumne County, Cal. One is an unworn upper back molar, apparently of a species of *Protohippus*. It is moderately curved from behind forward and downward, but only slightly from within outward. It is 21 lines long in a straight line. Its greatest breadth above the middle, fore and aft, is nearly 9 lines; its thickness, about 7 lines.

The other tooth is a lower molar, about one-third worn, probably of the same species. The triturating surface is 10 lines fore and aft, and nearly 7 transversely.

Two teeth labelled "Found 10 feet below the surface at Dry Creek, near Bear Creek, Mercer County, Cal." One of the specimens appears to be the portion of a canine tooth, and the other is an incisor. They resemble in form the corresponding teeth of the lama, and probably belong to a species of the same genus. The incisor is about $1\frac{1}{2}$ inch in length; the crown externally is 11 lines long and $4\frac{1}{2}$ lines wide.

In a recent letter, Prof. Whitney informs me that the collection of fossils, indicated in the Proceedings for 1870, page 125, was obtained from the same locality as the two teeth just mentioned; that is to say, from Dry Creek, Mercer County, Cal. The locality given at the time with the notice of the specimens is erroneous.

FEBRUARY 14.

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

Eleven members present.

FEBRUARY 21.

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

Nineteen members present.

FEBRUARY 28.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-one members present.

The following were elected members:—

Caleb Cresson, J. B. White, M.D., William. P. Jenks, Henry T. Peck, Archibald McIntyre, John McLaughlin, Lewis Thompson, George Thompson, Rachel L. Bodley, Lieut. Clarence E. Dutton, S. J. W. Mintzer, M.D., Elizabeth Shreve, Charles C. Phillips, Richard Morris Smith, S. Warren O'Neil, Charles T. Yerkes, Jr.

S. B. Buckley was elected a correspondent.

On favorable report of the committee, a paper "On Certain Species of Falconidæ, Tetraonidæ, and Anatidæ," by Prof. A. Newton, was ordered to be printed.

MARCH 7.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-nine members present.

The following paper was presented for publication:—

"Descriptions of new species of Invertebrate fossils from the Carboniferous and Devonian Rocks of Ohio." By F. B. Meek.

The death of Dr. Charles M. Wetherill was reported.

MR. THOMAS MEEHAN referred to some observations he made before the Academy last autumn in regard to a peculiar storing up of turpentine in the common insect, *Reduvius novenarius*. Since then entomologists had been investigating the use for which this turpentine was employed, without success. He was now able to report that it was for the purpose of fastening its eggs on the branches of trees, and for sticking them together. Also, in probability, as a means of protection against enemies and the weather. The eggs of the *Reduvius* were inserted in groups, and each set upright one against another with the turpentine, like the cell in a

honeycomb. It had hitherto been supposed by entomologists that the matter used for this purpose was a secretion of the insect itself; but so far as he could judge by the senses, the matter used was merely turpentine, and no doubt the turpentine he had observed the insect storing up in the fall.

Mr. Meehan exhibited some flowers of the common *Bouvardia leiantha* of the green-houses, and of the hardy *Deutzia gracilis*, and referred to his papers, published a few years ago in the Proceedings of the Academy, on practical diœcism in the trailing Arbutus (*Epigæa repens*) and *Mitchella repens*, in which he pointed out that these plants, though apparently hermaphrodite, had the stamens and pistils of different characters in separate plants, and were, therefore, subject to the laws of cross-fertilization as indicated by Darwin. He had had his attention called to the *Bouvardia*, by Mr. Tatnall, of Wilmington, Del., as furnishing a similar instance to that of *Epigæa* and *Mitchella*, to the same natural order as which the *Cinchoneous* division of *Rubiaceæ* the *Bouvardia* belonged. These had some plants with the pistils exserted, while in others only the stamens were visible at the mouth of the corolla tube. Mr. Tatnall had not had the matter suggested to him early enough to say that it was so in all cases; but he believed that these flowers, which practically might be termed pistillate and staminate, were found entirely on separate plants. This is a very important fact, as the *Bouvardia* is not raised from seeds in green-houses, but from cuttings of the roots, and, therefore, all these plants with separate sexes must have been produced from one original individual, without the *intervention of seed*, and thus confirm the position advanced in a previous paper of the speaker on "Bird variations," namely, that variations in form, and, by logical inference, new species, may arise without seminal intervention; and that in this way identical species may appear in separated localities, without the necessity of supposing an emigration from one small point, as Darwinism now does.

In the specimens of *Deutzia gracilis* were two forms of flowers on the same plant. Besides the large ones with stamens and pistils apparently perfect as generally seen, there were numerous small flowers in which the petals were only partially developed. The filaments were entirely wanting, but the anthers were as perfect, if not larger than in what we should call the perfect flowers. Any one could see that these small flowers were the result of deficient nutriment, and would be apt to pass the matter over with this simple reflection; but he wished to emphasize the fact that this defective nutrition rendered the female organs inoperative, while the male organs were still able to exercise their functions; thus affording another instance, if any more be needed, of the truth of his theory of sex, namely, that with defective nutrition, the female sex is the first to disappear; and that only under the highest conditions of vitality is the female sex formed.

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In the case of the *Bourardia* a similar law was seen. The most vigorous stems, or, as they would technically be called, woody axes, produced the female flowers.

Prof. Cope made some observations on a Batrachian of the coal measures, *Sauropleura remex*, Cope. A specimen more perfect than the type recently obtained by Prof. Newberry, exhibited posterior limbs such as had been ascribed to the *S. pectinata*. The vertebræ posterior to this point were perfectly preserved, and supported the remarkable processes to the end.

He also stated that the *Oestocephalus amphiuminus* was distinct, and was furnished with branchial arches of branchihyal bones, for the support of external gills.

March 14.

The President, Dr. Ruschenberger, in the chair.

Seventy-one members present.

The publication of the proceedings for September, October, November, and December, 1870, was announced.

March 21.

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

Eighteen members present.

Prof. Leidy made the following remarks on *Tænia mediocanellata*. Recently, one of our ablest and most respected practitioners of medicine submitted to my examination a tapeworm which had been discharged from a young man, after the use of the *Aspidium filix-mas*. The physician, in giving an account of the case, stated that he had previously treated the patient for another affection, in which raw-beef sandwiches had been prescribed for food. After looking at the worm, I remarked that it appeared to be the *Tænia mediocanellata*, a species which I had not before seen, and added that the patient had probably become infected from a larva swallowed with the raw-beef sandwiches. The specimen consisted of the greater part of the worm, broken into several pieces. Including some lost portions, it was estimated to have been upwards of thirty feet in length. Unfortunately, the head proved to be absent; but, so far as characters could be obtained from the specimen, in the form of the segments, position of the genital orifices, and the condition of the ovaries, it agreed with the description given of *T. mediocanellata*, rather than with

T. solium. From a want of acquaintance with the former, I did not feel entirely satisfied that the specimen actually belonged to that species.

Subsequently, my friend brought to me the anterior part of the body, probably, of the same individual tapeworm. He observed that his patient continuing to complain, he had administered another dose of the male-fern, which was followed by the expulsion of the portion of the worm now presented. The head of the parasite was included, and it confirmed the view that it pertained to the *Tænia mediocanellata*.

The case serves as another caution against the use of raw flesh as food.

The description of the worm, as derived from the specimen, is as follows:—

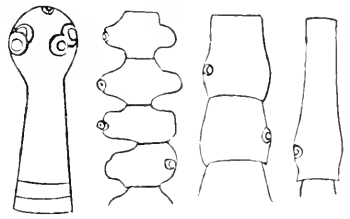
The head is white, without pigment-granules, obtusely rounded, unarmed with hooks, and unprovided with a rostellum, but furnished with a minute acetabuliform fovea at the summit. The four acetabula are spherical, and opaque white. The diameter of the head is three-fourths of a line. The neck, or unsegmented portion of the body immediately succeeding the head, is about 4 lines long by half a line in breadth. The most anterior indistinctly defined segments of the body, and those immediately succeeding them, but more distinctly separated, are about one-fifth of a line long by two-fifths of a line broad. In a more posterior fragment of the body, the flat and nearly square segments measure half a line long and 1 line broad, to one-third line long and $2\frac{1}{2}$ lines broad. A succeeding fragment exhibits segments $3\frac{1}{2}$ lines long by 4 lines broad, and 2 lines long by 5 lines broad. Many of the segments in this piece are irregularly separated, laterally, by deep, wide notches. In a succeeding long portion of the worm, the segments are wider behind than in front, and measure 2, 5, and 3 lines long by 5 lines broad. In a long piece of the posterior part of the worm, the segments are first 4 lines long and broad; and in the last four feet of the same piece, the segments are clavate in outline, from 6 to 10 lines long, and 2 and 3 lines broad.

The genital apertures are conspicuous, and are situated behind the middle of the segments. They alternate irregularly. Thus, in the last two feet of the posterior fragment of the worm, the first two segments exhibit the aperture on the left margin; the succeeding segment presents the anomaly of an aperture on both margins; then follow three apertures on the right, next two on the left, then four on the right, then eight alternating in pairs, then one on the left, and so on. The ovaries are opaque white, and exhibit numerous closely crowded lateral branches.

In the absence of pigment-granules to the head, and in the less robust character of the worm, the specimen differs from *T. mediocanellata* as described by Küchenmeister. The minute acetabular

pit or fovea at the summit of the head is not mentioned by Küchenmeister and subsequent observers as a character of that species. It is a point, however, that might be readily overlooked, especially if the parts of the head are obscured by the presence of pigment-granules.

Fig. 1.



a. Head and neck magnified. *b*. Form of segments in an anterior fragment of the worm. *c*. Form of segments in an intermediate fragment of the body. *d*. Form of segments at the posterior part of the worm.

Prof. Cope exhibited a number of fishes from the Amazon above the mouth of the Rio Negro, which included some new and rare forms. Some of the latter were *Doras brachiatus*, *Plecostomus scopularius*, *Roeboides rubrivertex*, *Myletes albiscopus*, etc. The *Plecostomus* has the following characters: D. I. 7 ; A. 5 ; L.l. 27 ; head 25, total length ; eye 25, interorbital width. Interopercular bristles very short, acute. Dorsal fin longer than high ; eight scuta between the first and second dorsals. Length, two feet. Color, light brown, with very numerous closely placed brown spots, those on the head more closely placed and often vermiform. Dorsal fin spotted. Long bristles on front and outer surfaces of both pectoral and caudal supporting rays, which are hooked at the end. Caudal marginal radii subequal. No ridge in front of orbit ; a short, prominent supra-occipital crest.

He exhibited a specimen of *Pariodon microps*, Kner, describing the parasitic habits of *Stegophilus* and those ascribed to *Vandellia*. He thought the structure and coloration of the *Pariodon* indicated similar habits, and that it would be found to be an inhabitant, at times at least, of the cavity of the body of some other animal.

March 28.

The President, Dr. Ruschenberger, in the chair.

Twenty-three members present.

Mr. Joseph Wharton remarked that a letter, received this day, from Thomas Macfarlane, the discoverer of Silver Islet, in Lake 1871.]

Superior, near the north shore, states that, up to March 2, ores to the value of $250,000 had been taken out, and it is confidently believed that this will be increased before the opening of navigation to $500,000. A coffer-dam has been built around the islet, at a cost of $60,000, to increase the area for working. The ore has thus far been sent to the factory of E. Ballach & Son, Newark, N. J., but works are now about to be built at Wyandotte, near Detroit, for the treatment of it. Although the islet is in Canada, and the discoverer is a Canadian, it was not found possible to interest Canadians in the venture of opening the vein, and this extremely promising deposit is therefore the property of citizens of the United States. The ore is worth about $1500 per ton.

The death of Mr. J. J. Cohen, a correspondent of the Academy, was announced.

The following gentlemen were elected members: Gustavus A. Nicholls and J. Price Wetherill.

The following were elected correspondents: John Hauxwell, of Pebas, Equador, and Hon. H. Nevill, of Ceylon.

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

DESCRIPTIONS OF NEW SPECIES OF INVERTEBRATE FOSSILS FROM THE CARBONIFEROUS AND DEVONIAN ROCKS OF OHIO.

BY F. B. MEEK,

OF THE OHIO STATE GEOLOGICAL SURVEY.[1]

The fossils described in this paper are some of the new forms collected during the progress of the Ohio Geological Survey, now being prosecuted under the direction of Prof. J. S. Newberry, the State Geologist. Illustrations of these and other characteristic fossils from the different formations are in course of preparation, and will be published along with full descriptions of the same in the reports of the Survey.

ECHINODERMATA.

DOLATOCRINUS ORNATUS, Meek.

Body, including the vault, depressed subglobose, the portion below the arm-bases being a little higher than the vault, with nearly vertical sides above, but rounding under below to the somewhat flattened under side; arm-bases protuberant, mainly in consequence of the rather deep furrows or sinuses of the vault over the interradial areas; vault composed of irregular pieces, each of which projects in the form of a little sharply prominent node or short spine, the largest of which are situated around the nearly central ventral tube, and on the elevations between it and the arm-bases. Base small, a little impressed within the shallow concavity of the under side, and marked by a distinctly indented column-facet, which occupies near three-fourths of its entire breadth, so that only a narrow ring, as it were, of the basal pieces can be seen when the column is attached. First radial pieces comparatively large, extending out nearly horizontally, or only a little arching upward, and with their inner ends curving slightly into the shallow central concavity; all wider than long, and hexagonal, with the upper (outer) side of each longer than any of the others. Second radial pieces about half as large as the

[1] I am under obligations to Prof. Henry for the use of books, rooms, and other facilities at the Smithsonian Institution, while preparing this paper.

first, wider than long, and quadrangular in outline.[1] Third radials about as large as the second, from the curved-up edges of which they rise vertically, wider than long, and pentagonal in form; bearing on each of their superior sloping sides a smaller secondary radial, each of which supports another smaller, more or less cuneiform piece, from which the arms arise; thus making two arms from each ray, unless the number is increased by bifurcations after they become free; arms unknown, but apparently composed, at their origin, of a double series of alternating pieces.

First interradial pieces, somewhat larger than the first radials, about as wide above the middle as their length, eight or nine sided, with the lower part of each curving under to connect with the first radials, while they curve upward vertically from near or below the middle; each supporting on the upper side a much smaller hexagonal piece, which rises vertically, and usually bears on its short superior lateral edges two smaller pieces connecting with the secondary radials or first arm-pieces, while its short truncated upper side is not surmounted by any succeeding piece, but connects on its inner surface with the vault.

Sutures between all the plates channelled. Surface of body-plates ornamented with raised lines or very small radiating costæ, that cross the sutures parallel to each other at the sides of the plates, but soon become bent about and connected in various ways, so that very few of them extend directly to the middle of any of the plates, the arrangement being such as to produce a kind of vermicular style of ornamentation, especially over all the central part of the plates, like that often seen on the body-plates in *Amphoracrinus*. A small rather sharp ridge also extends up the middle of each radial series of plates, more or less interrupted at the sutures, and showing a slight tendency to form a pinched node on the middle of the first and second radials; while it is sometimes seen to bifurcate on the third radial, to send branches to the secondary radials, but these are generally so small as scarcely to be distinguished from the other little ridges ornamenting all of the body-pieces.

Ventral tube unknown, but, judging from the spiniferous cha-

[1] In one ray of the typical specimen the second radial is abnormally wanting, while the third is larger than usual.

racter of the vault-pieces around its base, probably also spiniferous.

Height of body to arm-bases, 0.47 inch; do. to top of vault, 0.60 inch; breadth, 0.95 inch.

This species differs so materially from *D. lacus* and *D. Marshi*, of Lyon, in its ornamentation and other characters, as to render a comparison unnecessary. The only other described species from the same horizon, known to me, *D. lamellosus* (= *Cacabocrinus lamellosus*, Hall, Fifteenth Report of Regents, p. 141), must also differ materially, as it is described as having the body "spreading horizontally to the top of the third radial plates." It also has four arms to each ray, instead of only two, as in our species, which likewise differs in the details of its ornamentation.

It is probably more nearly allied to some of the other species described by Prof. Hall from the Hamilton Group, under Troost's name *Cacabocrinus*, though it seems to differ from them all in details; while the limited vertical range of the species of Crinoidea, renders it extremely improbable that the same species would be found in both the Corniferous and Hamilton groups.

It may be proper to remark here that there is no difference between *Dolatocrinus*, Lyon, and *Cacabocrinus*, Troost. It is true, Mr. Lyon gives five as the number of basal pieces in his genus, but he also stated in a note that it may have only three basals, as he had not seen specimens showing the structure of the base very clearly. Troost's genus, as published from his manuscript, after the date of Mr. Lyon's publication of *Dolatocrinus*, agrees exactly with the characters assigned the latter, excepting in having only three instead of five basal pieces. The species here described, however, is certainly a typical *Dolatocrinus*, and yet shows only three basal pieces.

For the use of the fine specimen affording the above characters, the Survey is under obligations to the Rev. Mr. H. Hertzer, of Columbus, Ohio.

Locality and position. Columbus, Ohio. Corniferous division of the Devonian.

LAMELLIBRANCHIATA.

AVICULOPECTEN CRENISTRIATUS, Meek.

Shell thin, attaining a moderately large size, plano-convex, with a truncato-suborbicular outline; height and breadth nearly equal; basal margin more or less regularly rounded; posterior margin rounding from the posterior ear into the base, sometimes a little straightened above; anterior side rounded so as to make a shorter curve than the other; hinge less than the breadth of the valves in length, but rather long.

Left valve moderately convex; beak rising a little above the hinge margin, nearly or quite central and not oblique; posterior ear small, with a marginal ridge, flat, without being separated from the swell of the umbo by a sulcus, rather acutely angular at the extremity, and distinctly shorter than the margin below, from which it is separated by a nearly rectangular notch; anterior ear larger, or sometimes nearly as long as the margin below, rather acutely angular at the extremity, convex and separated by a rounded impression from the umbo, defined by a rather deep subangular marginal sinus. Surface ornamented by numerous, very slender, radiating costæ or raised lines, separated by rather wide flat surfaces, in each of which a still smaller line is sometimes intercalated; crossing all of these are smaller regularly arranged, sharply elevated, concentric lines, that seem to form little projections at the points of crossing, so as to give a rough appearance to the surface; costæ becoming more closely crowded, but not smaller, on the ears.

Right valve flat or a little concave, and with beak obsolete; ears flat, and of nearly the same size and form as in the other valve, excepting that the anterior one is broader and defined by a more shallow and more rounded sinus than appears to exist in the left valve; surface cancellated by regular, rather closely arranged, radiating and concentric lines, the latter being very sharply elevated, and minutely and regularly waved, crenate, or somewhat vaulted; radiating costæ somewhat larger, and more distant on the ears.

Height, 2.50 inches; breadth, 2.78 inches; convexity about 0.40 inch.

The specimens of this species are not very well preserved, being

mainly casts with some portions of the surface. It is remarkable in having only a comparatively shallow rounded sinus under the anterior ear of the flat right valve, where it is usually deep and angular in species of this genus; while in the left it is deeper and more angular, though none of the specimens are in a condition to show clearly its exact form. One cast shows a little of the cardinal plate, which is rather coarsely striated longitudinally. None of the specimens of the left valve have the surface well enough preserved to show whether the sharply elevated concentric lines or laminæ are minutely waved as in the other valve, but they probably are so when the surface has not been worn or exfoliated.

I am not acquainted with any described species so nearly allied to this as to render a comparison necessary.

Locality and position. Sciotoville, Ohio. Upper part of the Waverley series of the lower Carboniferous.

AVICULOPECTEN (STREBLOPTERIA?) HERTZERI, Meek.

Shell usually under medium size, higher than wide, rather compressed, the right valve being nearly flat, and the left only moderately convex; subovate in general outline (exclusive of the small ears), with a slight backward obliquity caused by the greater prominence of the anterior margin; basal outline semicircular and curved regularly into the rather prominently rounded anterior side; posterior margin less prominent than the anterior, and forming a longer and more gentle curve from the posterior ear into the base. Hinge distinctly shorter than the antero-posterior diameter of the valves; posterior ear in both valves very small, flattened, very obtusely angular, much shorter than the margin below, but well defined from the umbo, and only separated from the margin below by a faint sinuosity; anterior ear of each valve distinctly larger than the posterior, though not as prominent as the anterior margin below, rather strongly compressed or flattened so as to be abruptly distinct from the umbo, and defined by a distinct sinus from the margin below, the sinus being deeper and more angular in the right valve; beaks compressed, scarcely projecting above the cardinal margin, and placed a little behind the middle of the hinge, as well as that of the valves. Surface of both valves elegantly ornamented by numerous, sometimes sharply elevated, nearly equal, very regularly

arranged radiating and concentric lines, which are larger and more strongly defined in the anterior ear of the right valve, particularly the radiating markings, which there sometimes assume the character of small costæ, while the concentric markings sometimes project as little lamellæ slightly above the hinge-margin, so as to give it a dented appearance.

Height of one of the largest specimens seen, 1.32 inches; antero-posterior diameter, 1.20 inches; convexity, about 0.18 inch.

I know of no other shell in our rocks that is liable to be confounded with this, its general form and neatly cancellated markings being sufficient to distinguish it. Although I refer it provisionally to *Aviculopecten*, I really do not think it belongs properly to that genus, as restricted to the typical forms. At least it differs from all the characteristic forms of *Aviculopecten*, in having the anterior ear larger than the posterior, as well as in having its beaks placed a little behind the middle of the valves, thus giving the slight backward obliquity mentioned in the description. This latter character seems to approximate it to *Streblopteria* of McCoy, but as we know nothing of its hinge and interior, it is not possible to determine whether it belongs to that group.

The specific name is given in honor of the Rev. H. Hertzer of the Ohio Geological Survey, to whom I am indebted for the use of some fine specimens from his own private collection.

Locality and position. Newark, Ohio. Lower Coal-measures.

LUCINA (PARACYCLAS) OHIOENSIS, Meek.

Shell apparently not attaining a medium size, compressed, nearly circular; beaks small, central, depressed nearly to the dorsal line, and contiguous; anterior margin rather abruptly compressed above, just in front of the beaks; hinge-margin short and rounding into the posterior dorsal outline; surface ornamented with small, more or less regular concentric undulations (most strongly defined on the umbones), and very fine lines of growth; posterior dorsal slope of each valve marked by a strong oblique sulcus, extending from the back part of the beaks to the upper part of the posterior margin.

Length, 0.46 inch; height, 0.42 inch; convexity, 0.18 inch.

This species seems to be related to *L. lirata* (=*Posidonia lirata*, Conrad, Ann. Geol. Rept., N. Y., 1838, p. 116; and Thirteenth

Report Regents on State Cab., N. H., pl. ii, fig. 12); but its peculiar posterior dorsal sulcus, which gives it so much the appearance of the recent *L. Jamaicensis*, is neither represented in Mr. Conrad's figure, nor mentioned in his description of *L. lirata.*

The identity of these Devonian shells with the existing genus *Lucina* may admit of some doubt, as their hinges and internal characters are not yet well known. The species under consideration, however, has even more exactly the *external* appearance of that genus than several foreign Devonian forms that are generally referred to it. Perhaps they may all be included under one distinct genus, for which the name *Paracyclas*, Hall, may have to be retained.

Locality and position. Dublin, Franklin Co., Ohio. Corniferous division of the Devonian.

[1]PTILODICTYA (STICTOPORA) GILBERTI, Meek.

Corallum growing in thin, or much compressed, branching (or perhaps sometimes foliaceous) expansions; branches varying from about half a line to three lines in breadth, with a thickness of near half a line; nonporiferous margins sharp, with striæ well defined, and curving laterally and forward. Pores nearly circular, or slightly oval, and provided, in well-preserved specimens, with raised margins; ranged in about eight to ten longitudinal rows in a branch two and a half lines in breadth, those in adjacent rows regularly alternating so as to produce a quincuncial arrangement; five of them occupy a space of one line, measuring longitudinally, and about six measuring obliquely, the spaces between the pores in the longitudinal direction being usually a little greater than the diameter of the pores themselves; rows of pores separated by a slender, sharply raised longitudinal line. Axis forming about one-third of the thickness of the branches, and having the transverse striæ sometimes very regular, well defined, and regularly arched.

I have not seen enough of any one specimen of this species to show whether or not its branches anastomose, but as they evidently frequently bifurcate, and send off lateral branchlets, it is probable that they do. It seems to be more nearly allied to *Stictopora fenestrata*, of Hall, from the Chazy limestone, in the

[1] This description was accidentally inserted in this place.

arrangement and nearly circular form of its pores, as well as in having a raised longitudinal line between each row of pores, than to any of the known Upper Silurian species. It is a much more robust species, however, with only about the same number of rows of pores, in a branch of twice the breadth of those of that species, while it shows no traces of the transverse bars mentioned in the description of *S. fenestrata*. Its flattened, nonporiferous, and striated margins are also much more strongly developed. Indeed, no traces of this character of the margins are represented in the published figures or mentioned in the description of that species.

Although I am not aware that any published notice of the occurrence of this genus in the Devonian rocks has hitherto appeared, I have little hesitation in referring this species to the group, since it seems to present all the characteristics assigned to the same. In one respect it differs from some of the species described under *Stictopora*. That is, in having the pores a little contracted, and nearly circular at the aperture. In this respect, however, it appears to agree with *S. fenestrata*, the first species described under that genus; and Prof. McCoy has shown that this character occurs in British species of *Ptilodictya*, of Lonsdale, of which it is now generally admitted that *Stictopora*, Hall, is only a synonym, or at most founded on types only subgenerically distinct.

From the same horizon as that from which the above-described species was obtained, but from a different locality (Whitehouse, Lucas Co.), there is in the collection a foliated specimen more than two inches in breadth, and 4.70 inches long, with broken margins all around. It is split in breaking the rock, so as to expose one side of the strongly wrinkled and striated axis. So far as I have been able to determine from some imperfect remaining portions of the poriferous part, its pores would seem to have the same form, size, and arrangement as the species here described. It may, therefore, *possibly* belong to the same species, though I am inclined to believe it will be found to be distinct. If so, it may be called *P.* (*Stictopora*) *lichenoides*.

Locality and position. Sylvania, Lucas Co., and Marblehead. Corniferous limestone. Mr. Gilbert.

CONOCARDIUM OHIOENSE, Meek.

Shell rather small, longitudinally subovate or subtrigonal, being widest and most convex anteriorly,[1] where the valves are rather distinctly ventricose; posterior side produced and abruptly contracted behind the gibbous anterior region, partly from lateral compression, and partly from the upward and backward slope of the posterior basal margin, which is slightly sinuous near the extremity, and distinctly gaping, the widest part of the hiatus being above; hinge-line straight, or sometimes slightly declining at the posterior extremity; cardinal margins of the valves anchylosed; anterior side short, though not properly truncated, abruptly contracted and a little impressed in front of the umbonal convexity, and apparently provided with a slender projection above (this part broken in the specimens); beaks projecting a little above the cardinal margin, placed in advance of the middle and incurved; umbonal slopes gibbous, broadly rounded, and, like the beaks, slightly inclined backward. Surface (as seen in specimens apparently a little exfoliated) ornamented by simple, somewhat flattened, radiating costæ, about five or six of which, on the gibbous part of each valve, are separated by flattened furrows nearly or quite as wide as the costæ themselves; while on the posterior contracted portion, the costæ are proportionally wider, and separated by merely sharply impressed hair-lines, excepting near the posterior cardinal margin, where these impressed linear furrows are represented by little *raised* lines; costæ on the anterior surface more obscure; fine regular lines, and a few stronger marks of growth, are also seen crossing the costæ parallel to the free margins.

Length of a specimen with the anterior attenuated appendage broken away, 0.64 inch; height, 0.43 inch; convexity, 0.37 inch.

This species belongs to the section of the genus that has the umbonal slopes rounded instead of angular, and the anterior side in front of these slopes not so distinctly truncated or flattened as to impart the peculiar Hemicardium-like appearance so often seen in the genus. These characters at once distinguish it from its associate, *C. trigonale*, Hall, sp.; which is also distin-

[1] I merely follow the most general adopted method of describing the gaping end as the posterior, without being entirely satisfied that this is the correct view.

guished by its remarkable alation extending forward from the angular umbonal slopes.

I have seen no specimens of our shell quite entire at the anterior end, but it is evident that there was a slender projection somewhat like that of *C. aliforme* of Sowerby, though it may not have been so long as in that species.

Locality and position. Columbus, Ohio. Corniferous division of the Devonian.

SOLENOMYA (JANEIA) VETUSTA, Meek.

Shell of medium size, transversely sub-oblong or narrow sub-elliptic, the length being a little less than twice and a half the height; valves rather convex; anterior or longer side regularly rounded; posterior extremity more narrowly rounded; basal margin nearly or quite straight along the central region, but rounding up at the extremities, the curve being more gradual behind; beaks depressed to a level with the dorsal margin, and placed somewhat behind the middle; dorsal margin a little convex and nearly horizontal in front of the beaks, but rounding regularly into the anterior outline, and behind the beaks, slightly depressed below the horizon of the latter, though without sloping much posteriorly. Surface apparently smooth; interior showing distinct radiating striæ below the middle of the valves, excepting near the extremities. Posterior muscular impression rather narrow, suboval, oblique, placed near the margin, and well defined by a slight oblique ridge along its antero-inferior margin; anterior do. larger and faintly marked.

Length, 1.22 inches; height, 0.50 inch; convexity, about 0.32 inch.

This is another type very unexpectedly found among the Corniferous specimens. So far as I am aware, no example of this group has ever before been obtained from any horizon below the mountain limestone. Whether we regard the Carboniferous and Permian forms usually referred to *Solenomya*, as really belonging to that genus, or as constituting a distinct group (for which Prof. King proposed the name *Janeia*), there can be no question whatever, that the shell here described belongs to the genus that includes these Carboniferous and Permian species. Specifically, it is perhaps more nearly related to *S. biarmica* of the European Permian rocks, than it is to *S. Puzosiana*, de Kon., or to *P. primæva*,

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Phillips, from the Carboniferous. Indeed it might even be referred to *S. biarmica*, with more propriety than a Kansas Coal-measure species that has been so referred by Prof. Geinitz. Compared with the figures of the original Russian example of *S. biarmica*, figured in the Palæont. of Russia and the Ural Mountains, pl. xix. fig. 4 *a* and 4 *b*, our shell is seen to be proportionally somewhat more depressed and longer, with the beaks a little less prominent, and farther removed from the shorter or posterior extremity. Its posterior dorsal slope, even in the internal cast, is also less oblique. In this latter character it is even less like the English and German Permian forms referred to *S. biarmica*.

I have elsewhere (Proceed. Acad. Nat. Sci., April, 1870, p. 44) expressed the opinion that these Palæozoic shells usually referred to *Solenomya*, may yet have to be separated from that genus, and ranged under Prof. King's name *Janeia*, notwithstanding the fact that he subsequently abandoned his genus, under the impression that it is not distinct from *Solenomya*. I still think it probable that this may have to be done.

Locality and position. Dublin, Franklin Co., Ohio. Corniferous group, of the Devonian.

CLINOPISTHA ANTIQUA, Meek.

Shell very thin, transversely suboval, gibbous, with flanks along the middle near the lower margin, somewhat flattened or slightly concave; more than half as high as long. Anterior or longer side regularly rounded in outline; posterior sloping above from the beaks to the narrowly rounded extremity, which is most prominent below the middle; basal margin straightened or broadly sinuous along the central region, and rather abruptly rounded up at the extremities; beaks depressed nearly or quite to the dorsal outline, and placed about half-way between the middle and posterior extremity; dorsal outline nearly horizontal and parallel to the base, in front of the beaks, but rounding regularly into the anterior margin. Surface merely showing moderately distinct lines of growth, with some obscure traces of radiating striæ when a little worn near the base; these last-mentioned markings being more distinct on the internal cast.

Length, 0.82 inch; height, 0.51 inch; convexity, 0.39 inch.

I have been much surprised, to find among the collections from the Corniferous limestone, a shell agreeing so exactly as this in all

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its known characters, not evidently merely specific, with the type of the genus *Clinopistha*, which I had previously supposed to be confined to the Coal-measures. It has the same short gibbous form, thinness of substance, posterior position of the beaks and ligament, surface markings, and even the same obscure internal radiating striæ. Indeed, if it were not for its rather more narrowly rounded, and more protuberant, instead of slightly truncated, posterior or shorter end, somewhat less gibbous beaks, and faintly sinuous base and flanks, it would scarcely be possible to distinguish it from the Coal-measure form by any external character, excepting the white chalky texture of the shell merely due to its state of preservation. The valves are a little displaced in the only good specimen I have seen, but the beaks certainly give some evidence of being slightly unequal, that is, of the left one lapping slightly upon the other, as in the typical species from the Coal-measures.

Locality and position. Same as last.

SANGUINOLITES? SANDUSKYENSIS, Meek.

Shell approaching a longitudinal-oblong or trapezoidal outline, moderately convex, a little more than twice as wide as high, and slightly narrower anteriorly than behind; cardinal margin straight, equalling about three-fifths the entire length; basal margin nearly straight and subparallel to the hinge, or slightly ascending anteriorly along its entire length, and rounding up a little more gradually into the front than behind; posterior extremity compressed, obliquely truncated above, and rather narrowly rounded to the base below; anterior end very short, sloping from the beaks above, and rather narrowly rounded at the middle; beaks depressed nearly or quite to the hinge-line, compressed, and placed near the middle of the anterior third; posterior umbonal slopes not angular, or even prominently rounded. Surface only showing a few irregular furrows and slight undulations of growth, most distinct below the middle of the valves.

Length, 2.70 inches; height at the posterior end of the hinge, 1.20 inches; do. under the umbones, 1.04 inches; convexity, about 0.52 inch.

I know nothing of the hinge of this shell, and merely refer it to the genus *Sanguinolites* provisionally. Indeed, until palæontologists can agree in regard to which one of the several shells that

were originally referred to that genus is to be regarded as the typical form of the same, and something can be known in regard to the hinge and internal characters of those shells, it seems to me almost impossible to determine what *Sanguinolites* is. I do not agree with those, however, who would make *Allorisma* of King a synonym of Prof. McCoy's genus, though some of the species included by him may belong to *Allorisma*.

Locality and position. Same as foregoing.

SANGUINOLITES? OBLIQUUS, Meek.

Shell so depressed and elongated as to be nearly three times as long as high, rather distinctly convex, particularly along the posterior umbonal slopes, which are more or less angular from the beaks nearly to the posterior basal extremity; pallial margin very nearly straight along most of its length; anterior end extremely short, and a little sinuous on the upper side just in front of the beaks, the sinuosity being caused by a very small deep lunule, at the lower end of which the margin is a little projecting and subangular in outline, and from this little projection curves obliquely backward into the base; cardinal margin extending back about three-fourths the length of the valves, and inflected so as to form a well-defined, lanceolate escutcheon along its entire length; posterior side narrowed with a long slope above from the end of the hinge to the extremity, which is a little gaping and very narrowly rounded or almost angular below; beaks strongly depressed, very oblique, compressed below the ridges, very nearly terminal, and with the immediate points incurved over the little lunule. Surface showing only lines and furrows of growth, with occasional small, obscure, concentric wrinkles, that are not regularly arranged.

Length, 2.13 inches; height, 0.77 inch; convexity, 0.70 inch.

This species seems to be nearly related to a form from the same rock at Medina, Ohio, specimens of which were loaned by Dr. Newberry to Prof. Hall, some time back, and returned with the name *Sanguinolites æolus* attached. A careful comparison, however, of good specimens of each, shows them to be clearly distinct; the form under consideration being much more convex along the umbonal slopes, which are also more angular. Its beaks likewise differ in being decidedly more nearly terminal, and the inflection of its cardinal margin wider. The specimens of *S. æolus* also

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show faint traces of two or three very obscure longitudinal ridges above the umbonal angle of each valve, and impressions in casts, of a slight ridge behind the anterior muscular impression, that are not seen in our shell.

From the little that is now known of the shell that will probably have to be regarded as the type of the genus *Sanguinolites*, it is impossible to determine whether or not such shells as this can be properly referred to that genus. They seem to agree, however, more nearly with the same than they do with the typical forms of *Allorisma*, to which they are also related.

Locality and position. Rushville, and Newark, Ohio. Upper part of the Waverley group, of the lower Carboniferous.

ALLORISMA (SEDGWICKIA?) PLEUROPISTHA, Meek.

Shell depressed and elongated, or more than twice as long as high, moderately convex centrally and anteriorly, and alate and produced behind; pallial margin long, nearly straight along the middle, rounded up anteriorly and ascending more gradually behind; posterior side very narrow, truncated and somewhat gaping at the extremity, which intersects the cardinal margin at an obtuse angle, and rounds abruptly into the base; anterior side wider (higher) than the other, and more or less abruptly rounded. Dorsal margin depressed below the horizon of the beaks behind the latter, where it is concave or nearly straight in outline, and inflected so as to form a short corselet near the beaks; while in front of them it slopes forward rather abruptly, and is provided with a well-defined oval lunule. Beaks moderately prominent, rather gibbous, and incurved without any obliquity or fissure; placed a little less than one-third the length of the valves from the anterior margin. Posterior umbonal slopes subangular, the ridge extending toward the posterior basal extremity, but becoming obsolete before reaching it; while above this ridge the posterior dorsal region is flattened or a little concave and smooth.

Surface ornated with more or less defined concentric wrinkles and lines of growth, which are crossed on the posterior portions by linear but distinct raised radiating costæ, separated by wider depressions. Of these costæ, the anterior ones descend almost vertically from the beaks to the base; while farther back they gradually become more oblique, and near the middle of the flanks

more closely arranged, but above and behind this they become more widely separated again, and nearly as oblique as the obscure umbonal ridge, above which they are not defined.

Length, 2.28 inches; height, 1 inch; convexity, about 0.85 inch.

This shell strongly reminds one, by its general outline and physiognomy, of those Jurassic species for which Prof. Agassiz proposed the genus *Cercomya*. In that group, however, there is no lunule, and I am not aware that any of the species of the same are marked by radiating costæ as in the species under consideration. From all that is known of its characters, I am inclined to believe it more nearly allied to the curious Lyonsia-like Carboniferous shells, upon which Prof. McCoy originally proposed to found the genus *Sedgwickia*, but which he afterwards referred to the genus *Leptodomus*. Still, it differs from the group *Sedgwickia* also, in the possession of radiating costæ. These are not mere rows of granules, such as doubtless existed on nearly all the different types of this family (*Anatinidæ*), but decided costæ, such as we see in *Pholadomya*, and, what is rather singular, they do not exist on the anterior part of the valves, but extend only as far forward as the beaks, under which they end abruptly, the anterior one being as strongly defined as any of the others, while only the concentric striæ and wrinkles exist on the anterior third of the valves. In the possession of the radiating costæ mentioned, as well as in the shortness of its hinge and the inflection of its cardinal margin, and in its general physiognomy, it differs from the typical species of *Allorisma*, and hence it may be thought desirable to establish a subgenus for its reception, in which case I would propose for the group the name *Cercomyopsis*.

Along with the typical specimen of the foregoing species, another was found, with the same form and surface characters, excepting that the anterior end in front of the beaks is shorter, and more angular at the lower end of the lunule; while the anterior of its radiating costæ are directed much more obliquely backward, instead of descending vertically from the beaks to the base. This specimen has the posterior end broken away, but as the peculiarities mentioned seem not due to any distortion, I am much inclined to believe it belongs to another species, for which *Allorisma* (*Sedgwickia?*) *obliqua* would be a good name.

Locality and position. Rushville, Ohio. Waverley group of Lower Carboniferous. Prof. Andrews' collection.

1871.]

GRAMMYSIA? RHOMBOIDES, Meek.

Shell attaining a moderately large size, not very convex, the greatest convexity a little before and above the middle; valves without an oblique mesial ridge or fold; rhombic suboval in outline, with height equalling about three-fourths the length, closed or nearly so all around; basal margin most prominent just behind the middle, from near which it ascends with a nearly straight outline obliquely forward, and more abruptly with a convex outline behind; anterior side truncated obliquely forward from the beaks above, and very narrowly rounded near the middle; posterior side less narrowly rounded at the middle, with its upper edge probably sometimes obliquely truncated; cardinal margin equalling about one-third the length of the valves, and inflected so as to form a well-defined escutcheon that narrows backward from the beaks; lunule rather deep, well defined, lance-ovate in form, and as long as the truncated anterior dorsal slope; beaks moderately prominent, not very gibbous or very strongly incurved, and situated a little nearer the middle than the anterior margin; posterior umbonal slopes forming a very obscure rounded ridge, between which and the dorsal and posterior dorsal margins there is a rather narrow, slightly concave, or flattened space on each valve. Surface with only small marks or lines of growth, which are gathered into very small obscure wrinkles along the margins of the lunule.

Length, 2.90 inches; height, measuring vertically from the most prominent part of the beaks to the horizon of the tops of the beaks, 2.15 inches; do. to cardinal margin behind the beaks, 1.93 inches; convexity, 1.40 inches.

I only know this shell from casts, which show neither the nature of the hinge nor the muscular or pallial impressions. It presents no traces of the characteristic oblique mesial fold or ridge, seen in the typical forms of *Grammysia*, and might, when its cardinal margin and lunule are concealed in the matrix, be mistaken for a large *Schizodus*. Its well-defined lunule and escutcheon, however, and obsolete muscular impressions, show that it cannot be even nearly related to that group. As the casts show no indications of the characteristic internal cartilage process of *Edmondia*, and it does not seem to have the habit of *Cardiomorpha*, I know of no genus to which it appears to be more nearly related than to *Grammysia*, and have concluded to place it provisionally

in that group until its relations can be more precisely determined from the study of better specimens.

Locality and position. Same as last.

GRAMMYSIA VENTRICOSA, Meek.

Shell attaining a moderate size, extremely ventricose, the convexity being greater than the height, with the greatest gibbosity a little in front of and above the middle; height equalling about half the length; posterior side comparatively long, a little gaping, and narrowly rounded in outline, at or a little above the middle; pallial margin usually a little sinuous near the middle or in front of it; anterior side very short, concave just under the beaks to the base of the lunule, where the margin is subangular or very abruptly rounded and most prominent, while below this it rounds obliquely backward into the base; cardinal margins scarcely more than equalling half the entire length of the valves, and inflected so as to form a kind of shallow escutcheon; beaks very gibbous, moderately elevated, oblique, strongly incurved, and placed almost over the anterior margin; lunule deep, ovate or obovate, and well defined; posterior umbonal slopes prominently rounded; flanks without any oblique ridge or sulcus. Surface marked on the anterior side of the valves near the lunule by small wrinkles, which pass into mere lines and linear furrows of growth farther back, while even the latter become nearly or quite obsolete over the more gibbous parts of the valve.

Length of largest specimen seen, 2.50 inches; height, 1.30 inches; convexity, 1.55 inches.

I know nothing of the hinge or muscular and pallial impressions of this shell, and refer it to *Grammysia* from its form and general appearance. It shows no traces of the oblique ridge and furrows seen on the typical species of that genus, but it is well known that this character is not constant in the group.

Locality and position. Same as foregoing.

GASTEROPODA.

PLATYCERAS MULTISPINOSUM, Meek.

Shell attaining a large size, comparatively thin, depressed subovate, and very oblique; apex free, stout, obliquely coiled so as

to make about one turn, beyond which the body part expands very rapidly to the aperture, making less than half of another volution; aperture proportionally very large, and nearly circular; lip not sinuous or undulated, but sometimes slightly, and broadly retreating behind; surface without plications or costæ, but thickly covered by numerous slender, tubular spines, which leave small, depressed, smooth, undefined tubercles on the internal cast.

Length, measuring direct from the most prominent part of the spire to the anterior margin of the aperture, 3.33 inches; height, to the most elevated part of the dorsal surface, when the shell is placed with its aperture downward, 1.44 inches; length and breadth of aperture, each about 2.90 inches.

This fine species differs from *P. dumosum*, Conrad, not only in its much larger size, more oblique, depressed, and more rapidly expanding form, but in having more numerous spines. The largest specimens of that species are said to have more than one hundred spines, while that under consideration must have had more than two hundred. It likewise differs in not having its lip waved or undulated as in Mr. Conrad's species.

It is probably more nearly related to *P. echinatum*, Hall, from the Hamilton group. No figures of that species have yet been published, but judging from the description, our shell is not only very much larger (that species being described as from one inch to one and a quarter inch in length, with an aperture one inch in diameter), but wants the sinuous peristome mentioned in the description of *P. echinatum*. The term "strong nodes" would also not apply to the numerous small obscure elevations marking the positions of the spines on internal casts of our species.

None of our specimens show the entire length of the spines, but judging from the fact that their broken ends, at a distance of 0.42 inch from their bases, only measure 0.08 inch in diameter, they would seem to have been probably shorter and more slender, as well as much more numerous, than those of *P. dumosum*. Although these spines are as completely tubular as those of the genus *Productus*, their internal cavity does not seem to have communicated with the interior of the shell, with probably the exception of those near the lip; for if that had been the case, the smoothly rounded obscure tubercles seen on the internal cast would have shown the broken bases of the casts of the internal cavities of the spines.

[June 6,

Locality and position. Columbus, Ohio. Corniferous group of Devonian series.

PLATYCERAS ATTENUATUM, Meek.

Shell attaining a moderate size, very slender and elongated. Body part more or less arched above, a little compressed behind,[1] subangular on the right side, rounded over the dorsal or anterior slope, and gradually tapering backward to the small free apex, which is composed of one to one and a half contiguous volutions, and twisted to the right of the longitudinal axis of the free body. Aperture irregularly oval or suborbicular, and comparatively small or little expanded; lip most produced on the right anterior side, and sometimes a little retreating behind, with one or two other faint, smaller undulations of its margin around the front. Surface of cast without longitudinal plications, folds, or undulations, but showing over the dorsal and anterior slope numerous small tubercles that evidently mark the positions of spines on the exterior. Surface markings of the shell itself unknown.

Length of the largest specimen, measuring direct from most prominent part at the curve of the spire to that of the anterior margin of the aperture, 2.10 inches; do. measuring from the apex over the dorsal curve to the same, about 3.70; greatest breadth of aperture, 1.35 inches.

This shell seems to differ from all of the described spiniferous species with which I am acquainted, in being more slender, more elongated, and in having the small apex twisted nearly at right angles to the axis of the body part. These characters appear to distinguish it readily from the typical *P. dumosum*, Conrad; while from the variety of that species that has been described under the name *rarispinum*, it differs in never having its body even "moderately ventricose," nor in any case in contact with the apical coils, as well as in having more numerous spines, if we can judge from the number of tubercles, of which about fifty may be counted on the specimen from which the foregoing description was made out.

In general form it resembles the more slender individuals of the non-spiniferous species *P. reflexum*, from the Oriskany sandstone,

[1] I describe such forms, for convenience, as if placed with the aperture downward and the apex directed backward toward the observer.

but its body part is much straighter, while it is never so large and ventricose as in some varieties of that species.

Locality and position. Columbus, Ohio. Corniferous group.

NATICOPSIS LEVIS, Meek.

Shell apparently attaining a medium size, subovate in general form, at maturity, but proportionally shorter in the young; spire moderately prominent; volutions four to four and a half, convex, increasing rather rapidly in size; last one large, or forming near nine-tenths of the entire bulk of the shell, rounded on the sides, and a little extended below; suture well defined; aperture ovate, being regularly rounded below, and more or less angular above; columella arcuate, and distinctly flattened, or a little concave below the non-perforate umbilical region, above which the inner lip is thickened. Surface only showing obscure lines of growth.

Length of the largest specimens seen, 0.60 inch; breadth, 0.48 inch; height of aperture, 0.38 inch; breadth of do., 0.27 inch.

So far as I am at present informed, this is the first Devonian species, beyond doubt known to belong to this genus, that has yet been described in this country; though it is certainly represented in rocks of that age in Europe.[1] Our species is even more closely allied to the typical Carboniferous forms of the genus, than it is to the European Devonian species, such as *Naticopsis subcostata* and *N. margaritifera* (=*Natica subcostata* and *N. margaritifera*, d'Archiac and de Verneuil).

It is an interesting fact that the above-mentioned European Devonian species represent both of the subgenera found in our Coal-measures, the first belonging to the subgenus *Trachydomia*, and the other to the typical section of the genus.

Locality and position. Dublin, Franklin County, Ohio. Corniferous group of the Devonian.

NATICOPSIS (PLATYOSTOMA?) ÆQUISTRIATA, Meek.

Shell subglobose; spire much depressed; volutions four, in-

[1] It is probable that several of the so-called Naticas of the European Silurian rocks also belong to this genus, as may be the case with some of the American Silurian species referred to *Holopea*, and other genera, from the study of mere casts.

creasing rapidly in size, those of the spire convex, last one large and ventricose; suture well defined; aperture ovate; outer lip thin, extended forward and very oblique above, and broadly retreating or sinuous below the middle; columella narrow arcuate, imperforate, and showing some appearance of being a little furrowed below, as if for the reception of the edge of an operculum; inner lip apparently not thickened above. Surface ornamented by fine, very regularly and closely arranged striæ of growth, which pass very obliquely backward and downward on the upper and outer side of the body volution, and then curve gracefully forward again below, so as to conform to the broad sinuosity of the outer lip.

Height, 0.17 inch; breadth, 0.18 inch.

This little shell will be at once distinguished from the young of the last, of corresponding size, with which it agrees very nearly in form, by its beautiful, very regular, well-defined, and gracefully curved striæ, as well as by its narrower columella, and thin inner lip. The latter characters lead me to doubt whether it is not more properly a *Platyostoma*.

Locality and position. Same as last.

BELLEROPHON NEWBERRYI, Meek.

Shell scarcely attaining a medium size, subglobose in form; volutions rounded, all hidden by the last one, the umbilicus being closed on each side; last turn expanded at the aperture, which is rather large, transversely lunate or subreniform, being nearly twice as wide transversely as the antero-posterior diameter; lip moderately sinuous in front, and rounded in outline on each side, very thin excepting in the umbilical regions, between which it is thinly spread a little over that part of the return of the spire indenting the inner or posterior side of the aperture. Dorsal band rather narrow, not usually elevated above the surface of the rounded dorsum, and merely defined by a slight furrow along each side.[1] Surface ornamented by distinct, very regularly disposed little transverse costæ, or coarse raised lines, most strongly defined on the dorsal side, where they curve a little backward near the band, and more abruptly in crossing the latter; while they become finer, more curved, and directed backward in approaching the

[1] In one of the smaller specimens, the band is a little raised so as to form a slight ridge.

umbilical region on each side, and diminish to mere fine lines of growth on the expanded part of the body volution near the aperture. Traces of much finer longitudinal, or revolving lines are also seen on well-preserved specimens.

Greatest antero-posterior diameter of a moderate-sized specimen, 0.70 inch; transverse diameter of aperture, 0.72 inch.

In its surface markings, this species seems to agree with *B. patulus*, Hall, from which it differs materially in having its aperture very much less expanded, and not overlapping the volutions posteriorly; as well as in not having its axis umbilicate. It is much more nearly like *B. hiulcus*, Sowerby, as illustrated by de Koninck (Ann. Foss. Carb. Belg., pl. xxvii, fig. 4, a, b, c), but in addition to being much smaller, its aperture is less transverse, and not near so deeply sinuate posteriorly by the inner volutions; while its lip is very much less spread over the latter behind. It likewise differs in the possession of fine obscure revolving striæ.

The specific name is given in honor of Prof. J. S. Newberry, the State geologist of Ohio.

Locality and position. Dublin, Franklin Co., Ohio. Corniferous group of the Devonian.

BELLEROPHON PROPINQUUS, Meek.

This species agrees so nearly with the last in form and size, that it may be sufficiently characterized by pointing out the few characters in which it differs. In the first place, its transverse lines are distinctly finer, more crowded, and less regularly arranged; while it has a small umbilical perforation not entirely closed by the thickened lip on each side, as we see in that species. Again, its dorsal band is always distinctly elevated, very narrow, and furrowed along the middle, so as to present a biangular appearance, while the transverse lines bend back more strongly in approaching this band than in *B. Newberryi*, and do not impart the crenated or subimbricated appearance in crossing the band, seen on this part of that species. It is likewise destitute of the very fine obscure revolving striæ of *B. Newberryi*, and seems to have its aperture somewhat less expanded, though the specimens are scarcely in a condition to show the expansion of the aperture satisfactorily.

Locality and position. Same as last.

CYCLONEMA CRENULATA, Meek.

Shell turbinate, subtrochiform, thin; spire depressed conical; volutions four, increasing rather rapidly in size, those of the spire convex but not rounded; last one large, convex on the upper slope to the periphery, which is rather narrowly rounded; suture well defined between the upper volutions, and somewhat canaliculate farther down; aperture ovate. Surface ornamented by sharply elevated revolving lines or small ridges, which are beautifully and minutely crenate by the crossing of the fine, very oblique lines of growth; of these revolving lines from sixteen to eighteen may be counted on the body volution, and six on the next above, while those farther up appear to be quite smooth.

Length, 0.34 inch; breadth, 0.32 inch.

This species seems to be related to *C. multilira*, Hall (Fifteenth Report of Regents, p. 48, pl. 5, fig. 17), but has a more depressed form, with the volutions of its spire merely convex instead of rounded, and its body volution narrowly instead of regularly rounded. It also has more revolving lines, which likewise show a delicate crenate character not represented in the figure nor mentioned in the description of *C. multilira*.

In general appearance our shell more nearly resembles Mr. Conrad's original figure of his *C. bilix* (Journ. Acad., N. S. VII, pl. xvi, fig. 10), but it is less oblique, with more convex volutions, and more numerous revolving lines.

Locality and position. Same as last.

ISONEMA HUMILIS, Meek.

Shell large and robust, depressed subturbinate, about one-fourth to near one-third wider than high; spire much depressed: volutions four, increasing rather rapidly in size, the exposed part of those of the spire gently convex; last one large and regularly rounded, or sometimes very obtusely subangular around the middle of the outer side; suture well defined, without being properly channelled; aperture circular a little within, but more or less angular above at the immediate edge of the lip, where it is more oval in outline; outer lip thin, and, in mature specimens, slightly dilated; inner lip thickened, very distinctly flattened, and slightly spread over the imperforate umbilical region, as well as a little thickened near the top of the aperture. Surface ornamented

with oblique, slightly arched lines of growth, which, on the first and second turns of the spire, are rather coarse, well defined, and present the characteristic regularity of size and arrangement, but soon become, on the succeeding turns, much finer and more crowded, as well as occasionally interrupted by irregular, stronger furrows and wrinkles of growth.

Height of a medium-sized specimen, 1.10 inches; breadth, 1.50 inches; height of aperture, measuring at the margin of the lip, to the top of the angle above, 0.95 inch; breadth, about 0.87 inch.

It is possible that this may be the full-grown adult form of *Isonema depressa*, M. & W., as its first and second volutions have much the form and surface markings of that shell. Still, as it shows only the same number of volutions in specimens of nine or ten times the volume of the typical specimen of that species, I am led to believe it distinct. Although young specimens are more inclined to be subangular around the middle of the outer turn than in the adult, which often has the body whorl regularly rounded, I think it is never at any stage of growth so angular as in the *I. depressa*.

In large examples, with the strong striæ of the first turns of the spire obscured by erosion, the specimens of this shell (which are usually preserved in such a condition as to present a perfectly white chalk appearance), when viewed from above, resemble very much the bleached shells of some of the large depressed forms of *Helicidæ*. The strongly flattened, smooth inner lip, however, gives a very different expression to the under side.

Until more is known in regard to the texture and ornamentation, and particularly in regard to the nature of the inner lip, in the shells on which the genus *Holopea* was originally founded, it is scarcely possible to determine exactly the relations of our shells to that group. My present impression, however, is that they constitute a distinct genus.

The species here described resembles some forms of *Platyschisma*, McCoy, but they show no traces whatever of the shallow sinus of the outer lip, and differ remarkably in the presence of the thickened, appressed, and distinctly flattened inner lip, while in the species here described, and in *I. depressa*, there is not even a slight umbilical perforation. This latter character, however, may not be constant in the group.

Locality and position. Same as foregoing.

ORTHONEMA NEWBERRYI, Meek.

Shell turreted, elongate-conical; volutions eight or nine in adult examples, compressed-convex, with a more outward slope than the general slant of the spire, the most convex part being near the lower side of each, a little above the suture; first one or two very small and depressed, and the next one or two more rapidly increasing in size than those below, thus giving a proportionally shorter and more conical appearance to young than adult specimens; suture well defined, in consequence of the prominence of the lower part of each turn just above. Surface ornamented by three very slender, raised revolving lines, one of which is placed a little below the suture, and the other two below the middle of the turns of the spire, and on the middle of the last volution; of these revolving lines the upper two are broken up into minute, regularly arranged, projecting points, while the other is usually continuous; lines of growth minute, sharply defined, and very regularly and closely arranged, passing vertically and very nearly or quite straight across the volutions. (Aperture unknown.)

Length, 0.63 inch; breadth, 0.22 inch.

The general appearance of this very neat little shell, with its three slender revolving lines, two passing around the middle of its body volution, and below the middle of those of the spire, at once recalls to the mind the genus *Murchisonia*. A moment's examination under a magnifier, however, shows that the sharply defined lines of growth pass straight across the volutions, without making the slightest flexure indicating a sinus in the lip, such as we see in *Murchisonia* and *Pleurotomaria*.

It is a more slender shell than the type of the genus, *O. Salteri*, M. and W., from the Coal-measures, and has a much deeper suture, and less angular body volution, with other differences in the details of its markings. Although nothing is known of the nature of its aperture and columella, it agrees so exactly in all its other generic characters with the genus *Orthonema*, that I have no hesitation in referring it to that genus. It is certainly not a *Murchisonia*, and differs radically in its ornamentation from *Loxonema*, and all of the other palæozoic types to which the more or less similar univalves of the older rocks are usually referred.

Locality and position. Otsego, Wood County, Ohio, from the Corniferous groups, just above the Glass Sand. Mr. Gilbert.

1871.]

TROCHITA? ANTIQUA, Meek.

Shell strongly depressed, subtrochiform, about three times as wide as high; under side flattened and provided with a broad, shallow, excentric umbilical impression; volutions two and a half to three, a little convex, with a gentle outward slope above, and an angular periphery at the connection of the upper slope of the whorls and the base; suture rather obscure; aperture transversely rhombic; nearly three times as wide as high, with acutely angular outer and inner extremities; upper edge of lip very oblique, and extended far forward beyond that below, which seems to be nearly straight. Surface of upper side ornamented by rather distinct lines, or small ridges of growth, which cross the volutions very obliquely, with strong backward curves as they approach the periphery parallel to the margin of the lip.

Breadth, 2.12 inches; height, 0.66 inch.

The specimens of this shell yet found are very imperfect, but its form and general appearance are so peculiar that there can scarcely be any difficulty in identifying it. Although it has a broad umbilical impression, this impression does not appear to extend up into the very short spire as a true umbilicus. It may not be a true *Trochita*, but the specimens yet seen show no characters by which it can be separated from that group, which seems to be represented in the Carboniferous rocks.

Locality and position. Monclova, Lucas County, Ohio. Corniferous group of the Devonian.

TROCHONEMA TRICARINATA, Meek.

Shell turbinate, thin, a little wider than high; spire depressed. Volutions about five, strongly shouldered, or nearly rectangular above; the upper surface being flat, or a little concave, and extended out almost horizontally to the rectangular and carinate shoulder; below this the outer side is nearly vertically flattened to a second carina passing around near the middle of the body whorl, exactly coincident with the suture between that and the succeeding turn, so as not to be exposed on the spire; below this second carina the under side of the body volution is flattened, with a strong inward slope, to a third well-defined carina, passing around the middle of the under side, and forming the margin of the umbilicus. Aperture oval-subpentagonal, being a little higher

[June 6,

than wide, and somewhat angular above, at the connection of its outer lip with the return of the spire, and at the termination of each of the three revolving carinæ, as well as very obscurely so a little below the middle of the inner side; inner lip thin below its connection with the carina passing around the umbilicus, at which point it is very slightly thickened, while above this it seems to be nearly or quite obsolete. Umbilicus rather wide, but shallow, or very rapidly contracting within. Suture well defined, without being in the slightest degree furrowed. Surface only showing very fine lines of growth, which, on the upper flattened space of the volutions, pass obliquely outward and backward, with a very slight curve from the suture to the upper angle or shoulder, below which they pass nearly straight down the outer flattened area to the second carina, which is as far as they can be traced in the specimen studied.

Height, 0.81 inch; breadth, 0.90 inch; height of aperture, 0.54 inch; breadth of do., 0.46 inch.

This rather neat shell seems to agree exactly in all of its generic characters with the type of Mr. Salter's genus *Trochonema* (*T. umbilicata*, Hall, sp.), excepting in not even showing any tendency to have its body volution become free at the aperture, nor apparently its peritreme continuous. The first of these characters, however, seems not to be always constant in the typical species of *Trochonema;* but the fact that it *does generally* occur in the same is worthy of note; while the apparent absence of a continuous peritreme in the shell here under consideration, would certainly seem to be one of more than specific importance. If so, I would suggest for it, at least as a subgeneric designation, the name *Trochonemopsis*.

Specifically this shell will be readily distinguished from *T. umbilicata*, which it most nearly resembles, not only by its more depressed form, closely contiguous body volution, obsolete inner lip above the middle of the aperture, and more shallow umbilicus, but also by not having its suture channelled and bordered below by a fourth carina around the upper margin of each volution, as in that species.

Locality and position. Marblehead, Ohio. Corniferous group.

NOTE.—In the same matrix with the above-described shell, I have been surprised to notice numerous minute bodies that I can scarcely doubt are

really the fruits of the fresh-water genus *Chara*. At any rate, they certainly seem to present all the external characters of the same. These little bodies are globose, about 0.05 of an inch in diameter, and each ornamented by nine strongly defined, and very regularly disposed, spiral ridges, which start on one side around a minute pit, and pass with perfect regularity spirally so as to converge to an exactly opposite point on the other side, making each about one spiral turn in passing from side to side. If really the seeds of this fresh-water genus of plants, they must have been carried into the sea by streams, and deposited where we now find them, along with numerous marine shells.

PTEROPODA.

CONULARIA MICRONEMA, Meek.

Shell elongate-pyramidal, with the sides equal and diverging from the apex at an angle of about 16 degrees; lateral surfaces nearly flat, and without any mesial furrow, but sometimes showing a very faint, slender mesial ridge, that becomes nearly or quite obsolete toward the smaller end; each of the four angles a little rounded, and provided with a shallow, moderately distinct longitudinal furrow. Surface with numerous, extremely small, closely crowded, transverse striæ, of very nearly the same size on all parts of the shell; striæ gently arching forward as they cross the sides, and scarcely interrupted at the little mesial longitudinal ridge; minutely crenate, and separated by extremely slender linear furrows, numbering fifteen in the space of one-tenth of an inch on all parts of the surface; crenulations of striæ twelve to fifteen in one-tenth inch.

Length of a specimen broken at both ends, with a diameter of 0.96 inch at the larger end, and 0.46 inch at the smaller, 2.30 inches.

This species is remarkable for the extreme fineness and closely crowded uniform character of the transverse striæ on all parts of the surface. I know of no other species, resembling it in other respects, with near such fine crowded striæ. At a little distance these lines are entirely invisible to the unassisted eye, and it requires the aid of a magnifier to see them distinctly. The furrows between these striæ are more impressed hair-lines, in which no crenulations are visible in the specimen.

Locality and position. Sciotoville, Ohio. Waverley, or lowest division of the Carboniferous.

CONULARIA ELEGANTULA, *Meek*.

Shell presenting the usual quadrangular pyramidal form, with the divergence of the sides from the rather pointed apex, forming an angle of about 18 degrees; each of the four lateral angles slightly rounded and distinctly furrowed; sides equal, nearly flat, and without any well defined longitudinal mesial furrow. Surface ornamented by numerous, very small, closely arranged, transverse lines that arch gently forward or toward the aperture, and sometimes become slightly interrupted and alternating along the middle of each side; while in other instances they are merely a little deflected and continuous across this slight impression or imaginary line. These lines attain their largest size, and are separated by spaces of their own breadth, at about 0.70 inch from the apex, and beyond this become gradually smaller and more crowded toward the aperture. Where largest and widest apart, they number about seven in one-tenth of an inch. They are all crenulated, there being fourteen of the crenulations in a length of one-tenth of an inch. Furrows between the transverse lines marked by very fine striæ, much smaller and more crowded than the crenulations on the striæ, and running in the direction of the longitudinal axis of the shell.

Length of specimen, apparently nearly entire, 1.70 inches; breadth, about 0.59 inches.

This species is related to *C. byblis* of White (Proc. Bost. Soc., N. H., Feb. 1862, p. 22), and *C. [illegible]*, M. & W. (Proc. Acad. Sci., Phila., Dec. 1865, p. 252), from the Waverley group of Iowa and Ohio. It differs, however, in having its transverse lines smaller and more crowded, there being about 70 of them to the inch, at the point where they are largest and widest apart, and 100 in the same space near the larger end of the shell; while in both of the Waverley species mentioned, only forty-five to fifty occur in an inch. The crenulations of the transverse striæ are also smaller and more crowded in the species under consideration, there being usually fourteen of them in one-tenth of an inch, which would give 140 to the inch; while, according to Prof. Winchell's measurements, they are so much larger and more distant in *C. byblis*, that 60 to 75 of them would occupy the same space. The obtusely rounded and smooth apex mentioned in Dr. White's description, if natural, would be another very important distinction; 1871.]

but I suspect, from the appearance of some of the specimens of species of this genus figured by Prof. Barrande, that this is due to the removal of the apex by some accident, so as to expose one of the smooth septa within.[1]

Compared with *C. Niagarensis*, Hall, the species under consideration evidently differs in being much more gradually tapering, and has the transverse lines much smaller and more crowded toward the larger end of the shell. In form it agrees more nearly with *C. simplex* of Barrande, which, however, has the furrows between the transverse lines smooth, and these lines not becoming smaller and more crowded toward the aperture from a point six to seven tenths of an inch from the apex.

Locality and position. Delaware, Ohio. Corniferous division of the Devonian.

CEPHALOPODA.

CYRTOCERAS OHIOENSE, Meek.

Shell long, slender, gently arched, and very gradually tapering, section nearly circular, the dorso-ventral diameter being slightly greater than the transverse. Septa distant from each other, on the outer or convex (ventral) side of the curve, slightly more than one-sixth, and on the inner side about one-seventh, the dorso-ventral diameter. Siphuncle situated near the outer side of the curve, but not exactly marginal. Surface ornamented by small, somewhat irregular annular ridges and striæ that curve a little backward in crossing the ventral side. Rather distinct, raised lines also mark the surface longitudinally, so as to form with the annular markings a somewhat cancellated appearance.

Length of a specimen incomplete at both ends, and septate throughout, excepting about one inch of the anterior end, 6.50 inches (measuring along the convex side of the curve). Dorso-ventral diameter at the posterior end, 1.33 inches; transverse

[1] Since seeing these figures of Prof. Barrande's, I am led to think it probable that *C. byblis*, White, and *C. multicostata*, M. & W., may belong to one species, the apparent obtusely rounded smooth apex of *C. byblis* being the principal character that led us to suppose the *C. multicostata* to be quite distinct. A comparison of specimens, however, might show other distinctions.

diameter at the same place, 1.27 inches. The increase in size is such that the same measurements at a point three inches farther forward, are respectively 1.56 and 1.50 inches, while from this point to the broken anterior end, which includes only about one inch of the body chamber, the shell diminishes a little in both diameters, but apparently more in the transverse than the dorso-ventral, though this may be in part due to accidental lateral pressure.

This species seems to be related to *Cryptoceras eugenium*, Hall (Regents' 15th Report, p. 70, pl. 9, figs. 1, 2, and 3), but evidently not only attained a larger size, but differs in having its dorso-ventral diameter a little greater than the transverse, instead of the reverse. It also differs in being marked with distinct longitudinal raised lines, as well as in tapering somewhat, from the central region forward, and in having its septa more closely arranged. In form it agrees more or less nearly with several of the Bohemian species figured by Dr. Barrande, but it differs from all of them in its surface markings; while from his *C. pugio*, which has somewhat similar sculpturing, it differs in being a little more curved, and without transverse undulations.

The entire shell could scarcely have been less than 12 to 14 inches in length, and probably curved so as to form about one-fourth of a circle.

Locality and position. Dublin, Franklin Co., Ohio. Corniferous group of the Devonian series.

GYROCERAS (TROCHOCERAS?) OHIOENSE, Meek.

Shell attaining a large size, oval-subdiscoid; composed of three or four rather rapidly enlarging whorls, the inner ones of which are closely contiguous, while the last one seems to become a little free at the aperture; umbilicus large and of moderate depth. Volutions rounded—subquadrangular, with the transverse diameter somewhat greater than the dorso-ventral; rather broadly flattened on the periphery, and compressed convex on the sides, which round off gradually into the umbilicus, and more abruptly to the periphery, excepting in young shells, which have the sides of the volutions more flattened, and rounding as abruptly into the umbilicus as to the flattened outer side. Septa moderately distant, or separated by spaces which measure, on the middle of each side, about one-third the dorso-ventral diameter of the volu-

tion at the same point; curving gracefully backward as they cross the sides, and forward as they pass from the sides to the flattened periphery, in crossing which they again make another, but stronger, backward curve. Body chamber large, or occupying more than half the outer volution. Surface (of cast) ornamented by small transverse ridges, of which about thirty may be counted to a side of each volution, the outer half only of which they occupy, without passing over or upon the periphery; while on the inner volutions they are sometimes so short as to assume the aspect of transversely elongated nodes. Siphuncle, aperture, and finer surface markings unknown.

Greatest diameter across the disc of a specimen with a part of the outer volution broken away, about nine inches; dorso-ventral diameter of outer volution at the point where it is broken off, 3.63 inches; thickness, or transverse diameter, of same at same point, about 3.90 inches.

Owing to the fact that the only two specimens of this species I have seen are both in such a condition as to show clearly only one side (the upper side of it is a *Trochoceras*), I am in some little doubt whether it is a *Gyroceras* or a *Trochoceras*. From the depth of the concavity of this side, however, I can scarcely question that the volutions are really coiled in the same plane, as in *Gyroceras* and *Nautilus*. The contiguous character of its volutions (excepting apparently the last one, near the aperture) is, however, rather against its being a *Gyroceras*, though the inner turns are sometimes in contact in species apparently belonging to that genus. If the last turn really does become free, as seems to be the case, this character would be equally against the probability of its being a *Nautilus;* but as the specimens are not in a condition to quite remove all doubts on this point, it is barely possible that this shell may be found to belong to some of the sections of that group, though I can scarcely think so.

I know of no described species of *Gyroceras* so nearly allied to this specifically, as to require a close comparison.

Locality and position. Delaware, Ohio, and in Marion County of the same State. Corniferous limestone of the Upper Helderberg Series (Devonian).

GYROCERAS (NAUTILUS?) INELEGANS, Meek.

Shell attaining a large size, subdiscoidal. Volutions about two and a half to three, increasing rapidly in size, having a somewhat greater dorso-ventral than transverse diameter, being moderately compressed on each side, narrowly rounded over the periphery, and rounding regularly into the umbilicus, which is of moderate depth and distinctly narrower than the dorso-ventral diameter of the outer whorl. First turn apparently slightly embraced by the second, which seems to become free toward the aperture. Septa rather distant, deeply concave on their anterior faces, and all crossing the sides and periphery with very slight backward curves; separated from each other on the periphery by spaces equalling about half the dorso-ventral diameter at the point of measurement. Body chamber large, or forming half the outer volutions; aperture not expanded; lip sinuous on the outer side. Surface of cast showing, on the inner volutions, some traces of rather distant transverse ridges, which become nearly or quite obsolete on the outer turn. Siphuncle and finer surface markings unknown.

Greatest diameter across the disc of a specimen a little compressed by accidental pressure, nine inches; dorso-ventral diameter of last turn near the aperture, 4.10 inches; transverse diameter of same, 3.50 inches.

This is another form in regard to the generic characters of which I am in doubt. Its more rapidly expanding volutions, more rounded periphery, proportionally narrow umbilicus, and closely contiguous, or even slightly embraced inner turns, give it a much more nautiloid look than the last, and I should scarcely hesitate to refer it to the genus *Nautilus*, if it were not for the fact that the outer volution seems to be a little detached at the aperture. Still, this may possibly be due to compression.

Locality and position. Corniferous group, Marion County, Ohio.

CRUSTACEA.

PROETUS PLANIMARGINATUS, Meek.

Pygidium depressed, semi-elliptic, the length and breadth being nearly as five to seven; anterior margin gently arcuate or convex in outline; posterior somewhat narrowly rounded; lateral margins diverging forward, with slightly convex outlines, to the anterior

lateral angles, which are not truncated. Mesial lobe rather depressed, but rounded and well defined, narrow, or only about two-thirds as wide at its anterior end as the lateral lobes, tapering gradually, with straight sides, to its posterior extremity, which terminates at a distance of about half the breadth of the anterior end, within the margin; provided with about twelve or thirteen nearly straight segments, most of which are well defined. Lateral lobes gently convex, sloping gradually from near the middle to the lateral and posterior margins, which are horizontally flattened, but not thickened; segments eight or nine, not extending upon the flattened margins, and each divided its entire length, by so broad a furrow (flat within) that only a very narrow anterior and posterior margin is left projecting, and merely separated from that of the contiguous segment by a faint linear depression, thus presenting the appearance of narrow ribs or segments longitudinally marked by faint linear furrows, and separated from each other by broad flattened depressions. Surface apparently nearly smooth. (Other characters unknown.)

Length of pygidium, 0.64 inch; breadth, 0.94 inch; height of lateral lobes, 0.13 inch; do. to top of mesial lobe at its anterior end, 0.23 inch.

The pygidium of this species seems to present much the same proportions as the corresponding part of *P. Haldemani*, Hall, from the Hamilton group; but it has a proportionally narrower mesial lobe, and a smaller number of segments in the lateral obes. It also differs in having a distinctly flattened instead of thickened border. If I have correctly understood the nature of the segments of its lateral lobes, they are also very different from those of *P. Haldemani*, being provided with wide flattened longitudinal furrows. These furrows are so wide and strongly defined that I have been in some doubt whether they ought not rather to be regarded as the divisions between the segments (which, in that case, would be represented by the comparatively narrow intervening furrows) than as the furrows of the segments themselves. On tracing them inward, however, to the mesial lobe, they are found to be abruptly narrowed and curved slightly forward as they approach the latter, so as to seem to correspond to the furrows *on* the segments, rather than to depressions *between* them.

None of the specimens show much of the surface, but, as far as it can be seen, it seems to be smooth, and to coincide exactly

with the smallest elevations and depressions of the internal cast, from which the foregoing description was drawn up.

Locality and position. Upper part of the Corniferous group, Sylvania, Lucas County, Ohio. Devonian. Mr. Gilbert's collection.

DALMANITES OHIOENSIS, Meek.

Pygidium large, depressed, semi-elliptic or semi-oval in general outline, nearly straight or gently convex in outline on the anterior margin, with the lateral angles a little rounded; posterior extremity somewhat raised and truncated, with the lateral angles of the truncated margin produced into two rather short, distinctly converging spines. Mesial lobe narrow, or only equalling half the breadth of each lateral lobe at the anterior ends, depressed and gradually tapering to the posterior end, which terminates very near the truncated posterior margin; rather distinctly separated by the furrow on each side from the lateral lobes; segments about eighteen, passing straight across, and separated by well-defined furrows, that are narrower than the segments themselves, which are not furrowed. Lateral lobes most convex along somewhat within the middle, where they are nearly or quite as high as the mesial lobe, toward which they slope slightly on the inner side, while beyond the middle they slope off gradually to the lateral margins, which are very narrow, not thickened above, and curve outward nearly horizontally; segments about fifteen, widening slightly outward, and separated by deep, well-defined furrows extending very nearly to the lateral margins; the larger ones showing faint traces of a slender longitudinal furrow along the middle, while all, excepting a few of the smallest posterior ones, are produced beyond the lateral margins in the form of slender, sharp rounded spines, that curve a little backward and upward. Surface nearly or quite smooth. Thorax and cephalic shield unknown.

Length of pygidium, 1.70 inch; breadth, 2.70 inches; height or convexity, 0.25 inch; breadth of posterior truncation, 0.45 inch; length of longest spines projecting from lateral margin, 0.38 inch.

This Trilobite seems to be closely allied to *D. myrmecophorus* (= *Asaphus myrmecophorus*), Green, to which I was at one time inclined to refer it. A careful comparison, however, with the

description of that species given by Green and Hall, seems to show that our fossil cannot be properly considered identical. In the first place, it differs in having the mesial lobe only just half as wide as each of the lateral (measuring both at their anterior ends), instead of only about one-third as wide (see dimensions *D. myrmecophorus*, given in the Fifteenth Report, Regents Univ. N. Y., on State Cab. N. H., p. 18). Again, it shows no traces whatever of nodes or spines (excepting the marginal spines) on any of the segments, either of the mesial or lateral lobes; while in Green's species the segments of the lateral lobes are described, in the Regents' Report above cited, and also by Green, as being marked by one or two rows of nodes, and those of the mesial lobe are described in the Regents' Report as being marked each by three spines. Our species also shows a faintly impressed mesial line along each segment of the lateral lobes, not mentioned either by Hall or Green in describing *D. myrmecophorus*.

Green gives the number of segments in the middle lobe of the pygidium as fourteen, and in each lateral lobe as thirteen; while in apparently a larger specimen (three inches in length), Prof. Hall counted twenty-four segments in the axis, and twenty in each lateral lobe; from which we may infer that the number of segments varied somewhat with the size of the specimen in that species.

Although nothing is known of the cephalic shield of this species, or, I believe, of that described by Green, I have little or no hesitation in expressing the opinion that at least the form here under consideration possessed the peculiar perforated or digitated extension of its anterior margin seen in *D. selinurus*, and hence that it belongs to Mr. Conrad's subgenus *Odontocephalus*.

Another specimen in the collection from the same locality and position as that from which the foregoing description was made out, consisting of a rude cast of the pygidium, shows the same proportional breadth of the mesial and lateral lobes, and apparently about the same number of segments, but differs in being proportionally longer, its length being to its breadth as about 8 to 11, instead of about 8 to 13. It also differs in having the spines on each side of the truncated posterior extremity distinctly larger than in the form above described, and directed straight backward as in *D. selinurus*, instead of converging, as in the last. The spines along its lateral margins, however, are, on the contrary,

proportionally decidedly smaller. This, I suspect, belongs to a distinct species; but, as the specimen is too much eroded to show its surface character clearly, I have preferred to refer it doubtfully, for the present, to the same.

Locality and position. Marblehead, Ohio. Corniferous group of the Devonian.

ON CERTAIN SPECIES OF FALCONIDÆ, TETRAONIDÆ, AND ANATIDÆ

BY ALFRED NEWTON,
PROFESSOR OF ZOOLOGY IN THE UNIVERSITY OF CAMBRIDGE, ENGLAND.

[Communicated by Mr. Coues.]

MAGDALENE COLLEGE, CAMBRIDGE.
28th November, 1869.

MY DEAR SIR: I have just received your letter of the 9th inst. I have the greatest pleasure in giving you all the information in my power.

As to the Great Northern Falcon question—I cannot count more than six men in Europe who really understand it. It would be invidious to name them. Two of them, Schlegel and Blasius, I had the pleasure of converting from their old heresies. I endeavored to bring Cassin to a right understanding of the matter when I was in Philadelphia more than a dozen years ago, but I did not succeed, and consequently his notice in the "Birds of North America" (p. 13) is all wrong. I have not much to add or anything to retract from some remarks of mine on this question in "The Ibis" for 1862 (pp. 44–53), in my appendix to Baring-Gould's "Iceland" (pp. 404, 407), and in the "Oötheca Wolleyana" (pp. 85, 87).

The first thing to become fully impressed with is that these large falcons have exactly the same changes of plumage as *Falco peregrinus* or *F. anatum* (supposing they are distinct), *i. e.*, the young in their first plumage are marked longitudinally, and this plumage they keep until their *second* autumn, when the fully adult plumage is assumed. In saying this, I do not mean to declare that the moult is a matter of a very short time. On the ontrary, I have reason to believe that in most examples it lasts for some months; but by the end of their second autumn they are in fully adult plumage. All that has been said about these birds growing whiter and whiter as they grow older is founded on mere speculation and fancy. The main differences between immature and adult plumage are that the browns become grays, and the longitudinal markings transverse. None of the European dealers understand this; and if you have skins from Paris, you will find, I am sure, young white birds marked "très adulte," and old

blue birds marked "jeune." It is the same with specimens from Copenhagen and elsewhere. Now it being understood that, as I have above said, the age of the bird may be detected from the color, and, still better, from the direction of the markings, it will then be evident that in a large series you have what at first sight appears to be almost every step from the nearly pure white phase —which some consider, though I do not, to be the *F. arcticus* of Holböll—to the dark-colored *F. labradora* of Audubon, and it is not easy to see how they can be distinguished. Easy it is, however, on trial. Sort out all the specimens with white bills and claws (the white is often flesh-colored owing to extravasated blood), and then you will have *Falco candicans*. Then turn all the other specimens on to their bellies, and lay in one heap those that have the tops of their heads *not darker* than their backs, and on another those that have the tops of their heads *not lighter* than their backs. The first of these heaps will be *F. islandicus*, and the second *F. gyrfalco*. You will have perhaps some five per cent. that this test will not reach, and this remainder will require further comparison; but I am much mistaken if the "moustache" will not enable you to distribute the balance. Then you may look at the labels—always being, of course, suspicious of French geography—and I think you will have something like this result:—

BILL AND CLAWS.	PLUMAGE ABOVE.		SPECIES.	LOCALITIES.	
				Adult.	*Immature.*
White or pale flesh color.	White with dark markings.		*F. candicans*,	N. Greenland, N. parts of fur countries, Siberia?	Iceland, British Islands, Norway, Sweden, Canada, U. S., "Siberia" (Pallas), (in Mus. Berol), "Amoor" (Schrenck).
Dusky horn color.	Dark with light markings.	Top of head not darker than back; moustache light.	*F. islandicus*,	Southern Greenland and Iceland.[1]	British Islands, Norway, Iceland, Labrador, Canada, U. S.
		Top of head not lighter than back; moustache heavy.	*F. gyrfalco*,	Norway, Sweden, Finland, Siberia?	Norway, Sweden, Holland, N. Germany.

[1] P. S. 6 May, 1871. Since this letter was written Prof. Baird has kindly sent me some specimens from Alaska to examine. These are adult, and differ from Icelandic examples only in being slightly darker. (P. Z. S. 1870, p. 384.) "Alaska" should, therefore, be added to the localities named above. 1871.]

The adults will be from the countries where each form breeds, and the young from those to which they wander (generally in the autumn or winter).

We have in Europe (including Iceland and Spitzbergen as European), in my opinion, four[1] species of *Lagopus;* for I count *L. scoticus* as a species, since it can be always most readily distinguished from *L. albus*, and has (nowadays) a different habitat, but that it is only *L. albus* modified to suit an insular climate, I am persuaded; just as I am that *Lepus hibernicus* is a mere insulated form of *L. timidus*, Linn. nec auctt. (Cf. P. Z. S. 1864, p. 497.) Of *L. scoticus*, however, I need say nothing here. *L. albus*, of which remains are found in the caves of the "Reindeer period" in the south of France, together with those of *Nyctea nivea*, is nowadays, as you no doubt know, confined to Norway and Sweden in Western Europe, Finland and Russia in the East. Its southernmost limits in Russia I do not know. I think I have read somewhere of its occurring in the very east of Prussia, but I cannot be sure. Between European and American specimens of *L. albus*, I have never been able to detect any difference at all. The *L. brachydactylus* of Temminck, figured by Werner (Atl. Ois. Eur.) and by Gould, is *L. albus*, as I know by the type at Leyden which I have examined (so also says Schlegel somewhere). It is a winter bird with perfectly white remiges; but I may here remark that the variation in the color of the remiges (I speak of the adult, for in the young the primaries first assumed and borne till the first moult are always brown) seems to me but an individual character. Examples killed from the same flock exhibit much diversity in the coloring of the space alongside the shaft of the primaries. Sometimes there is a broad dark-colored patch extending along the greater part of it, and sometimes all is pure white. I have noticed much the same thing in American birds. Next to *L. albus*, we have *L. mutus* or *alpinus*—the species to which the Gallic name Ptarmigan is really applicable. This inhabits Scotland, Norway and Sweden, Finland, Northern Russia, the Alps and Pyrenees, its range being determined by the elevation above the sea-level, which varies inversely as the latitude. The male of this in FULL breeding plumage has a black breast (as figured in Gould's B. of Grt. Brit.), but the *full* breeding plumage

[1] P. S. 6 May, 1871. I should now say "five," see next note.

is very seldom completed, and before all the winter (white) feathers have been shed, some of the ashy-gray autumn plumage are generally observable. Still, a ♂, killed, say in May, always has a considerable number of purely black feathers on his breast. At this time the ♀ is of a bright orange color, vermiculated above with black, and hardly to be distinguished from *L. rupestris* of the same sex and season. Later in the year both sexes put on an ashy-gray plumage (for *Lagopus* has three moults a year), and in this you have the "plumage des noces" of most of the continental dealers. I myself have never seen Pyrenæan specimens, but it is said that they are specifically identical with those of the Alps, and these last are certainly not distinguishable from our own or Scandinavian examples. I am told that there is appreciable difference observable in the size of Scotch specimens according as they are from the summits of the hills or lower down, and I know there is such difference in Norwegian ones. The largest *L. mutus* I ever saw were from Qvalö, the island on which Hammerfest stands, and owing to its proximity to the sea, I suppose, and the influence of the gulf stream (the well-known "Horri-eye" bean is constantly thrown up there), the climate of Qvalö is certainly much more equable and milder than that of the frontier range of mountains between Norway and Sweden, and still more so than such hills as those about Kilpisjeroi, whence have come the smallest specimens I ever handled. I should think two Qvalö birds would weigh as much as three from Kjölen, and the difference of size is plainly visible even in the sternum. But of course no one would wish to separate these birds unless it was Brehm. The fourth European species I hold to be the same as your *L. rupestris*, which *L. mutus* certainly is not. Under the name of *L. hemileucurus* (or, Malmgren would say, *L. hyperboreus*), the Spitzbergen bird has been described as distinct, but I have hardly a doubt[1] remaining that it is in every respect identical with the Islandic *L. islandorum*, which again I hold to be specifically identical with *L. reinhardti* of Greenland, and *L. rupestris* of Labrador, and the

[1] P. S. 6 May, 1871. Dr. Von Heuglin having kindly sent me some examples of the Spitzbergen bird obtained by him last year, an examination of them has entirely changed my opinion on this point. I now believe *L. hemileucurus* to be a good species, and I have stated my reasons for so thinking in notes which will shortly be published by that naturalist or by Dr. Finsch.

Hudson's Bay territory. The females at no time of the year differ much from *L. mutus*, but, so far as I know, the males never in spring assume or attempt to assume a *black* breast—the color of the new spring feathers upon that part being always a dark (blackish if you like) brown, but mottled and freckled with *rust color*. In this stage the bird has none of the fresh look which the brilliant contrast of the pure black and white gives to *L. mutus* ♂. The autumnal plumage of the ♀ *rupestris* I have never been able to make out satisfactorily; but I have some reason to think that it is not of the generally clear ashy-gray hue that that of *mutus* is. This is a point I want especially to be informed upon. They send many skins from Greenland, which I *suspect* are autumnal birds, but the men are content to mark them "Sommer." I have autumnal females from Iceland, where the orange-yellow of the spring is fast giving way to the white of winter, without the intervention of any autumnal gray. What the Icelandic ♂ does at the same time I do not know; I did not stay long enough in Iceland to find out, and the specimens I desired to be sent to me are all apparently females. That *L. islandorum* and *L. reinhardti* are identical, I think there can be no doubt, and I cannot conceive why Brehm ever invented the latter. That *islandorum* and *hemileucurus* (from Spitzbergen) are the same, I also strongly opine,[1] and if I could only get the latter to compare with my skins of the former, I think I could settle the question, but it is rare.

I yesterday received from Malmgren a copy of a paper by him in the "Notiser ur Sällskapets pro Fauna et Flora Fennica Förhandlingar" for 1869, containing remarks upon the Finnish and Scandinavian geese (*Anseridæ* he calls them). I am delighted to see that he has come to my opinion on several points where we were at issue. Of the genus *Chen* I can tell you nothing. Of true *Anser* we have *five* European species:—

1. *A. ferus* (Linn.), (*A. cinereus*, Meyer), with a white "nail" to the bill, and light gray carpal feathers.

2. *A. segetum* (Gmel.), with a black nail to the long bill, dark brownish-gray carpal feathers, and orange-red legs.

3. *A. brachyrhynchus*, Baillon (*A. phœnicopus*, Bartlett), with a black nail to the short bill, gray (but not so light as in No. 1) carpal feathers, and pink legs.

[1] P. S. 6 May, 1871. But see preceding note.

4. *A. albifrons* (Gmel.), with a white nail, dark gray carpal feathers, and orange legs.

5. *A. erythropus* (Linn.), much resembling the last, but much smaller (about the size of *Anas boschas*) and perhaps redder orange legs. The synonyms of this bird are: *A. fumarchicus*, Gunnerus, *A. temminckii*, Boie, *A. minutus*, Naumann, and, as I now see by Malmgren, *A. brevirostris*, Fritsch; but this last I have not myself certified.

No. 1. *A. ferus* is undoubtedly the species from which our tame geese have sprung. It formerly bred in England, and now breeds in Scotland, where it is, *I am satisfied*, the only species that does so. (Cf. Ibis. 1865, p. 441; 1869, p. 21.) It also breeds in Iceland. (Ibis. 1864, p. 132.) The Scandinavian naturalists have said it breeds on the coast of Norway, if not in Sweden also; but they have only just begun to know *A. brachyrhynchus*, and I *suspect* most if not all of the geese breeding on the Norwegian coast belong to that species. It seems, however, to breed in certain parts of Central Europe, and undoubtedly in Turkey (Simpson), and also Spain (Saunders). Its occurrence in *England* is now rare.

No. 2. *A. segetum*, with which I also unite *A. intermedius* and probably *A. arvensis* of Naumann, comes to England as a regular winter visitor, but is not so common as the next species; the *A. segetum* of Naumann (Naumannia, 1853) is I believe *A. brachyrhynchus*. I only *know* of Lapland as a breeding place of this species. The *A. paludosus* of A. Strickland (his *A. segetum* being also *A. brachyrhynchus*) is no doubt identical, but proof is wanting that it ever bred in this country.

No. 3. *A. brachyrhynchus* is the commonest winter goose in England, arriving often in August. It breeds in Iceland (Ibis. 1864, p. 132), Spitzbergen (Malmgren and Newton), north Norway (Ibis. 1869, p. 226), and I *suspect* all the way down the Norwegian coast to Trondhjem. Besides the synonym *A. phœnicopus*, Bartlett, I believe it to be *A. segetum* of Naumann and A. Strickland.

No. 4. *A. albifrons* breeds in Iceland (A. N.), but I do not know where else—certainly not in northern Scandinavia. In Holland they have breeding *A. pallidipes*, De Selys, which I take to be a *feral* race of this bird, or perhaps a cross between it and *A. ferus* (*cinereus*); but it is doubtful to me how far it can be called wild there. It has the very white front of *albifrons*, but is larger

1871.]

and with the legs of *A. ferus*. *A. albifrons* occurs every winter and sometimes numerously in England.

No. 5. *A. erythropus*. I first showed the identity of *A. minutus* with the bird originally described by Linnæus (P. Z. S., 1860, June 26). Except *A. segetum*, it is the only goose that breeds in the interior of Lapland, and it seems also to breed a good deal to the eastward—in Russia, for instance. I do not know of any instance of its occurring in England, but apparently they catch it occasionally in Holland. Saunders has seen it in Italy (Ibis. 1869, p. 395), and I think some one met with it on the Nile.

* * * * * * * * * *

Yours, very truly,

ALFRED NEWTON.

ELLIOTT COUES, ESQ., M. D.

April 4, 1871.

The President, Dr. Ruschenberger, in the chair.

Thirty-two members present.

Mr. Thomas Meehan, referring to the two-leaved division of Pinus of Gray's *Manual*, said that *Pinus mitis* was especially named as having sometimes three leaves in a fascicle; but in two others of that section, *P. inops* and *P. pungens*, he found the so-called leaves in threes almost as abundantly as in the former one. But the chief interest was that in all three species the three-leaved bundles became more numerous as the growth of the season approached its end. In many instances the fascicles just beneath the terminal buds were mostly in threes, and in those cases, where a second wave of growth had occurred, the terminal fascicles were almost wholly in threes. He thought that these indications of order in their production might eventually lead to the discovery of the plan on which the fascicles were produced. It would, at least, appear that in all two-leaved fascicles the germs of three were present, and that it depended on some varying phase of growth whether they were all developed or not.

Mr. M. also said, in regard to the *Acer rubrum*, that he had examined a large number of trees this season in order to test definitely whether there was any difference between the brown-flowered form and the darker one, that had hitherto escaped the attention of botanists. He found that there was no difference, but that as a general rule the brown ones were male; and it was the brown filaments which gave them this color. There were, however, occasional trees of both sexes which favored either color. But he found that there were no truly hermaphrodite flowers amongst them, and therefore the description of the books, "polygamo-diœcious," was not strictly correct. In many female trees there were apparent stamens, but the filaments were almost wanting, and he had been unable to find any of the anthers which they bore, polleniferous. These abortive stamens hardly extended at any time beyond the minute petals; while the true stamens in the male flowers had filaments extending a half inch or more beyond the petals. He suggested that the fact of the apparently hermaphrodite flowers in *Acer rubrum* being really pistillate was perhaps a small matter in itself; but it would have much interest to those who were observing how numerous were the species which fell in with Darwin's discovery, that many plants took especial pains to avoid self-fertilization.

April 11.

The President, Dr. Ruschenberger, in the chair.

Twenty-eight members present.

The death of Prof. Constant Duméril, of Paris, was announced.

A paper was presented for publication entitled—

"Morphology of the Carpellary scales in Larix." By Thomas Meehan.

April 18.

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

Twenty-nine members present.

Prof. Leidy made the following remarks on some extinct turtles from Wyoming Territory:—

Several species of extinct turtles from the tertiary deposits of Wyoming differ from those previously described by me from the same formation. They are indicated by imperfect, though sufficiently characteristic, remains, sent to me by Dr. J. Van A. Carter, of Fort Bridger; and by others obtained during Prof. Hayden's exploring expedition the last year.

Anosteira ornata.—One of the turtles is founded upon a number of isolated plates and fragments of others of the carapace of about four different individuals, obtained from Church Buttes and Grizzly Buttes, Wyoming. The specimens are mainly marginal, including two pygal plates. The latter are remarkably thick at the fore part, where they are hollowed into a concavity directed forward, and bounded below by a projecting ledge. This concavity continues outward and forward upon the contiguous marginal plates as a groove, bounded by an inferior ledge, which would appear gradually to become narrower, and disappear at the third marginal plates in advance. The upper part of the pygal plate slopes on each side from a median acute ridge or carina, which subsides at the posterior third. The marginal and pygal have all been conjoined with the costal plates by suture, and the former in addition by gomphosis, as in living emydes. The free surfaces of the plates are closely covered with radiant elevations. These centrally form rounded tubercles and peripherally more or less interrupted ridges with more or less interrupted branches. Apparently in younger plates the elevations form more continuous radiant and branching ridges, which would appear in older animals to have become more and more broken so as to form rounded tubercles. In some specimens the radiant ridged appearance is more conspicuous on the under surface of the marginal plates,

while the rounded tuberculous condition is more obvious above. In two marginal plates, conspicuously tuberculated above, the lower surfaces are perfectly smooth. These probably pertain to a different species. None of the plates exhibit scute impressions, generally so evident in the emydes.

Anosteira ornata was almost the size of the palm or middle hand. A pygal plate measures about eleven lines in length and breadth; and its height or thickness in front is seven lines. Another plate from a younger animal measures about seven lines long, eight broad, and four lines thick in front.

HYBEMYS ARENARIUS.—The second turtle, almost as large as our common *Emys picta*, is founded on two specimens obtained by Prof. Hayden from a tertiary formation on Little Sandy Creek. They consist of a marginal plate and the portion of a costal plate. The bones are proportionately thicker than in our common emydes, but like them are smooth and deeply impressed by the scutes.

The marginal plate appears to be the ninth of the series. From the groove of the costal scute impression it is directed quite as abruptly outwardly as in any recent emys. Its peculiarity, upon which I have founded the genus, is a striking character. The surfaces, separated by the groove of the marginal scute impressions, present each a half circular boss at the fore and aft borders of the bone. Thus from this specimen we may infer that the margin of the carapace was ornamented with a series of hemispherical bosses, each of which was situated in the position of, and divided by the sutures of the marginal plates. The breadth of the specimen fore and aft and transversely is half an inch.

APRIL 25.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-nine members present.

The resolution to amend Art. 2, Chapter XI., of the By-Laws by the addition of the following words: "If there is no quorum at these meetings then the election may be held at the subsequent meetings," having been approved at two preceding meetings for business, was finally adopted.

The deaths of Mr. Benjamin Marshall and Prof. Charles M. Wetherill were announced.

The following gentlemen were elected members: H. Crawford Coates and B. F. Quimby.

Professor Marsh, of Yale College, made a communication on some new reptiles and fishes from the Cretaceous and Tertiary formations. Nearly all the specimens described were discovered by the Yale College scientific party during their explorations in the Rocky Mountain region last summer.

Among the specimens from the Cretaceous exhibited were portions of a skeleton with the caudal series complete of a new species of *Clidastes*, about the size of *Clidastes propython*. The anterior caudals were elevated, and the diapophyses extended back to about the twenty-fourth vertebra with chevrons. The tail was extremely attenuated, as there are in the series eighty-one vertebræ with chevrons, the terminal ones being less than one-twelfth of an inch in diameter. The muzzle in this species is less pointed than in *C. propython*. The remains were found in the Cretaceous of Kansas, and the species was named *Clidastes Wymani*.

A second and very diminutive species of the same genus was represented by portions of the skull and teeth, with the quadrates, and several cervical vertebræ. The species was considerably smaller than *C. propython*, and differed essentially from that species in several respects, especially in the quadrate, which had the postero-superior process terminated by a short compressed hook. The teeth were smooth and nearly round at the base. This species, which was also from the Gray Shale of Kansas, is the smallest known mosasauroid, and was hence named *Clidastes pumilus*. Another new Cretaceous reptile was indicated by two teeth, which were found together in the middle marl bed at Birmingham, New Jersey. They apparently belonged to a Crocodilian, probably allied to *Hyposaurus*. One of the teeth, apparently from the anterior part of the jaw, is long, pointed, nearly round, and covered with strong angular but smooth ridges, except just at the apex, where they disappear. The posterior cutting edge is sharp and prominent, and extends the entire length of the crown. The anterior edge is only distinct a short distance near the apex. The second tooth has the crown short and compressed, with irregular ridges, and resembles somewhat the posterior teeth of *Hyposaurus*. These specimens indicate a species considerably larger than *H. Rogersii*, which, until its generic characters are more fully determined, may be called *Hyposaurus ferox*.

Among the other reptilian remains exhibited by Professor Marsh were several new species of Crocodilians from the Tertiary of Wyoming. One of these, which was named *Crocodilus ziphodon*, was remarkable in having smooth compressed teeth, with serrated edges, resembling the teeth of some of the carnivorous Dinosaurs. This animal, which was of moderate size, appears to have been covered with articular scutes. The quadrate was subtriangular in transverse outline at its distal end. Another small species, also with articulated scutes, was indicated by the more important parts of the skeleton. It had very slender jaws, and smooth, nearly round teeth. The quadrate was unusually flat at its distal end, and had a broad longitudinal elevation on its lower surface. The hypophysis was simple, elongate, and compressed. The species was named *Crocodilus liodon*. A third new species was apparently indicated by a nearly complete skeleton, and parts of several

others. It had slender jaws, a short symphysis, and rugose, striated teeth, somewhat compressed. The quadrate was constricted at its distal end, and had a sharp longitudinal ridge on its lower surface. For this species the name of *Crocodilus Grinnelli* was proposed.

The remaining reptilian fossils described by Professor Marsh were also from the Tertiary of Wyoming, and indicated several species of *Lacertilia*, some of them of large size. They belong to a new and peculiar genus of lizards, with the head and parts of the body covered with thick, highly ornamented bony plates, and hence the generic name *Glyptosaurus* was proposed. The teeth were pleurodont, and in some of the species, at least, short and obtuse. The vertebræ resembled those of *Varanus*, and the species discovered appear to all have had long tails. Four species were described which could readily be distinguished by the form and ornamentation of the cranial plates, and some of them by other characters. *G. sylvestris*, about four feet in length, had thin, nearly flat, cranial shields, with small irregular tubercles, and articular ventral scutes of the same general pattern. *G. nodosus*, about three feet long, had more convex cranial plates and thicker frontals. *G. ocellatus*, at least four feet long, had very thick articular plates, with the tubercles arranged concentrically. A much smaller species, probably two feet in length, and perhaps generically distinct, was indicated by a number of vertebræ, and jaws, and possibly by some scutes. This was called *G. anceps*.

In addition to the reptilian fossils, Professor Marsh exhibited a number of fish remains which were found in the same fresh-water Tertiary basin in Wyoming. Among these were numerous vertebræ and cranial bones, evidently belonging to the genus *Amia*, and indicating two species about the size of the modern *A. calva*. One of these species, which had the pit of the articular depression in the dorsal vertebræ considerably above the centre, was named *Amia Newberrianus*. The other species had vertebræ more nearly like the living *Amia*, but broader, and without the median groove on the lower surface of the centrum. This was called *Amia depressus*. In the same beds with these specimens numerous other fish remains were discovered, which clearly represented the genus *Lepidosteus*, and indicated two species, both having smooth scales, and about the same size as the modern gar-pike. One of these fossil species, which had unusually short vertebræ, was named *Lepidosteus glaber*. The second species, with proportionally longer vertebræ, was called *L. Whitneyi*. All the specimens exhibited belong to the Yale College Museum, and will soon be described in full, by Professor Marsh, in the *American Journal of Science*.

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

MORPHOLOGY OF CARPELLARY SCALES IN LARIX.

BY THOMAS MEEHAN.

THE facts which I have from time to time contributed, verbally or in papers, to the Academy, in regard to longitudinal series of axillary buds, and adnated and free leaves in coniferous plants, will, I believe explain something of the structure of the flowers of coniferæ, which, if not quite distinct from any view before taken, will at least have reached the conclusion by an original line of argument.

I have shown that in the cases where there are longitudinal series of buds, one of the buds, and generally the upper supra-axillary one, is the largest. So far as this longitudinal series of buds is concerned, I find by extensive observation that there are very few of our American trees or shrubs which do not produce them under some circumstances, although they are more generally apparent in some than in others. In many cases they do not break quite through the cortical layer, but continue to grow from year to year, just as the wood grows, always remaining just under the outer bark. It is from these concealed but living buds that the flowers of the *Cercis*, or the spines of *Gleditschia*, will often appear from trunks many years old. In *Magnolia* and *Liriodendron* these concealed buds are easily detected by a thin shave of the outer bark with a sharp knife. In very vigorous shoots of the latter, a series of two—one supra-axillary—is not rarely found prominently above the bark. In many cases one of these buds, usually the lower, and really axillary one, never pushes into growth. In *Gymnocladus* neither upper nor lower would probably ever push, only for the fact that it matures no terminal bud, and thus the laterals have to renew the next season's growth. But for this, *Gymnocladus* would go up like a palm, or, more familiarly, as *Aralia spinosa* does, without a single branch. Failing in the terminal, but two laterals push, giving the branches their dichotomous character. The two which push are always the upper ones in the series of 2, 3, or 4, which appear in this species.

The purpose of this duplication of axillary buds will interest

all who study this part of Botany. I find that they are not for the duplication of parts, but are separately organized from one another. Thus, in *Cratægus* and *Gleditschia*, the upper bud produces a spine, the lower is organized to grow as an axillary shoot the next season. But the best illustration of the distinctive organization is in those cases where both upper and lower buds sometimes push the same season, as in *Itea*, *Lonicera*, *Caprifolium*, or *Halesia*. Here we find that one is organized for floral organs, and the other for axillary prolongation. The upper bud always has the same function, and the lower its own, in the same species.

A flower being a modified branch, in which the bract is the leaf and the peduncle the axillary bud, it follows that the laws of axillary stem-production will be more or less reproduced in the inflorescence.

Referring now to my paper on *Adnation in Coniferæ*, we found that the true leaves of many genera in this order were adnate to the stem, forming what some botanists have termed *pulvini*, or cushions, under the fascicles of some species of *Pinus*, and that what are commonly called leaves, the "needles," are really phylloidal shoots. An examination of *Abies excelsa* will show that the upper portion of the needle has a different origin from the lower adnated portion, or pulvinus, and that in all probability it is a modification of the phenomenon referred to in *Gymnocladus*, and other plants, of a longitudinal string of buds, in which the upper is of a different organization to the lower one. In *Larix* it was shown that in the verticils, or perhaps more properly spurs or clusters, the true leaves were free, while in the elongated axis they became for most of their length adnate with the stem, forming the spathulate scales we find peel off the two-year-old wood.

At the flowering time of the Larch, the male and female flowers proceed from the termination of the spurs—not merely "of the preceding year," according to *Gray's Manual*, but in some cases of many preceding years, "the sterile from leafless buds, the fertile mostly with leaves below." (*Gray's Manual*, 5th ed., p. 472.) Why have the female flowers leaves under them, and the male none? Comparing the male and the female catkins, we see why. The scales of the male are formed out of the leaves which become fully formed in the female one. The pair of anther cells are thus simply on the back of a transformed leaf, just as we find the spore-cases of ferns borne in the same way. The weaker organization which I have

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shown in my paper, and communications on sex, permits no further development here. But in the case of the female flower the leaf maintains a separate organization all through the catkin or cone; and, as shown in my paper on the *Stipules of Magnolia*, the midrib of the leaf shortens, and, assuming a stipular character, increases in width, until we have the purple bractea so well known in Larix. As soon as these bractea have been arrested in their development, the carpellary scales, which answer to the phylloidal fascicles of *Pinus*, commence their growth in most species of Larch, finally equalling the bracts in length.

Whether or not the ovules which appear in the axis of the carpellary scales again result from a third longitudinal bud, I have no evidence; what I have proposed to myself in this paper is simply to show that *the scales in the male catkin of Larix are modified true leaves; while in the female they arise from buds of another organization, being the morphologized secondary leaves, or phylloidal shoots as I term them, of other coniferous genera.*

May 2.

The President, Dr. Ruschenberger, in the chair.

Thirty-four members present.

Mr. Thomas Meehan exhibited some flowers of the *Magnolia purpurea*, which were much curved toward the apex, and said that this curvature was always towards the north when the flowers opened in the full sun. This had always been a subject of speculation with him, as the tendency of growing vegetation was usually towards the south, or towards the greatest source of light. This season he has had the opportunity of examining many hundred, and almost all were due north; a few were either a little west or east of north. The plants bearing these flowers were low, and the sun had full power on all the opening blossoms. That this northern tendency of the curve was, however, due to the sun, was evident from the fact that when growing under the shade of trees, the flowers of this plant were perpendicular, and of uniform growth all round.

This season he believed he had found the explanation. He observed the same curving towards the north in the expanding male catkins of *Salix caprea*. These, so long as elongation continued, were perpendicular; when this ceased, the stamens developed first on the warmest side, the side next the sun. The growth of these expanding stamens was very rapid; and he had observed that this growth not only was towards the light, but the growing parts had the power of *drawing part of the axis to which it was attached with it*. A very small rise in the temperature was sufficient to excite growth in the willow, and the difference between the sun striking against the south side of the catkin, and the heat which could be commanded by the north side, made a difference of several days in the expansion of the stamens on the respective sides. Sometimes a catkin would be formed on the north side of the plant, in the shade of the tree, in which case the most heat coming from the north, that side of the catkin would expand its stamens first, but slowly. In this case there would be a slight curve towards the south. In the case of curved catkins, the curve was always greatest after a hot burst of sun, when the stamens grew most rapidly. When the northern side developed, the axis curved back again, so that the ultimate direction was perpendicular, as it was in the beginning.

The growth of the flower of magnolia being comparatively slower, did not furnish the same evidence in detail; but the results were the same, and no doubt were influenced by the same law. The flowers curved to the north while expanding; but after a few days of full opening the north side caught up, and the flowers were

finally erect, as in the case of the willow catkin. He thought we might safely conclude from these facts that vegetation not only grew towards the light, but exercised at the same time a lifting force which we had not before recognized.

He believed no explanation had ever been given that was generally accepted as to the curving of many kinds of pine-cones. Possibly the facts now offered might furnish the key.

Mr. Meehan then exhibited some expanding buds of *Fraxinus quadrangulata*, and showed that they had *no bud-scales* as other species of ash had. These other species had two pairs, the outer broad and somewhat thin, and which underwent little change in spring; the other and inner often grew into a short succulent subpetiole. In the *F. quadrangulata*, at the termination of its full growth, instead of the usual broad scales, there were but minute black specks, which in the spring grew out into fully developed leaves. The buds of this species of ash were, therefore, "naked" buds. He had under his observation only one tree of this kind; but he took it for granted it was the usual condition of other trees of the species.

On his grounds were many hundred of *Fraxinus excelsior*, and he noted this season a large number of them, of which he exhibited specimens, that had the same characteristic buds as in the *F. quadrangulata*. Examining further, he found that in all cases of this kind the buds terminated second growths of last year. In all other cases, where the normal solitary cycle of growth was all that was made, the usual broad bud-scales were present. Thus we arrived at the important conclusion that a law which operated with sufficient uniformity in the case of *F. quadrangulata* to constitute a specific character, existed only in special cases in another species. What that law is, he thought yet unknown. To most persons it would be a sufficient answer to say, it was the *late* second *growth* which caused the non-development of true bud-scales in the case of the *F. excelsior:* but, remembering the case of *F. quadrangulata*, where the same facts existed without the second growth, we could only say that this circumstance merely aided the action of a law, which could operate without it.

He suggested that the science of botany had suffered from the too hasty assumption of explanation of facts. For instance, it was taught in our best text-books that the "office of bud-scales was to protect the tender parts beneath." It would strike any one at once that it ought to be as necessary for *F. quadrangulata* to have this protection as *F. excelsior;* but not only this, but here we have the fact of *F. excelsior* getting through the winter as well without as with them, and that, too, on the secondary, and as many would suppose more immature, growth.

Mr. Meehan further referred to a paper which he contributed to the "Proceedings" of the Academy last fall, on the flowers of *Ambrosia artemisiæfolia*, in which he showed that the horns of the

achenia were but the remains of other flowers which had been absorbed by the central and stronger one in an early stage of their existence, and by this adnation had become an integral part of the structure of the flower.

He had now to exhibit to the Academy a small plant of this species, which had grown in a pot in his hot-house during winter, and which was in flower, and not only exhibited this fact better than the specimens he had brought to the notice of members last year, but also presented some other very remarkable phenomena. Here was a regular gradation of true horns down to an entire separation from the central achenium, in which case these detached horns bore the usual twin pistils, or rather elongated stigmas. But what was remarkable in this case was that beneath all these normal and abnormal pericarpia some small bulbels issued from the stem, and these also had stigmas more or less perfectly developed.

The whole plant, he observed, was in many respects a curiosity, which would rival the art-produced Japanese dwarf. Here was a plant a little over an inch in height, which, at the second node above the cotyledons, commenced to produce female flowers. There were no male flowers. Indeed, it was not impaired nutrition which gave it its dwarf character, for the soil in which it was growing was very rich, and the bright green color of the plant was opposed to all idea of starvation.

Another suggestion occurred to him in connection with the little plant exhibited. The ambrosia was the common rag-weed of our cultivated ground. When such plots of ground were put down into grass, no more of this weed appeared; yet, though this ground remained in sod an unlimited number of years, when broken up the ambrosia always appeared in immense numbers. Though we know that the seeds of this weed, preserved as ordinary garden-seeds are, will only live a season at best, yet all farmers and many good botanists believe that the plants spring from seeds of the crop which ripened many years before, and which have retained their vitality through all the period. But if such pigmy plants as these can perfect their seeds, we see at once how hundreds can exist amongst the grass and other vegetation, thus perfecting seeds and perpetuating themselves year after year successively, fully accounting for the appearance of plants on the subsequent breaking up of the sod, without resorting to a mere imaginary theory of wonderful vitality.

Mr. Gentry directed attention to the fact that *Alyssum calycinum*, Lin., a native of Europe, was growing abundantly on the western side of the Mt. Airy water-works, near the city, where it appears to have permanently established itself.

MAY 9.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-four members present.

The following paper was offered for publication:—

"Notes on the Natural History of Fort Macon. No. 2." By ELLIOTT COUES.

PROF. LEIDY said that he had just received, from its author, Mr. Mason, a copy of an abstract from the proceedings of the Asiatic Society of Bengal, for June, 1871, giving an account of a case of polydactylism in a horse from Bagdad. In this case the usual "splint-like rudiments of the metacarpals of the fourth toe in the fore feet had given rise to an additional toe provided with three phalanges, of which the last is incased in a hoof." A preparation of the foot of a horse, preserved in the Museum of the University of Pennsylvania, exhibits a similar condition. The abnormally developed metacarpal has the toe with two phalanges, of which the last is inclosed in an irregular hoof. If there were a corresponding development of the metacarpal on the other side of the preparation, the foot would represent the normal condition of the tertiary horse Hipparion. If both outer toes were still better developed in relation with the intermediate one, the foot would represent the condition of the earlier tertiary horse Anchitherium.

PROF. COPE demonstrated some anatomical points of importance in the classification of some of the Siluroids of the Amazon, noticing first those which have no swimming-bladder, but having the post-temporal bone pierced in a sieve-like manner, forming minute tympana; these he characterized as "*Otocinclus*."

Others having huge swim-bladders, gun-boat style of shape. No adipose fin; the back naked. No lyre plate; indicated as "*Zathorax*."

A 3d, body protected by bony shields above. No adipose fin; the scapular arch dermoössified and lyre-shaped below; indicated as "*Physopyxis lyra*."

A 4th, shielded all over its sides, with the under lip turned back, genus "*Corydoras*."

A 5th, where the under lip is separated, except at the ends, forming loops, named "*Brochis*."

In the 6th, where the lips are separated from the beard distally forming chin beards, indicated as "*Dianema*."

LIEUTENANT DUTTON remarked that the persistence and constancy of specific characters, while generic features were undergoing change, was admirably illustrated in some of the genera of Brachiopoda in the Silurian and Devonian. These genera are

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very numerous and very abundant in species, and seem to exemplify the views of Prof. Cope in a remarkable manner. Take, for instance, the Orthis family, one of the most common and prolific both in respect to individuals and species. In this family are five or six well-marked genera, and yet the specific characters, so far as they are discernible in the hard parts, are often quite identical in species of different genera; and though they have often varied, yet sufficient constancy is maintained to deceive any careless investigator, and to give the idea of specific identity. It is fairly to be inferred from a study of this class of fossils that generic and perhaps higher characters may change very rapidly, while specific ones are changing but slowly, nor remaining constant.

May 16.

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

Twenty-three members present.

Remains of Mastodon and Horse in North Carolina.—Prof. Leidy exhibited two photographs, received from Prof. W. C. Kerr, State Geologist of North Carolina, representing some remains of *Mastodon americanus* found in that State. One of the specimens represented is that of the greater part of the lower jaw of a mature male, retaining both incisor tusks and the last two molar teeth. The latter, with their angular lobes separated by deep angular and nearly unobstructed valleys, are quite characteristic of the species. The incisors are an inch and three-fourths in diameter. The last molar has four transverse pairs of lobes and a well-developed heel. The penultimate molar has three transverse pairs of lobes. The specimen was obtained from gravel overlying the miocene marl near Goldsboro', Lenoir Co., N. C. An isolated last lower molar of the same species, represented in company with the jaw, was obtained in Pitt Co.

Prof. Leidy also exhibited a specimen of an upper molar tooth, which Mr. Timothy Conrad had picked up from a pile of miocene marl at Greenville, Pitt Co., N. C. He suspected, from its size and intricacy in the folding of the enamel of the islets at the middle of the triturating surface, that the tooth belonged to the post-pliocene *Equus complicatus*, and was an accidental occupant of the miocene marl. It may, however, belong to a Hipparion of the miocene period, but the imperfection of the specimen at its inner part prevented its positive generic determination.

Remains of Extinct Mammals from Wyoming.—Prof. Leidy then directed attention to what he regarded as one of the most remarkable fossils which had yet been discovered in our western

territories. The specimen consists of the greater portion of the lower jaw of a pachyderm from the Bridger tertiary formation, probably eocene, of Wyoming. It was discovered by Dr. J. Van A. Carter, of Fort Bridger, in the vicinity of that place. In the same locality were also found remains of *Palæosyops paludosus*, and the curious turtle *Anosteira ornata*.

The jaw belonged to an old individual, as indicated by the worn condition of the molar teeth; and the animal to which it pertained was about the size of the larger Peccary. The jaw, however, is of much more robust character than in the latter. The two rami are completely coössified at the symphysis, as in recent pachyderms. The chin, or forepart of the jaw, resembles in its broad slope the corresponding part in the Rhinoceros or Peccary, but is convergent as in the Beaver or other rodent.

The forepart of the jaw is occupied by two large teeth, the features of which are such that at first glance one would think we had before us a portion of the skeleton of some huge representative of the order of Rodentia. The two teeth curve upward and forward in the same manner as in the latter, but are separated by a decided interval, which at the edge exhibits alveoli for a pair of small incisors. Hence the number of incisors appears to be four, and the large teeth are to be regarded as the lateral pair. These do not extend backward in their alveoli further than the position of the premolars, and in this respect differ widely from the condition of the Beaver and other rodents.

The form and construction of the incisors are wonderfully like in the latter animals. As in these, their forepart alone is invested with enamel, which is quite thick. They are, however, decidedly convex in front, and not nearly flat, as usual in rodents. They have been worn off in a sloping manner, not only as in these, but also laterally, so that it would appear the corresponding upper teeth were more divergent than the lower ones, or held a position related with one another resembling the condition in the peccaries and hogs, rather than in the rodents.

Unless the large teeth described are to be regarded as canines, instead of incisors, they were absent, as in the Rhinoceros and Mastodon.

The fossil exhibits evidences of the existence of six molar teeth, and there may have been a seventh in the series, but this is not obvious in the specimen. The molars extended close to the position of the large incisors, leaving no hiatus like that in Rhinoceros, Mastodon, and the rodents, or like that in the Peccaries back of the canines.

Nearly all the molars have been lost in the fossil, the imperfect crown of the second true molar and part of that of the first alone being preserved. The base of the crown of the last of the series indicates a fore and aft three-lobed tooth, as in *Palæosyops*, *Titanotherium*, and *Palæotherium*.

The crown of the second molar is much worn, but in the entire

condition appears to have had nearly the same construction as in the genera just named. It was indeed suspected from the form of this tooth that the jaw belonged to *Palæosyops*, but to a smaller species than *P. paludosus*, the forepart of the jaws of which have not been discovered. The bottom of the symphysis of the jaw under examination reaches as far back as the position of the first true molar, but in a fragment of *Palæosyops paludosus* is seen not to extend as far as the last premolar. Other differences in the corresponding portions of the jaw indicate the animals to belong to different genera.

For the curious pachyderm, first brought to our notice by Dr. Carter, the name of TROGOSUS CASTORIDENS, or the Beaver-toothed Gnawing-hog, was proposed.

The fossil brings to our view an animal which would appear to have pertained to the stock from which diverged the Rhinoceros and Mastodon, the Peccary, and perhaps the Beaver.

Measurements of the fossil are as follows: Length of jaw from back of last molar to fore edge of symphysis, 4 inches 10 lines; depth of jaw below true molars, 1 inch 8 lines; depth of symphysis, 2 inches 8 lines; thickness of jaw above base, 10 lines; length of molar series from position of large incisors, 4 inches; length of true molar series, 2 inches 7 lines; space between large lateral incisors, 4 lines; fore and aft diameter of large incisors, $9\frac{1}{2}$ lines; transverse diameter of the same, 6 lines.

Another interesting fossil, discovered by Dr. J. Van A. Carter in the same locality as the former, is the portion of the ramus of a jaw of a carnivorous animal about the size of the Gray Fox. The specimen contains two teeth, apparently the last premolar and the sectorial molar, behind which are portions of two other teeth.

The last premolar is larger than in the Gray Fox, and is larger than the succeeding tooth, being both wider and higher. The principal cusp exhibits a feeble denticle in comparison with that on the back border in the Gray Fox. The heel of the crown is proportionately better developed than in the latter, and presents a fore and aft acute edge, from which the sides slope to the basal ridge.

The carnassial tooth is less in size than the tooth in advance. The crown has the same general form as in the corresponding tooth of the Foxes and Weasels. The forepart or sectorial portion of the crown is less well developed than in the Fox, and the inner cusp is half as large as the principal one. The notch of the sectorial border does not end in a cleft, as in the Fox. The heel or back portion of the crown is nearly half the breadth of the latter, and it includes a concavity bordered by a horseshoe-like ridge, as in the Weasels.

The next tooth is rather larger than the one described, and is inserted by two fangs. The forepart of the crown is broken away; the back part has the same form as in the tooth in advance. This may also have been a carnassial tooth.

The last tooth, the smallest of those in the jaw specimen, was also inserted by a pair of fangs. Its crown is broken away.

The animal indicated by the jaw fragment appears to have held a position intermediate to the musteline and canine families. It was proposed to name it SINOPA RAPAX, the former name, according to Prof. Hayden, being that applied by the Blackfeet Indians to a small Fox.

MR. THOMAS MEEHAN exhibited a specimen of Achillea millefolium, in which an underground stolon of an Agrostis had penetrated, and referred to a similar case, to which he had called the attention of members last year, where a Triticum had penetrated through large tubers of potatoes. He remarked at that time on the peculiarity of the growing force of plants which would rather endeavor to push directly through an obstruction, than turn to one side out of its straight course. He thought the present instance still more remarkable, as the living stem of Achillea was little thicker than ordinary brown thread, yet the grass had cloven it directly in halves in a manner we could scarcely imitate with a needle.

He then presented a quantity of sprouting peach-kernels, in order to call attention to the great variety of form which existed in the cotyledons. The most usual was ovate, the apex and base both regularly tapering, but some were obtuse—occasionally almost square—at the apex; while others were so lengthened out at the base as to give to the cotyledon a spathulate form. Others were cordate at the base, some more with the base of the lobes spurred, and others again which were simply gibbous on one side. We were, he said, all familiar enough with the fact of great natural variations in foliar and floral organs, but he believed no great differences in cotyledons have been exhibited here.

But he thought there prevailed a still greater interest in the lobing of the separate cotyledons. It was very common to find some which had one of the cotyledons separated for one-third the depth, some one-half, and occasionally two-thirds, and in some cases both cotyledons would be divided, so as to present the appearance of four perfect ones—that is, the two would be divided almost down to what might be termed their petioles. Still more interesting he thought the fact that, in one of the cases he exhibited, another plumula had been formed in the angle of the divided cotyledons. It had been his opinion that in many plants cotyledons were to be considered as modified axis, rather than modified leaf, speaking according to the general idea of stem-structure, for he inclined to the opinion that all axis originally is but modified leaf—and in these cases it would seem as if the cotyledons had started to make another mode of growth, as a true stem axis would do.

In regard to the number of cotyledons, he thought a close examination might find it variable in many classes of plants. Mr. Burk, of the Academy, had called his attention to the fact that it

was by no means uncommon for the common morning-glory (*Convolvulus purpureus*, L.) to have three cotyledons. In Coniferæ the numerical variations were well known.

Amongst the peach cotyledons was one in which the radicle, with numerous branching fibres, had pushed several inches beneath the integuments, and coiled themselves about the cotyledons. The interest here was, that this had evidently taken place, before the seed had quite finished its growth in the fall, as there were grooves all along the surface of the cotyledons which indicated that they had rather grown around the fibres, than that the latter had forced their way through after the cotyledonous growth had been completed.

Mr. Meehan further exhibited two stalks of a *Lilium candidum*, the common white lily, grown in a greenhouse by Mr. W. C. Strong, of Brighton, Mass., which, instead of the usual flowers, had each terminated in two large scaly bulbs, one inch, and one and a half inches in diameter, precisely similar to those produced under ground. In the ordinary growth of this lily, the spring leaves, which started from the scales, were broadly ovate, not long and narrow as the stem leaves were, and in these terminal stem-bulbs the broad leaves terminated the scales in the same way, giving the flower-stems a peculiar coronetted appearance. He explained a difference in the bulblets we often find in some lilies, and true bulbs, in this, that bulblets form in the axils of the leaves; and while the scales of the true bulb were simply dilated and succulent leaf-stalks. They had no axillary buds visible. These axillary buds were, however, really formed, but were absorbed by the leaf structure, as he had shown in past times was the case in *Cassia marilandica*, when accounting for the gland on the petiole of that plant In the case of the lily, however, the bud, though absorbed, did not wholly lose the power of development, for though, if suffered to remain on the parent stem, scales, absorbed buds and all, usually died away, yet if these scales were removed so that the matter stored in them was not absorbed by the growing flower-stem, the latent bud in the scale would develop itself into a bulblet, which the next year would become a bulb of the ordinary character. It was in this way that the lily was now so extensively propagated by commercial florists.

May 23.

The President, Dr. Ruschenberger, in the chair.

Twenty-eight members present.

The following papers were presented for publication:—

"On the fishes of the Ambyiacu River." By Edw. D. Cope.

"Descriptions of new species of fossils from Ohio and other western States and Territories." By F. B. Meek.

"Contributions to Orthopterology." By Prof. C. Thomas.

1871.]

Prof. Leidy directed attention to some remains of *Palæosyops*, recently received from Dr. Joseph K. Corson, U. S. A., who discovered them at Grizzly Buttes, near Fort Bridger, Wyoming Territory. They were more complete than those from which this curious tapiroid animal was first characterized, and mainly consist of portions of several lower jaws.

The specimens exhibit teeth, and fragments and traces of others indicating, at least, a series of six molars, which approached so closely the position of a large canine tooth, as to indicate that little or no hiatus existed between the former and the latter. The back portion of the lower jaw is broad and deep as in the Tapirs, and a deep concavity occupies a position externally in advance and below that of the condyle. The body of the jaw is thick and strong, with a thick convex base. The bottom of the symphysis appears hardly to have reached the position of the anterior premolar.

The lower true molars are like those of the *Palæotherium*, *Anchitherium*, &c. The outer portion of the corresponding upper molars likewise resembles that in the genera just named, but the inner portion is different. The antero-internal lobe is a low cone with a base expanding so as to occupy two-thirds the inner portion of the crown. The postero-internal lobe is trilateral. The last upper premolar has the crown composed of an outer pair of conical lobes, and a single larger inner cone. The last lower premolar is like the succeeding true molars. The lower penultimate premolar has the anterior lobe of its crown proportionately more, and the posterior lobe less, developed than in the succeeding teeth. The series of the lower true molars measures $3\frac{3}{4}$ inches; the depth of the jaw below the interval of the second and last true molars is $2\frac{3}{4}$ inches. The last lower molar measures 19 lines fore and aft. The second upper true molar is $16\frac{1}{2}$ lines transversely and fore and aft. The last upper molar is about 19 lines fore and aft at its outer part.

Mr. Thomas Meehan said he had recently observed that a clasping motion when touched existed in the stigma of *Torenia asiatica*, similar to that well known in the leaf of *Dionæa muscipula*. In this the stigma was cloven into two flat valves, which were usually expanded and somewhat revolute; when it was touched on its inner surface, the valves slowly closed together. The motion could scarcely be perceived, on account of the smallness of the parts; but it occupied in a total closing only about thirty seconds.

He also exhibited a branch of *Cissus amazonica* in which the tendril, usually situated on the stem opposite to a leaf, was in one instance on the other side, under the leaf, as if the leaf were axillary to the tendril. He remarked that the best botanists did not seem united in their opinions as to the correct morphology of the tendril in vitaceous plants. He had supposed the basis of structure in this

order was that of opposite leaves, only that on one side of the node, instead of the opposite leaf and axillary bud, the whole had been developed into a tendril, thus giving the appearance of an alternate-leaved structure. This appeared the more probable as the Phyllotaxis was in the half arrangement so common in opposite-leaved plants. But the appearance of the tendril, as in this case, could scarcely be deemed possible under this view, and it might be that the tendril really belonged to the leaf system opposite, as we saw it in *Cucurbitaceæ*, *Passifloraceæ*, &c., only that it had become twisted around on the opposite side. We saw this tendency in Cucurbitaceæ. Instead of being exactly over the leaf axil as in Passifloraceæ, it was twisted so as to extend one-third the way round the axis in Cucurbitaceæ, and it might, therefore, get half-way round in the grape-vine and other vitaceous plants. But he simply made this as a suggestion. He thought that at any rate the appearances of the tendril in this instance might be of service to those who were studying the morphology of tendrils in this tribe of plants.

The death of Mr. Stephen Morris was announced.

May 30.

The President, Dr. Ruschenberger, in the chair.

Twenty-two members present.

The report of the Biological and Microscopical Section for January, February, March, and April was received.

The following gentlemen were elected members: Wm. Campbell Gatzmer, and Samuel P. Wetherill.

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

NOTES ON THE NATURAL HISTORY OF FORT MACON, N. C., AND VICINITY. (No. 2.)

BY ELLIOTT COUES.

As the identification of the Fishes and Insects that were collected seems likely to be delayed, our "Notes" are continued[1] with lists of the Crustacea Decapoda, and of the Shells, mostly marine, as well as of a few other marine Invertebrates.

CRUSTACEA DECAPODA.

The identifications of most of the species were made by Prof. S. I. Smith, of the remainder by Dr. Wm. Stimpson. The majority of the specimens referred to, including all those taken with the dredge alone, were collected by Dr. A. S. Packard and myself.

Libinia canaliculata.

Dredged in various parts of the harbor, and found common on Bird Shoals. (*Cf.* Streets, these Proceedings, 1870, pp. 104–5.)

Cancer irroratus, Say.

Beach and elsewhere.

Menippe mercenaria. "Stone Crab."

Common, and highly esteemed as an article of food. It is much less generally distributed than, not so abundant as, the common edible crab.

Panopaeus herbstii, Edw.

Panopaeus herbstii var. obesus.

Pilumnus aculeatus.

A few specimens, dead on the beach.

Platyonychus ocellatus, Latr.

Dredged, and dead on the beach.

Callinectes hastatus, Ordway.

Exuviæ found in great numbers in shallow pools in the marsh, middle of April.

Achelous spinimanus.

[1] From p. 49 of these Proceedings for 1871.

Achelous gibbsii.

Achelous depressifrons.

Arcnæus cribrarius, Dana.

Sesaima reticulata, Say.

Sesaima cinerea, Say.

Gelasimus pugilator, Latr.

Gelasimus minax, Lec.

Gelasimus pugnax, Smith.

The fiddler crabs occur in immense numbers throughout the marsh, and the muddier banks of the harbor. The three species given above were taken together, and appear to associate indiscriminately. They form a considerable part of the food of various birds, especially the herons, rails, gulls, fisherows, and grackles, and many are destroyed by the larger crabs, as the Stone, and the common edible species. They may be found at all seasons, but are much more numerous during the warmer months than in winter, when, however, some are seen abroad; and they may always be taken by digging into their holes. Of their numbers one who has not seen them can form no adequate estimate: they gather about decaying substances until the ground for several square yards may be completely covered; and troops running through the scant herbage of the marsh make a rustling sound. They doubtless exercise great influence upon the natural economy of the localities they frequent, in devouring decomposing matters, both vegetable and animal. They swim with ease, but in general avoid the water, and appear to prefer rather dry and sandy places to the heaviest mud. This preference is especially marked in the selection of places for boring the holes; this is done chiefly, I think, during the night, at least I do not remember to have seen the animals so engaged; and frequently places I had walked over the day before, when there had been no holes seen, were riddled through in the morning. The holes average in diameter little over half an inch, and look exactly as if punched by the end of a walking-stick; they are sunk at all angles with the surface, are oftener tortuous than straight, and generally a foot, or less, deep. Little piles of sand near the entrance show the fresher excavations, as they are soon levelled by natural causes. The tunnels are

probably at first the exclusive right of the individual digging them, but the proprietorship is not observed, at least on an occasion for alarm, when the crabs tumble promiscuously into the nearest one, often with struggle for precedence; and it is particularly amusing to see some large individual, caught away from his own habitation, stick in a hole too small for him, or try several such in desperate hurry. I noticed that the animals went in either side first with equal facility. Without alluding to what may have been the specific characters used to separate the above species, I should judge that specimens incontestably the same varied indefinitely in coloration. The great claw of the larger individuals is sufficiently strong to bring blood from the finger. Although pretty active, they are much less swift-footed than the next species, and may be easily captured by hand. The only use to which I knew of their being put, was to bait hooks for fish, for which purpose they are well adapted, being greedily taken by sheepshead, sea-trout, and other smaller kinds.

Ocypode arenaria, Say.

While the preceding kind is confined to the marsh and adjoining soil, the sand-crabs are equally restricted to the beach and the clean dry sand of the dunes, there forming one of the most conspicuous features of the locality. Although they do not occur in such immense numbers as the fiddlers, they are numerous enough to act as efficient scavengers in their own territory; and, particularly during the summer months, hundreds may be seen in a few minutes' walk. At times they gather in troops of considerable size, though never very closely aggregated, and march together to near the water's edge. Each one throws up a little embankment of sand or digs a slight pit for himself, and they all lie in wait for their prey. When disturbed at such times they scamper *en masse* into the surf, and such is their custom, also, whenever caught too far away from home. But they are apparently not at ease under water, and seek the first chance to creep safely out. Whenever a shark or other large fish is rotting on the beach, they fairly invest the carcass, encamping closely about it, and not raising the siege as long as anything edible is left. I think their holes, the mounds around which dot the neighboring sand, usually or often connect with the meat under ground; because in digging out remains of cetaceans, the crabs are often turned out with the

spade. The holes are usually just large enough to admit the hand a little way, and pass in every direction downwards; may be straight or tortuous, and from a few inches to a yard or more in depth; two or three feet may be an average excavation. Usually the sand is heaped up about the entrance, and forms quite a conspicuous mound. It is apparently simply pushed out in most instances; but in one instance that I examined with particular care, this was not the case. The hole was in perfectly dry and drifting sand, and all around, at varying distances, from a foot to over a yard from the entrance, lay little separate piles of fresh wet sand brought up from below; a different set of tracks leading to each heap. This showed that the animal had repeatedly brought up an armful of sand, and dumped it at some distance. The holes, I may add, are almost invariably placed above ordinary high-water mark, mostly in the flat dry shingle separating the beach proper from the adjoining sand-drift dunes. A small proportion of the crabs live in the sand-drifts still back of this, and a few others come about the houses near the fort, digging in odd corners, and to all intents and purposes replacing the house-rats. Their remarkable swiftness of foot is well known; and when brought to bay, their pugilistic attitudes and actions are as noticeable as is the sly cat-like aspect they present when crouching closely, in hopes the intruder will pass them unnoticed, or in lying in wait for prey. The large claws are of porcelain-like whiteness and hardness, and capable of inflicting a wound not to be overlooked in a moment; but the general covering is so soft that the animals are disabled, or even killed outright, by being simply dropped upon the hard sand from the height of a man's head. The young, which are at first spotted, and bear little resemblance to the adults except in shape, begin to appear in the latter part of April; and they are an inch or more wide before they begin to assume the general dull yellowish color of the adults. These crabs are put to no use, except to afford excellent sport to boys and boyish men, who bait them with their canine companions.

Pinnotheres ostræum.

The oysters furnish the usual numbers.

Persephona punctata.

Common, on the sand-bars, &c.

Hepatus decoris.

Dredged, and found on the beach.

Hepatus angustatus, White?

Hippa talpoides, Say.

Very common, in sheltered portions of the sandy shore, the sand-bars, clear tide pools, &c. They often gather in large numbers in the pools among the stone jutties along the beach, actively swimming about in a manner that forcibly recalls the similar sports of the *Notonectes*, and burying themselves in the sand with remarkable speed. Females with eggs were taken early in May.

Eupagurus pollicaris, Stimp.

Eupagurus longipes, Stimp.

These two hermits are found in every locality about the harbor, except it be, perhaps, along the open beach, and in the muddiest parts of the marsh. They were dredged in the deepest portions of the channel, and are numerous in the tide-pools along the shore and on the sand-bars. The smaller species is much the most abundant, and finds ample accommodation in *Nassa obsoleta*, of which there are thousands dead everywhere, *Littorina*, and shells of similar shape; the other is usually taken in young *Busycons*, *Fasciolariæ*, and the *Cancellaria reticulata*.

Palæmon vulgaris, Say.

(*? Palæmonopsis carolinus.*)

Peneus braziliensis, Latr.

The smaller shrimp I only noticed about the pools in the marsh, where it is extremely abundant. It is not, to my knowledge, used in this locality, as the other frequently is. The latter occurs in great numbers along the inner shores of the harbor and about the sand-bars, and more sparingly in clearer parts of the marsh.

Homarus americanus.

One specimen was taken during the summer of 1870, the first I ever heard of in this locality; and it was a question whether it had not been lost overboard from some vessel coming southward.

ENTOMOSTRACA.

Limulus polyphemus.[1]

Common, but much less abundant than further north. It may be taken at any season, but is especially numerous in May, when it resorts to the shoal water about the harbor to spawn. About the middle of this month hundreds were noticed on Bird Shoal, these mostly copulating or seeking to do so; and all the females examined were laden with eggs. One specimen taken presented a curious monstrosity, having the tail bifurcated at the extremity for over an inch. One of the forks was rather smaller than the other, and stood out more obliquely from what appeared to be the proper termination.

CIRRHIPEDIA.

Balanus eburneus?

In profusion, on all hard submerged objects.

Two other species of cirrhipeds occur, chiefly, it would appear, on wood, &c., that has floated from some distance southward.

ANNULATA.

BRACHIOPODA.[2]

Lingula pyramidata, Stimp.

This animal can be procured in any desired numbers, with little trouble, in a particular part of the harbor. After numerous trials, the best place was found to be the southern side of Bird Shoals (side next the fort), and in a straight line between the flagstaff upon the fort and the large building at the eastern extremity of

[1] On the development of this animal, see LOCKWOOD, S., "A Contribution to the Natural History of the King Crab," read October, 1869, N. Y. Lyc. Nat. Hist.; and "The Horse-Foot Crab," Am. Nat., IV., July, 1870, p. 257; and A. S. Packard, jr., abstract of a paper read before the 19th meeting of the A. A. A. S. in the Am. Nat., IV., October, 1870, p. 468.

[2] Mr. E. S. Morse's discussions of the position and relations of the group, as "a division of *Annelida*," which have attracted so much attention, will be found in the Am. Nat., IV., July, 1870, p. 314; Am. Journ. Sc. and Arts., 1870, (abstract from Pr. Bost. Soc. N. H.); Am. Nat., IV., Oct. 1870, p. 493 (abstract from Proc. of 19th Meeting of A. A. A. S). An abstract of a paper by W. H. Dall in the same number of Nat., p. 510, gives an opposite view of the case. Prof. W. C. Kerr (abstract of a paper in Am. Nat., Nov. 1870, p. 571) ascribes the origin of the Carolina phosphates to *Lingula*.

the town of Beaufort. This is a solid and apparently nearly stationary part of the shoals, where the sand is somewhat packed and matted with a scant growth of some marine grass. No specimens whatever were found, although carefully sought for, in more exposed and shifting parts. As the shoal is flooded over with two or three feet of water at high tide, and the animal lives only about at or below low-water mark, it can be gathered only during an hour or two when the tide is fully out. They will be found a few inches below the surface, and may readily be procured by the expedient devised by Mr. Morse, of digging up spadefuls of sand, and sifting it through a coarse sieve held partly under water. It will be found most convenient to wade into the water where it is a foot or less deep, and dig there, as there is then no necessity of carrying the sieve back and forth. In this way Mr. Morse, Dr. Packard, and myself once procured over fifty in about an hour, and I several times took twenty or thirty in the same time. They should be carefully picked out from the stems and roots of the grass in which they are found entangled after sifting, and placed in a basin or bottle of water with some clean sand, where they may be kept alive for an indefinite length of time. Mr. Morse wrote me that all the specimens he took north in May, were alive several months subsequently. Other interesting specimens may be procured along with the Lingulas, in the same way; as numerous tubicolous worms, an ophiuran, *Renilla*, and the rare and highly prized *Branchiostoma*.

CEPHALOPODA.

I have not the means of identifying the following species, and merely presume that the names may be correct, from the circumstance of their occurring in Kurtz's list.

Octopus granulatus, Lam.

One specimen, measuring about three feet across the tentacles, was brought to me in winter by some fishermen, who considered it a rarity.

Loligo brevipinna, Lesueur.

Rather common; several specimens obtained at different seasons.

The collection of *Marine Shells* was referred to Sanderson Smith, Esq., for determination; and the names in the following

list, with a few exceptions, rest upon his identifications of the specimens. His critical observations are introduced between quotation marks. My own notes, though merely those of a collector, may prove of some use to future observers in this locality; their general accuracy is believed to be unquestionable.

In May, 1870, Dr. Packard and Prof. Morse visited Fort Macon, bringing a dredge; and all the species exclusively obtained with its use are among the results of our joint collecting.

The list is restricted to the species actually collected, and contains a few not previously recorded from this locality.

I cannot do better than to reproduce in this connection a part of the prefatory remarks in Dr. Stimpson's article.[1]

"The vicinity of Cape Hatteras, the most projecting point of our coast south of New York, has peculiar interest to the student of zoology. This Cape, which divides the Areniferous region into two nearly equal parts, the Virginian and Carolinian provinces, is remarkable for the exhibition of a fauna more tropical in character than that of either of these provinces. * * This is an evident result of its proximity to the gulf stream, the warm waters of which are even said to be deflected directly upon the cape after violent southeast gales.

" * * The harbor of Beaufort is situated at one of the southern outlets of Pamlico Sound, where it joins Bogue Sound. It is shallow, and much obstructed by extensive shoals. * * The bottom is generally sandy, but that of the deeper channels is shelly, and that of the shallower channels often muddy. Outside the harbor, and off the coast, the depth never exceeds eight fathoms within a few miles of the land, with a variable bottom, sometimes 'sticky' or clayey. * * In following the beaches, we observed a decided increase of the tropical character as we proceeded eastward toward the Cape.

"Geologists will be interested to notice the occurrence of several species hitherto only known as Tertiary fossils, such as species of Axinæa, Lucina, Astarte, Amphidesma, Tellidora, Myalina, Panopæa, Entalis, and Columbella. These were found either alive or in such condition as showed them to be recent shells, which would doubtless have been found alive upon further search. The occurrence of *Myalina subovata* is interesting, although our specimens

[1] American Journal of Science, May, 1860.

of this species, as of *Amphidesma constricta*, are not certainly recent, being only single valves. Of the beautiful *Tellidora lunulata* we obtained several living examples, some attaining a length of nearly two inches. Among the shells of a tropical character several species will be noticed which have not hitherto been found north of the West Indies, and do not exist upon the South Carolina coast."

Beaufort, Fort Macon, and the Morehead Depot are nearly equidistant, and about two miles from each other. Vessels of ordinary tonnage reach Morehead by the nearly direct ship-channel, but none larger than schooners of the lightest draught can reach Beaufort, between which and Fort Macon lies a small island. The entrance to the harbor is comparatively narrow; and as a large body of water passes through it twice a day, the current in the main channel is strong. This sweeps sharply close past the projecting extremity of Bogue Banks, but its erosive action seems to be about counterbalanced by that of the S. to W. winds which almost constantly prevail, depositing sand as fast as it is removed. I can account only in this way for the permanence of this, the most exposed point in the harbor. The waters that pass through the main outlet are collected from several widely separated directions from E. through N. to W.; and this is one evident cause of the numerous shoals that now obstruct the harbor, deflecting the different currents, and increasing as well as continually varying their conflict with each other. As a result, the hydrography of the harbor is notably inconstant, and surveys can be relied on in detail only for comparatively short periods. The channels and minor water-lines are especially susceptible of change, because the land consists almost entirely of loose sand. No better illustration of general instability is required, than the present condition and situation of what was once the site of Fort Hamilton; now a slight shoal indicated by breakers between Fort Macon and the western point of Shackleford, nearly a mile from the present Fort. This last has only been preserved from the encroachment of the sea, which once washed the base of the glacis, by a system of stone breakwaters laid down on the outer beach, which have carried the water-line outward one or two hundred yards. Details of the contour of the beach change noticeably with every considerable storm; and within the harbor, the shoals have very perceptibly varied in extent and shape during the short

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time they have been under my observation. Bird Shoals, the most extensive of these, is believed to be now cutting in two; and it will probably in time form two islands, covered with vegetation, like the "town marsh," above mentioned as now lying between Beaufort and Fort Macon. A current directly across it, in a line from Beaufort to the point of Shackleford, is already perceptible during a part of each tide.

The formation of the long, narrow islands that girt so large a portion of the southern coast, is excellently shown here. Along a considerable part of Shackleford and Bogue Banks the loose sand is blown by the prevailing off-sea winds, and heaped up to such extent, in some places, as to bury trees twenty feet high. At other points the reverse action of the elements is witnessed, in the stumps of trees, apparently cedars, that are denuded at low tide.

The general character of the shells that are so abundantly strewn on the outer beaches, may be gathered from the list; of these, as distinguished from those not likely to be procured except by dredging, the list is believed to contain very nearly all; the exceptions being chiefly such as only occur nearer Hatteras, alluded to in Dr. Stimpson's article. The abundance of fossil species found on the beach, as the several *Arcas* and others, is especially noteworthy. I should judge that nearly half the number of individual shells (not, of course, of the species) are not certainly recent. In the harbor, Bird Shoals will be found the most fruitful collecting-grounds when the dredge is not used. This is a mile or so long, by half as wide, almost perfectly flat, alternately covered with two or three feet of water and completely exposed. The edges are loose and shifting, but most of the surface is somewhat fixed, and supports a slight sparse growth of marine plants. This portion affords the best things. A considerable proportion of the living shells of the locality may be found there. The sand is full of tubicolous worms of several different species. Several Echini, star-fishes, and jelly-fishes lie just about its edges. It is the favorite spawning-ground of *Limulus* and two or three *Busycons*. An Ascidian, an Ophiuran, *Renilla reniformis*, and *Synapta* (?), are abundant. Two or three specimens of the rare *Branchiostoma* were secured in sifting for *Lingula pyramidata;* of which last, as stated elsewhere, any desired quantity can easily be procured

In forming the present collection of marine invertebrates, every part of the harbor was pretty thoroughly explored with the dredge, which, however, was not used outside. Nearly everywhere the depth of water proved less than we had been led to expect, and the bottom freer of everything except shelly detritus. Upon the whole, the results of dredging were not in a usual ratio, in interest and importance, with those of collecting by hand on the shoals, &c. I mention this fact, which surprised us at the time, as it goes to show the changeableness of the locality. Probably some of the dredging-grounds worked over by Drs. Stimpson and Gill, in 1860, are not now such.

The following names occur in Dr. Stimpson's list and not in the present one :—

Cynthia vittata; Molgula sp.; Ascidia sp.; Plicatula sp.; Lima sp.; Axinæa sp.; Arca cælata; Pinna carolinensis; Modiolaria lateralis; Lucina cribraria and two other species; Felania; Lepton lepidum; Astarte undulata; Trigona sp.; Venus rugosa?; Chione pygmæa; Lucinopsis n. sp.; Semele reticulata; Tellina fausta, versicolor, constricta, T. sp., T. n. sp.; Strigilla carnaria; *Tellidora lunulata;* Solen viridis; Saxicava distorta; Lyonsia sp.; Pholadidea cuneiformis; Tornatella punctostriata; Dentalium sp.; Clypidella pustula; Scalaria turbinata, multistriata, novangliæ?; Turbonilla sp.; Volva uniplicata; Mangelia rubella, filiformis; Columbella sp.; Nassa ambigua?; Cerithiopsis? n. sp.; Acus concavus.

Additional ones of the present list are: Pecten sp. (fossil?); Arca occidentalis, transversa, limula (fossil?); A. sp. (fossil?); Modiola castanea?; Gemma tottenii; Strigilla sp.; Cochlodesma leana; Crepidula, var. intorta; Pleurotoma plicata; Marginella apicina; Cypræa exanthema; Nassa?; Rapana cinerea.

Some of the undetermined names in the two are presumably the same, and several of those in Dr. Stimpson's list have without doubt been also found by me, but, in consequence of the miscarriage of a box containing them, were never finally determined.

Ascidia.

A species we have not determined is very common on Bird and other shoals

LAMELLIBRANCHIATA.

Anomia ephippium, Linn.

Abundant in all situations.

Ostrea virginiana, Latr.

Abundant, of excellent quality; worth, according to season, from 25 cents to 50 cents per bushel.

O. equestris, Say.

Abundant; adhering to rocks, with *Modiola* and *Mytilus*.

"Prof. Stimpson informs me that this is not a N. C. species, although it is in his Beaufort list. The specimens seem to me to agree exactly with Say's description and figure; they are short and small, with from six to twelve denticulations on the upper valve near the beak, received into corresponding depressions on the edge of the lower valve."

Plicatula depressa, Lam.

Frequent. Beach.

Lima scabra, Born.

Nos. 2615–6–7, dredged in the channel.

Pecten dislocatus, Say.

Abundant. All the live ones I saw were on the sand-bars and somewhat muddy flats about the harbor; the worn and variously discolored valves are strewn everywhere. The scallops bring a high price in the market; the muscle is considered the only edible part. These molluscs, and the large *Cytherea*, furnish some part of the food of the herring gulls in winter.

"Distinguished by the interrupted and dislocated colored markings from *P. irradians*, Lam., which has concentric bands of color. Some of the specimens probably belong to this last species; but all the perfect ones I examined, even though showing prominent concentric bands, display the zigzag markings, especially when placed in water, so as to bring out the colors."

Pecten concentricus, Say. (*P. irradians*, Lam.)

Among the interminable variations in color of worn specimens, some are pure white, or with only faint coloration in apparently perfectly regular and concentric bands.

Pecten nodosus, Lam.

Apparently very rare; one valve only (No. 2584); beach, worn, in winter.

Pecten, sp. indet.

One specimen (No. 1687), fragment of a large species. "Probably fossil."

Pectunculus, probably **charlestonensis**, Holmes.

A few specimens (Nos. 1704, 2504, 2640) from the beach.

"I think there is another species, much smaller. There ought to be a good many fossil *Pectunculi*, of which eleven species are given by Conrad in his list of the miocene shells of the Atlantic slope, most of them from North or South Carolina. Living or fresh specimens would be of great interest."

Arca americana, Gray.

Very common, beach and elsewhere, both living and dead.

Arca holmesii, Kurtz.

Beach and elsewhere; very common.

"I have seen no detailed description nor authentic specimen of this species, and am uncertain whether a detailed description has ever been published. I feel no doubt, however, of the correctness of the identification" (of Nos. 2500, 49, 50, 1, 3, 4, etc.).

Arca lienosa, Say.

Beach, frequent; all the specimens I gathered were discolored and more or less worn.

"Fossil? Say described it as fossil, but Stimpson has it in his recent list."

Arca noæ, Linn.

More abundant than the next, to judge from specimens gathered indiscriminately. Beach; generally much worn.

"*A. zebra* Swainson, according to Say. Whatever is the proper name of this, it is certainly the shell that Say describes and figures (Conchology, Binney's Reprint, p. 229, fig. 66)."

Arca occidentalis.

Beach, common; usually worn.

"Prof. Stimpson says this is different, and I see a very plain distinction; in *noæ* the ribs are alternately large and small, while

in *occidentalis* the larger ribs are comparatively few and distant, with three or four smaller ribs between each pair."

Arca transversa, Say.

"I find some small specimens that I think are this species, but am uncertain whether they are not the young of some of the others, especially as Stimpson does not include it in his Beaufort list. Kurtz, however, gives it from both N. and S. C." I should add, that Prof. Stimpson, in looking over an early lot of shells I sent to the Smithsonian, made the same identification, presumably from the same specimens that Mr. Smith subsequently received.

Arca limula, Conr.

Beach, frequent. The specimens were without exception grayish or rust-colored, with a chalky appearance in places.

"Fossil? Conrad quotes it as a miocene fossil from the Neuse River, below New Berne, and from Wilmington, N. C. It agrees perfectly with Conrad's description and figure (Mioc. Foss. U. S., p. 60, pl. 31, fig. 3)."

Arca ponderosa, Say.

Beach; fresh or living specimens, common.

Arca incongrua, Say.

Beach; the most abundant of the genus, apparently; and, with the last, oftenest found alive.

Arca.

"Numerous specimens, all I think fossil; and I have not the means of determining them."

Nucula proxima, Say.

Dredged, in the channels.

Yoldia limatula, Say.

Beach, occasional, and dredged.

Leda acuta, Conr.

In the sand, frequent, Bird Shoals.

Pinna seminuda of Kurtz's list.

Abundant. There may have been another species among the many specimens gathered, only a few of which were forwarded.

Avicula atlantica, Lam.

Not common; only two specimens secured.

Modiola plicatula, Lam.

Very abundant, in the muddier parts of the marsh, below high-water mark, and thence part way out to the beach; but no live ones seen in the sand of the beach itself. In the former situations, the shells closely assimilate in color to the ground in which they are partly imbedded; in the sand, they are clearer, and show the purplish hues. The larger ones are generally found singly, anchored to bits of stick, the roots of plants, etc.; the smaller, in masses, along with *Mytilus*, adhering to plats of raccoon oysters, the stones of the wharves at Beaufort, and the jutties of rock on the beach.

Modiola americana, Leach.

Rather uncommon, on the beach only; none found alive, and most somewhat worn.

"Krebs gives '*M. americana* Tarvart d'Herbigny (*M. americana* Leach? *M. tulipa* Link, etc.)' and does not quote *M. tulipa* otherwise. Stimpson gives in the Check List *M. americana* (Leach), and among the doubtful species, *M. tulipa* Lam. In the Beaufort List, he gives both *M. americana* and '*M. tulipa*.'"

Modiola castanea, Say?

A single specimen, dredged alive in the channel.

"I have never seen an authentic specimen of this species, which Kurtz in his catalogue gives only from S. C. It seems to differ from *M. americana*, and to agree exactly with Say's description."

Mytilus carolinensis.

Abundant; adhering in masses to rocks and bunches of oysters.

Mytilus edulis, Linn.

Beach.

Mytilus cubitus, Say.

Chama arcinella, Linn.

Beach; rather uncommon.

Chama macrophylla, Chemn.

Beach and elsewhere, abundant. Dr. Stimpson informs me that this is near its northern limit.

Cardium magnum, Born.

The most conspicuous shell on the beach, by reason of its size

and striking variegated colors, as well as its abundance. Dead shells are strewn everywhere; and live ones (mostly young) may be found in every part of the harbor.

Cardium muricatum, Linn.

Beach; rather common.

Cardium isocardia, Linn.

Beach; common.

Liocardium lævigatum, Lam.

Beach; not uncommon; almost always worn, and with slate or blackish discoloration.

"*Cardium lævigatum* Lam. is given by Hanley as a syn. of *C. serratum* (Linn.), and *C. lævigatum* (Penn., and Linn?) as = *C. serratum* Lam. The first named is our species, the other coming from England."

Liocardium mortoni, Conn.

Dredged, and on the beach; but apparently not abundant.

Lucina strigilla, Stimp.

Extremely abundant everywhere; but no live ones seen. This is a favorite with the population in the vicinity for what they consider ornamental purposes—as, to paste on picture-frames, along with *Donax variabilis*, *Tellina alternata*, *Sigaretus perspectivus*, and *Scalaria humphreysii*.

Lucina chrysostoma (*L. radula* of Kurtz's list).

Very common, beach and elsewhere; no live ones seen.

Diplodonta? punctata, Say.

Dredged.

Astarte lunulata, Conr.

Dredged; apparently rare.

Cardita tridentata, Say.

Dredged, one or two specimens.

Mercenaria violacea, Schum.

The representative species, and extremely common.

Mercenaria violacea *var.* **notata.**

Several specimens, among numbers of round clams indiscriminately gathered.

1871.]

Mercenaria mortoni, Conr.

The quahogs with prominent recurved concentric laminæ are common, and, so far as I am able to judge, readily distinguishable from the more usual kind. Very large specimens (five to six inches) are scattered over the sand, half buried, on Bird or other shoals, where I did not notice *M. violacea*. I have seen boat-loads brought for sale, consisting entirely of the ridged kind, and was assured that they occurred in certain localities to the exclusion of the other species. The fishermen seem to make a distinction, and certainly I saw none that I hesitated to discriminate. Young specimens (two to three inches) are quite smooth between the fewer and sharper laminæ; in the largest ones the ridges become blunter and more crowded, and the whole surface is rugged.

Gemma totteni, Stm. (*Venus gemma*, Tott.)

Dredged.

Chione cancellata, Linn.

An abundant shell.

Cytherea convexa, Say.

Strewn in numbers over the beach. Of the many examples gathered, all show gray or olive discoloration, and are much eroded.

"Fossil? Stimpson does not give it, and Kurtz marks it 'N. C., fossil?' If fossil, the specimens are probably *C. sayana* Conrad, which he described and figured in his Miocene Fossils of the United States as identical with Say's *convexa*; but in his Catalogue of the Miocene Shells of the Atlantic Slope (Pr. A. N. S. Phila., 1862, p. 575) he states it to be different. I have seen no notice of the differences. It would be well to search for living shells."

Cytherea gigantea, Chemn.

An abundant and conspicuous species of the sand-bars and half muddy flats in the harbor; also dredged in the channel; not seen on the beach. The colors of equally fresh specimens vary much, in the general hue, and in the distinctness of the radiating dark lines; the young are generally brightest. They are always more or less scratched about the most convex part, where much of the epidermis may be worn off. This mollusc is a favorite article of food with the gulls; the birds hold them under foot much after the manner of hawks with their prey, and

break in one valve by repeated blows with the beak—a tedious process, it seemed, in some cases that I watched. The fracture of this shell is clean, sharp, and almost vitreous.

Dosinia discus, Reeve. (*Artemis concentrica*, Born.)

Very abundant; the dead ones, almost always with the hinge intact, are conspicuous on the beach; and some live specimens were procured about the harbor.

Lucinopsis, sp. indet.

Dredged.

Petricola pholadiformis, Lam.

Dead shells are common everywhere, but especially on the beach.

Raeta canaliculata, Say.

Beach, very abundant.

Raeta lineata, Say.

Not ordinarily common; but occasionally, after storms that seem to disturb some special situations they inhabit, they are strewn on the beach in large numbers.

Mactra raveneli, Conr.

Strewn in profusion on the beach and elsewhere. Most of the worn specimens are variously discolored.

"Probably what is catalogued as *M. oblonga*, Say, by Kurtz and Stimpson."

Mactra similis, Say.

With the last; not so common.

"I find among the specimens some that I think are this, but it is a doubtful species."

Mactra lateralis, Say.

Abundant, with the first.

Donax variabilis, Say.

Very abundant; living a few inches below the surface of the sand, chiefly of the beach itself. At certain states of the tide, &c., they are in the habit of coming to the surface, and of disporting with considerable agility. They must, however, be somewhat cautiously watched, as they have a sense of observation, whatever it may be, that imforms them of probable danger, and causes them

to disappear below with a degree of celerity that astonishes one who observes it for the first time.

This species is very appropriately named. In looking at some hundreds, I have found very few alike in color. After death the valves, like those of *Dosinia*, long remain joined.

Cumingia tellinoides, Conr.

Dredged; apparently not common.

Semele orbiculata, Say.

A few specimens, dredged in the channel.

Amphidesma constricta? Philippi.

Dredged? (Label misplaced.)

Abra æqualis, Say.

Common; valves on beach and elsewhere; and dredged.

Tellina alternata, Say.

The largest and most conspicuous, if not also the most abundant, species of the genus noticed. Valves everywhere; and dredged.

Tellina tenera, Say.

Tellina tenta, Say.

Tellina iris, Say.

These three species are common; *tenta* apparently less so than the two others; the specimens of it were all, I think, picked up on the beach, where both *tenera* and *iris* also occur. The two last, however, are more abundant on the sand-shoals, and in shallow dredging-ground; and, in particular, numbers of them were taken among eel-grass with *Bittium sp.*, which see. Some of the several other species of the genus given by Stimpson may also have been taken; but if so, were not identified.

Tellina polita, Say.

Strigilla flexuosa, Say.

Dredged.

Strigilla, sp. indet.

Solen ensis, Linn.

Abundant. Younger shells, living, are very numerous on Bird Shoals. *S. viridis* was not obtained.

Siliquaria gibba, Spengl. (*Solecurtus carribæus*, Lam.)

Very common; dead valves are plentiful on the beach, but still

more so on the shingle at the mouths of the estuaries that make from the marshes into the harbor, where the best specimens may be found.

Siliquaria bidens, Chemn.

Common, on the beach only, where all the numerous specimens were gathered.

Solemya velum, Say.

Not uncommon; living specimens dredged, and taken on Bird Shoals, a few inches below the surface.

Mya arenaria, Linn.

Not common, comparatively; occasional valves occur anywhere, but the species is not known here as an article of food.

Corbula contracta, Say.

Dredged; a few specimens.

Myalina subovata, Conr.

Dredged; a few specimens.

Panopæa americana, Conr.

Apparently rare; two specimens; one valve (No. 1818). very large, worn, was found on the beach, in winter; another (2494*a*), fresher and smaller, was taken the next winter, after one of the storms that threw up numbers of *Raeta lineata*.

Gastrochæna, sp.

Dredged; one specimen. I do not find the name among Mr. Smith's MSS., and think it was an identification of Mr. Morse's.

Cochlodesma leanum, Conr.

Lyonsia hyalina, Conr.

Dredged, I think (label misplaced).

Pandora trilineata, Say.

One specimen (No. 2618); beach.

Pholas costata, Linn.

Beach, very common.

Pholas truncata, Say.

Beach, frequent. As in the cases of several other species, I found valves quite plentiful at intervals, between which none were seen.

GASTEROPODA.

Polycera ? sp.

One specimen, dredged in the deeper part of the channel, about an inch long, noticeable for its bright blue and yellow tentacles.

Aplysia ? sp.

Two specimens of another nudibranch were taken Aug. 3, 1870, as they were floating on the surface of the water in the harbor, and the same species was subsequently several times seen. The animals were quite lively, moving about freely, especially if irritated, by a regular waving motion of the free edges of the tunic. When most contracted, they were of a flattened and somewhat irregularly oval shape, some three inches long; and were capable of stretching out between six and seven inches. Placed in water, the color appeared of a clear warm brown, pellucid-punctate all over; these whitish dots gathered in irregular patches, changing their contour with the animal's motions; when it was closely contracted, an open network of dark lines appeared all over the surface. Out of water, the whitish patches confer a general glaucescence upon a dull brown ground. The animal is tinted, especially behind, with carmine, from the deep lake-colored, viscid, glairy fluid it emits in a stream, apparently at will. Black eye-specks, distinct at the base in front of the posterior pair of tentacles. I have not the means, at present, of identifying the species, which seems to be not at all rare, but presume that it may be recognized by the above description.

Utriculus canaliculatus, Say.

Dredged, and on the beach.

Bulla solitaria, Say.

Dredged.

Chiton apiculatus, Say.

Fragments on the beach, and one perfect specimen, dredged.

Entalis pliocena, T. & H.

Numerous specimens, all dead; beach, and dredged.

Crepidula fornicata, Linn.

Very abundant, and the one oftenest found alive; one, or several together, upon the outside of other larger shells.

Crepidula fornicata, *var.* intorta, Say.

Several specimens.

Crepidula convexa, Say.

Common.

Crepidula unguiformis, Say.

Common; dead, anywhere; and alive, adhering to the *inside* of shells, such as *Neverita*, etc.

Fissurella alternata, Say.

Common; chiefly on the beach.

Zizyphinus, sp.

Very rare; a single specimen, dead, on the beach (No. 2516).

Turbo crenulatus, Gm. ?

A single *worn*, incrusted specimen (No. 2595), from the beach, evidently transported from a distance.

"Exactly like Cuban specimens marked *T. hippocastaneus* = *T. castaneus* (Chemn.), which, however, I do not find recorded from our coast."

Littorina irrorata, Say.

Extremely abundant, in the marsh; generally seen crawling up the culms of reeds and grasses, from which they drop at a touch. During summer they are so numerous in some places, that they almost give color to the herbage.

Scalaria humphreysii, Kiener.

"Blood-shells," so called often, from the purplish color of the soft parts that appear at the opening. Very abundant, chiefly on the beach, where occasionally they may be found touching each other, if not heaped. The purity of color and pleasing form of this shell render it a great favorite for those peculiarly ugly fabrications called "shell-frames."

Scalaria lineata, Say.

Common everywhere.

Solarium granulatum, Lam.

Vermetus radicula, Stimps.

Common.

Cerithium, sp.

Some specimens, as 1782, which apparently Mr. Smith did not receive, were mentioned to me by Dr. Stimpson as "*Cerithium ferrugineum?*"

Bittium nigrum, Tott.

Bittium greenii, C. B. Ad.

Dredged.

Bittium, sp.

Extremely abundant in the shallowest and most sluggish parts of the harbor, adhering to marine plants. On forcing a boat through beds of this vegetation, where the water hardly covered the dredge, we took scores of specimens in a few minutes; and the same haul showed the following: Tellina tenera, T. iris, Columbella avara, Abra, Nucula, Corbula, Obeliscus, Turbonilla interrupta, Arca holmesii, Nassa vibex, obsoleta, &c. The Bittiums were blackish, and covered with vegetable matter.

Triforis nigrocinctus, C. B. Ad.

Dredged.

Odostomia seminuda, C. B. Ad.

Dredged, in deeper waters.

Odostomia impressa, Say.

Dredged, with the last.

Turbonilla interrupta, Tott.

Beach and dredged.

Turbonilla? sp.

Specimens in a large miscellaneous lot gathered on the beach.

Obeliscus crenulatus, Holmes.

Dredged.

"I have not access to Holmes's description, but think this must be his shell."

Eulima oleacea, Ktz. and Stm.

Dredged? (Label misplaced.)

Sigaretus perspectivus, Say.

Very common. Dead shells are plentiful everywhere; and on Bird Shoals the live animals are frequently found. The largest animals measured about four inches across, with a shell of an inch or more.

Natica pusilla, Say.

Not common. Two or three specimens dredged.

Neverita duplicata, Say.

Abundant.

Cypræa exanthema, Linn.

Rare; one specimen (No. 1810), a worn fragment, so identified by Dr. Stimpson.

Pleurotoma cerina, Ktz. and Stm.

Dredged.

Pleurotoma plicata, C. B. Ad.

Dredged.

Marginella apicina, Menke.

Dredged, and frequently found on the beach.

Oliva litterata, Lam.

Very common; called "Key-shells."

Olivella mutica, Say.

Very abundant; "Bead-shells."

Columbella avara, Say.

Common; beach, shoals, and dredged in various parts of the harbor. "Some are of unusually bright colors."

Columbella ornata, Ravenel?

Several specimens.

Columbella lunata, Say.

Several specimens dredged.

Dolium galea, Linn.

Beach, frequent.

Semicassis granulosa, Brug.

Common.

Cassis cameo, Stm.

Common; but I never saw it alive, and nearly all the specimens noticed were worn, and usually also with slate discoloration.

Purpura floridana, Conr.

Rare, I should judge, having obtained but few specimens—Nos. 1757 and 2588 (a broken one), and two live ones.

Ilyonassa obsoleta, Say.

I should judge this to be the most abundant shell of this locality, *Littorina*, even, not excepted. Myriads cover the sand-1871.]

shoals and mud-bars of the harbor, and the mud of the marshes, in some places so thickly that no step can be taken without treading them under foot. They may be dredged at all depths; and bleached shells are heaped in some places. Such numbers, in devouring decaying vegetable substances, must exercise decided influence in the natural economy of the locality. The dead shells of this as well as of the species of the next genus afford the most usual accommodations of the smaller *Eupaguri*. Many specimens may be found with the apex perfect; but in such cases it is usually lighter colored and more fragile than the rest of the shell, as if already devitalized.

Nassa vibex, Say.

Common.

Nassa trivittata, Say.

Common.

Nassa ——?

Several undetermined specimens; and others marked "*Nassa vibex?*"

Cerithiopsis terebralis, C. B. Ad.

Dredged, in the channel.

Acus dislocatus, Say. (*Cerithium petitii*, R.)

Very abundant. The species lives mostly on the shoals and in the shallower dredgings; dead shells are found everywhere.

Rapana (Fusus) cinerea, Say. (*Buccinum plicosum*, Menke.)

Common on the beach and dredged in various places. The shells are too numerous to be likely to escape ordinary observation (and the species may have been accidentally omitted from Dr. Stimpson's list). "I have some doubt about this identification, as there appears to be some difference in the canal and outer lip; but if not this, I do not know what it is."

Busycon pyrum, Dillw. (*Fulgur pyruloides*, Say.)

Not common; two or three specimens only, dead, from the beach.

Busycon canaliculatum, Linn.

Common, but less so than the next. While the many specimens examined seemed to me constant in form, the colors are notably variable. Nearly all are white, more or less pure, outside, but the older ones have a rough brownish epidermis; inside, the

tint varies from nearly white or pale delicate yellow to bright salmon-color.

Busycon carica, Linn.

Abundant; probably there are ten or more of this to one of the last or of the next. They are used for food by the lower classes.

This pyrula spawns in May. I have observed and taken numerous specimens with the egg-case issuing from them. At this season the females resort to the shoals covered with a foot or so of water at high tide, and exposed at other times. They bury themselves a few inches below the surface of the sand, and doubtless remain stationary during the whole process, which appears to require considerable time (not ascertained, even approximately). The case is thrust upward through the sand, and at length appears above the surface, lying exposed, and thus indicating the whereabouts of the animal. The string begins as a simple shred of the substance, two or three inches long, without proper cases. The first few cases are imperfect, smaller than the rest, and of decidedly different shape; one or more may not contain young shells. They regularly increase in size, and assume with equal regularity the perfect shape. The string is spun out to an average length of between two and three feet; the cases are largest and most closely packed at or just beyond the middle; the series generally terminates more abruptly than it began.

These egg-cases have the form of those ascribed to *Pyrula canaliculata* by Mr. Smith (Ann. Lyc. Nat. Hist. N. Y., vol. vii, p. 150), and by Mr. Geo. H. Perkins (Proc. Bost. Soc. Nat. Hist., vol. xiii, p. 115). Mr. Smith writes: "I have determined the species to which each form of egg-cases belonged simply by comparison of the young shells contained in them with adult specimens of *P. carica* and *canaliculata;* and have ascertained from Mr. Perkins that he made his determination in the same way. I have made a comparison of the young shells contained in the broad-edged cases coming from Fort Macon, with similar ones from Rockaway, L. I., and find them to agree exactly. Mr. Perkins and myself are therefore evidently wrong, the broad-edged cases belonging to *P. carica*, and the sharp-edged to *P. canaliculata*." Egg-cases of the broad form are abundantly strewn on the beach and elsewhere, especially during the summer months; but I do not now call to mind that I ever noticed the sharp-edged ones.

1871.]

Specimens of this species, or of one closely resembling it, vary remarkably in color, and to a notable degree in general contour, number of spines to a whorl, their length and stoutness, &c. Younger individuals, up to three or four inches in length, are much variegated, but pretty regularly so, with the brown bands; the full-grown ones are too different in this respect to be concisely described. The oldest lose distinctive coloration, from the growth of rough dark epidermis, and are usually incrusted with foreign substances, as well as often with balani, ostreæ, &c. Inside, the shells appear to have no determinate color; this varying from indefinite whitish, with some variegation from the colors outside showing through (in young specimens), to yellowish or tawny; and finally, in mature spring specimens at any rate, to brilliant salmon—almost red. I should judge that the coloration could afford no reliable specific characters. The shells bleach pure white in time, passing through a tawny or rusty stage; others present slate, or almost black, discoloration. The upper surface of the foot in life is jet black, contrasting strongly with the vivid color of the under side.

This species, and the last, as well as, doubtless, the others, are carnivorous, and apparently rapacious, animals; they also prey upon each other. I have found younger shells of both *carica* and *canaliculata*, enwrapped and half hidden in the folds of large individuals of their own and the other species.

"There are probably several species of *Busycon* on our coast, but they are not well made out. No. 1771, as well as some of the smaller ones (thus 1732, &c.), having numerous rather low spines and dark brown bands, is probably *B. spinosum* (Conrad, Pr. A. N. S. Phil., 1862, p. 553)."

Busycon perversum, Linn.

Common; about equalling, I should judge, *canaliculatum* in numbers. It generally passes, hereabouts, for a "she conch," *carica* being the "he."

Cancellaria reticulata, Linn.

Common? Two or three specimens, dead.

Fasciolaria tulipa, Linn.

One mutilated specimen (2126).

Fasciolaria distans, Lam.

Common. This and young *Busycons* are favorite residences of the larger *Eupagurus*.

Fasciolaria gigantea, Kiener.

Two specimens, from the beach, much worn and discolored (slate), each over a foot long.

Ranella caudata, Say.

Common.

Murex spinicostata, Val.

Not common (two or three specimens).

Strombus pugilis, Gm.

Frequent. Of about a score of specimens examined, all were much worn, and had evidently been transported from a distance.

[NOTE.—I append to the foregoing list the names of a few air-breathers that were collected.]

(GASTEROPODA *Pulmonata*.)

Limax, sp.

Observed under decaying wood, &c., on Bogue Island.

Helix albolabris, Say.

Helix thyroides, Say.

Helix multilineata, Say.

These three species were obtained, the two first in large numbers, from the beach of Shackleford, but no one of them was seen on Bogue Island.

Helix postelliana, Bland.

"Interesting on account of the locality, neither this species nor any other of the group to which it belongs having hitherto been found here" (*Bland*, in epist). Very abundant on Bogue Island, in moist grass, &c., about the edges of the marsh.

Melampus bidentatus.

Melampus obliquus, Say.

Rather common, on the beach, and dredged in shallow water among marine plants.

RADIATES.

The few specimens that have been determined, out of a considerable number collected, furnish the following names, mostly 1871.]

given upon Dr. Stimpson's authority: A species of *Physalia*, and another allied form, are of frequent occurrence along the beach. Two or three jelly-fishes were noticed, one of them occurring in large numbers about the harbor. Several corals and sea-fans also occur.

Ophiophragmum wurdemanni?

Bird Shoals, common.

Asterias arenicola.

Abundant.

Luidia clathrata.

Very abundant.

Astropecten articulatus.

Abundant. Fresh specimens are of a rich purple, edged with golden yellow.

Melita quinquefora.

The most abundant echinoderm of all, found everywhere.

Schizaster lachesis.

Rather common.

Echinocidaris punctulatus.

Lytechinus variegatus?

This and the last are two common species, found about the edges of the shoals throughout the harbor.

Actinia? sp.

A medium-sized plain grayish sea-anemone occurs in abundance on the rocks of the jutties along the beach.

Renilla reniformis.

Rather common. Specimens ranged from a few lines to over two inches in breadth.

(To be continued.)

CONTRIBUTION TO ORTHOPTEROLOGY.

BY PROF. C. THOMAS.

Caloptenus differentialis. Thomas.

Syn. *Acridium differentiale*, Uhler. Trans. Ill. St. Ag. Soc., v. 450. (Thos.) *Cyrtacanthacris differentialis.* Walk. Cat. Dermap., IV. 610.

Although the name of this insect has found its way into the catalogues, yet it has received no other description than the very short and imperfect one given by me in the Transactions of the Illinois State Agricultural Society, vol. v. 450. It was designated by the name *A. differentiale*, in a box of Orthoptera kindly named and returned to me by Mr. Uhler. But as he has never described it, and, as I learn from him, does not propose to do so, I give here the first regular description, that it may no longer stand in the catalogues as a mere name.

Large, robust; sides of the pronotum squarely deflexed, but lateral carinæ not distinct; wings as long as the abdomen; pulvilli of tarsi remarkably large. General color, olive-brown.

Female. Occiput convex, not punctured; a transverse indentation between the angles of the eyes; vertex broad, expanding in front of the eyes, obtuse, with a broad shallow sulcus above (perhaps not always distinct); the frontal carina broad, flat, or very slightly sulcate, sides parallel, a row of slight punctures each side; lateral carinæ obtuse, nearly parallel. Antennæ passing the thorax slightly, slender, filiform, joints not distinct except near the base. Pronotum has the sides squarely deflexed, the dorsum but slightly convex, that of the posterior lobe being almost flat; the three transverse incisions distinct, the posterior, which is deeply indented, being postmedial; the median carina distinct on the posterior lobe, but indistinct on the anterior lobes; the lateral carinæ consist only of the rounded angles formed by the deflexion of the sides. Elytra narrow, about as long as the abdomen. Wings thin and delicate, with slender nerves, a little shorter than the elytra. Abdomen large and fleshy, somewhat keeled above; upper and lower appendages very stout, cerci very short. Posterior femora very much swollen near the base and quite thick, tapering rapidly so as to be rather slender near the knee; a little shorter than the abdomen; not sharply carinated either above or below. Tibiæ much enlarged at the apex; about as long as the femora; the apical half furnished with strong spines and hairy.

Claws of the tarsi stout; pulvilli remarkably large. Prosternal spine cylindrical, blunt, and bent back to the margin of the mesosternum.

Male. Is only about two-thirds the size of the female, from which it differs as follows: Frontal carinæ more distinct, the middle one more distinctly sulcate. The elytra and wings are longer in proportion to the body, extending beyond the abdomen; the posterior femora also proportionally longer. The abdomen is considerably enlarged at the extremity, and turned abruptly upward; the cerci very large, bent upward and inward, broad at base, with an offset or notch on the lower edge; the little angular processes at the base of the superanal plate are very minute and blunt (much less than in *C. spretus* or *femur-rubrum*); the subanal plate convex, pointed, and almost entire, hairy.

Color (dried after long immersion in alcohol).

Female. Head and anterior lobes of the pronotum reddish-brown; labrum and parts of the mouth black; antennæ rufous. Posterior lobe of the pronotum an olive-brown. Elytra unspotted, olive-brown at the base, fading toward the extremity. Wings transparent, with a portion of the nerves near the front and apex dark. Abdomen and under side dark reddish-brown. Posterior femora with the disk and upper edge dark brown, lower edge yellowish; inside yellow, with an oblique, interrupted, dark stripe running from the upper edge back across to the lower edge beyond the middle; knee black. Tibiæ have the upper end and lower half yellow, spines black; tarsi brown; claws yellow at base, black at the points; pulvilli with a yellow stripe through the middle.

Male. Very similar, the principal difference being that the thorax, abdomen, and under side are of a lighter olive or yellow color; an oblique yellow stripe immediately behind the middle legs quite distinct and bright.

When the insect is living, the olive-brown is an olive-green or olive color; and there are yellow spots and stripes on the thorax, and the abdomen and under side are principally yellow. The male is generally of a brighter color than the female.

Dimensions. Female, length 1.7 in.; head and pronotum .52 in.; femora .92 in.; tibiæ .9 in. Male 1.2 in.

Habitat. Jackson County, Illinois.

Note.—Walker (Cat. Dermap, iv. 610) has placed this species in *Cyrta-*

canthacris, for no other reason, so far as I can see, than that the prosternal spine approaches the border of the mesosternum. Although it differs slightly from the typical species of *Caloptenus*, yet it certainly has more characters of the latter than of the former genus. It is, in shape, very much like the larger specimens of *C. bivittatus*. The back of the pronotum is not sloped from the median carina, but is exactly like the dorsum of *femur-rubrum*, *spretus*, *bivittatus*, etc.

Opomola brachyptera, Scudd.

As Mr. Scudder's description is founded on a single male specimen, I will give a full description of what I conceive to be a female of the same species.

Female. Vertex carinated; elytra narrow, reaching the tip of the second abdominal segment. Antennæ broad, ensiform. Pale orange-brown, with minute dusky points.

Occiput convex, straight, not ascending, with a shallow longitudinal depression each side, leaving a low, broad, rounded ridge in the middle. Vertex triangular, margins turned up, a very distinct median carina, the three meeting together in front form a blunt point; length in advance of the eyes equal to about one-third the entire length of the head. The face tricarinate, or rather quadricarinate, as the frontal ridge is so deeply sulcate that it forms two distinct carinæ, which meet at the vertex; all somewhat divergent, and reaching the cross suture. Eyes oblong-ovate. Antennæ scarcely as long as the head and thorax, ensiform, flattened, and slightly prismatic. Pronotum about as long as the head, tricarinate; sides almost perpendicular, parallel; only the posterior transverse impression distinct on the dorsum, situated a little behind the middle. Elytra lanceolate, narrow, reaching the extremity of the second abdominal segment. Wings narrow, minute, about half as long as the elytra. Abdomen long, slender and somewhat cylindrical, slightly carinated on the dorsum. The four anterior legs short and slender; posterior femora slender, straight, and not as long as the abdomen; tibiæ slender, nearly cylindrical, somewhat hairy at the apex. The prosternal point is short, being only a blunt protuberance; behind it the prosternum is marked by a shallow sulcus (but this may not be constant). *Color* (dried after long immersion in alcohol). General color a pale orange-brown, without distinct spots or markings, but with minute dusky points. The antennæ brown, with a purplish tinge; vertex, legs, and abdomen tinged with the same color. Spines of

the posterior tibiæ, abdominal appendages, and tarsal claws tipped with black.

When living, the only specimen I have seen appeared to be of a uniform grayish-brown. Length 1.5 inches.

My unique specimen was caught near the ruins of Fort Casper, on the North Platte, Wyoming Territory, August, 1870. Found in the tall grass on the river bottom.

Mesops wyomingensis, Thos. nov. sp.

Small, slender, cylindrical; elytra reaching the fifth abdominal segment; abdomen of the male terminating in a pointed process. Pale green, sometimes varied with red, immaculate.

Female. Occiput convex, slightly bowed up in the middle; a very slight median ridge can be discerned which reaches a little in front of the eyes, where it suddenly terminates in a semicircular depression, which separates it from the vertex. The vertex is flat above, conical, margin not turned up, triangular, advanced considerably in front of the eyes; a shallow foveola may be distinguished under each lateral margin; the circular depression which divides it from the occipital ridge, sweeps round from the upper canthus of one eye to that of the other. The face quadricarinate —the frontal ridge being so deeply sulcate as to appear like two distinct carinæ, all prominent, sharp, divergent below, and reaching the cross suture; the sides of the frontal ridge approach each other just below the ocellus, and on each side, directly opposite this constriction, there is a short transverse indentation (this appears to be constant). Eyes oblong-ovate, somewhat prominent, situated near the antennæ. Antennæ flattened, broad, and somewhat prismatic. Pronotum about as long as the head, nearly cylindrical, not carinated, though a faint median line is sometimes visible. Elytra narrow, sharply rounded at the apex, reaching to the anterior margin of the fifth segment. Wings nearly the same length. Abdomen elongate, cylindrical, slightly enlarged at the apex; appendages short, the upper ones nearly covered by the super-anal plate; the cerci are mere points. The four anterior legs are very short and delicate; posterior femora of moderate length, reaching the tip of the fifth segment, slender and deeply channelled below; posterior tibiæ about the same length as femora, very slender, cylindrical, furnished with delicate spines about two-thirds their length; tarsi somewhat elongate,

the middle joint being rather longer in proportion to the others than usual. Prosternal point quite short and blunt, more so in the female than in the male. Mesosternum convex, with a sharp indentation running lengthwise on each side.

Color (dried after long immersion in alcohol). Pale greenish-yellow, immaculate. Antennæ dull ash color, darkest along the exterior margin Spines of the posterior tibiæ and tarsal claws tipped with black. When living, the female is of a uniform pea-green color.

Male. Differs from the female as follows: Is much smaller and of more slender proportions. The vertex more pointed and the margins slightly elevated. Face rather more oblique, being almost horizontal. Abdomen terminating with a long-pointed extension bent slightly upward at the tip, about equal in length to the head. Elytra and wings same proportional length as in the female. Antennæ, face, vertex, occiput, pronotum, posterior femora, and abdominal appendage a pale carneous red; a white stripe runs from the lower border of the eye along the lower edge of the face and pronotum to the base of the middle legs. This description of the male marks the extreme variation from the female, those of immediate shades being common.

Found along the east base of the Black Hills of Wyoming, in the vicinity of Cottonwood Creek, August, 1870. Taken in the grassy creek bottoms.

Dimensions. Female—length 1.1 inch; male, .9 inch.

I have placed this species in *Mesops*, to which it appears to belong from the incomplete generic description of Serville, who had only one imperfect specimen, which had the apex of the abdomen wanting. Walker (Cat. Dermap., III. 501) names another species of this genus—*M. carinatus*—as found in the United States, but speaks of the sheaths of the oviduct of the female as being *lanceolate*.

Note.—Two errors occur in my paper published in the Proceedings July, 1870, which should be corrected.

B. nigrum, Thos., should be *B. nubilum*, Thos.

Syn. *Gryllus nubilus*, Say.

Oed. pruinosa, Thos., should be *Oed. trifasciata*, Thos.

Syn. *Gryllus trifasciatus*, Say.

The descriptions are proper, and may stand, as the original descriptions of Say are very short and incomplete. The corrections were forwarded before publication, but failed to reach their destination.

JUNE 5, 1871.

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

Nineteen members present.

The publication of pp. 57 to 88 of the proceedings for 1871 was announced.

Remarks on a Fossil Testudo from Wyoming.—Prof. LEIDY directed attention to some remains of a fossil turtle discovered by Dr. Joseph K. Corson, U.S.A., of Fort Bridger, at Grizzly Buttes, Wyoming, in association with remains of *Palæosyops*, &c. Most of the remains of turtles from the same locality, which had been submitted to his inspection, appeared to belong to the same family as our terrapins, except those referred to the genus *Trionyx*. The present fossils appear to indicate a large species of land tortoise, equal in size to the living *Testudo indica* of the Galipagos Islands. Less characteristic fragments, apparently of the same turtle, had been previously found by others, especially Prof. Hayden and Dr. J. Van A. Carter. The most characteristic specimen obtained by Dr. Corson is the anterior extremity of a sternum, consisting of the greater part of both episternals and a small portion of the entosternal bone. It might be supposed to belong to an *Emys*, but its abrupt and prolonged extension forward as in several of the living species of land tortoises, coupled with its great thickness and strength, leads to the opinion that it really indicates a large *Testudo*.

The gular scute impressions are defined by strong oblique grooves diverging at angles of about 40°. From the outer boundary of these impressions, the episternals are directed rather abruptly forward for an inch and three-quarters. In front, the sternum forms a nearly straight line three and three-quarter inches wide, and is only slightly notched at the middle.

The under surface of the episternals corresponding with the position of the gular scutes, is strongly convex; the upper surface slopes forward to the anterior acute border.

The gular scutes, at their posterior angle, touched upon the entosternal bone. Their length in the median line is three and a half inches; at their outer border, three and a quarter inches. The episternals measure three and a quarter inches in advance of the entosternal plate; their thickness reaches an inch and a half.

The species was named TESTUDO CORSONI, in honor of its discoverer.

Remarks on supposed Fossil Turtle Eggs.—Prof. LEIDY then exhibited a number of specimens of what he suspected were fossil

turtle eggs. They were found by Dr. J. Van A. Carter, of Fort Bridger, Wyoming, in the same formation which has yielded so many remains of turtles. Dr. Carter had discovered upwards of forty of them together, and first suggested the idea that they might be eggs. Prof. Hayden's collection from the same vicinity contained several specimens of the same bodies, which had been incidentally glanced at as coprolites. The uniformity in shape and size of these bodies, coupled with the structure, which consists of a thin homogeneous stony shell filled with an arenaceous matrix, renders it probable they may be eggs. They have the elongated oval form of the eggs of our common *Emys picta*, and measure about an inch in length and five lines in the short diameter.

Remarks on the Garnets of Green's Creek, Delaware Co.—Prof. LEIDY also directed attention to the character of the garnets of Green's Creek, Delaware County. These garnets, usually much prized by our mineralogists, appear not to have been discovered in place, and have been found as part of the pebbles of the creek bottom. They never present a crystalline form, and are looked upon as rolled pebbles. Specimens exhibited show a singular grooved appearance, apparently due to the abstraction of crystals of some other mineral, which had been imbedded in the surface of the garnets. This condition would indicate that the garnets probably existed in the rock in the form of nodules and not of crystals, as is frequently the case with minerals imbedded in trap rocks. In Dana's Mineralogy it is stated that chlorastrolite occurs on the shores of Isle Royale, L. S., in small rounded pebbles which have come from the trap and are water-worn. To avoid an erroneous impression, it should rather state they are found in the trap as rounded nodules, and become detached by the breaking up of the trap on the shores of the lake.

Mr. THOMAS MEEHAN referred to some remarks made by him to the Academy recently in regard to variations in the cotyledons of the peach, in which the most striking fact was that there was a multiplication of cotyledons when there was a plurality of embryos, without any increase in the usual cotyledonous mass; and that in the division of this mass no proportionate rule was adopted in the apportionment of each. He said he could not then understand how this arrangement accorded with the general opinion that the lobes of the dicotyledonous seed were formed almost simultaneously with the origin of the fertilized vesicles, but dared not express his doubts on that one instance alone. But he had now to offer for the examination of the members numerous specimens of sprouting cotyledons of *Quercus robur* and *Quercus rubra*, which seemed to admit of no other conclusion than that the division into cotyledons was accomplished long after the cotyle-

donous mass had been shaped as we find it finally developed in the seed.

In the case of *Quercus robur* a plurality of plantlets from one sprouting seed was not uncommon. He had found dozens in a peck of seed. These were usually in twos, but occasionally in threes. Of the last he exhibited only one specimen. In all these cases there was no more matter employed than if only one dicotyledonous seed had been perfected in the usual way. The division of the mass into four or six cotyledons was very arbitrary. In some cases one cotyledon would have one-third the whole to itself, the remaining being divided between the rest. There was also the same irregularity in direction. In some cases the division, after going longitudinally perhaps one-third the distance, would take a lateral direction, giving a broken-off appearance to the one cotyledon, similar to the leaf of a *Liriodendron*, while the opposite division would thus be left with a thick gibbous tip. The divisions in other cases would take a somewhat spiral course. It was evident that there was little more rule in these divisions than there would be in the breaking of a piece of glass.

He had examined a half peck of sprouting acorns of *Quercus palustris* and another of *Quercus macrocarpa*, but in these he could detect no sign of variation—each seed seemed cleft smoothly and directly through the centre into two regularly equal halves. But in *Quercus rubra* there were some remarkable phenomena. Of these he exhibited numerous specimens. In none of them did he find a plurality of embryos, the interest was in the division of the pair of cotyledons. All the specimens of *Quercus rubra* examined had fissures extending from the outside towards the centre. These were two, three, or four. In some cases the fissures extended but a mere line in depth; at other times they would penetrate to near the centre of the mass. In all these instances the surfaces in the fissures were clothed with membrane, just as we find to be the case in the walnut. The divisions of the cotyledons *were always in the direction of these fissures*, giving the lobes a very irregular appearance. In some cases a triangular section served for one lobe, while the sum of two united triangular sections served for the second one. It was so evident here that the divisions of the seed into cotyledons were in the weakest lines of union, and that these weak lines existed *prior to the division*, that he thought no one of the gentlemen present who were examining them could possibly dispute the conclusion.

He further suggested that the absence of any secondary membrane from the face of the cotyledon was an argument in favor of a late and smaller division. In ruminated seeds, such as the walnut or papaw, this membrane followed the innermost outline of the surface, and was no doubt a formation directly from the cells of the cotyledonous mass; but the suddenness of cotyledon forma-

tion would prevent the formation of such a membrane, especially after the cells had lost much of their vitality by being converted into depositions of starchy or other matter. Hence we found but the finest membrane covering the cotyledon faces.

He could not understand how the facts exhibited accorded with the early division into cotyledons by actual growth, as taught in our leading botanical works. For himself, he felt that botanists would yet come to regard *all seeds as non-cotyledonous in their early stages; and that the divisions into cotyledonous lobes was a mechanical result* determined in a great measure by the position of the germinal vesicle without the cotyledonous mass.

Mr. Meehan also referred to remarks he made on a former occasion in regard to the sensitive clasping of the stigmatic divisions of the pistil in *Torenia asiatica*. He had since found the same phenomenon in *Mimulus*, *Lindernia*, and *Diplacus;* allies of the *Torenia*. He did not know that this irritable closing power had been placed on record anywhere; but as there were hybrids of *Mimulus* in cultivation, the fact could not but have been noticed by cultivators at some time. In *Mimulus* the motion was more rapid than in others he had tried.

JUNE 13.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-seven members present.

The following papers were offered for publication:—

"Notice of a new Brachiopod from the Lead-bearing rocks at Mine La Motte, Mo." By F. B. Meek.

"Descriptions of three new species of Exotic Unionidæ." By Isaac Lea.

"Descriptions of twenty new species of Unionidæ of the United States." By Isaac Lea.

Prof. COPE made some extended observations on the supposed orders of *Plectognathi* and *Lophobranchii* of Cuvier, of which the following is an abstract: He stated that, after an examination of their structure, he could not regard them as divisions of equal value with the *Physostomi* and *Physoclysti*, etc. He stated that the *Plectognathi* are *Physoclysti* in all respects, viz., the relations of the supra-occipital to the other cranial bones, the structure of the scapular arch, hyoid and branchial arches, in the relations of the dorsal and ventral fins, structure of basis of caudal fin, of swim-bladder, etc. The family *Teuthyes*, among other *Physoclysti*, formed the nearest approach to them, and that the coalescence of

the bones of the maxillary and mandibular arches is not more important than many other structures found in the same subclass.

He regarded the *Lophobranchii* as a group having the same general affinities with the *Physoclysti*, but aberrant with some other groups in the possession of abdominal ventral fins. It was closely related to another division of the *Physoclysti* which he called the *Hemibranchii*, which has ventral fins, and wants one or more of the outer series of the superior pharyngeal bones, besides other characters. This order embraces the *Fistulariidæ*, *Centriscidæ*, and *Gasterosteidæ*, and should perhaps include the *Lophobranchii* also.

JUNE 20.

The President, Dr. RUSCHENBERGER, in the chair.

Sixteen members present.

The following paper was presented for publication:—

"Synopsis of the genus *Chettusia* (*Lobivanellus*), with a description of a new species." By J. A. Ogden.

JUNE 27.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-one members present.

The following gentlemen were elected members:—

Fred'k W. Endlich, Edw. K. Williams, and Fred'k Gutekunst.

Gen. L. E. Yorke, of Cincinnati, Ohio, was elected a correspondent.

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

DESCRIPTIONS OF NEW SPECIES OF FOSSILS FROM OHIO AND OTHER WESTERN STATES AND TERRITORIES.

BY F. B. MEEK.

The Ohio fossils described in this paper are a part of the collections of the Geological Survey of that State, now being prosecuted under the direction of Dr. J. S. Newberry. Full descriptions and illustrations of these will appear in the reports of this Survey. Those from Illinois will likewise be illustrated and described in the reports of the Survey of that State. For the latter I am under obligations to Mr. William Gurley and Dr. Winslow, of Danville, Illinois.

The *Melantho* and *Viviparus*, described at the end of the paper, belong to collections brought by Dr. Hayden from Wyoming Territory, and were accidentally omitted in my preliminary paper recently published in Dr. Hayden's report. They will be figured along with the others in his final report.

OHIO COLLECTIONS.

FENESTELLA DELICATA, Meek.

Growing in flat flabelliform, very finely reticulated expansions; branches very slender, rigid, bifurcating, and often nearly parallel, or gradually diverging to give room for new ones formed by division; dissepiments about half as thick as the branches, alternating or opposite, and but little expanded at their ends as seen on the non-poriferous side; fenestrules very uniform, oblong, with length usually about one-third to one-half greater than their breadth; non-poriferous side roughened by little granules; poriferous side with a row of little pointed elevations along a more or less defined mesial ridge of each branch, pores comparatively large, alternating and numbering two, or occasionally three, in each row opposite each fenestrule, and one generally exactly at each end of each dissepiment.

Size of entire polyzoum unknown, but it apparently attains a length of three inches or more; number of fenestrules in 0.20 inch, measuring longitudinally, three; ditto, measuring transversely, four.

As seen on the non-poriferous side, this species closely resembles Prof. McCoy's figure of his *F. plebeja*, as represented natural size, excepting that it forms a slightly finer network. Under a magnifier, however, it is seen to differ in having a row of little nodes along each branch, and I have not seen any longitudinal striæ on its branches, though they probably exist on those of perfect specimens. The magnified figure of the poriferous side of *F. plebeja* shows still more important differences, its fenestrules being proportionally much longer, with four or five pores opposite each side. The little nodes or projections along the middle ridge of this side of the branches in our species do not exist in *F. plebeja*, nor does the latter usually have a pore opposite the end of each dissepiment, as in the species under consideration.

Locality and position. Lodi, Ohio. Waverley group of Lower Carboniferous.

PTILODICTYA (STICTOPORA) CARBONARIA, Meek.

Ramose, branches from their origin generally nearly equalling the breadth of the stem from which they spring more or less alternately and at angles of about 50° to 60°; poriferous surfaces of each side flattened convex; lateral margins sharp and smooth; pores arranged in quincunx so as to form about seven to nine longitudinal rows (those of each two adjacent rows alternating), and about the same number of pores may be counted in each oblique row, very nearly or quite circular, and each with a prominent margin, so as to appear as if penetrating minute pustules; intervening spaces usually about once and a half to twice the breadth of the pores, and smooth or without longitudinal ridges or furrows.

Entire size unknown; breadth of medium-sized branches, 0.14 inch; thickness in the middle, 0.05 inch; number of pores in a space of 0.10 inch of each longitudinal row, six; while in the oblique rows about seven may be counted in the same space.

Among the Silurian species of *Stictopora*, this seems to agree most nearly with *S. punctipora*, Hall, from the Niagara Group, which it nearly resembles in its round pores with raised margins, as well as in the number and arrangement of its pores. It differs, however, in having its sharp lateral margins smooth, instead of being striated. A critical comparison of specimens from these

two widely-separated horizons would doubtless show other differences of details.

Its branches are narrower, and the number of its longitudinal rows is less than in the species from the Corniferous limestone that I have described under the name *P. Gilberti*, which also differs in having longitudinal ridges between the rows of pores.

Locality and position. Newark, Ohio. Coal-measures (lower part).

AVICULOPECTEN SANDUSKYENSIS, Meek.

Shell attaining a rather large size, strongly compressed, very nearly equivalve, rather oblique, somewhat longer in its antero-posterior diameter than high; posterior margin rounded and somewhat produced below, and sloping upward and forward above; anterior margin rounding obliquely backward and downward from the anterior ear into the base, which is semiovate, being a little more prominent behind than anteriorly; hinge line rather distinctly shorter than the entire antero-posterior diameter of the valves; ears flat, subequal, and acutely pointed, the posterior one being shorter than the margin below, and the anterior sometimes longer than the anterior margin beneath; in the left valve both are defined by somewhat angular nearly equal marginal sinuses, while in the right valve the anterior one is slightly concave and defined by a more angular sinus, from which a linear impression extends obliquely upward to the beak, which seems not to project above the cardinal margin; beak of left valve slightly more convex than that of the other, but scarcely more prominent, and placed a little in advance of the middle of the hinge. Surface of left valve ornamented by numerous unequal, slender, radiating costæ or thread-like lines, that are narrower than the spaces between, and obscure concentric striæ, only the latter of which are usually seen on the ears; surface of right valve similarly but less distinctly marked.

Antero-posterior diameter of a specimen under medium size, 1.27 inches; height, measuring at right angles to the hinge, 1.20 inches; convexity, about 0.16 inch. Some specimens were, when entire, evidently not less than twice the linear dimensions of that from which these measurements were taken.

As near as can be determined from Mr. Conrad's rather brief

description, and his figure of a single right valve of his *Avicula parilis* (Journ. Acad. Nat. Sci. Philad., vol. 8, pl. xii., fig. 9), the species under consideration would seem to be somewhat nearly allied. It has nearly the same general outline and obliquity, and somewhat similar ears, though its anterior ear is proportionally shorter, and defined by an impressed line extending from the sinus obliquely upward to the beak. Our shell also differs in being very nearly or quite equivalve, instead of having the right valve flat and the left plano-convex.

I know nothing of the hinge of this shell, and therefore merely refer it provisionally to *Aviculopecten*. It is rather more oblique than the species of that genus generally are, and possibly it may be found to have the internal characters of *Pterinea* or *Avicula*, and thus have to take the name *Pterinea Sanduskyensis* or *Avicula Sanduskyensis*.

Locality and position. Sandusky and Delaware, Ohio. Corniferous group of the Devonian series.

PTERINEA (PTERONITES?) NEWARKENSIS, Meek.

Shell small, longitudinally subovate or truncato-semiovate, about two-thirds as wide (high) as long, being wide behind and narrowing anteriorly; cardinal margin straight or slightly curved in outline behind the beaks, and about two-thirds the length of the valves, very short and declining in front of the beaks; posterior margin truncated so as to intersect the hinge at an angle of about 100°, but rounding regularly into the base; anterior side very short, somewhat lobed and narrowly rounded; basal margin semiovate, being most prominent, and ascending obliquely with a very slightly sinuous outline before. Left valve moderately convex, the greatest convexity being near the middle, or a little before it, and thence obliquely forward and upward to the beak, as well as downward to the most prominent part of the base behind the middle; beak very oblique, elevated a little above the hinge margin, and placed about one-fifth the length of the valve from the anterior extremity; swell of the oblique umbonal and central regions separated from the slightly lobed, narrowly rounded anterior extremity by a broad undefined impression extending to the antero-basal margin; posterior dorsal margin compressed and somewhat alate; surface apparently smooth, excepting some very faint ridges of growth, which are most strongly defined on the

anterior extremity. (Right valve unknown.) Length of left valve 0.55 inch; height (behind the middle), 0.35; convexity, 0.10 inch.

This is one of those peculiar forms presenting an intermediate appearance between *Avicula*, *Pterinea*, and *Pteronites*, but not agreeing exactly in outline with well-defined species of any of these groups. So far as can be determined from casts of the left valve only, it does not appear to have had the hinge teeth of *Avicula* or *Pterinea;* while it also differs from the latter in not having the posterior extremity of the hinge extended or acutely angular, though there is an obtusely angular, slight posterior dorsal alation, which, however, is not defined by any sinuosity of the posterior margin. From the forms on which the genus *Pteronites* was founded, it differs in having the hinge a little shorter than the posterior margin, and its beaks further removed from the anterior extremity.

There are probably several undefined genera among the Carboniferous shells of this general appearance, that we have not yet the means of defining.

Locality and position. Newark, Ohio. Waverley group of the Lower Carboniferous series.

CYPRICARDINA? CARBONARIA, Meek.

Shell small, longitudinally oval, less than twice as long as high, the widest (highest) part being under the posterior extremity of the hinge; rather gibbous, with often a shallow undefined impression or slight concavity extending from the beaks obliquely backward and downward to near the middle of the basal margin; posterior side rounded below the middle, and somewhat straightened and sloping up obliquely forward to the posterior extremity of the hinge; anterior side extremely short and more or less rounded; cardinal margin nearly straight or slightly arched, and about two-thirds the length of the valves, sometimes showing a very faint compression, or tendency to become a little alate behind; base most prominent posteriorly, and gently ascending forward, with a more or less defined broad sinuosity along the middle; beaks extremely oblique, terminal, and so little prominent as scarcely to project beyond the rounded outline of the anterior end. Surface ornamented by about twenty, very regularly disposed, subimbricating laminæ of growth.

Length, 0.56 inch; height, 0.34 inch; convexity, about 0.17 inch.

This little shell agrees very nearly, in size, form, and ornamentation, with the typical forms of the group for which the name *Cypricardina* was proposed, excepting perhaps the fine sculpturing seen between the larger regularly disposed lamina of growth in those shells, though even these markings may possibly exist on well-preserved specimens of our species.

In regard to the hinge of the typical species of *Cypricardina*, nothing is known. In the shell here described, however, one of the casts shows a moderately well developed hinge plate, with one linear tooth in one valve, and two in the other, running nearly parallel with the cardinal margin along its entire length, and at the posterior end of the hinge one or two shorter linear teeth parallel to and beneath the others; while at the anterior end of the hinge, in the right valve, there is one very small, slightly oval tooth, fitting between two similar minute teeth in the left valve. These little teeth are slightly compressed from above and below, and range with their longer diameter nearly parallel to the hinge margin. No cardinal area can be seen, though there may have been a very small narrow one immediately between the beaks, as there is no cavity seen in the hinge margin for an internal cartilage. The muscular and pallial impressions are so faintly marked that no traces of them have been seen on the casts of the interior.

Until the hinge of the typical species of *Cypricardina* can be made out, it is impossible to determine whether our shell belongs to that genus or not. I have the impression, however, that it belongs to a distinct Carboniferous group nearly allied to the Silurian genus *Cypricadites* of Conrad, but differing in having its principal hinge teeth extending the entire length of the cardinal margin, with the cardinal area more or less nearly obsolete, and the anterior muscular impression very obscure. It also differs from the known species of Mr. Conrad's genus, in having remarkably regular, prominent, imbricating, concentric ridges or laminæ. *Arca squamosa*, *A. obscura*, and *A. faba*, de Koninck, belong apparently to the same group, and possibly also the form referred by this same author to *A. obtusa*, Phillips, though the latter approaches still more nearly to the typical Silurian forms of *Cypricardites* in its hinge characters.

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If *Cypricardina* should be found to have a differently constructed hinge, I would propose for the group of which the species here described might be regarded as the type, the name *Synopleura*, in allusion to its very regular concentric costæ or laminæ of growth. It is still possible, however, that this group may be found too nearly allied to *Cypricardites* to stand as a distinct full genus; if so, the name of the species under consideration would have to be written *Cypricardites* (*Synopleura*) *carbonaria*.

Locality and position. Newark, Ohio. Lower Coal-measures.

SCHIZODUS MEDINAENSIS, Meek.

Shell of medium size, subtrigonal, moderately convex above the middle and cuneate below, somewhat longer than high; anterior side rounded; basal margin somewhat straightened or slightly convex in outline along the middle, rounded up regularly in front and more abruptly behind; dorsal outline sloping nearly at right angles from the beaks toward the extremities, the anterior slope being more abrupt than the other; posterior side longer than the anterior, sloping with a more or less convex or subtruncate outline above, and very narrowly rounded below; beaks rather prominent, pointed, located a little in advance of the middle; posterior umbonal slopes rather prominently rounded or subangular from the beaks obliquely to the posterior basal extremity. Surface nearly smooth, or only showing fine lines of growth.

Length, 1 inch; height, 0.82 inch; convexity, 0.44 inch.

This species has been supposed to be identical with, or nearly related to, a New York Chemung form, which was, I believe, described by Mr. Conrad under the name *Nuculites Chemungensis*. It certainly differs, however, materially in form from that shell as figured and described by Mr. Conrad in vol. viii. of the Journ. Acad. Nat. Sci. Philad., and might with as much propriety be identified with western Coal-measure species, ranging even up into beds referred by some to the Permian. One of these, described by Prof. Swallow under the name *Cypricardia? Wheeleri* (Trans. St. Louis Acad. Sci., vol. ii. p. 96, 1862), and figured by Prof. Geinitz under the name *Schizodus obscurus*, in his "Carbonformation und Dyas in Nebraska," agrees more nearly in form, but differs in being decidedly more depressed, with less elevated beaks, and a more

truncated posterior outline. It also differs from the shell under consideration, in being sometimes a little sinuous on the posterior basal margin. Another Coal-measure form figured by Prof. Geinitz, under the name *Schizodus Rossicus*, is in some respects still more nearly like our shell, but differs in other characters.

As difficult as it certainly sometimes is to separate closely allied species of this genus, I cannot think that we ought to refer to the same species forms found occupying such widely different horizons as the Chemung group of the Devonian, and the Waverley group and Coal-measure of the Carboniferous; on the contrary, it seems to me that we ought to regard them as distinct species, although it may not be easy, in all cases, to point out well-defined distinctions in the fossilized shells.

Locality and position. Medina, Ohio. Waverley group of the Lower Carboniferous.

SCHIZODUS SUBTRIGONALIS, Meek.

Shell trigonal-subovate, about once and a half as long as high, rather convex; basal margin more or less nearly semicircular in outline, rounding up regularly in front and abruptly behind; anterior side short, rounded or subtruncate; posterior side somewhat extended, rounded below, and slanting very obliquely forward and upward above to the posterior extremity of the hinge, which is short and a little straightened; posterior umbonal slopes prominently rounded; beaks somewhat depressed and usually nearer the anterior end than the middle. Surface smooth, with apparently only fine lines of growth.

Length, 0.96 inch; height, 0.66 inch; convexity, 0.36 inch.

This species is more depressed and oblique than the last, and has its beaks placed farther forward. In its depressed oblique form, it agrees even more closely with *S. Wheeleri*, Swallow (sp.), than the last, but it differs again in having its beaks placed farther forward, or sometimes almost over the anterior margin. It also appears to be always without the faint sinuosity of the posterior basal margin sometimes seen in that Coal-measure form.

Locality and position. Wooster, Ohio. Waverley group of the Lower Carboniferous series.

ALLORISMA WINCHELLI, Meek.

Shell of about medium size, elongate subelliptic, the length being equal to about three and a half times the height, moderately convex; posterior extremity a little gaping, obliquely subtruncated above and narrowly rounded below the middle; anterior extremity extremely short, closed, concave in outline obliquely forward and downward from the beaks above, to the lower end of the lunule, where it is subangular, and from this point rounding off obliquely into the base; ventral margin forming a broad, gentle curve, but generally somewhat straightened, and sometimes faintly sinuous near the middle; dorsal margin nearly straight, or a little concave in outline, and showing the usual inflection, which forms a lanceolate escutcheon with a slight ridge on each side, from the beaks to the posterior extremity of the hinge, which equals about three-fourths the entire length of the valves; beaks much depressed, very oblique, incurved, and located only about one-fourteenth the entire length of the shell from the anterior extremity; posterior umbonal slopes merely somewhat prominently rounded; anterior umbonal slopes generally subangular near the beaks, and sometimes this prominence is obscurely continued as a faint rounded ridge obliquely backward and downward to a point a little in advance of the middle of the base. Surface ornamented with concentric lines and ridges of growth, that generally assume the character of little regular wrinkles on the umbones. Lunule small, rather deep, moderately well defined, and obovate in form.

Length of a mature specimen, 1.74 inches; height to middle of dorsal side, 0.83 inch; do. to horizon of beaks, 0.87 inch; convexity, 0.70 inch; length of hinge line, 1.17 inches.

This is a very neat, symmetrical species, often found in an excellent state of preservation as casts of the exterior showing perfectly the form and surface-markings, excepting the fine granulations usually, if not always, existing in species of this genus. Like other species of the group, it varies more or less in form, some individuals being proportionally shorter and higher than others. In size and general appearance it closely resembles *A. clavata* of McChesney, from the Chester group. It does not resemble the particular *variety* of that shell, however, figured by Prof. McChesney, so nearly as it does what I have always believed 1871.]

to be the usual form of the same, his typical specimen having the beaks more prominent and farther removed from the anterior end than in the more normal form of the species, and its dorsal outline straighter and more sloping posteriorly, with the valves more compressed. Compared with specimens that I have referred to, *A. clavata* from the Chester group of West Virginia, collected by Prof. Stevenson, our Waverley species are found to agree very nearly with some individuals of the latter, though it always has its ridges of growth less strongly defined and more irregular, and its anterior basal margin usually more oblique. It also differs in the possession of an anterior umbonal ridge extending from the beaks obliquely backward and downward nearly or quite to the basal margin a little in advance of the middle.

The specific name is given in honor of Prof. A. Winchell, the able State geologist of Michigan, who has described many fossils from the same horizon in the western States.

Locality and position. Rushville and Newark, Ohio. Upper part of the Waverley group of the Lower Carboniferous.

ALLORISMA VENTRIOSA, Meek.

Shell subovate, the length being about once and a half the height, moderately convex; posterior margin obliquely subtruncated above, and narrowly rounded or subangular near the middle, thence sloping obliquely under and forward; base rather deeply and somewhat irregularly rounded, the most prominent part being near the middle; anterior side short, with an oblique truncate or concave forward slope above, to the lower extremity of the lunule, where there is a more or less angular projection, below which the margin slopes with a slightly convex outline oblique backward and downward sometimes nearly to the middle of the base; dorsal margin more or less concave in outline, and showing the usual lanceolate escutcheon margined on each side by a subangular ridge; hinge equalling about two-thirds the length of the valves; lunule rather small, deep, well defined, and narrow-subovate in form; beaks moderately prominent, oblique, and placed about one-seventh the length of the valves from the anterior end. Surface ornamented by small irregular ridges and furrows of growth.

Length, 1.46 inches; height to cardinal margin, 0.98 inch; do. to horizon of beaks, 1.03 inches; convexity, 0.66 inch; length of

hinge, 1 inch. Another specimen, 1.54 inches in length, has a convexity of 0.75 inch.

It is barely possible that this may be a variety of the last, but as I have before me ten good specimens of that shell, and two of the form under consideration, and there are among them no intermediate gradations between the two forms, I can but regard them as distinct species. The shell here described differs from the last, with which it was found associated, in being proportionally decidedly shorter and wider (higher), as well as in having its ventral margin much more prominent or deeply rounded in the central region. Its beaks are also less oblique, rather more prominent, and proportionally farther from the anterior end. It shows some faint traces of a similar anterior oblique umbonal ridge to that seen in the preceding species, but it is less distinct, and does not show so decided a tendency to become angular at the beaks.

Locality and position. Rushville, Ohio. Waverley group.

PLATYOSTOMA? TRIGONOSTOMA, Meek.

Shell strongly depressed or subdiscoid, with the periphery angular; spire so low that the shell is less convex above than below the periphery; volutions three, very rapidly increasing in size, particularly in breadth, merely with an outward slope above; last one large and compressed convex, but not much projecting below, a little declining near the aperture on the inner side above; suture linear; aperture large, subtrigonal, with breadth greater than height; lip extended forward on the inner side above, and apparently very oblique. (Surface marking unknown.)

Breadth 1.35 inches; height about 0.60 inch.

I am not sure that this is a true *Platyostoma.* It is far more depressed in form than any of the described species of that genus, and, judging from some faint undulations on the cast apparently corresponding to the direction of the lines of growth on the upper and lower sides of the body volution, these lines would seem to have curved strongly backward in passing outward toward the periphery, thus indicating the presence of a rather deep, broad sinuosity of the lip at the termination of the peripheral angle. If this is the real direction of the lines of growth, it would probably be nearer correct to call the species *Pleurotomaria trigonostoma:* but as there is no appearance of a band on the periphery, and the lines of growth are not *certainly* known to describe these curves,

I have concluded to place it provisionally in the genus *Platyostoma*.

I should perhaps remark here, that this is certainly not a depressed variety of *Platyostoma Niagarensis;* and the specimens clearly show that they have not been accidentally compressed. In internal casts there is a small umbilical perforation, but this was probably occupied by the columella, before the shell itself was dissolved away.

Locality and position. Yellow Springs, Ohio. Niagara group of Upper Silurian.

PLATYCERAS (ORTHONYCHIA?) LODIENSE, Meek.

Shell rather small, non-spiral, or merely having the form of rapidly expanding cone, with a backward obliquity that brings the apex nearly over the posterior margin; lateral slopes nearly straight or slightly concave, and converging to the apex at an angle of about 80°; posterior side vertical and a little concave in outline; anterior slope somewhat more than twice as long as the height of the posterior side, moderately convex in outline, and provided with a ridge or obtuse carina along its entire length; aperture oval suborbicular, being slightly longer than wide; lip a little sinuous anteriorly, immediately on one or both sides of the termination of the central ridge of the anterior slope, which ridge is thus made to terminate in a little projection of the margin. Surface marked by fine lines of growth, most distinct on the anterior slope, where they curve backward as they approach the mesial ridge, and then abruptly forward in crossing this ridge; extremely faint traces of minute radiating striæ apparently also exist. Apex rather abruptly pointed and directed backward, without any lateral obliquity.

Length, measuring obliquely from apex, 0.97 inch; breadth, 0.82 inch; direct length from anterior to posterior margin, 0.96 inch; height of apex, 0.40 inch.

This species is remarkable for its regular obliquely-conical form and non-spiral apex, which is merely rather obtusely pointed and directed obliquely backward, without the slightest lateral curve. It therefore differs widely in form from the typical species of *Platyceras*, and agrees more nearly with existing species of *Capulus*. It also resembles a shell figured and described in the third

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volume of the Palæontology of New York, from the Oriskany Sandstone, under the name *Cyrtolites expansus*, excepting that its apex is not so alternate. Although possibly not a true *Platyceras*, it seems to be more nearly allied to the section of the same for which the name *Orthonychia* has been proposed than to *Cyrtolites*, which was founded on a very different type (*C. ornatus*, Con.), with a very peculiar style of ornamentation. In its surface markings our shell agrees with *Platyceras*, in being merely marked with fine lines of growth more or less undulated on the anterior slope, with traces of very obscure radiating striæ, which latter, with its non-spiral form, indicate relations to the section *Orthonychia*. It therefore bears the same relations to the elongated forms of *Orthonychia* that the depressed, rapidly expanded species of *Platyceras*, such as *P. obscurum*, bear to the typical forms of the genus.

Locality and position. Lodi, Ohio. Waverley group of the Lower Carboniferous series.

PLATYCERAS TORTUM, Meek.

Shell very thin, dextral, attaining a medium size; in young specimens composed of about one and a half to two volutions subglobose, these first turns being contiguous, rounded and rapidly increasing in size, after which the next turn, which composes the larger part of the shell, becomes free, very oblique, and increases little in size toward the aperture, thus making the entire form very obliquely subrhombic; body volution a little flattened on the upper slope, subangular above, and somewhat prominently rounded near and below the middle; aperture apparently oval suborbicular; lip without sinus; surface without plications, and with only moderately distinct lines of growth.

Length, 1.36 inches; breadth, 1 inch; breadth of aperture, 0.80 inch; height of aperture, 0.82 inch.

I have long been familiar with casts of this shell in the collections of the Illinois Survey, but as they were only casts of the interior, I had some doubts whether they might not be from distorted specimens of some of the other *Gasteropoda* already described. The specimens from which the above description was made out, however, retain the shell itself, and show that it is a true *Platyceras*. Specifically it is more nearly allied to some of

the non-plicated varieties of the N. York Upper Silurian *P. spirale*, than it is to any of the other Carboniferous species known to me, though its first two volutions are more compactly coiled together than those of that species.

Locality and position. Greentown, Summit Co., Ohio. Coal-measures.

HOLOPEA (CYCLORA) NANA, Meek.

Shell very small, subglobose, wider than high; spire much depressed; volutions three, rounded, increasing rapidly in size, so that the last one forms the larger part of the shell; suture deep or almost channelled; surface smooth; umbilicus small; aperture subcircular; lip simple.

Height of the largest specimen seen, 0.05 inch; breadth, 0.07 inch.

This little shell seems to be quite abundant, and from the fact that the larger specimens present considerable uniformity of size and general appearance, I can scarcely doubt that they are adults. It will probably fall into the genus *Cyclora*, Hall (Am. Jour. Sci. and Arts, vol. xlviii. p. 294, 1845), and would seem to agree closely in size and form, as near as can be determined from a description alone, with the typical species *C. minuta*. So far as I have been able to determine, its inner lip, however, does not appear to be reflected over the minute umbilicus, as is said to be the case in that shell. The *C. minuta* came from the Cincinnati group at Cincinnati, and it is very improbable that it ranges up to the horizon at which the specimens under consideration were obtained.

Locality and position. Clinton, Ohio. Silurian.

ORTHOCERAS? ISOGRAMMA, Meek.

The only specimens of this shell that I have seen are flattened by accidental pressure. The most nearly perfect specimen in the collection is 2.80 inches in length, with a breadth (as seen flattened in the matrix), at the larger broken end, of about 0.95 inch, and with sides diverging from the smaller, rather bluntly pointed extremity, at an angle of about 18°. At and near the smaller end the surface is marked by very minute, crowded, transverse, or annular striæ. About three-fourths of an inch farther up, these

striæ gradually increase in size, and become more irregular in their arrangement, but soon pass above into very regular larger transverse lines, separated by spaces about twice as wide as the lines themselves. These spaces gradually increase in breadth, until they become five or six times as wide as the lines, above which point they continue very regular in their arrangement, about four of the lines and three of the intervening spaces occupying a space of 0.10 inch. Near the smaller end, the flattened spaces show what appear to be impressions of septa made visible through the thin shell by pressure. Two of these occupy a space of 0.10 inch.

As it is seen flattened in the matrix, the very regular transverse lines on this fossil give it somewhat the appearance of an attenuated *Conularia*; but as it shows no indications whatever of longitudinal angles or furrows, it cannot belong to that genus, from which it also differs in texture, though I am not quite sure that it is an *Orthoceras*. It will be readily distinguished by its surface-markings alone, from any species of the latter genus hitherto described from our Coal-measures. In its surface-markings, it bears some resemblance to *Dentalium cinctum*, de Koninck (Am. Foss. Belg., pl. xxii., Fig. 3), which Prof. de Koninck afterwards refers to the genus *Orthoceras*. Our shell, however, is much more rapidly tapering, and straight instead of arched.

Locality and position. Newark, Ohio. Lower Coal-measures.

ILLINOIS COLLECTIONS.

[1]STREPTACIS WHITFIELDI, Meek.

Shell small, elongated, slender, and very gradually tapering; volutions nine or ten, increasing gradually and regularly in size; first or embryonic turn minute, planorbicular and standing edge upward; succeeding turns convex and obliquely coiled; suture deep and very oblique; aperture ovate. Surface smooth.

Length, 0.16 inch; breadth, 0.04 inch; slopes of spire straight, with a divergence of about thirteen degrees.

This little shell agrees so nearly with those Tertiary species on which Deshayes founded his genus *Aciculina*, that I am strongly

[1] I referred this shell to *Aciculina*, Desh., in MS.; but as that name was preoccupied, I propose for our type the name *Streptacis*.

inclined to think it belongs to that group. It has exactly the form, size, surface, aperture, and lip, and even the irregularity, of the embryonic volutions seen in *Aciculina;* while the only difference I have been able to see is, that its embryonic turns, instead of forming a minute cone turned to one side at right angles to the longitudinal axis of the body of the shell, have the form of a *Planorbis* standing edge upward. Whether or not this slight peculiarity in the minute apex may have been accompanied by some important difference in the structure of the animal, it is of course impossible to say.

The specific name is given in honor of R. P. Whitfield, Esq., of Albany, New York.

Locality and position. Danville, Illinois, where it occurs with many other small shells of the Coal-measures, in a bed of shale immediately over the coal-mine of that place.

LOXONEMA ATTENUATA, var. **SEMICOSTATA.**

Chemnitzia attenuata, Stevens, 1858, Am. Journ. Sci., vol. xxv. (Sec. series), p. 259.—(Not *Loxonema attenuata*, Hall, 1859.)

Shell very small, elongate-conical, somewhat more tapering above than below the middle; volutions about twelve, slightly convex and increasing gradually in size from the apex, the last one being rounded and not larger in proportion to the regular increase of the whole than the others; suture distinct; aperture ovate, scarcely equalling one-fourth the entire length of the shell. Surface of the upper volutions (excepting one or two of the smooth apical turns) each ornamented by thirteen or fourteen very regular, straight vertical costæ, about equal in length to the furrows between; farther down these costæ gradually become obsolete, so that three or four of the lower volutions show only minute lines of growth that are invisible without the aid of a magnifier.

Length of a rather small specimen, 0.13 inch; breadth, 0.15 inch; slopes of spire slightly convex and diverging from the apex at an angle of about 18°.

This little shell is evidently closely allied to the form called *Chemnitzia attenuata* by Dr. Stevens, but its volutions increase more rapidly, and have the costæ smaller. It is probably a distinct species, but until more specimens can be examined with the view of determining how far the species varies in the characters mentioned, I have preferred to place it as a variety *L. attenuata.*

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One of the specimens of this species shows some indications of having the immediate apical turn, as it were, very slightly uncoiled, from which I am inclined to suspect that its embryonic volution may have been reversed. This and the very small size of the species seem to separate it from the typical Loxonemas and approximate it to *Turbonilla*. If its apex really was reversed, it should be placed in the latter genus, with the name written *Turbonilla attenuata* var. *semicostata*.

Locality and position. Shale over the coal-bed at Danville, Illinois.

MURCHISONIA OBSOLETE, Meek.

Shell small, conical; spire moderately prominent, with lateral slopes, straight, or sometimes very slightly concave a little above the middle, rather attenuated near the apex; volutions about ten, compactly coiled, and regularly and gradually increasing in size from the apex, compressed convex; last one not enlarged, or more produced below than in proportion to the general increase in the size of the others, somewhat prominently rounded, but not even subangular below the middle; aperture subrhombic, being a little longer than wide, angular above, apparently angular or effuse on the inner side below, and rather abruptly rounded on the outer side below the middle, while the arcuate character of the columella gives a rounded appearance to the middle of the inner side; suture deeply impressed; spiral band very obscure, being flat, even with the surface, and only defined by the faintest possible impressed line along its upper and lower margins. Surface almost entirely smooth, but showing, when closely examined, very obscure traces of marks of growth curving strongly backward as they approach the spiral band, which passes around rather less than its own breadth above the suture on the volutions of the spire.

Length of largest specimen, 0.95 inch; breadth, 0.37 inch.

This species will be at once distinguished from the last, by its shorter and more compactly coiled volutions, and almost entirely smooth surface, on which no traces of revolving lines, or of the distinct regular lines seen on that shell, occur. It also wants the impressed line immediately below the suture of *M. loxonemoides*. It is very peculiar in having the revolving band almost entirely obsolete.

Locality and position, same as last.

1871.]

PLEUROTOMARIA TEXTILIGERA. Meek.

Shell attaining a medium or somewhat larger size, turbinate or rhombic, suboval in general outline, with height a little greater than the breadth; spire depressed conical; volutions four or five, flattened exactly on a line with the slope of the spire from the apex to near the middle of the last turn, where there is more or less defined angle; last turn large, somewhat ventricose below the angle, and produced so as to make this angle near the middle of the entire bulk of the shell; umbilical region a little excavated, the excavation apparently being continued as a small perforation up into the axis; aperture, as inferred from sections of the body volution, obliquely rhombic-oval; suture merely linear, or sometimes very narrowly channelled between the middle volutions; spiral band occupying, and slightly truncating, the angle of the body volution, where it is flat or a little concave, and passing around immediately above the suture on the volutions of the sphere, excepting on some of the upper turns, where it seems to sink nearly or quite below the suture line. Surface very neatly cancellated by distinct, regular, curved, threadlike transverse and revolving lines, of about equal size and distance apart, the former becoming much finer and arched backward in crossing the band.

Height of a large specimen, 1.42 inches; breadth of revolving band on body volution, 0.10 inch; angle of spire, 70° to 80°.

I was for some time inclined to think this might be the form described by Dr. White and Mr. Whitfield, from the same horizon at Burlington, Iowa, under the name *Pleurotomaria Mississipiensis*, but on comparison with a sketch of the typical specimen in the Museum of the University of Michigan, sent to me by Prof. Winchell, I find it to be quite distinct. The type specimens of *P. Mississipiensis* are natural casts, but Prof. Winchell's sketches show that they differ from casts of the species under consideration, in having the angle of the body volution continued on those of the spire distinctly above the suture, so as to give them a turreted appearance instead of being all flattened exactly on a line with the slope of the spire. It also has the spire more elevated than that of our shell, and the upper slope of the body volution concave instead of flat. Indeed, White and Whitfield's species is more nearly allied to *P. tabulata* of Conrad, from the Coal-measures, than it is to that under consideration.

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Locality and position. Medina, Ohio. Waverley group of the Carboniferous, where it seems to be quite abundant.

PLEUROTOMARIA GURLEYI, Meek.

Shell small, with breadth somewhat greater than its height; spire depressed-conical, slightly obtuse at the immediate apex; volutions five and a half, convex, and near the apex rounded, but becoming nearly rectangular farther down, the angle being at the middle of those of the spire, and passing around above the middle of the body whorl, which is rather convex but not much produced below; upper side of all the volutions (excepting the rounded ones near the apex) sloping a little and flattened or slightly concave from a linear revolving carina just below the suture, outward to the mesial angle, below which the outer side is vertically flattened and smooth; suture canaliculate; revolving band very narrow, rather distinctly concave, with a linear ridge or minute carina along each margin passing around upon or just above the mesial angle; umbilicus very small. Surface on the inner side of the body volution ornamented by about fourteen distinct raised revolving lines, the upper of which are somewhat larger than the others, and on the upper slope above the mesial angle, by three or four very small revolving lines; while the small rounded whorls near the apex are each occupied by about six revolving lines; striæ of growth very minute, and, on the upper slope and flattened outer side of the whorls, very strongly and abruptly curved backward to the band, so as to indicate an unusually profound, rapidly widening sinus in the lip. Aperture wider than high, and obliquely subrhombic in form.

Height, 0.17 inch; breadth, 0.20 inch; slopes of spire straight; divergence of same nearly rectangular.

This little shell has much the form and general appearance of *P. Grayvillensis*, N. & P., but may be distinguished at a glance by the differences in the details of its sculpturing; and particularly by the smooth vertically flattened outer side of its volutions, on which the lines of growth are seen, by the aid of a magnifier, to be much more obliquely curved backward than those on the corresponding part of *P. Grayvillensis*. It must be very rare, as I have seen only the single typical specimen among all of the Coal-measure fossils of the western States and Territories that have ever come under my observation.

1871.]

The typical specimen is beautifully mineralized by brilliant iron pyrites, and was discovered by Mr. William Gurley, of Danville, Illinois, in honor of whom I have named the species.

Locality and position. From the shale over the Danville coal-bed, Danville, Illinois.

COLLECTIONS FROM MISSOURI, WYOMING, TEXAS, &c.

AVICULOPECTEN? WILLIAMSI, Meek.

Shell small, subcircular, convex lenticular not oblique; hinge shorter than the antero-posterior diameter of the valves; anterior and posterior margins rounding regularly into the rounded base; beaks a little nearer the posterior than the anterior extremity of the hinge. Right valve rather distinctly convex, the greatest convexity being in the middle; anterior ear of moderate size, shorter than the anterior margin, rather acutely rounded at the extremity, compressed so as to be distinctly separated from the swell of the umbo, and defined from the margin below, by a moderately deep angular sinus; posterior ear a little smaller than the anterior, and, although compressed, less distinctly defined from the convexity of the umbonal region, considerably shorter than the posterior margin, and nearly rectangular at its extremity, but with its posterior margin slightly sinuous. Left valve a little more convex than the right, but otherwise similar, unless there is some difference in the ears, which are not known. Surface of both valves smooth or only with very fine concentric striæ, excepting on the anterior ear, which (at least on the right valve) is marked by a few small radiating costæ. (Hinge unknown.)

Height and length, or antero-posterior diameter, each 0.53 inch; length of hinge, 0.35 inch; convexity, about 0.32 inch.

As I have not seen the hinge of this little shell, I cannot be sure whether or not it belongs to the genus *Aviculopecten* proper. Its nearly equivalve form, and slightly larger anterior ear, together with its rather prominent anterior margin, lead me to think it will probably be found not to belong to that genus, when all of its characters can be known. I therefore suspect that it may have to be called *Streblopteria Williamsi*, as the external peculiarities mentioned seem to indicate affinities to the types upon which Prof. McCoy proposed to found his genus *Streblopteria*.

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Specifically, it seems to be more nearly allied to *Aviculopecten neglectus* (=*Pecten neglectus*, Geinitz) from the Coal-measures, than to any other form known to me. It has much the same form, and agrees in having the body part of both valves smooth, and the ears costated, or at any rate the anterior one of the right valve. It has a rather shorter hinge, however, more convex valves, and a rather more rounded general outline, with less deeply sinuous margins under the ears; while it attains a somewhat larger size. It may be regarded as the Lower Carboniferous representative of that Coal-measure species, as many of the other forms from this horizon represent species in the Coal-measures.

The specific name is given in honor of Dr. G. A. Williams, of Boonville, Missouri, to whom I am indebted for the typical specimens.

Locality and position. Chonteau Springs, Boon County, Missouri; from the beds called the Chonteau Limestone in the Geological Reports of that State, but now known to belong to the same horizon as the upper part of the Waverley group of Ohio.

SPIRIFER (TRIGONOTRETA?) TEXANUS, Meek.

Shell scarcely attaining a medium size, very gibbous in the adult, varying from subquadrate or subglobose to longitudinally subovate, the widest part being generally in advance of the middle, and the length greater than the breadth; hinge line short, or in young individuals scarcely equalling the breadth of the valves, and in the adult often proportionally very decidedly shorter, sometimes obtusely angular at the extremities, while in the more gibbous individuals its extremities do not project beyond the lateral slopes; anterior margin often somewhat emarginate in the middle. Dorsal valve truncato-subcircular or subquadrate and moderately convex; beak incurved with the narrow area, but not prominent; mesial elevation commencing as a small simple plication at the beak, but rapidly widening and becoming more prominent and angular, with, on each side, several small costæ, which divide so as to form altogether 14 to 16 at the front; lateral slopes having at the beak each two or three plications or costæ, which farther forward divide so as to form as many fascicles, beyond which the costæ become uniform, smaller, and number about 9 on each side

of the mesial fold and sinus. Ventral valve more gibbous than the other, and strongly arched from beak to front; beak very prominent in the adult, always point and distinctly curved backward over the hinge; cardinal area moderate, well defined, extending to the extremities of the hinge, directed backward and strongly curved with the beak; foramen slightly wider at the hinge than its height, open nearly or quite to the apex, and provided with a distinct marginal furrow on each side; mesial sinus angular, commencing small at the beak, but widening and deepening very rapidly to the front, where it is very profound, and terminates in a strongly curved triangular projection that fits into a corresponding sinus in the margin of the other valve; surface costated as in the other valve, the costæ in the sinus being smaller than those on the lateral slopes; fine, rather obscure undulating striæ, and near the front and lateral margins a few stronger marks of growth traverse the valves parallel to the free margins; while numerous small, rather scattering but regularly disposed granules, apparently the remaining bases of minute spines, may be seen on the whole surface of well-preserved specimens; which also sometimes show traces of extremely minute radiating striæ.

Length of a large gibbous example, 1 inch; breadth, 0.88 inch; convexity, 0.82 inch; length of hinge, 0.57 inch. Smaller specimens are proportionally shorter, wider, and less convex, with a longer hinge line.

Small specimens of this species resemble somewhat the more gibbous forms of *S. cameratus*, with a very short hinge line; but in the adult the shell becomes proportionally much more elongated anteriorly, more gibbous, and has the beak of the ventral valve so narrow and so much produced and incurved as to give the shell the appearance of a *Pentamerus*. Its distinctly granular and minutely striated surface, however, will always serve to distinguish even those specimens with the most extended hinge line from any of the analogous gibbous varieties of *S. camaratus*. Its granular surface leads me to suspect that it may possibly be a *Spiriferina:* but as I have not been able to see any punctures in the substance of the shell, it probably does not belong to that group. Should a more careful examination reveal the punctate structures, however, and the characteristic internal lamina, of course the species will have to be called *Spiriferina Texana.*

Compared with foreign forms, this shell seems to be most nearly like the extremely narrow and elongated variety of *S. duplicosta*, Phillips, as illustrated by Mr. Davidson's figure, 8, pl. iv., Mongr. British Carb. *Brachiopoda*. It is much more gibbous, however, with a decidedly more prominent and more angular mesial sinus, while its surface granules and minute striæ serve to distinguish it. Although its mesial fold has a very angular appearance, a careful examination shows it to be very slightly flattened, or even faintly furrowed along its prominent middle; while there is sometimes a faint indication of a slightly more prominent rib in the middle of the angular sinus of the other valve.

Locality and position. Young County, Texas; where it was found by Mr. H. R. Roessler associated with Coal-measure fossils.

I have never seen it from any of the western localities north of Texas.

CAMPELOMA (MELANTHO) MACROSPIRA, Meek.

Shell attaining a large size, thick and strong, elongate-subovate; spire much elevated; volutions five, convex but not rounded, increasing gradually in size, excepting the last one, which is more abruptly enlarged, oblique, and somewhat produced below; suture strongly defined; aperture ovate, nearly or quite half the length of the shell; inner lip thick and more or less reflected in the adult, but leaving uncovered a rather distinct umbilical impression. Surface with only moderately distinct marks of growth.

Length of an adult, 1.70 inches; breadth, 1.10 inches.

Specimens of this species have been brought by various exploring parties, during the last eight or ten years, from the Bear River country, Utah; but always in too imperfect a condition to show their characters clearly, until some recently brought in. These show it to resemble, when not distorted, an abnormally elongated specimen of *C.* (*Melantho*) *integra*, Say, figured by Mr. Binney in his Smithsonian monograph, part iii., p. 49, excepting that its volutions are less convex, its spire a little narrower below, and its body volution and suture more oblique. Its inner lip is also less oppressed to the columella, so as to leave a decided larger and deeper umbilical impression. It is likewise a thicker, stronger shell than any of the varieties of *C. decisa* I have ever seen, being as thick as *C. ponderosa*, if not thicker.

I have sometimes been inclined to think Prof. Hall's *Turbo paludinæformis*, of Fremont's Report, might have been founded upon a young or imperfect specimen of this species, but the fact that that shell occurs in a yellowish-gray limestone showing sometimes an oolitic structure, and also containing Prof. Hall's *Cerithium nodulosum* (a true *Goniobasis*), shows that it must belong to a different horizon from the shell here under consideration, which comes from the oldest tertiary beds of the Bear River country, holding, according to Dr. Hayden's examinations, a position below the yellowish-gray limestone beds of that region.

Locality and position. Gilmore, Wyoming (Mr. Durkee); Bear River near the mouth of Sulphur Creek, Utah (Col. Simpson); and at various localities in the Bear River country (Dr. Hayden). It is always associated with *Corbula pryriformis*, *Pyrgulifera humerosa*, *Corbicula Durkei*, and *Unio priscus:* none of which have been identified among the specimens from the higher beds of that district.

VIVIPARUS? WYOMINGENSIS, Meek.

Shell obliquely conoid-subovate; spire conical, with slightly convex slopes; apex rather pointed; volutions six, those of the spire obliquely compressed convex, last one large, a little compressed on the upper slope, but rounding over the middle, and somewhat produced below; suture well defined, but not deep; aperture ovate; lip not thickened on the inner side below, and apparently very faintly dilated around the outer side, at the immediate margin. Surface with rather regular, distinct, oblique lines of growth, that are crossed, near the upper margins of the volutions, by fine, regular, revolving striæ. Axis apparently sometimes very slightly perforated.

Length, 1.45 inches; breadth, 1.15 inches; height of aperture, about 0.90 inch; breadth of do., about 0.60 inch; divergence of slopes of the spire, 0.72°.

The specimens of this shell in the collection are mainly broken or distorted casts. One of the latter, however, is very nearly perfect, while some of the other specimens retain more or less of the shell itself. From the strong, regularly arranged striæ of growth, seen on some of the latter, and apparently some indications of a slight reflection of the outer lip, I was led to think it a land shell, probably belonging to some of the elevated types

of the *Helicidæ*, with which I am not familiarly acquainted. Another reason for suspecting that this might be the case is, that we have from the same formation, somewhat farther northward, another similar but more depressed form (*H. veterna*, M.), which has the same kind of surface-markings, with a slightly but unmistakably reflexed outer lip; while this latter shell stands, as it were, exactly intermediate in form between the still more depressed *H. Leidyi*, H. & M., from the White River territory, and that under consideration. That these latter two shells (*H. Leidyi* and *H. veterna*) really belong to some section of the genus *Helix*, there seems to be no reason to doubt.

Although believing the form under consideration to be related to the two species last above mentioned, its unusually elevated spire left me in doubt respecting its affinities. Consequently I sent the best specimen in the collection (which, however, is a cast retaining none of the shell) to Mr. Tryon, of Philadelphia, who has studied the existing land and fresh-water *Gasteropoda* with much care, and requested him to give me the benefit of his opinion in regard to its relations; and he writes that he doubts the propriety of viewing it as a land shell, or at least that he thinks that if it be, it cannot belong to any of the existing North American groups. He rather inclines to think it a *Viviparus* allied to *V. Japonica*, a species now inhabiting the streams of Japan. It certainly has much the form of that species, though more depressed.

Without being entirely sure that it belongs to that genus, I have concluded to refer the species provisionally to *Viviparus*. If a land shell, it would seem to be related to some section of the genus *Cochlostyla*, though probably not even then belonging to any of the recent groups ranged under the same.

Locality and position. Henry's and Black's forks, Church Buttes, &c., Wyoming; Middle Territory.

ISOCARDIA? HODGEI, Meek.

Shell cordate-subtrigonal, very gibbous; length and height nearly equal; beaks elevated, gibbous strongly involute, and placed in advance of the middle; posterior dorsal side of valves convex; incurved and sloping rather abruptly backward from near the umbones; anterior side very abruptly truncated by a broad, well-defined, large concave, cordate lunule, extending with the

curve of the beaks to their points, and downward to the anterior basal angle; while within this area there is a smaller, deep, and sharply defined impression, or second lunule, under the beaks; basal margin forming a nearly semiovate curve from the lower extremity of the large lunule to the posterior end of the valves. Surface ornamented by small, nearly regular radiating costæ, separated by rather broader furrows; the whole being crossed by larger concentric ridges and furrows, which become smaller, more regular, and rather more distinct on the large lunule, where there are no radiating costæ.

Length and height, each 1 inch; convexity, 0.86 inch.

Of this curious form I have seen but one specimen, which is in the condition of an internal cast. The shell itself must be very thin, as the surface-markings are quite distinct on the cast. In general form, and its strongly incurved beaks, it reminds one of *Isocardia*, but its radiating costæ, and very large lunule-like cordate impression occupying the whole anterior end of the shell, are peculiar characters, I believe unknown in that genus. In addition to these features, its hinge would seem to have been without the teeth of *Isocardia*, so far as can be determined from the internal cast. From these facts I strongly suspect that it will be found to belong to an undescribed genus. If so, I would propose for it the name *Procardia*, in allusion to the distinctly heart-shaped impression occupying the whole anterior end. This species is evidently related to *Cardium? decussatum*, Mantell, and must belong at least to the same group. It is much smaller, however, and differs specifically in having mere radiating lines, instead of broad costæ.

I am under obligations to Dr. Newberry for the use of the only specimen I have seen, which was given to him by Prof. J. T. Hodge, who brought it from the Upper Missouri country.

Locality and position. Mr. Hodge discovered the typical specimen in a band of iron ore that extends along the Upper Missouri for some distance, near the Great Bend in the Fort Pierre group.

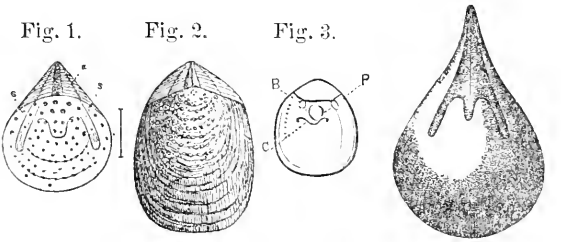
NOTICE OF A NEW BRACHIOPOD FROM THE LEAD-BEARING ROCKS AT MINE LA MOTTE, MISSOURI.

BY F. B. MEEK.

LINGULELLA LAMBORNI, Meek.

Fig. 4.

Fig. 1. Fig. 2. Fig. 3.



1. *Lingulella? Lamborni;* being a view of the area and interior of a ventral valve, enlarged to 2½ diameters: s, s, are lateral internal scars, and (*a*) the area with its mesial furrow for the peduncle.

2. *Lingulella Davisii;* being an internal cast of the dorsal valve, with a view of area of the ventral valve and its mesial furrow. Nat. size, after Mr. Davidson.

3. An outline internal view of another specimen of same species, showing internal scars as understood by Mr. Salter; C, being supposed to represent the anterior retractors; and B, on each side, the sliding muscles. Nat. size, after Mr. Salter.

4. *Lingulepis pinniformis;* being a view of internal cast of a ventral valve, showing the trilobate scar within. Enlarged about 2 diam. From N. Y. Regents's 16th State Cab., Nat. Hist. Report, pl. 6, fig. 16, for comparison with fig. 1.

Shell small, compressed, broad-subovate, being about one-fifth longer than wide. Ventral valve pointed at the beak, from which the nearly straight lateral slopes diverge at an angle of about 35°, to near the middle of each lateral margin, from near which these margins round forward into the regularly rounded front; false cardinal area well developed, and extending back with the beak nearly one-fourth the length of the valve behind that of the other valve, and having its mesial furrow for the peduncle well defined, with on each side of it a diverging longitudinal line extending from the apex of the beak, so as to form the margins of the false area, which is transversely striated; interior marked by numerous little irregularly scattered pits, which are largest posteriorly and diminish in size forward; while near the anterior margin very obscure traces of minute radiating striæ are sometimes seen; internal scars presenting a trilobate appearance,

there being a short mesial rounded lobe nearly reaching the middle of the valve, and near half way between this and each posterior lateral margin, there is a long, slender, diverging lateral lobe or impression. Dorsal valve shorter than the other, and subcircular in form, its beak being apparently a little truncated; interior showing the same pitted appearance seen in the other valve; visceral and muscular impressions unknown. Surface of both valves marked by fine concentric striæ.

Length, 0.26 inch; breadth, 0.22 inch; convexity, about 0.04 inch.

From the foregoing description and illustrations, it will be seen that this shell agrees exactly in the nature of its pitted interior, and in its furrow in a triangular false area, for the reception of the peduncle, with the type of Mr. Salter's genus *Lingulella* (*L. Davisii*, Salter). The scars of the interior, however, do not agree with the muscular impressions as made out by Mr. Salter (see the cut fig. 3, reproduced from one of Mr. Salter's figures). Still, as Mr. Davidson says, he could not see these impressions as Mr. S. represented them, even on carefully examining his typical specimens; it is quite probable that the latter gentleman, although a careful, conscientious observer, may not have made them out exactly right, especially as they are said by Mr. Davidson to be *very* dimly defined.

I have represented, in fig. 1, these scars of the interior of the ventral valves as they *appear* to be in the form under consideration, though they are obscurely defined, and seem to me to be rather the impression of the visceral sack, than those of the muscles. By comparing these impressions, as represented by the accompanying fig. 1, with those seen in the type of the genus *Lingulepis* of Hall (reproduced by the annexed fig. 4), it will be seen that they agree very nearly. I therefore suspect that *Lingulepis* and *Lingulella* may yet be found to have been proposed for the same genus, as we have here a shell with the area and furrow for the peduncle of *Lingulella*, possessing scars of the interior corresponding to those of *Lingulepis*. If so, our species will have to be called *Lingulepis Lamborni*, as the latter generic name has priority of date. It is barely possible, however, that our shell may belong to an intermediate undefined genus, possessing some of the characters of both of the genera mentioned; especially as the type of *Lingulepis* shows no traces of the pitted

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interior seen in our shell and the type of *Lingulella;* and so far as I have been able to determine, from examining casts of *Lingulepis*, they do not appear to have possessed a false area with a furrow for the peduncle, seen in the shell under consideration and in Mr. Salter's type.

Compared with Mr. Salter's type (*L. Davisii*), as illustrated by Mr. Davidson, our shell will be readily distinguished specifically, by its much smaller size, proportionally shorter form, more pointed beak, and less straightened lateral margins. The interior of its ventral valve also shows no traces of a small ridge indicated by a linear furrow in the internal casts of Mr. Salter's species.

Locality and position. The specimens were discovered by Robert H. Lamborn, Esq. (after whom I have named the species), in a thin bead of shale between two beds of limestone bearing heavy deposits of galena, at Mine La Motte, Madison Co., Missouri. They were sent by that gentleman to Prof. Leidy, of Philadelphia, and by him referred to me for study. I am not acquainted with the age of the rocks at Mine La Motte, never having seen any other fossils from there, but from the affinities of this single fossil to *Lingulella* from the Lingula flags of Wales, and to *Lingulepis* from the Potsdam sandstone of Minnesota, it would seem that these lead deposits belong to a much older period than the Galena and Dubuque lead-bearing limestone, of Illinois and Iowa, although the latter is known to belong to the Lower Silurian.

DESCRIPTION OF THREE NEW SPECIES OF EXOTIC UNIONIDÆ.

BY ISAAC LEA.

Unio Jeffreysianus.

Testa crebre et leviter sulcata, regulariter elliptica, compressa, parum inæquilaterali; valvulis crassiusculis, antice parum crassioribus; natibus prominulis; epidermide tenebroso-fusca, polita, eradiata; dentibus cardinalibus parvis, lamellatis, obliquis; lateralibus longis, lamellatis subrectis et in utroque valvulo simplicibus; margarita vel alba vel salmonis colore tincta.

Hab. Australia, C. M. Wheatley.

Unio Stevensii.

Testa bialata, valde plicata, triangulari, compressa, valde inæquilaterali; valvulis crassiusculis; antice crassioribus; natibus vix prominentibus; epidermide tenebroso-cornea, eradiata; dentibus cardinalibus parvis sulcatisque; lateralibus longis, lamellatis subcurvisque; margarita alba et iridescente.

Hab. Yuruari River, Tributary to Essequebo River, Guiana, R. P. Stevens.

Anodonta exilior.

Testa alata, lævi, obovata, inflata, valde inæquilaterali; valvulis exilissimis; natibus prominulis, ad apices minute undulata; epidermide vel olivacea vel brunnea, polita et eradiata; margarita cærulea et valde iridescente.

Hab. Mexico, C. M. Wheatley.

DESCRIPTIONS OF TWENTY NEW SPECIES OF UNIONES OF THE UNITED STATES.

BY ISAAC LEA.

Unio Lawii.

Testa lævi, obliqua, clavæformi, antice tumida, valde inæquilaterali, postice obtuse angulata; valvulis crassis, antice aliquanto crassioribus; natibus prominentibus, fere terminalibus; epidermide flavida, radiis interruptis indutis; dentibus cardinalibus parviusculis, acuminatis crenulatisque; lateralibus sublongis, subcurvis lamellatisque; margarita argentea et iridescente.

Hab. Tennessee River, Tuscumbia, Alab., B. Pybas. Tenn. River, Dr. Edgar. Holston River, Miss A. E. Law and Prof. Cope.

Unio appressus.

Testa lævi, triangulari, securiformi, valde inæquilaterali, antice rotundata, postice subangulata; valvulis crassiusculis, antice aliquanto crassioribus; natibus prominentibus; epidermide flavida, radiis interruptis postice indutis; dentibus cardinalibus parviusculis, compressis crenulatisque; lateralibus sublongis, curvis lamellatisque; margarita argentea et aliquanto iridescente.

Hab. Tuscumbia, Alab., B. Pybas and J. G. Anthony. Holston River, Miss Law and C. M. Wheatley.

Unio validus.

Testa lævi, triangulari, inflata, inæquilaterali, antice rotunda, postice obtuse angulata; valvulis crassis, antice aliquanto crassioribus; natibus prominentibus, ad apices undulatis; epidermide olivacea, valde radiata; dentibus cardinalibus crassis, compressis crenulatisque; lateralibus sublongis, crassis subcurvisque; margarita argentea et iridescente.

Hab. Duck River, Tenn., Dr. Powell. Clinch River, Pres. Estabrook. Holston River, Dr. Edgar and Miss Law.

Unio litus.

Testa lævi, elliptica, subcompressa, inæquilaterali, antice rotundata, postice subbiangulata; valvulis subtenuibus, antice crassioribus; natibus prominulis; epidermide crocea, eradiata; dentibus cardinalibus parvis compressisque; lateralibus sublongis, sub-

curvis lamellatisque; margarita salmonis colore tincta et elegantissime iridescente.

Hab. Cahaba River, Shelby Co., Alab., E. R. Schowalter, M.D.

Unio simulans.

Testa lævi, obliqua, subcompressa, inæquilaterali, antice rotundata, postice obtuse angulata; valvulis crassiusculis, antice crassioribus; natibus prominulis; epidermide tenebroso-fusca, eradiata; dentibus cardinalibus parvis, compressis crenulatisque; margarita alba et iridescente.

Hab. Cahaba River, Shelby Co., Alab., E. R. Schowalter, M.D.

Unio Cahabensis.

Testa valde tuberculata, quadrata, compressa, subæquilaterali, antice rotunda, postice truncata; valvulis subcrassis, antice crassioribus; natibus subprominentibus; epidermide crocea, eradiata; dentibus cardinalibus subgrandis, compressis crenulatisque; margarita salmonis colore tincta et elegantissime iridescente.

Hab. Cahaba River, Shelby Co., Alab., E. R. Schowalter, M.D.

Unio acuens.

Testa lævi, triangulari, compressa, valde inæquilaterali, antice rotundata, postice subbiangulata; valvulis crassiusculis, antice crassioribus; natibus prominentibus; epidermide luteola, radiis interruptis; dentibus cardinalibus subcrassis, subcompressis crenulatisque; lateralibus subcrassis, brevis subrectisque; margarita alba et iridescente.

Hab. Holston River, near Concord, E. Tenn., Miss Law.

Unio crudus.

Testa lævi, subrotunda, compressa, inæquilaterali, antice rotunda, postice obtuse angulata; valvulis subcrassis, antice crassioribus; natibus prominentibus; epidermide rugosa, tenebroso-fusca, eradiata; dentibus cardinalibus subgrandibus, subcompressis crenulatisque; lateralibus crassis, subbrevis subcurvisque; margarita argentea et parum iridescente.

Hab. French Broad River, E. Tenn., Pres. Lindsley. Swamp Creek, Murray Co., Geo., Maj. Downie. Holston River, Miss Law and C. M. Wheatley.

Unio Tuscumbiensis.

Testa lævi, triangulari, tumida, ad latere planulata, inæquilaterali, antice subtruncata, postice obtuse angulata; valvulis

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crassis, antice crassioribus; natibus elevatis, subretusis; epidermide luteo-oliva, perradiata; dentibus cardinalibus parviusculis, subcompressis crenulatisque; lateralibus curtis, subcrassis subrectisque; margarita argentea et iridescente.

Hab. Tuscumbia, Alab., L. B. Thornton, Esq. Holston River, E. Tenn., Dr. Edgar.

Unio dispansus.

Testa lævi, elliptica, subinflata, valde inæquilaterali, antice rotunda, postice obtuse angulata; valvulis crassiusculis, antice crassioribus; natibus prominulis, fere terminalibus; epidermide tenebroso-olivacea, perradiata; dentibus cardinalibus parviusculis, tuberculatis et in utroque valvulo duplicibus; lateralibus prælongis, lamellatis subrectisque; margarita purpurea et valde iridescente.

Hab. East Tennessee, Dr. Edgar.

Unio Pealei.

Testa lævi, rotunda, valde inflata, subglobosa, valde inæquilaterali, antice et postice rotundata; valvulis crassis, antice crassioribus; natibus elevatis, tumidis, subretusis; epidermide luteo-olivacea, dilute perradiata; dentibus cardinalibus parviusculis, subconicis; lateralibus longis crassis subrectisque; margarita argentea et iridescente.

Hab. Topeka, Kansas, Chas. W. Peale.

Unio globatus.

Testa lævi, globosa, valde inæquilaterali; valvulis crassis, antice crassioribus; natibus valde inflatis, parum elevatis; epidermide tenebroso-fusca; dentibus cardinalibus percrassis et valde corrugatis; lateralibus curtis, crassis, parum curvatis corrugatisque; margarita argentea et iridescente.

Hab. Holston River, Dr. Edgar. Etowah River, Geo., Thos. Bland.

Unio subglobatus.

Testa lævi, suborbiculata, inæquilaterali; valvulis percrassis; natibus tumidis, elevatis, incurvis; epidermide tenebroso-fusca, ad apices maculata et radiata; dentibus cardinalibus parviusculis, compressis sulcatisque; lateralibus crassis, curvatis corrugatisque; margarita argentea et iridescente.

Hab. Florence, Alab., B. Pybas. Nashville, Tenn., Pres. J. B. Lindsley.

Unio recurvatus.

Testa lævi, rotundata, valde inflata, valde inæquilaterali; antice rotundata, postice obtuse angulata; valvulis crassis, antice crassioribus; natibus valde prominentibus et recurvatis; epidermide fusca, eradiata; dentibus cardinalibus parvis, crassis sulcatisque; lateralibus percrassis, curtis, subcurvis corrugatisque; margarita argentea et iridescente.

Hab. Tenn. River, J. G. Anthony. Holston River, E. Tenn., Miss Law.

Unio obuncus.

Testa lævi, triangulari, subinflata, ad basim arcuata, inæquilaterali, antice rotunda, postice obtuse angulata; valvulis crassis, antice crassioribus; natibus prominentibus; epidermide dilute oliva, perradiata; dentibus cardinalibus parvis corrugatisque; lateralibus crassis, lamellatis corrugatisque; margarita argentea et iridescente.

Hab. Tuscumbia, Alab. Holston River, E. Tenn., Miss Law.

Unio radiosus.

Testa lævi, subtriangulari, subinflata, subequilaterali, antice rotundata, postice obtuse angulari; valvulis crassiusculis, antice parum crassioribus; natibus prominentibus; epidermide luteo-oliva, perradiata; dentibus cardinalibus parvis, compressis crenulatisque; lateralibus subcrassis, lamellatis subrectisque; margarita alba et iridescente.

Hab. Holston River, E. Tenn., C. M. Wheatley and Miss Law.

Unio circumactus.

Testa lævi, rotundata, ad apices inflata, ad basim compressa, inæquilaterali; valvulis crassis, antice crassioribus; natibus elevatis recurvatisque; epidermide vel rufo-fusca vel castanea, maculata et radiata; dentibus cardinalibus crassis, subcompressis sulcatisque; lateralibus percrassis, subcurvis corrugatisque; margarita argentea et valde iridescente.

Hab. Florence, Alab., Rev. G. White. Holston River, Miss Law.

Unio radiolus.

Testa lævi, elliptica, subinflata, valde inæquilaterali, antice rotunda, postice obtuse angulata; valvulis crassiusculis; natibus prominulis, fere terminalibus; epidermide brunnea, valde radiata;

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dentibus cardinalibus parvis, subcompressis crenulatisque; lateralibus longis, lamellatis subcurvisque; margarita alba et iridescente.

Hab. Ogeechee River, Liberty Co., Geo., Major John Le Conte.

Unio pattinoides.

Testa lævi, obliqua, subcompressa, valde inæquilaterali, antice rotundata, postice obtuse angulata; valvulis subcrassis, antice crassoribus; natibus subprominentibus, fere terminalibus; epidermide luteo-brunnea, maculata; dentibus cardinalibus parvis, subcompressis corrugatisque; margarita argentea et iridescente.

Hab. Clinch River, Pres. Estabrook. Holston River, Dr. Edgar and Miss Law.

Unio Santeënsis.

Testa lævi, suboblonga, subinflata, valde inæquilaterali, antice rotundata, postice obtuse biangulata; valvulis crassiusculis; natibus prominulis, ad apices minute undulatis; epidermide tenebroso-fusca, nitida et valde radiata; dentibus cardinalibus parvis, compressis et in utroque valvulo duplicibus; lateralibus longis subcurvisque; margarita vel purpurea vel salmonis colore tincta et iridescente.

Hab. Santee Canal, S. C., Dr. Foreman. Oconee River, Geo., Major J. Le Conte.

SYNOPSIS OF THE GENUS CHETTUSIA (LOBIVANELLUS), WITH A DESCRIPTION OF A NEW SPECIES.

BY J. A. OGDEN.

The species belonging to the genus Chettusia are recognized by their moderately strong bill, the culmen somewhat depressed at the base, with the sides compressed and grooved for two-thirds their length; nostrils lateral, basal, with the opening linear; wings long, with the first, second, and third quills nearly equal and longest; the shoulder of the wing more or less armed with a tubercle or spine; tail broad and even; tarsi moderately long, exceeding the length of the middle toe; toes four; head not crested, and sometimes more or less lobed.

a. Species with wattles well developed; tubercle upon the wing prolonged into a spur, or spine; hind toe short.

1. C. senegalla (Linn.).

Parra senegalla, Linn., Syst. Nat. I., p. 259.
Vanellus albicapilla, Vieill., Nouv. Dict. d'Hist. Nat. XXXV., p. 205.
Vanellus senegalensis, Shaw, Gen. Zool. XI., 2, 515.
Vanellus strigilatus, Swains., B. of W. Afr. II., p. 241, pl. 27.
Vanellus albifrons, Rüpp., Pl. enl. N. 362; Reich., pl. C. figs. 682–83.

Hab. Western Africa (Swainson).

(Collection of the Academy.)

2. C. macropterus (Cuv.).

V. macropterus, Cuv., In Mus. Paris.
Ch. cucullatus, Temm., Pl. col. 505.
V. tricolor, Hors., Linn. Trans. XIII., p. 186.
Lob. tricolor, Strick.

Hab. "Indian Archipelago."

(Collection of the Academy.)

3. C. lobata (Lath.).

Tringa lobata, Lath., Ind. Orn. Supp. p. 65.
V. gallinaceus, Temm., Jard & Selby, Ill., Orn. vol. III., pl. 84.
V. Novæ-Hollandiæ, Stepp., Cont. of Shaw's Gen. Zool. vol. XI., p. 516.
V. lobatus, Vieill., Ency. Méth. Orn., pt. III., p. 1075.
Ch. lobatus, Wagl., Syst. Av., sp. 51.
Lob. lobatus, Gould., B. of Aust. fol., vol. VI., pl. 9.

Hab. New South Wales (Gould).

(Collection of the Academy.)

[October 24,

4. C. personata (Gould.).

Lob. personata, Gould., Proc. Zool. Soc., pt. X., p. 113. B. of Aust. fol., vol. vi., pl. 10; Reich. CIII., 1055–56.

Hab. Northern Australia (Gould).

(Collection of the Academy.)

5. C. lateralis (Smith).

V. lateralis, Smith., Zool. S. Afr., pl. 23.

Hab. South Africa (Smith).

(Collection of the Academy.)

b. Species with wattles not so well developed; wing armed with a short tubercle, otherwise the same as in the previous species.

6. C. inornatus (Schlegel.).

Lob. inornatus, Schlegel., Fauna Jap., p. 106, pl. 63.
V. inornatus, Swains.
C. Wagleri, Bonap.

Hab. India (Jerdon).

(Collection of the Academy.)

7. C. melanocephala (Rüpp.).

Lob. melanocephala, Rüpp., Syst. Ubers., p. 115, pl. 44.

Hab. Northern Africa (Rüpp.).

(Collection of the Academy.)

8. C. goensis (Gmel.).

Parra goensis, Gmel., Syst. Nat. I., p. 706.
Lob. goensis, Strick.
V. indicus, Bodd.
Ch. atrogularis, Wagl., Syst. Av. sp. 49; Pl. enl. 807; Gould, Cent. of Birds, pl. 78.

Hab. India (Jerdon).

(Collection of the Academy.)

9. C. atronuchalis (Blyth.).

Lob. atronuchalis, Blyth., Journ. Asiatic Soc. of Bengal.

Hab. Burmah (Blyth.).

c. Species devoid of wattles at the base of the bill; tubercle upon the wing rudimental; otherwise the same as in the previous species.

10. C. gregaria (Pall.).

Ch. gregaria, Pallas., Reise I., p. 456, No. 9.
Ch. ventralis, Wagl., Ill. Ind. Zool., pl. .
V. Keptuschka, Temm., Gould., B. of Europe, pl. 292.
P. cinereus, Blyth., Journ. Asiatic Soc. of Bengal, p. 587, 1842.

Hab. India (Jerdon); Europe (Gould); Central Asia (Pallas).

(Collection of the Academy.)

11. C. leucurus (Licht.).

V. leucurus, Licht., Eversm., Reise. Nach. Buch, p. 137.
V. flavipes, Sav. L'Egypt. Zool., pl. 6, fig. 2.

Hab. Middle Asia; N. Africa; rare in India (Blyth.).

(Collection of the Academy.)

12. C. crassirostris (Hart.). Cabanus Journal III., p. 427.

Hab. Borders of the Nile (Hart).

13. C. aralensis (Eversman.).

V. aralensis, Evers., Bull. Mosc., 1853, p. 497.

Hab. Russia (Evers.).

14. C. dominicana (Linn.).

Parra dominicana, Linn., Syst. Nat., p. 705.
Ch. Brissonii, Wagl., Syst. Av., sp. 55.

Hab. St. Domingo (Linn.).

15. C. ludoviciana (Gm.).[1]

Parra ludoviciana, Gm., Syst. Nat., p. 706.
V. miles, Bodd.
Ch. callæas., Wagl. Syst. Av., sp. 52.

Hab. Amboina (Forster).

16. Chettusia nivifrons, nov. sp. Plate I.

Fore part of head extending to the occiput, including the sides and foreneck white; the occiput, nape, and breast bluish-black; the remaining under parts, upper tail coverets, large and small wing coverets are also white; back and scapulars, light brownish-gray, with the tertiaries darker, slightly glossed with green; the three first primaries nearly of the same length, and are brownish-black; the tail brown, inclining to a bluish-black at the tip, excepting the portion under the coverets, which is white; the base of the bill apparently of an orange color, with the tip black; legs and feet of a reddish hue; the tibia for about one-half its length free of feathers.

Dimensions. Total length about 11 inches; bill, from gape, $1\frac{1}{4}$; wing $7\frac{3}{4}$; tail $3\frac{3}{4}$; tarsi $2\frac{3}{4}$; middle toe $1\frac{5}{8}$; outer toe $1\frac{3}{8}$; hind toe $\frac{1}{4}$.

Hab. "Fazoglou."

(In the museum of the Academy, from the Rivoli collection.)

[1] (The species Nos. 12–15 have not been examined by me.)

JULY 4, 1871.

Mr. MACTIER in the chair.

Eight members present.

Remarks on Donation of Fossils from Wyoming.—Prof. LEIDY directed attention to the collection of fossils presented this evening by Dr. Joseph K. Corson, stationed at Fort Bridger, Wyoming Territory. The fossils, consisting of remains of mammals, turtles, and crocodiles, were obtained at Grizzly Buttes, in the vicinity of Fort Bridger. Among the mammalian fossils are many pertaining to *Palæosyops paludosus*, consisting of portions of the skull, jaws with and without teeth, articular extremities of the limb bones, etc. Dr. J. Van A. Carter had recently sent to Prof. Leidy some well-preserved portions of jaws with teeth, of the same animal, from Lodge-pole-trail, thirteen miles from Fort Bridger, and also from Henry's Fork of Green River. Among the specimens from the latter locality, there is the most complete series of the upper molar teeth which he had yet seen.

The specimens of jaws and teeth indicate a variation in the size of *Palæosyops*. The molar series of teeth further undergo a rapid reduction in size from behind forwards, so that from isolated specimens of teeth, the smaller anterior molars might readily be viewed as pertaining to a smaller species. Prof. Marsh had recently designated what he supposed to be a smaller species of *Palæosyops* with the name of *P. minor*, from an inferior molar tooth, "apparently from near the middle of the series." The measurements which he gives to the tooth, ten lines fore and aft, and five lines in front, and five and sixteenths behind, at the summit of the lobes, would apply to the first true molar of *P. paludosus*, while the last premolar is still smaller.

In a nearly complete ramus of the lower jaw of *P. paludosus*, a series of teeth, consisting of the true molars and the two premolars in advance, measures 64 lines. Another series of true molars measures 46 lines. These measure in succession fore and aft, 11 lines, 15 lines, and 19 lines. The last premolar, looking like a reduced molar with the hinder lobe proportionately less well developed, measures scarcely 9 lines.

JULY 11.

The President, Dr. RUSCHENBERGER, in the chair.

Sixteen members present.

The following paper was presented for publication:—

"Contributions to the Herpetology of Tropical America. No. 9." By Edw. D. Cope.

The publication of pp. 89 to 120 of the Proceedings for 1871 was announced.

The death of Wm. P. Turnbull was announced.

JULY 18.

The President, Dr. RUSCHENBERGER, in the chair.

Thirteen members present.

The following paper was presented for publication:—

"Descriptions of five new species of Crustacea from Mexico." By T. Hale Streets.

The publication of pp. 121 to 136 of the Proceedings for 1871 was announced.

AUGUST 1.

The President, Dr. RUSCHENBERGER, in the chair.

Thirteen members present.

The following paper was presented for publication:—

"Descriptions of New Species of Birds of the Families *Troglodytidæ* and *Tyrannidæ*." By Geo. N. Lawrence.

The publication of pp. 137 to 152 of the Proceedings for 1871 was announced.

Remarks on Mastodon, etc. of California.—Prof. LEIDY stated that he had recently corresponded with Dr. Lorenzo G. Yates, of Centerville, Alameda Co., California, who had discovered the Mastodon remains to which he had called the attention of the meeting on Sept. 6th, 1870. Dr. Yates writes that in his travels through various portions of California, he had made special search for remains of Mastodon and Elephant. He has noted twenty

localities of the former, and nine of the latter, most of which he has visited.

The fragment of a tusk, from Stanislaus Co., referred to *Mastodon Shepardi*, Dr. Yates found imbedded in the bluff of a hill about ten feet above the bed of a creek. The hill, upwards of a hundred feet in height, is one of the tertiary hills mentioned in Whitney's Geological Report, as being scattered over the plain of San Joaquin, at the base of the foot-hills of the Sierra Nevada.

The remains of the Mastodon of Contra-Costa Co. were obtained from the rock at the base of *one of* the rounded hills, of tertiary age, mentioned in Whitney's Report, pp. 31, 32, near the edge of the San Joaquin Plains, which skirt along the foot-hills of Monte Diablo.

A small photograph, accompanying Dr. Yates' letter, represents a much mutilated lower jaw, without the ascending portions posteriorly, and with straight tusks projecting with an upward direction. The tusks appear to be quite as long as the jaw has been in its complete state. No details of character are given in relation to the specimen.

Note on Anchitherium.—Prof. Leidy also exhibited a specimen recently received from Prof. Hayden, who discovered it on the head waters of the Jefferson Fork of the Missouri River. It consists of a portion of the lower jaw, apparently of a species of Anchitherium, larger than *A. Bairdi*, and relating in size to a mutilated molar, from John Day's River, Oregon, referred to *A. Condoni* (Pr. 1870, 112), and may, perhaps, pertain to the same species.

On motion the following papers were ordered to be published:—

NINTH CONTRIBUTION TO THE HERPETOLOGY OF TROPICAL AMERICA.

BY E. D. COPE.

The materials examined, from which the present contribution is derived, are contained in six collections, viz: One made by the U. S. Expedition for the exploration and survey of a canal route across the Isthmus of Darien, under Commander Selfridge; a second by the U. S. Exploring Expedition to survey a canal route across the Isthmus of Tehuantepec, under Captain Shufeldt, made by Dr. T. Hale Streets, who accompanied it as naturalist—which collections were placed in my hands for determination by Prof. Henry, of the Smithsonian Institution; a third by John Hauxwell, our correspondent at Pebas, Eastern Equador; and a fourth made in the southeastern part of the Island of Hayti, in the republic of Santo Domingo, by our member, Wm. M. Gabb.

I. The first of these collections embraces the following species:—

LACERTILIA.

Goniodactylus, sp. aff., albigulari.

Corythophanes, sp.

Anolis squamulatus, Peters, Monatsb. Pr. Ac. 1863, 145.

Auricular opening nearly as large as eye-slit; scales smallest; seven rows between orbits, twelve at middle of muzzle, and eleven at middle of lores, the inferior not larger than the rest. No larger supra-orbital and infra-labial scales; scales of arm, back and tail, one-keeled.

Green, with seven crossbands, each of a double row of blackish spots from axilla to tail, the front very oblique. One anterior similar, extending from the ear to the shoulder.

This description is introduced for comparison with those of *Anolis microtus* and *A. insignis*, described a few pages later.

OPHIDIA, Kuhl.

Camilia Monotropis.

Ninia atrata, Hallow., var. with yellow inferior surfaces with median brown band.

Ophibolus micropholis, Cope.

Pliocercus euryzonus, Cope.

Dromicus ignitus, Cope, sp. nov.

Herpetodryas carinatus, L., var.

Thrasops occidentalis, Gthr.

Himantodes cenchoa, L.
Oxyrrhopus occipitoluteus, D. B.
Nothopsis rugosus, Cope, gen. et. sp. nov.

DROMICUS IGNITUS, Cope.

Posterior superior maxillary tooth scarcely longer than those preceding, but separated by a marked interspace. Scales in seventeen longitudinal series. Form slender, head little distinct. Rostral plate scarcely visible from above; common internasal suture considerably shorter than frontal shield, which is shorter than common suture of occipitals. Length of muzzle to orbit, equal width of frontal and one superciliary. Dorsal longer than high. Orbitals 2–2, in one case by median division, in another by inferior intercalated between labials. Temporals 1–1½, the first occupying the whole space between occipital and seventh labial. Eight superior labials, fourth and fifth in orbit; nine inferiors; genial pairs subequal. Gastrosteges 128; urosteges, 62 + (the end lost, at least fifteen urosteges wanting).

Color brown above, blackish along the sides throughout, up to the middle of the fifth row of scales, then a very bright brown, commencing abruptly and shading to a deeper brown on the median region of the back. The light margin becomes a white line on the anterior fifth of the length, which extends to the orbit. Upper lip and throat light yellow, rest of inferior surfaces, dark crimson; a black dot on the end of each gastrostege. Scales dusted with black. Length restored? 15.5 inches; to vent, 10 inches.

This serpent is allied to the *D. taniatus* of Peters (Monatsberichte, Berl. Ac. 1863, 275), from Mexico.

NOTHOPSIS RUGOSUS, Cope, gen. et sp. nov.

Teeth on all of the usual bones of the mouth, wanting on the premaxillary. Maxillary teeth of equal lengths, entire. Head flat, oval, moderately distinct; body and tail compressed. Urosteges in two rows, anal shield entire, gastrosteges narrow, angulate, the ends crossed by a longitudinal groove; pupil round. Head covered with small scales above, except a pair of internasals in contact with nasals and rostral; an isolated median frontal, and a pair of small oval occipitals, each also entirely surrounded by small scales. A single nasal pierced by the nostril; loreals

like other head scales, orbit surrounded by scales, labials not pitted. One pair of genecials. Scales of body subequal, keeled, without apical pores.

The above generic characters will indicate to the zoologist a type of whose affinities I have been quite uncertain. Its superficial characters remind one at once of the *Peropoda*, and the double urosteges suggest the *Pythons*. Examination shows that it does not possess the essential characters of the division, lacking all external trace of posterior extremities, and having the mandible constructed on the Colubrine type, thus lacking the coronoid bone. The form of the postfrontal bone is, however, significant; it is of considerable size, and sends forwards along the external margin of the frontal a process, as far as the prefrontal. This structure is characteristic of the family *Achrochordidæ*,[1] which embraces the genera *Chersydrus* and *Achrochordus*. The present genus differs in the possession of ventral shields, wherefore it may be referred to a new family under the name of the NOTHOPIDÆ. I should not be surprised to find that the genus *Xenodermus* of Reinhardt belongs to it.

The allies of this genus, then, are exclusively Old World, and confined to farther India and the Archipelago.

Char. Specif.—Head rather small; neck and tail rather slender. Scales of body in twenty-nine rows, all strongly keeled, those of the seven median rows a little broader than the lateral, and more strongly keeled. The scales of the inferior series are more acute than the superior. A broad shallow groove extends throughout the length, between the keel of the first row and the angle of the gastrosteges. The difference between the dorsal and lateral series of scales is more distinct posteriorly, which, with the angulation of the vertebral line, gives the animal a pentagonal section. The scales of the head are smaller than those of the body, not imbricate, and keeled; but one row separates the orbit from the labials. Muzzle rounded, a little projecting. Rostral plate not visible from above, subtriangular, broader than long. Nasal subparallelogrammic, the upper anterior angles nearly meeting above the rostral, the inferior approaching near to the labial margin. Superior labials small, twelve, seventh under orbit; inferiors fourteen or fifteen, the inferior four in contact with the genecials. First

[1] See Proc. Acad. Nat. Sci., 1864.

pair and genicals separated by a median longitudinal groove; latter plates 2.5 times as long as wide; remainder of gular region covered with small scales. Internasals together crescentic, the points extending to behind the nostrils. Frontal broad cordate, the apex posterior; a half suture from the front divides it. Occipitals narrow, length equal from muzzle to frontal, greater than width of latter. They are separated by a single series of small scales, in contact at one point. Gastrosteges 158, anal 1; urosteges 1 entire, 55 divided, and probably 10 wanting from the loss of the extremity. The section of the tail is compressed, pentagonal. Length, .381 M.; to vent, .225; to rictus oris, .001.

The ground color is brown, which is yellowish on the sides, dark on the vertebral region, darker anteriorly, and almost black on the head. The sides are marked from the second to the tenth series of scales with dark brown yellow bordered triangles, apices upwards, three in an inch; the bases scooped out and with the legs sometimes cut off. A series of subquadrate blackish spots separates their apices along the median line; these sometimes divide, and the halves alternate. Head unspotted, upper and lower lips with lateral ventral groove ochre-yellow. Belly clearer yellow, with several series of small deep brown marking. Outer ends of urosteges blackish, anal shield black.

The above description indicates how closely this serpent resembles in coloration the young examples of *Trigonocephalus atrox* from the same country, and the *T. neovidii* of Brazil. This is so marked as to constitute a case of mimetic analogy. But few cases of mimicry of the Crotaline venomous snakes are to be observed in South America, the imitations being chiefly of the other venomous group *Proteroglypha*, as represented by *Elaps*. In this connection may be made a

Reclamation, of the discovery of this, perhaps the most extensive example of mimetic analogy known in zoology. Alfred R. Wallace, in his admirable work, "Contributions to the Theory of Natural Selection," London, 1870,[1] gives Dr. Günther as his authority for the facts of the case with regard to the genera *Pliocercus Oxyrrhopus*, *Erythrolamprus*, etc., and refers to his own previously published account of it in one of the British Reviews for 1869. The first published account of the case will be found

[1] Wallace is quoted by Darwin in "Descent of Man," to the same effect.

in the "Proceedings of the Academy of Natural Sciences, Philadelphia," 1865, 199, in a paper by the author; although attention had been called to it in the same publication for 1860, p. 262.

It was repeated and extended in "Origin of Genera," 1868, but had been already pointed out in conversation with Dr. Wallace, and probably Dr. Günther also, in London, in 1863, a fact which had probably escaped his memory.

II. Examination of a collection of reptiles and fishes brought from near San José, Costa Rica, by Dr. Van Patten. The collection embraced forty-one of reptiles, six of batrachia, and nine of fresh-water fishes from the Rio Grande. The facies of this part of the fauna may be seen in the following list:—

OPHIDIA.

Candisona durissa, L.

Bothrops atrox, L.

Bothriechis affinis, Bocourt.

Bothriechis nigroviridis, Peters.

Elaps nigrocinctus, Gird.

Elaps ornatissimus, Jan. var. with black annuli ten scales apart, nineteen on body, six on tail.

Elaps multifasciatus, Jan.

Pelamis bicolor, Daud.

Dryiophis brevirostris, Cope.

Dryiophis acuminatus, Wied.

Thrasops ? mexicanus, D. B.

Leptognathus nebulatus, L.

Dipsas gemmistratus, Cope.

Leptodira annulata, var.

" " var.

Masticophis margaritiferus, Schl.

Masticophis boddaertii, St.

Herpetodryas carinatus, L.

Spilotes melanurus, D. B.

Liophis epinephelus, Cope, Proc. A. N. S., 1862, 78.

Coniophanes fissidens, Günther. Scales in fifteen series; belly red behind.

Conophis lineatus, D. B.

Erythrolamprus venustissimus, L.

Rhadinæa serperaster, Cope, sp. nov.

Tantilla melanocephala, Linn. Abundant.

Tantilla melanocephala, Linn. Variety.

Stenorhina ventralis, D. B.

Stenorhina degenhardtii, Berth.

Ninia maculata, Peters. Abundant.

Ninia atrata, Hallow.

Colobognathus hoffmannii, Peters. Abundant.

Colobognathus brachycephalus, Cope, sp. nov.

Colobognathus dolichocephalus, Cope, sp. nov.

Epicrates cenchria, L.

LACERTILIA.

Anolis insignis, Cope, sp. nov.

Anolis microtus, Cope, sp. nov.

Anolis nannodes, Cope, P. A. N. S., 1864, p. 173, var. with only five scales between the canthal rows on muzzle, and six rows of large smooth genecials.

Anolis hoffmannii, Peters, Monatsber. Pr. Acad., 1863, 142.

Anolis trochilus, Cope, sp. nov.

Sceloporus malachiticus, Cope, Proc. Acad. Nat. Sci., Phila., 1864, 178.

Cyclura acanthura, Wiegmann.

Phyllodactylus.

BATRACHIA.

Trypheropsis chrysoprasinus, Cope, Proc. Acad. Nat. Sci., Phila., 1866, 130; 1868, 117.

Atelopus varius. Very abundant. The light spots on this species are crimson in life.

Bufo.

Smilisca daudinii, D. B.

Agalychnis moreletii, Dum. Very abundant. Golden and green in life.

Descriptions of new species are appended."

TELEURASPIDES.

This group of the rattlesnake family embraces those with undivided anal shields and no rattle. It stands immediately between the true *Trigonocephali* and the *Crotali*, as the former have divided caudal scutella and the rattle absent, the latter the rattle with simple scutella. One genus of this division was described long ago by Beauvois, and adopted by Gray and others, that is, the *Ancistrodon* of North America and Mexico, but most of the genera have only been recognized within a recent period. In March, 1859, Prof. Peters distinguished a second genus of the

group, and, towards the close of the same year, the writer named a third. Prof. Peters subsequently named another genus which may be retained, though in a sense quite different from that in which it was originally intended. I allude to *Bothriopsis*, first defined by the four small scuta on the top of the muzzle of one of the species, a character not worthy of such a valuation. The characters adopted will be seen below. All the known species are found between North Mexico and Peru.

I. Head scaled above.

a. Body compressed, tail prehensile (*arboreal*).

A series of horn-like scales above the eye, outside of the superciliary shield. TELEURASPIS.

Superciliary reaching to the edge of the eye opening, no horns. BOTHRIECHIS.

aa. Body cylindric, tail straight (*terrestrial*).

Nasal plate one. PORTHIDIUM.

Nasal plates two. BOTHRIOPSIS.

II. Head with nine plates above.

Body cylindric; two nasals. ANCISTRODON.

TELEURASPIS, Cope.

Proceed. Acad. Nat. Sci., Phila., 1859, 338; 1860, 345.

The species of this genus are few, and are so far only known from the Isthmus of Darien and west of the Andes to Peru.

Teleuraspis schlegelii, Berthold, Abh. wiss., Göttingen, 1847, iii. 13 (*Trigonocephalus*). Cope, Pr. A. N. Sci., 1859, 338; 1860, 345.

From Veragua and Darien.

Teleuraspis nitida, Günther, Proc. Zool. Soc., London, 1859, Nov. Tab. (*Lachesis*). Cope, l. c. 345, et 1868, 110.

Equador.

Teleuraspis nigroadspersus, Steindachner Sitzungsber. Wien. Academie, 1870, May, pl. viii.

This species is near the last, especially to a bright yellow variety of it. It differs, according to its describer, in the two nasal shields, and the fewer superciliary horns.

Central America.

BOTHRIECHIS, Peters.

Monatsber. K. Preuss. Academie, 1859, 278. Cope, Pr. A. N. Sci., Phil., 1859, 345. *Thamnocenchris*, Salvin.

This genus is, like the last, confined to the great forests of Central America and the northwest of South America. Species have been found further north than those of *Teleuraspis*. Like the latter, they inhabit trees, filling the place in America of the species of the East Indies which belong to the *Trigonocephali*, and of the tree-vipers of West Africa, *Atheris*, Cope. All the species of these different groups are of green colors, in contradistinction to those of terrestrial habits, which are of various shades of brown. This is evidently related to their convenience in the struggle for existence in the localities in question.

Bothriechis nigroviridis, Peters, l. c. Cope, l. c.

Costa Rica. A specimen from Dr. Van Patten's collection is peculiar in having the nasal shield to reach the labial border in front of the labials, and the superciliary shield transversely divided. In all other respects it agrees with Peters' description and figures.

Bothriechis lateralis, Peters. Monatsb. Preuss. Acad., 1862, 674. *Bothrops bilineatus*, Pet. l. c., 1859, 278.? *Bothrops bicolor*, Bocourt, Ann. des Sci. Nat., 1868, p. 201.

Costa Rica.

Bothriechis aurifer, Salvin (*Thamnocenchris*). Proc. Zool. Soc., 1860, 459. Tab. pulcherrima!

Coban, Vera Paz.

PORTHIDIUM, Cope.

This genus is proposed to accommodate the *Bothrops lansbergii* and related species, which display characters intermediate in some respects between the last genus and *Bothriopsis*.

Scales in 23 rows. Rostral plate narrow, high; two or three scuta above canthus rostralis; superciliary wide. Body compressed. Dark brown crossbars alternating on sides. P. LANSBERGII.

Rostral higher; scales of vertex more elongate in front. P. NASUTUS.

Porthidium lansbergii, Schlegel, Magazine de Zoologie, 1841. Tab.

Tropical America.

Porthidium nasutum, Bocourt, Ann. Sci. Nat., 1868, p. 202 (*Bothrops*).

Guatemala.

BOTHRIOPSIS, Peters.

Monatsber. Preuss. Acad., 1861, 359, emendatus.

The species of this genus are all of terrestrial habits, and approach, in this respect, the *Ancistrodontes*. They have a more extended range than any of the preceding, occurring from the upper or Peruvian Amazon to northern Mexico. They are very venomous, but not so much dreaded as the true *Trigonocephali* of the same regions, which attain a larger size.

a. Superciliary shield wide.

Scales in 21 rows, two inferior smooth; canthus rostralis with two scales only; two rows below eye; a series of brown dorsal rhombs.
B. GODMANII.

Scales in 23 rows; rostral a narrow vertical parallelogram; three scales on canthus; 2–3 rows below orbit. Light, with twenty-one or fewer broad brown crossbars, alternating on each side; mouth black.
B. BRACHYSTOMA.

Similar, but with forty quadrate spots on each side the middle line, with two rows of spots below them on each side. B. OPHRYOMEGAS.
B. CASTELNAVI.

aa. Superciliary shields very narrow.

β. No small scales surrounding rostral.

Scales in 23 ("25") rows, three inferior smooth; small scales on canthus, four rows below eye; rostral broad as high; nine superior labials, fourth largest. Twenty-two dorsal rhombs. B. AFFINIS.

ββ. Rostral separated from nasals by small scales.

Scales in 25 rows; rostral triangular, broader than high; small scales on canthus, five rows below eye; 10–11 superior labials. A series of large dark brown dorsal rhombs. B. MEXICANUS.

Bothriopsis godmannii, Günther (*Bothrechis*). Am. Mag. N. H., 1863, nov. pl. vi., f. G. *Bothrops brammianus*, Bocourt, Ann. Sci. Nat., 1868, p. 201.

Vera Paz and Guatemala.

Bothriopsis brachystoma, Cope, Proc. Acad. Nat. Sci., Phila., 1861, 295 (*Bothriechis*). *B. castelnavi*, var. *brachystoma*, l. c. 1859, 339.

Guatemala.

Bothropsis ophryomegas, Bocourt (*Bothrops*, Bac.). Ann. Sci. Nat., 1868, 201.

Central America.

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Bothriopsis castelnavii, Dum. Bibr. Erp. Gen. vii. (*Bothrops*). Castelnau, Anim. Nouv. ou rares Am. Sud. Rept. Tab. Steindachner, Sitzungsb. Wien. Acad., 1870, May. *Bothriopsis quadriscutatus*, Peters, Monatsb. 1851, 359.

Equador; Peru.

Bothriopsis affinis, Bocourt. Ann. Sci. Nat., 1860, 201. *Teleuraspis mexicanus*, Cope, Proc. A. N. S., 1859, 339. *Bothriechis, do.*, Cope, l. c. 1860, 345, nec *Atropus mexicanus*, D. B.

Mexico, as far north as Tuxpan, and Central America to Costa Rica.

Bothriopsis mexicanus, Dum. Bibr. (*Atropus*). Erp. Gen. viii., p. 1521, Tab. 83 bis.? *Atropus nummifer*, Rüppel, Verzeichn. Senck. Mus. Frankr. p. 21. *Teleuraspis*, do., Günther. Am. Magaz. Nat. Hist., 1867, March, Tab. iii., fig. C, nec Copei, Pr. A. N. S. Phila., 1859, 339, et 1860, 345 = *B. affinis*, Boc.

Rüppel's description is so brief and worthless as to be unfit for application to any species. I used it for what turns out to be the *B. affinis of Bocourt*, but Dr. Günther retains it for this one, believing it to be identical with the former. Bocourt first distinguished them, but they may prove to be the same; they are at least very closely allied.

Common in Mexico.

Numerous specimens of these species are in the collections of the Smithsonian Institution, chiefly obtained by Henry Hague, of Coban.

ANCISTRODON, Beauvais.

Trans. Amer. Philos. Soc. *Agkistrodon* and *Toxicophis* (Troost). Baird and Girard.

Ancistrodon bilineatus, Günther. Am. Magaz. Nat. Hist., Nov. 1863.

Guatemala; Tehuantepec. Coll. Smithsonian.

Ancistrodon pugnax, Bd. Girard. Catal. Serpents N. Amer., 18.

Texas.

Ancistrodon piscivorus, Catesb.

United States, from Texas to Virginia; the Mississippi Valley to south Illinois (Kennicott).

Ancistrodon contortrix, Linn.

North America. East of Rocky Mountains, from Texas inclusive of Massachusetts.

Elaps multifasciatus, Jan. Mag. Zool. 1859, pl. A.

An elongate species, with extremely short tail, and head rather

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suddenly wider than the body, and with closely approximated broad black rings.

Tail one 22d or 3d of the total length, obtusely conic at the apex. Scales rather broad, in fifteen longitudinal rows. Head broad and short, the muzzle broadly rounded. Eye very small, not exceeding the external nostril. Rostril plate broad, low; internasals a little longer than wide. Frontal elongate, exceeding superciliaries by .33; occipitals large. Preocular large, triangular, the apex just touching the postnasal. Postoculars small, the upper larger, and in contact with occipital. Labials high and narrow, seven on the upper lip. Of these, the third is as wide as the base of the preocular, while the fourth and fifth, which support the orbit, are very narrow. The sixth is very large, and reaches the occipital on one side, but is separated on the other by a narrow temporal cut from its upper margin. Counting this one, the temporals are 1–1–1; the last two being large. Seventh labial but little longer than deep. The venom gland of this species must be large, as the head is much swollen laterally, and the labials exhibit a broad infolded margin at the borders of the lips which are in contact. The fangs are short. Inferior labials seven, all wide; genials large, the pairs equal, separated by three scales from the first gastrostege. Fourth labial in contact with genial in part, the other part with the fifth and sixth, bordered posteriorly by a plate which diverges from the genials. Gastrosteges 268; anal divided; urosteges 23.

Ground color crimson, crossed by numerous closely placed black annuli, which are closer together above than on the abdomen. They cover four series of scales above, and two gastrosteges. There are fifty-five on the body in the specimen, and two and a tip on the tail. The scales of the red annuli on the sides are dotted with black. The first ring forms a collar, in front of which the head is yellow as far as the postoculars and middle of fifth labials. In front of this point it is unspotted black. Chin little or not dark-spotted. Total length, M. 9.35; of tail, 0.47; width of head, 0.19.

The very *small* eyes and broad head give this serpent a vicious expression, and it is probably one of the most venomous of the genus. Its characters are intermediate between those of the *E. corallinus* and *E. mipartitus*, and the large extent of the sixth upper labial, if normal, will ally it to the *E. riisei*. It is as large

as the *E. lemniscatus*. It is evident from the above description that it is distinct from the *E. mipartitus*, D. and B., with which Günther is disposed to unite it. See Am. Magaz. Nat. Hist., Sept. 1859. Prof. Jan's figure does not represent the species well, having the black rings too wide; it must have been taken from a young animal.

COLOBOGNATHUS DOLICHOCEPHALUS, Cope, sp. nov.

Scales in thirteen longitudinal series carinate to the urosteges on the tail, to the first row of scales on the posterior, and to the second row on the anterior part of the body. Head elongate, conic, scarcely distinct from the neck. Internasals very small, prefrontals very long. Frontal wide, openly angulate in front, with superciliary margins distinct from the parietal; latter plates well developed. Superior labials six, second bounding nasal and loreal; third a little, fourth largely in eye, fifth longer than high, in contact with parietal. One temporal above sixth labial, which is higher than long. Inferior labials six, second and third minute, fourth long and narrow. Postgenecials small, separated by a scutum. Oculars 0-1. Rostral elevated, not separating internasals. Tail slender, 5.75 times in the total length. Gastrosteges 131, anal 1, urosteges 39. Color of body above, and entire tail, black; a series of large distant red spots on each side, which often meet above, forming half-rings. These disappear on tail and neck. Below red, lower lip and chin black. Length, 12–14 inches.

San José, Costa Rica. Dr. Van Patten.

This species differs from the *C. hoffmannii*, Pet., in its more numerous labial shields, keeled scales, coloration, etc. From the *C. nasalis*, Cope (*Catostoma*, olim), in the fewer scale-rows (the latter has seventeen), the coloration, etc.

COLOBOGNATHUS BRACHYCEPHALUS, Cope.

Scales in fifteen longitudinal rows, smooth, except a faint trace of carination near the posterior part of the body. Head flat; rather wide behind, and distinct from neck. Postgenecials small, separated by a scale. Rostral moderate, internasals not minute, prefrontals nearly broad as long. Frontal broad convex in front, superciliary and parietal sutures nearly continuous. Oculars 0–1. Superior labials six, two behind orbit, sixth longer than high, surmounted by one temporal; fifth longer than high, bounding

parietal; third and chiefly fourth in eye. Lower labials seven; genials short, wide. Gastrosteges 124, anal 1, urosteges 38.

Color of body and entire tail black; gastrosteges reddish, brown margined. A yellowish or orange collar crosses behind the parietal plates, and a band of the same color extends from the side of the neck to the tail on the second and third rows in front, and third to fifth behind. This band is composed of two rows of alternating narrow spots, which are not always perfectly united.

Total length eight inches, the tail one-sixth of the total.

The species just described agree with the *C. nasalis*, the *C. hoffmannii*, and the *Catostoma semidoliatum*, in having the first labial behind the eye in contact with the parietal shield. They are intermediate, in the structure of the jaws, between the type of the genus and the last-named *Catostoma*. In the *C. semidoliatum* the maxillary bone is developed, and bears teeth opposite the first labial plate. In the *Colobognathus hoffmannii*, it, with the palatine, is cartilaginous in front, and bears no teeth anterior to the fourth labial shield. In the *C. brachycephalus* and *C. dolichocephalus*, the maxillary and palatine are a little better developed, the teeth extending to the posterior margin of the second superior labial. In the serpent described by me (Proc. Acad. Nat. Sci., 1868, p. 131) as *Catostoma nasale*, the dentition is precisely as in the two species here described, and I accordingly refer it to *Colobognathus*. This genus will then embrace four species. In the genus *Colophrys*, Cope (l. c., 1868, 130), the maxillary is still better developed, the teeth commencing at the anterior part of the second upper labial.

RHADINÆA SERPERASTER, Cope, sp. nov.

This species agrees with those regarded as typical when the genus was first defined (see Proc. Acad. Nat. Sci., 1868, 132). That is, the teeth are equal, the scales smooth and poreless, the anal plate divided, the nasals two, loreal one, and oculars 1–2.

In this serpent the scales are in nineteen series. Superior labials eight, not elevated, fourth and fifth bounding eye. Temporals 1–2–3. Internasals transverse, narrow; postnasal larger than prenasal. Frontal wide, superciliary suture shorter than anterior, total length exceeding that of common parietal suture. Loreal square; genials subequal. Gastrosteges 164, anal 2, urosteges 78.

Dark brown, with six longitudinal yellow or white lines, of

which the first and second are brightest. The second dark band is wider than the first and vertebral; it and the third are partly divided by a faint white line. Another white line on each side is produced by a series of dark spots on the ends of the gastrosteges. Labial plates black, yellow spotted. Head dark brown above, with a pale shade across frontal, and two just behind parietals. Chin and belly yellowish.

ANOLIS INSIGNIS, Cope, sp. nov.

Auricular opening half as large as eye. Scales intermediate; seven rows between orbits; one or two superorbital rows but little larger than the others; eight rows across middle of muzzle, and six across loreal region at middle. Three large and two small keeled infralabial rows. Scales of arm smooth, of tail striate.

Fawn-brown, with four double bands of greenish-blue between axilla and tail. Divided between the brown band by a yellow band, which widens below and breaks into spots above. A large round greenish-blue spot with brown centre in front of axilla.

Interorbital and occipital regions deeply concave, the latter bounded posteriorly by two elevated osseous ridges which meet behind at an acute angle. No facial rugæ, front flat except a slight median elevation. Muzzle with broad median ridge. Scales of front equal, those of canthus osseous. Postfrontal and zygomatic arches prominent, rugose. Inferior loreal rows of scales larger than others, nares surrounded by small scales. Fan very largely developed. An elevated crest or dermal fold on the nape. Scales of the sides and back (except some median rows) flat, pavement-like, equal, smooth, one-third the size of the smooth ventrals. Four median dorsal rows subconic, smaller than the ventrals. Tail proximally compressed, covered with equal scales. Limbs stout, the anterior extending four-fifths way to groin; the hinder reaching nearly to the ear. Scales of the limbs small; dilatations distinct.

The colors of this *Anolis* are very elegant. Besides the large spot behind the angle of the mandible, there is a blue one on the angle surrounded by fawn color, and this by yellow. Sides of the temporal region and neck with yellow spots. Bluish of first cross-band in a coarse netted figure. Top of head fawn color; fan entirely vermilion; belly bright yellow. Tail with broad blackish annuli; limbs with dark crossbars, three on tibia, femur, and forearm; two on humerus.

Total length, 0 M. 44. Length to orbit, .0183; to ear, .037; to axilla, .062; to groin, .135; to angle of parietal crests, .035. Width at anterior angle orbits, .014; zygomatic arches, .019; length fore foot, .023; of tibia, .029; of hind foot, .04.

From San José. Dr. Van Patten.

This is a large species, being about equal to the *A. edwardsii* of Jamaica. It is one of the most elegantly colored among the species of a beautiful genus.

Its affinities, as already pointed out, are to the *A. squamulatus*, Peters, which is very near the *A. laticeps* of Berthold.

ANOLIS MICROTUS, Cope, sp. nov.

Auricular opening not larger than nares. Scales generally larger; four rows between orbits; two rows of large ones above orbits; seven rows between rows of canthus rostralis at middle of muzzle; three loreal rows at middle; three large smooth infralabial rows. Scales of tail and foreleg three or four keeled.

Brown, with cross-bands of large paler ocelli crossing the sides behind the axilla, at middle, and at crura. Eye and a broad band to shoulder, dark brown.

Description.—Scales of back, sides, and belly equal and smooth. Tail compressed at base, distally cylindric, covered with equal scales. Front without ridges, but with well-marked concavity; all the scales covering it equal and smooth. Occipital or parietal region concave, with high latero-posterior bounding ridges, which do not unite, but leave a notch between them (in one specimen). Occipital region covered with small scales. Zygomatic arch prominent, canthus rostralis not tubercular. Fan well developed. First two infralabial scales longer than the others. Limbs short, stout, anterior not reaching groin, posterior extending to angle of lower jaw. Dilatations well developed.

	M.
Total length	0.31
Length to orbit	.015
" " ear	.03
" " axilla	.05
" " groin	.0955
" " convergence of parietal crests	.029
" of fore foot	.017
" " tibia	.0183
" " hind foot	.029
Width at anterior angle orbits	.0125
" " zygomatic arch	.017

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This species is darker than the last, and is much less ornamented. The color is a rich yellowish-brown; where the epidermis is lost on the head, a strong yellow pigment appears, so that it is probable that it could in life change to that color at will. A deep brown band commences by covering the whole eye and extends to the shoulder, where it is marked by pale centred ocelli. It is separated above by a narrow paler band from a large dark brown patch that covers the nape and scapular regions. Limbs and tail broadly and indistinctly brown cross-banded. Belly and throat immaculate.

San José, Costa Rica. Dr. Van Patten.

This large species is allied to the last, but perhaps resembles more the *Anolis biporcatus*, Wiegm., the largest *Anolis* of Mexico. The latter has, among other points of difference, keeled abdominal scales and a shorter muzzle, with very different coloration. The uniform size of all the scales is a noteworthy character of the *A. microtus*.

ANOLIS TROCHILUS, Cope, sp. nov.

Abdominal scales small, flat, smooth; tail cylindric, with similar scales. Dorsal scales smaller than ventral, pavement-like, very weakly keeled, graduating into those of the lower part of the side, which are smaller. Head moderately elongate; width between anterior margins of orbit, equal length of muzzle from same point, measured on the side. Interrugal concavity of the front well marked, occupied by very small scales, much less than those of the rugæ, in nine rows. Scales between rugæ and canthus, large. Two rows separate the superciliaries, which are separated by three or four rows from the occipital. Five rows of loreal scales. Six smooth scales in the supraorbital disc, those inner larger, transverse, the three outer longitudinal. Four rows of infralabials medially; nostril surrounded by small scales. Auricular meatus one-half eye-slit.

Limbs long, toes slender, the dilatations well marked. The fore limb oppressed, reaches the groin; the hind limb extended, attains the end of the muzzle. Fan little developed.

Above and below, brilliant metallic green with a few black dots along the vertebral line. Head and anterior part of sides, brown; a black V extending from the auricular openings, which are connected by a broad black band with the orbits. Another V ex-

tends towards the occiput from the limbs of the nuchal V, inclosing a narrow brown area with it. Top of muzzle and limbs, blackish.

	M.
Total length	0.108
Length to orbit	.005
" " ear	.011
" " axilla	.018
" " groin	.0378
Width head behind	.006
Length hind foot	.014

San José. Dr. Van Patten.

A small species of metallic colors, allied to the *A. viridiaeneus*, Peters. It is the eighty-fifth of the genus known to the writer.

III. The third collection was made by the U. S. Expedition to survey the Isthmus of Tehuantepec for a ship canal, under Capt. Shufeldt, by T. Hale Streets, M.D. It included a few species of fishes whose names are appended.

OPHIDIA.

Elaps ornatissimus, Jan. (with distant annuli).

Masticophis margaritiferus, Schl.

Oxybelis acuminatus, Wied.

Coniophanes fissidens, Gthr.

Oxyrrhopus plumbeus.

Hydrops lubricus, Cope, sp. nov.

LACERTILIA.

Sphaerodactylus glaucus, Cope. Adult of two inches: labials $\frac{5}{4}$ $\frac{6}{4}$; tail orange-red. Scales smooth, flat. See Proc. Acad. Nat. Sci., 1865, 192.

Cyclura acanthura, Wiegm.

Cyclura pectinata, Wiegm.

Sceloporus.

Amiva.

Cnemidophorus.

Plistodon.

BATRACHIA.

Systoma ustum, Cope (*Engystoma mexicanum*, Peters).

Bufo agua, Dand.

Bufo sternosignatus, Gthr.

Lithodytes rhodopis, Cope (*Hylodes sallaei*, Gthr.).

FISHES.

Philypnus dormitator, C. V.

Tetragonopterus streetsii, Cope, sp. nov.

Xiphophorus hellerii, Heck.

Fundulus, sp. 1.

Fundulus, sp. 2.

HYDROPS LUBRICUS, Cope, sp. nov.

Head short, broad, little distinct from neck. Scales entirely smooth, poreless. Posterior grooved tooth not much larger than those in front of it. Head-shields normal, labials not divided; loreal distinct, not reaching orbit; oculars 1–2.

Internasals contracted in front. Frontal wide, with parallel sides longer than muzzle in front of it. Parietals still longer, somewhat contracted behind. Rostral broad, low; loreal small, higher than long. Temporals 1–2, first in contact with two labials. Superior labials eight, fourth and fifth bounding rather small orbit; seventh wider above than below. Inferior labials 10 or 11, 4.5 in contact with anterior, 1.5 with posterior or longer genials. Scales in 21 rows. Anal divided. Tail $4\frac{1}{6}$ times in total length.

Ground color above, a stone brown. A blackish lateral band extends from the end of the muzzle to the end of the tail, including all between the approximated edges of the second and sixth rows of scales. A dark brown shade extends throughout the length on the vertebral, and two series of scales on each side of it. Below the second row of scales white (? in life yellow), a large black spot marking the third from each end of each gastrostege and urostege, thus forming two series. Labial plates above and below, pale with a black spot; gulars and genials similar. Total length two feet. Gastrosteges 162. Urosteges 71.

This species was found by Dr. T. H. Streets on the bank of the Coatzacoalcos River, in the department of Vera Cruz, Mexico. It is excessively smooth, so much so as to produce the sensation of an oiled surface when the finger is passed over the scales.

TETRAGONOPTERUS STREETSII, Cope, sp. nov.

Radii D. 11, A. 25; scales 7–41–5. Maxillary bone elongated, the extremity extending to below the anterior part of the pupil, its margin toothless. Profile nearly plane, rising into the convex dorsum at the supra-occipital crest; muzzle obtuse, jaws nearly

equal. Interorbital region transversely convex, as wide as the diameter of the orbit. Dorsal fin originating a little behind that of the ventral.

General form elongate rhombic. Depth 2.5 times in length less caudal fin; length of head 4 times in same. Eye 3.2 times in head. Total length five inches. Color of superior half of head and body blackish; a vertical clavicular dark band, a leaden band from its upper margin to basis of caudal fin terminating in a pyriform black blotch of considerable size, which is prolonged on the caudal radii. Below, yellowish-white. Fins unicolor.

From the head-waters of the Coatzacoalcos River among the Cordilleras.

This species may be allied to those mentioned by Bocourt from the rivers of Belize and Peten (Ann. Sci. Nat., XI.); but it will be impossible ever to recognize them from the notes attached to the names.

IV. The collection made by Dr. Gabb was chiefly obtained near the city of San Domingo, in the southeastern part of the island. It embraces twenty species, as follows:—

OPHIDIA.

Dromicus parvifrons, Cope.

Hypsirhynchus ferox, Gthr. (*H. scalaris*, Cope).

This is no doubt the true habitat of this snake.

Thrasops catesbeyi, D. B.

" **oxyrhynchus**, D. B.

Ungualia maculata.

Homalochilus striatus, Fisch.

LACERTILIA.

Amiva vittipunctata, Cope.

Liocephalus raviceps, Cope.

Anolis cœlestinus, Cope.

" **semilineatus**, Cope

" **cybotes**, Cope

" **distichus**, Cope.

Hemidactylus.

Sphærodactylus notatus, Baird. Abundant.

BATRACHIA.

Bufo gutturosus, Latr. (Günther Cat. Anura B. M. Pl. V. fig. B.)

Hyla vasta, Cope, sp. nov.

Trachycephalus marmoratus, D. B.

Lithodytes lineatus, Grav.

HYLA VASTA, Cope, sp. nov.

The largest species of the genus, equalling in size the *Hypsiboas maximus*, *Cinclosoopus granulatus*, etc.

Form stout and rather clumsy. Head broad; muzzle short, rounded; canthus rostralis well marked, concave; vertex strongly concave. Width of head at tympana .33 greater than length to line of the same. Eye not very large, tympanic disc one-fourth its area. Teeth in two rather long transverse arches opposite the posterior margin of the inner nares. Tongue broader than long; choanæ smaller than inner nares. Parietal fontanelle not large.

The limbs are stout, the forearm and tarsus bordered by a dermal fold behind, which has a scalloped thickened margin. No fringes on the body, but the skin is covered everywhere with small warts, which are indistinct or obsolete on the median upper surfaces of body and limbs. The under surfaces, except the tibia, are areolate-warty, nearly smooth on the pectoral region. The fingers and toes are webbed to the base of the last phalange of all but the longest or median toes. The dilations are immensely large, the largest being twice the size of the tympanum. The fore limb extended reaches a little beyond the groin; the hind limb measures the end of the muzzle with the heel. Some small dermal flaps on the ischia.

	M.
Length of head and body (5 inches)	0.126
" to line of tympana	.032
" of fore limb	.076
" of hind limb	.187
" of hind foot	.081

Color above smoky gray, blackish on the head, with a brown band between the eyes. Inner surfaces dirty flesh-color, femur with three or four dusky cross-bands, unspotted behind. Throat black-spotted.

Near the city of Santo Domingo, W. I.

This tree-frog is probably not abundant, as it occurs now for

the first time in our collections, though I have examined four made in the island. From its size, its voice must be sufficient to betray its whereabouts to the naturalist. Its structural characters are apparently somewhat like those of *Hyla lichenosa*, Gthr., from Mexico. It differs in the larger palmation of the hand, concave front, minuteness of warts, size, coloration, etc.

AMIVA VITTIPUNCTATA, Cope, sp. nov.

Twelve series of abdominal plates; no heel spurs; one frontal plate. Seven plates in the infralabial series separated by granules and scales from the labials throughout; no plates inside the infralabials behind. A few gulars a little enlarged in the middle of the area. Edge of gular fold widely granular. Three supraorbitals, seven superciliaries. Teeth, 18 on maxillary bone, the anterior 14 with anterior denticle, the last 4 with both anterior and posterior. Brachial scales rather small, one row larger; postbrachials similar, two rows enlarged; antebrachials two narrow, one transverse row, well separated from brachials. Preanals, a marginal series with small central, with large ones bounding it, and three short rows of diamond-shaped scuta in front of them.

	M.
Length (tail perfect)	0.273
" to vent	.088
" to auricular meatus	.021
" of fore limb	.03

Longest toe of extended hind limb reaches to orbit. Femoral pores 18.

Color above, olive, with three pale lines on each side of the median line; a light lateral band from above axilla to groin, separated from outer dorsal line by a broad black band, which is marked by a median series of light dots. Sides and limbs white-spotted, tail brown-spotted, black below. Belly and throat uniform light olive; head above, uniform brown.

V. A small collection from the Island of Saint Eustatia, made by Dr. R. E. Van Rijgersma, contained the following species:—

Hemidactylus mabia, Cuv.

Anolis sagræ, D. & B. var.

Anolis gingivinus, Cope.

This species was described by me from specimens in the British

Museum said to be from "Anguilla Rock, near Trinidad." It appears, from Dr. Van Rijgersma's investigations, that the Island of Anguilla, far north of Trinidad, was meant.

Anolis leachii, Gray.

This species is near the last, but has coarser lateral scales and more slender mandible; it is also larger, and the color is quite different. It is bright green with a pale band over the shoulder, with a black spot above it, opposite the axilla. The fan is small.

AMIVA ERYTHROPS, Rijgersma, MS., sp. nov.

Abdominal plates in 12–14 series; no spurs on the heel. One frontal, four supraorbital, nine superciliary plates. Five infralabials separated by a few intermedials from posterior labials, first not separated from third labial. Seven rows of larger gular scales extending entirely across the throat. Three larger series on gular fold, which has several rows of granules near margin. Brachials small, in four rows; postbrachials small. Antebrachials large, two rows hexagonal, one transverse. Femoral pores small, 36 in a series. Preanal scales two large median with a single row of one or two in front; small scales occur in some specimens behind the posterior two. Outer hind toe a little longer than inner.

Teeth in adults compressed, one or two only with denticulations. The end of the longest toe of the extended hind foot reaches the anterior margin of the ear.

Color brownish-olive, with a broad greenish band on each side the back from the nape above the ear. In young specimens these bands are bright. Another less distinct band extends along the side from above axilla to groin. Between these and the dorsals, and across the back, are transverse black reticulations. Belly greenish, the color appearing as spots on the outer scales. Thorax and edge of sides of fold black; throat bright yellow; sides of head red; upper surface brown; limbs olive, with black reticulation.

	M.
Length of (tail reproduced)	0.32
" to vent	.126
" to auricular meatus	.029
" of fore limb	.05

VI. The collection from Ambyiacu R., from John Hauxwell, included the following:—

Helicops carinicauda, Wied.
Liophis pygmaeus, Cope.
Amiva surinamensis, Gray.
Mabuia? cepedii, Gray, with only 28 series of scales on the body.
Goniodactylus humeralis, Guich.
Goniodactylus varius, Dum.
Hyperanodon ochrocollaris, Spix.
Podocnemis sp. pullus.
Ranula palmipes, Spix.
Atelopus spumarius, Cope, sp. nov.
Scytopis allenii, Cope.
Scytopis aurantiacus, David.
Hyla marmorata, Daud.
Hyla leucophyllata, Beireis.

ATELOPUS SPUMARIUS, Cope, sp. nov.

Muzzle projecting, forming a narrow rim which is concave below, and overhangs the upper lip. Nostril lateral, above the symphysis of the mandible, when the mouth is closed. Loreal region plane, canthus rostralis straight, angular. Head, viewed from above, a section of a cone which is rounded truncate at the apex. Diameter of orbit equal from its front border to the nostril. Width of head behind equal length of humerus. Fingers nearly free, toes webbed at base. Tongue narrow, subcylindric. Muzzle marking basal third of forearm, and near middle of tarsus of hind limb.

Above, dark brown, with a broad band from orbit to groin, composed of numerous aggregated annuli of greenish-yellow, which has the appearance of dried foam. The band sends branches inwards on the back. Bands of the same character cross the fore and hind limbs in various places. Soles, palms, under surfaces of the limbs except tibia, and tarsus, yellow. Throat and belly yellow, dark brown spotted. Length M. .0275; width of sacral diapophyses .007.

In a second specimen the gular region is very sparsely spotted.

VII. Two new serpents from the Atlantic Southern States have been recently received by the Academy, as follows:—

DROMICUS FLAVILATUS, Cope, sp. nov.

This species is of especial interest, as the first representative of a West Indian and Mexican genus, found in the Nearctic Re-

gion. No species of *Dromicus* has been known in North America, and the occurrence of this one on the extreme eastern coast, and its very close affinity to a species (*D. callilæmus*, Gosse) common in Jamaica, are circumstances suggestive of origin by carriage in floating driftwood on the current of the Gulf Stream.

Habit moderately slender; tail 3.2 times in total length; head distinct, elongate, oval. Scales very thin, without scale-pores, in seventeen longitudinal series. Superior labials seven, third and fourth in orbit; fifth higher than long, with sixth separated by a narrow temporal from occipital; seventh longer than high. Inferior labials nine, four bounding genecials. Postgenecials longer than pregenecials. Internasals nearly quadrate; prefrontals longer than wide. Frontal, anterior width .75 length; parietals rather elongate. Nostril in prenasal, which is lower than postnasal; loreal very small, high as long; sculars 1–2. Gastrosteges 126; urosteges 77.

In *D. callilæmus* the frontal plate is very nearly as wide as long, and the gastrosteges number 140; the coloration is also different.

Color above, a rich golden brown, the scales of the two inferior rows on each side broadly gold-edged, the color of the back commencing on the third row. The ends of the scales of the vertebral row are sometimes darker-tipped. Head dark brown, darkest behind, with numerous but obscure paler vermiculations. Sides of head paler, with a reddish-brown band from the rostral plate through the eye to the middle of the last labial. Labials whitish, with black dots on the posterior, in oblique rows. Below white, lower labials sparsely black-dotted A pair of pale dots on the common occipital suture.

This, the first addition to the Ophidia of our Eastern States made for some years, was discovered by Dr. Henry C. Yarrow, near Fort Macon, on the coast of North Carolina. Near the same time another new Ophidian came to hand, as follows:—

CONTIA PYGÆA, Cope, sp. nov.

In its generic features, this species may be thus described. The dentition is complete, and the teeth of the maxillary bone are of equal length. The scales are smooth and without pores, and the anal plate is divided. The head-shields are normal; the nasal, usually entire in the genus, is in this species half divided by a

suture from the nostril to the labial border. Two pairs of genials; a loreal; rostral obtuse. The head is little distinct from the body, and the pupil is round.

The form of this species is stout and subcylindric, the tail entering the total length 4.33 times. The head is stout, oval, the profile a little arched. The centre of the orbit, anterior to the middle of the lip margin. The rostral is visible from above; the nasals approach so as to reduce the internasals to a subtriangular form each, of which the middle and posterior suture are equal. The frontal is long, and with parallel sides, its length exceeding that of the head in front of it. The parietals are still longer, and wide, with subtruncate outline behind. Loreal plate higher than long, half the height of the single preocular, which does not reach the frontal. Postoculars 2; temporals 1–2, the first in contact with three labials. Superior labials eight, their height subequal, the fourth and fifth bounding the orbit. Inferior labials nine, six in contact with genials, five with the first, two with the second genial. Latter subequal. Scales in seventeen series, those of first deeper than long. Those of sides at vent and of basal two-thirds of the tail roof-shaped or obtusely keeled. About one-sixth of the length in front of and behind the vent compressed, the dorsal outline keel-formed. Gastrosteges 120; urosteges 54.

Coloration above, black, with a very faint pale line along the centre of each scale of several lateral series. The lines are more distinct near the vent and on the tail, and heighten the effect of carinæ produced by the angulation of the scales. Beneath, pale in the alcoholic specimen; the posterior half of the body, with the tail, red; each scutum with a short black crossbar at its ends on the anterior margin. These cease a short distance anterior to the vent.

Length nine inches. Discovered at Volusia, Florida, by Edward Tatnall, of Wilmington, Delaware.

This interesting addition to our reptile fauna is quite unlike any species heretofore found in our territory. Its nearest affinity is apparently with the *C. mitis* of Baird and Girard, common in California. The only other American species, *C. episcopa* of Kennicott, has been found in Texas.

DESCRIPTIONS OF FIVE NEW SPECIES OF CRUSTACEA FROM MEXICO.

BY T. HALE STREETS.

PACHYCHELES MEXICANUS, nov. sp.

Plate II. Fig. 1.

Carapax broadly oval, about as broad as long, slightly convex antero-posteriorly; surface shining, but minutely granular through the lens; anterior portion of the carapax deflexed, triangular, and furrowed, a small white spot at the tip; neither spines nor teeth anywhere on the body; eyes small, supra-orbital border concave and inflated. Carpus as broad as long; three teeth on the anterior border; two slightly elevated ridges of granules on the superior surface; hand broad and large, the right larger than the left; fingers hooked at their extremities, denticulated; surface of the carpus and hand more coarsely granulated than the carapax; the granules extend to the ends of the fingers. Color red, with patches of a lighter shade; three posterior pairs of legs striped; the last article furnished with a few stiff hairs. Length of the carapax 0.18 inch; the hand 0.25 inch.

Habitat.—Gulf of Tehuantepec, Mexico.

PANULIRUS GRACILIS, nov. sp.

Plate II. Fig. 2.

Antennary ring armed with two spines, situated near together on the anterior border; behind these, and separated more widely from each other, are two rudimentary spines, seen through the lens; two stout horns projecting forward over the base of the ophthalmic peduncles; surface of the carapax covered with spines, larger anteriorly than posteriorly; also furnished with a few stiff hairs, attached mostly to the spines; epistoma armed with three spines; abdomen smooth; the transverse sulci, except the last, interrupted in the middle; a pit between the last nearly connects them, separated by two very narrow bands on either side of the pit. Color reddish-brown; external antennæ striped with bands of white. Length 0.9 inch.

Habitat.—Gulf of Tehuantepec, Mexico.

PALÆMON DASYDACTYLUS, nov. sp.

Plate II. Fig. 3–3*a*.

Rostrum long and slender, reflexed, extends beyond the lamelliform appendages of the external antennæ; armed on the superior margin with nine or ten teeth, and six or seven on the inferior

margin; the first tooth on the upper margin small, situated more directly on the carapax than, and separated from, the following six, which are situated together; the seventh and eighth separated by a wider space; last tooth quite small; apex of the rostrum pointed; the fifth tooth on the upper margin (counting from the carapax) nearly over the first on the lower margin; eighth over the last on the lower margin; those with but six teeth on the inferior margin have the last under the seventh of the superior margin; the first constant in its situation. Two external flagella of the internal antennæ united for a very short distance, smaller flagellum very short; all the others very long. First pair of legs short and slender; carpus more than twice the length of the hand; fingers half the length of the hand, slightly pubescent; second pair of legs very long; carpus not quite as long as the hand; fingers cylindrical and straight along their approximated surfaces, not as long as the palmar portion of the hand, densely downy; under surface of this pair of legs covered with spinules to the base of the fingers; the spinules on the carpus arranged in four parallel rows, of which the anterior and posterior rows contain the largest spinules. Posterior legs rough to the feel, pubescent.

This species can very readily be distinguished from *P. mexicanus* (Saussure), which it most closely resembles, by having six or seven teeth on the inferior margin of the rostrum. The carpus in *P. mexicanus* is longer than the hand, and the terminal segment of the abdomen is armed with three spines. In *P. dasydactylus* the terminal segment of the abdomen is armed with five spines—one in the middle, and one at either extremity, and a larger articulated one on either side of the middle.

Length from the tip of the rostrum to the end of the terminal segment 4.37 inches.

Habitat.—Tide-water of the Coatzacoalcos River, Isthmus of Tehuantepec.

PALÆMON SEXDENTATUS, nov. sp.

Plate II. Fig. 4–4*a*.

Rostrum long and slender, more relaxed than in the preceding species; longer than the lamelliform appendages of the external antennæ; armed on the superior margin with nine or ten teeth, and *six* on the inferior margin; sixth tooth on the upper margin over the first on the lower; the last on the lower margin half way

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between the eighth and ninth on the upper margin; those with but nine teeth on the superior margin have the first below under the space between the fourth and fifth; the last midway under the space between the seventh and eighth of the superior margin. Inner free flagella of a deep red color. Anterior pair of legs slender and delicate; carpus more than twice the length of the hand; hand slightly pubescent; second pair of legs slender, smooth on the upper surface; under surface beset with very minute spiniform granules, seen only through the lens; carpus longer than the hand, twice the length of the palmar portion of the hand; fingers cylindrical, straight, less than half the length of the hand; posterior legs smooth. Length 2.81 inches.

This species is very closely allied to *P. mexicanus* (Saussure), and may prove to be nothing more than a variety of that species. The measurements of the second pair of legs of *P. sexdentatus* agree with De Saussure's description, but differ widely from the measurements of his figure. *P. mexicanus* has but four or five teeth on the inferior margin of the rostrum. The terminal segment of the abdomen in *P. sexdentatus* is armed with three small teeth, and two longer movable spines situated one on either side of the middle tooth; the hand is very largely beset with hairs.

Habitat.—Same as the preceding.

PALÆMON FLUVIALIS, nov. sp.

Plate II. Fig. 5–5*a*.

Rostrum short, lanceolate, somewhat arched above; not as long as the lamelliform appendages of the external antennæ, reaching to the end of the second joint of the antennæ; superior margin armed with seven teeth, the inferior margin with two, situated near the point of the rostrum. One specimen of this species had but four teeth above and one below. Two flagella of the internal antennæ united for a very short distance; spines on the lateral portion of the carapax very small; first pair of legs slender; hand more than half the length of the carpus; hand of the second pair stout; carpus shorter than the palmar portion of the hand, gradually enlarged toward the hand; fingers cylindrical and straight, shorter than half of the hand, the same length as the carpus, beset with a few stiff hairs; legs smooth. Length 1.3 inches.

This is a fresh-water PALÆMON, taken from a tributary of the Coatzacoalcos River among the Cordilleras.

AUGUST 8.

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

Fifteen members present.

Remarks on Fossil Vertebrates from Wyoming.—Prof. LEIDY remarked that the collections of fossils presented this evening, by Drs. J. Van A. Carter and Joseph K. Corson, were of unusual interest. They consist of remains mainly of turtles, with those of mammals and crocodiles, and were obtained from the tertiary deposits in the vicinity of Fort Bridger, Wyoming Territory.

The great abundance of remains of turtles, of many species and genera, of fresh-water and terrestrial habit, obtained in Wyoming, indicates this region to have swarmed with these animals during the earlier portion of the tertiary period. Crocodiles and lacertian reptiles were likewise numerous. The many mammalian remains found in association with the reptilian fossils mainly belong to tapiroid and carnivorous animals.

The Wyoming tertiary fauna presents a remarkable contrast with the later faunæ of the Mauvaises Terres of White River, Dakota, and of the Niobrara River, Nebraska. Among the large number of fossils from these two localities, rich in evidence of mammalian life, there occur the remains of a single species of turtle in each, and none of crocodiles or other reptiles.

Dr. Carter's collection, besides containing remains of *Trionyx guttatus*, *Emys Jeanesianus*, *E. Haydeni*, and *E. Stevensonianus*, and *Baena arenosa*, also adds two new turtles to the list. One of these is a species of Emys of the largest size, and exceeds any now living. The carapace has measured about two feet and a half in length, and the sternum about two feet. In honor of its discoverer, it may be named *Emys Carteri*.

The first and second vertebral plates of this species present an unusual, perhaps an anomalous, appearance. The first is 4 inches long, and clavate in shape, with the narrow part foremost. The second is $2\frac{1}{4}$ inches long, and presents the usual hexagonal form reversed. The third plate, a little longer, is quadrate, with convex sides. The first vertebral scute is vase-like in outline, $5\frac{1}{2}$ inches long, $2\frac{3}{4}$ inches wide in front, $4\frac{3}{4}$ inches near the middle, and $3\frac{1}{2}$ inches at the back border. The second scute, of the ordinary form, is 5 inches long, and 4 inches wide.

The second turtle belongs to the recently characterized genus *Baena*, but is considerably larger than its associated species which have been described. The shell in its complete condition has been upwards of a foot and a half in length, and is seven inches and a half high. The sternum is flat, and about fifteen inches long. Its pedicles ascend at an angle of about 45°, and are seven inches and a half broad. As in the living *Dermatemys*,

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and the sea-turtles, they are covered with large scutes, four in number, as in *Baena arenosa*. The intermediate vertebral scutes, are longer than broad—the third being 4 inches long, and $3\frac{1}{2}$ inches wide. A peculiarity of the species is the undulating manner in which the costal scutes join the marginal scutes, and the sternal scutes one another. The species may be named *Baena undata*.

Dr. Carter's collection also contains some fragments of bones of a large mammal, which are so mutilated as to be hardly characteristic. A jaw fragment among them, with the retained fragments of the true molars, would appear to indicate a species of *Palæosyops* much larger than *P. paludosus*. In absence of other evidence, it might be viewed as a species of this genus, under the name of *P. major*. The true molars occupied a space of four and a half inches. The last molar measured an inch and seven-eighths fore and aft, and an inch transversely in front.

Dr. Carter had also sent some fossils to Prof. Leidy, among which were portions of jaws, with nearly full series of teeth of *Hyrachyus agrarius*. This animal is related to the Tapir, *Hyracodon*, and *Lophiodon*. The formula of its dentition is the same as in *Hyracodon:* 7 molars, 1 canine, and 3 incisors. The true molars are like those of *Lophiodon*, except that the last lower one has a bi-lobed instead of a triple-lobed crown. Apparently the same animal has been indicated by Prof. Marsh, under the name of *Lophiodon Bairdianus*. A fragment of a lower jaw containing the last premolar, and the first true molar, indicates a larger species of *Hyrachyus*, which may be named *H. eximius*. The crown of the last premolar is $7\frac{1}{4}$ lines antero-posteriorly, and $5\frac{1}{2}$ transversely. The true molar has measured about $8\frac{1}{2}$ lines fore and aft, and 6 lines transversely. The depth of the jaw fragment below the true molar is over an inch and a half.

Another fossil is a mutilated incisor, indicating a species of *Trogosus* rather more than half the size of *T. castoridens*, which may be named *T. vetulus*.

A femur of *Palæosyops paludosus*, in the collection, exhibits the third trochanter, characteristic of the unequal-toed pachyderms. The astragalus of this animal almost repeats that of the living Tapirs.

Among the remains of Dr. Corson's collection, there is the greater part of the lower jaw of a large crocodile, but too much broken to attempt to give an opinion in regard to its specific character, until it is in some degree mended or restored.

AUGUST 15.

The President, Dr. RUSCHENBERGER, in the chair.

Eight members present.

AUGUST 22.

The President, Dr. RUSCHENBERGER, in the chair.

Nine members present.

AUGUST 29.

The President, Dr. RUSCHENBERGER, in the chair.

Fourteen members present.

Notice of some Extinct Rodents.—Prof. LEIDY remarked that Dr. J. Van A. Carter had recently sent to him some remains of rodents discovered in the tertiary deposits near Fort Bridger, Wyoming. Prof. Marsh has already indicated some remains of the same order, obtained from the same locality, which he has referred to a genus under the name of *Sciuravus*. The characters given are insufficient to determine positively whether the remains I have the opportunity of examining pertain to the same genus, though, from the greater size of the animals they indicate, they clearly belong to different species.

The remains appear to have belonged to a peculiar genus of the *Sciurine* family apparently allied to *Arctomys*.

The lower jaw is short and deep compared with that of most living rodents, apparently from a shortening of the bone in advance of the position of the molars. To compensate for this reduction in length, and give room for the incisors, they not only extend beneath all the molars, but also above them posteriorly and externally. Prof. Marsh states that in *Sciuravus* "the incisor extends below the entire molar series." The hiatus in advance of the molars presents an acute edge nearly on a level with the alveolar border, and does not form a deep notch as usual in living rodents. The masseteric fossa does not extend so far forward as usual in most living rodents, except the hares, only reaching below the position of the penultimate molar, where it is bounded by a prominent rectangular ridge, as in the Maryland marmot. The principal mental foramen is situated immediately in advance of the position of the first molar. The symphysis at its lower part apparently extended below the first part of the molar series.

The number of molars is the same as in the squirrels and marmots. They are of nearly uniform size, but are proportionately narrower than in the animals just mentioned, that is, the fore-and-aft diameter exceeds the transverse, which is usually the reverse

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in the sciurine animals. The crown is composed of four lobes, of which the antero-internal is the largest and most prominent, the one behind it is the smallest, and the outer ones are of intermediate size, and nearly equal.

If not Sciuravus, the genus may be named PARAMYS. The specimens probably indicate three different species of the genus, mainly differing in size.

PARAMYS DELICATUS.—The largest species was perhaps a fourth less in size than the Maryland marmot, though its molar series is equal in length with that of the latter, measuring three-fourths of an inch. The hiatus in advance of the molars has measured about three lines and a half, or about half that in the Maryland marmot. The depth of the jaw at the first molar is $6\frac{1}{2}$ lines, at the penultimate molar 6 lines. The incisor is $2\frac{1}{2}$ lines fore and aft, and $1\frac{1}{2}$ lines transversely.

The specimen upon which the species is indicated consists of the greater portion of the right ramus of the lower jaw. It presents two mental foramina, one below the first molar, besides that in the usual position. A prominent tubercle is formed at the angle of convergence of the two ridges bounding the fore part of the masseteric fossa.

PARAMYS DELICATISSIMUS.—The smallest species is indicated by a similar specimen to the former, and was about two-thirds the size of the largest species. The molar series is half an inch in length. The hiatus in advance of the molars measures $2\frac{3}{4}$ lines. The depth of the jaw at the first molar is $4\frac{1}{2}$ lines, at the penultimate molar 4 lines. The incisor is $1\frac{1}{2}$ lines fore and aft, and 1 line transversely.

PARAMYS DELICATIOR.—An intermediate species is apparently indicated by the greater portion of a left ramus of the lower jaw. The molar series has measured about $7\frac{1}{4}$ lines in length. The jaw is 5 lines deep at the penultimate molar. The incisor is 2 lines fore and aft, and $1\frac{1}{2}$ lines transversely.

A smaller rodent than the preceding, and of a different genus, is indicated by the portion of a lower jaw containing the posterior two molars, and the fangs of the two in advance.

The constitution of the jaw is similar to that in the former genus. The jaw being comparatively short and deep; the hiatus in advance of the molars short and nearly straight, and the masseteric fossa advancing only as far as the position of the penultimate molar. The molars are inserted each by two fangs: their crowns are slightly greater fore and aft, especially the first and last of the series.

The crown of the penultimate molar in its worn condition presents a pair of transverse elliptical dentinal tracts united by a narrow median fore-and-aft isthmus. In the slight recess of the inner poles of the ellipses of dentine, a small tubercle projects with a circular islet of dentine on the summit. The crown of the

last molar exhibits five shallow tubercles with minute dentinal islets at the summits.

The size of the animal was but little greater than the domestic mouse. The molar series measures 3 lines in length. From the front of the incisor to the back of the last molar measures $4\frac{3}{4}$ lines. The relations of this extinct rodent I have not determined, nor can I refer it to any genus with which I am familiar. It may be named MYSOPS MINIMUS.

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

DESCRIPTIONS OF NEW SPECIES OF BIRDS OF THE FAMILIES TROGLODYTIDÆ AND TYRANNIDÆ.

BY GEO. N. LAWRENCE.

TROGLODYTIDÆ.

1. **Catherpes sumichrasti.**

Upper plumage and wing coverts of a deep reddish-brown, sides of the head lighter, and the rump more of a blackish-brown; quills dark brownish-black, the secondaries narrowly edged with the same color as the back, and crossed with darker nearly obsolete bars; throat of a dull light grayish-rufous, breast and sides of the neck of a clear rather dark rufous, each feather of the lower neck and breast crossed with several faint dusky narrow bars; the abdomen is dark reddish-brown, besprinkled with small round white spots, which are surrounded narrowly with black, the sides of the breast and abdomen are of a dark reddish-brown, crossed with not very conspicuous black bars; the sides under the wings, thighs, and under tail coverts deep blackish-brown like the rump; upper mandible black, the under is yellow, except at the end and on the sides for its terminal half, where it is blackish-brown; "iris brown;" tarsi and toes black; the tail, unfortunately, is deficient.

Length to rump, 5 inches; wing, $2\frac{3}{4}$; bill, $1\frac{1}{8}$; tarsi, $1\frac{1}{8}$; hind toe and claw, $\frac{7}{8}$.

Habitat. "Mata Bejuco (Vera Cruz)."

"Collected by Mr. T. Labarraque."

Type in Museum Smithsonian Institution, from the collection of Prof. F. Sumichrast.

Remarks.—This is rather a remarkable looking bird, and seems to be a second species of *Catherpes*, though of a much stouter form and darker colors than *C. mexicanus;* the bill is precisely of the same form, though proportionally stronger, and the minute white spots on the abdomen are similar to those on the back of that species; the wings are very short and rounded, and the feet large and strong.

It was received over two years since, and I delayed its description hoping to get others, that by the character of the tail its

true position might be more satisfactorily determined. Prof. Sumichrast has not been able to obtain any more specimens, and, as he has informed me his collections are suspended for the present on account of the revolution which has taken place in Tehuantepec, I have concluded to describe it, and have conferred his name upon it.

TYRANNIDÆ.

2. **Myiozetetes grandis.**

Crown dusky olive-gray, with a concealed crest of bright vermilion; front and sides of the crown pale yellowish-white, the stripe becoming broader as it extends backwards; lores and sides of the head dark grayish fuliginous; upper plumage greenish-olive; tail feathers dark brown, narrowly margined with the color of the back; quills dark brown, narrowly edged with greenish-yellow; the smaller wing coverts are the color of the back, the middle and larger coverts dark brown, tipped with dull pale yellow; throat grayish-white, just tinged with yellow; entire under parts besides, and under wing coverts gamboge yellow; bill and feet black.

Length, $7\frac{3}{4}$ inches; wing, $3\frac{3}{4}$; tail, $3\frac{5}{8}$; tarsi, $\frac{3}{4}$.

Habitat. "Province of Tumbes, Peru."

The type is in the Museum of Vassar College, and was received by Prof. Orton from J. F. Reeve, Esq.

Remarks.—This species somewhat exceeds all others of the genus in size, and is also of a deeper yellow below; in its coloration and markings it most resembles *M. columbianus*, but besides its much greater dimensions, it differs in having a wider superciliary stripe, which, with the throat, is more tinged with yellow, also in the deeper coloring of the under plumage; it, likewise, is somewhat like *M. texensis*, but is rather larger; in that species, however, the wing coverts are without yellowish margins.

3. **Empidonax atrirostris.**

The feathers of the crown are light brown, slightly rufescent and with dusky centres; the front is grayish-white, and a line of the same color extends from the bill to over the eye; plumage above of a light brownish-olive; tail feathers blackish-brown, the outer web of the lateral feather and the ends of all edged with dull gray; the wing coverts and quills are blackish-brown, all ex-

cept the primaries, conspicuously margined with dull white; throat grayish-white; lower part of neck in front and upper part of breast light cinereous; breast, abdomen, under tail coverts, and under wing coverts pale yellow; inner margins of quills grayish-white; entire bill black; tarsi and toes brownish-black.

Length (skin), $5\frac{1}{2}$ inches; wing, $2\frac{7}{8}$; tail, $2\frac{7}{8}$; bill, $\frac{7}{16}$; tarsi, $\frac{11}{16}$.

Habitat. Venezuela? Collected by Mr. C. Wood.

Type in my collection.

Remarks.—The nearest ally of this species seems to be *E. traillii*, but the plumage above is browner, with scarcely a tinge of olive-green; the margins of the wing coverts and quills are whiter, besides, the gray front and supercilliary stripe do not exist in *E. traillii;* in the new species the yellow of the abdomen is much brighter, but the smaller jet black bill is the most striking characteristic difference.

4. **Myiarchus yucatanensis.**

Myiarchus mexicanus. Lawr. Ann. Lyc. N. Y., vol. IX., p. 202.

Soon after suggesting that this bird might be *Tyrannula mexicana*, Kaup, on account of its short wings, and contending for the integrity of my *M. cinerascens* (generally referred to *mexicanus*) on account of its longer wings, I found from an examination of many examples of *cinerascens* that the measurement of the wings was not a reliable character in this genus. This caused me to question the probability of the *Yucatan* bird being Kaup's *mexicanus*, and I concluded the true status of that species could only be determined by an inspection of the type. Consequently I solicited the aid of Mr. Sclater, sending him my specimen of the *Yucatan* bird, and about the same time Prof. Baird sent the Smithsonian specimen, with the request that he would endeavor to get a view of Dr. Kaup's type. He recently wrote Prof. Baird that on application to Dr. Kaup, he sent the type of his *T. mexicana* for examination, which, to his surprise, proved to be *M. cooperi*, Baird.

The species now described, therefore, required to be named.

Its length is $7\frac{1}{4}$ inches; wing, $3\frac{3}{8}$; tail, $3\frac{1}{2}$; tarsi, $\frac{7}{8}$.

It is allied to *M. cinerascens*, *mexicanus*, and *lawrencii*, but is smaller than the first two, and rather larger than the last; the bill is not so depressed as in *lawrencii*, the culmen being more rounded. It differs from all the above-named species in being

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brown above, and in the color of the abdomen and under tail coverts being of a pale dull ochreous, whereas in the others these parts are clear yellow; the red color on the inner tail feathers occupies the outer portion of the inner webs for half their width, this color blends with the dark color next the shaft, the separation of the colors is not so clearly marked as in *mexicanus*. The extent of the red color on the tail feathers is a good character on which to separate the allied species, in *M. cinerascens* this color occupies the entire web up to the shaft; in *mexicanus* it takes up about four-fifths, leaving a well-defined dark line next the shaft; in *yucatanensis* it extends over half of the inner web; but in *lawrencii* it exists only as a mere bordering, and in many specimens it is very faint.

SEPTEMBER 5.

The President, Dr. RUSCHENBERGER, in the chair.

Ten members present.

SEPTEMBER 12.

The President, Dr. RUSCHENBERGER, in the chair.

Eighteen members present.

The following paper was presented for publication: "Catalogue of Crustacea from the Isthmus of Panama, collected by J. A. McNeil." By T. Hale Streets.

SEPTEMBER 19.

The President, Dr. RUSCHENBERGER, in the chair.

Nineteen members present.

SEPTEMBER 26.

The President, Dr. RUSCHENBERGER, in the chair.

Eleven members present.

The death of Dr. John Edward Holbrook was announced.

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

CATALOGUE OF CRUSTACEA FROM THE ISTHMUS OF PANAMA. COLLECTED BY J. A. McNEIL.

BY T. HALE STREETS.

BRACHYURA.

MAIOIDEA.

FAMILY MAIIDEA.

Subfamily PISINAE.

Omalacantha, nov. gen.

Carapax pyriform as in *Pisa*. Orbit complete above and below, oval, superior border armed with a triangular tooth. Eye very small; peduncle short. Rostrum well developed, bifurcated nearly to base, horns divergent, apices convergent; præorbital tooth flattened, obtuse; external antennæ not hidden by rostrum, but completely exposed, on same level as rostrum; first and second articles broad, flattened, clubbed at distal extremity.

This genus is very closely allied to that little known genus, *Microphrys*,[1] M. Edw. It is readily distinguished from *Microphrys* by its greater triangular form (not being broader than long); by the broad, club-shaped articles of external antennæ (in *Microphrys* they are cylindrical), and by the antero-lateral border of carapax being less inflated.

Omalacantha hirsuta, nov. sp.

Carapax triangular, convex, tuberculated, pilose; hairs hooked at extremity; prominent spine projecting from junction of antero-lateral with postero-lateral border; another smaller spine below, and in front of this on branchial region; spine on hepatic region below and behind external angle of orbit; one on side of branchial region, near the groove separating it from hepatic; row of five small tubercles on inferior border of hepatic region; on gastric region tubercles arranged in the form of the letter T; an arcuate row of four tubercles on intestinal region; another single one below these at posterior extremity of same region. Longitudinal row of hairs on horn of rostrum, and continuing on lateral portion

[1] For description, see "Zoologie Expedition dans l'Amérique du Sud, par Castlenau."

of branchial region. Tooth on superior margin of orbit obtuse; orbit obtuse at external angle. External antennæ ciliated; rostrum slightly reflexed, more so in female than in male. The chelipeds larger in male than in female, smooth, with exception of arm, which presents a row of tubercles on upper surface; covered with rounded spots of a violet-red color. Fingers closely approximated and finely denticulated at extremity; in female approximated along their whole length. Two or three rudimentary tubercles on third article of second pair of feet. A deep red spot at the projecting lateral angle of carapax. Color reddish shade. Length, 1.37 inch; breadth, .94 inch.

Subfamily MITHRACINÆ.

Mithraculus coronatus, Stimpson. An. Lyc. Nat. Hist. N. Y., vol. VII., p. 186.

CANCROIDEA.

FAMILY CANCRIDÆ.

Subfamily XANTHINÆ.

Carpilius corallinus, M. Edw. Hist. Nat. des Crust., tom. I., p. 381.

Actæa labyrinthica, Stimpson, An. Lyc. Nat. Hist. N. Y., vol. VII., p. 204.

Menippe mercenaria, Stimpson. **Cancer mercenaria**, Say. Journ. Acad. Nat. Sci. Phila., vol. I., p. 448.

Panopaeus chilensis, Edw. et Lucas. D'Orbigny's Voy. en Am. Mérid., Crust., p. 16; pl. VIII., fig. 1.

FAMILY ERIPHIDÆ.

Subfamily ERIPHINÆ.

Eriphia gonagra, M. Edw. Hist. Nat. des Crust., tom. I., p. 426, pl. XVI., figs. 16 and 17. Dana. U. S. Expl. Exped., Crust., vol. I., p. 250.

FAMILY PORTUNIDÆ.

Subfamily LUPINÆ.

Lupa dicantha, M. Edw. Hist. Nat. des Crust., tom. I., p. 451. Dana, U.S. Expl. Exped., Crust., vol. I., p. 272, pl. XVI., fig. 7.

Lupa rubra, M. Edw. Hist. Nat. des Crust., tom. I., p. 454.

OCYPODOIDEA.

FAMILY MACROPHTHALMIDÆ.

Subfamily OCYPODINÆ.

Ocypoda Gaudichaudii, Edw. et Lucas. D'Orbigny's Voy. en Am. Mérid., Crust., p. 26, pl. XI., fig. 4.

Ocypoda rhombea, M. Edw. Hist. Nat. des Crust., tom. II., p. 46.

FAMILY GRAPSIDÆ.

Subfamily GRAPSINÆ.

Grapsus pictus, Latr.; M. Edw. Hist. Nat. des Crust., tom. II., p. 86.

FAMILY GACARCINIDÆ.

Subfamily UCAINÆ.

Uca lavis, M. Edw. Hist. Nat. des Crust., tom. II., p. 22.

ANOMOURA.

FAMILY HIPPIDÆ.

Hippa emerita, Fabr.: M. Edw. Hist. Nat. des Crust., tom. II., p. 209.

FAMILY PORCELLANIDÆ.

Petrolisthes armatus, Stimpson. An. Lyc. Nat. Hist. N. Y., vol. II., p. 73. Porcellana armata, Gibbes, Proc. Am. Assoc., 1850, p. 176.

Petrolisthes occidentalis, Stimpson. An. Lyc. Nat. Hist. N. Y., vol. VII., p. 73.

FAMILY PAGURIDÆ.

Subfamily PAGURINÆ.

Aniculus longitarsis, nov. sp.

This species is very closely allied to *A. typicus*, Dana, but differs from it in the greater length of the tarsus of the ambulatory feet. In *Pagurus aniculus* (*Aniculus typicus*, Dana), Milne Edwards describes the tarsus as being "extremely short." No statement is made as to its length in comparison with the preceding article; but in Dana's figure, and in that figured in Quoy and Gaymard, Voy. de l'Urania, it is shorter than the preceding article. In *A. longitarsis* it is always longer. The median areolet is distinct, trapezium-shaped, and is not produced to the posterior edge of the gastric region.

FAMILY CENOBITIDÆ.

Cenobita diogenes, Latr. M. Edw. Hist. Nat. des Crust., tom. II., p. 240, pl. XXII., figs. 11 and 13.

Cenobita intermedia, nov. sp.

Anterior portion of carapax convex, narrowed in front, granulated. Differs from *C. purpurea*, Stm., in not being more granulated posteriorly than anteriorly, nor are the granules acute and setous. Lateral portion pilous; margin of branchial region projecting, prominent. Eyes compressed, triangular, acute; peduncles nearly as high as long, finely granulated on superior surface.

Tibia of the third pair of legs, left side, produced at inferior border; ultimate and penultimate articles convex externally, smooth and punctate as in *C. purpurea;* tarsus irregularly quadrilateral, longer than right; inferior surface concave; fine, close-set row of black-tipped spinules on inferior surface of tarsi of second and third legs, left side. Legs spinulose (with exception mentioned), hairy; tarsi triangular, concave on inferior surface. External surface of larger hand sparsely granulated; granules of a pearly appearance. Coxæ of fifth pair produced in male. Length of carapax .94 inch.

Cenobita panamensis, nov. sp.

Carapax as in *C. intermedia*. Eyes also similar. Tibia of third leg, left side, slightly produced at inferior angle; penultimate article convex externally and granulated, in this respect differing from *C. purpurea* and *C. intermedia;* tarsus irregularly quadrilateral, shorter than right, thereby differing from *C. perlata* and *C. intermedia;* row of spinules on supero-lateral margin; row on superior surface; spinules sparsely on external surface; denticulated ridge on inferior surface of tarsi of second and third pairs; spinules black-tipped; inferior surface not so much evacuated as in *C. intermedia*, triangular. Larger hand granulated; granules acute, except on external surface, black-tipped. Coxæ of fifth pair produced in male.

Length of carapax 1.62 inch.

MACROURA.

Family GEBIDÆ.

Gebia longipollex, nov. sp.

Front tridentate; middle tooth largest, and presents at its extremity two small obtuse teeth, which give to it a bifid appearance when looked at from above; furrowed in the median line; small spine on antero-lateral margin of carapax just over the external antennæ; anterior portion of carapax rough and hirsute; scabrous surface reaching about half way to the dorsal suture. Hands equal, smooth, without spines or teeth, marked with longitudinal rows of hair; row on inferior margin very long; thumb long, reaching almost to extremity of finger, slightly incurved; movable finger very pilose, with two teeth on inferior margin—one near base, and one near apex; latter receives point of thumb; two very small teeth situated together near base of thumb; spine on upper and lower apex of carpus, and two small ones on antero-lateral margin; spine on distal extremity of arm. Second pair of legs ciliate above and below at extremity; tarsus smooth; third article ciliate below, and armed with spine above at distal extremity; remaining pairs unarmed. Caudal segment rectangular.

Length, 1.12 inch.

Family PALINURIDÆ.

Panulirus guttatus, Gray. **Palinurus guttatus**, Latr. Ann. du Mus., tom. III., p. 393; M. Edw. Hist. Nat. des Crust., tom. II., p. 297, pl. XXII., fig. 1.

Panulirus americanus. Palinurus americanus. Lamarck. M. Edw. Hist. Nat. des Crust., tom. II., p. 298.

Family PALÆMONIDÆ.

Subfamily Alpheinæ.

Alpheus bispinosus, nov. sp.

Carapax compressed; rostrum short, acute; surface between the eyes carinated; anterior border of eye-shields rounded, and without spines. Lamelliform appendages of external antennæ not quite as long as base, little longer than base of internal antennæ. Second article of internal antennæ twice as long as first and third; basal tooth of inner antennæ not longer than first article; basal spine of outer antennæ short, and hooked inward. Hands of first pair of feet unequal; margins of larger hand indented near the

fingers; lower indentation deep; surfaces sulcated, uneven; margins of the fingers beset with long hairs; movable finger considerably hooked at extremity; smaller hand cylindrical and regular; fingers longer than palmar portion of the hand; inner edges of approximated borders pubescent; no spines on arm. Feet of second pair but little longer than third; first joint of carpus as long as second and third, and little longer than third, fourth, and fifth; fifth not as long as third and fourth, and shorter than hand; third article of following pairs of legs devoid of spine at inferior apex.

Length, 1.5 inch.

FAMILY PENÆIDÆ.

Panæus occidentalis, nov. sp.

Rostrum longer than the lamelliform appendages of the outer antennæ, recurved, pointed at extremity. In the examination of a number of specimens the majority presented ten teeth on the superior margin of the rostrum, and four on the inferior; may vary from eight to eleven on the upper, and from four to five on the lower border. Carapax carinated almost to posterior edge; sulcus on each side of rostrum terminating about midway the carapax; spine situated on lateral portion near anterior border, opposite the insertion of superior antennæ; ridge running from this spine obliquely downward and backward; second spine behind, and on a lower level than the first, and separated from it by a sulcus; two smaller sulci forming two sides of a triangle around base of second spine. Eye large and rounded; sulcus on external border of peduncle. Flagella of superior antennæ usually shorter than antennary peduncle (in one large specimen they were longer). Bases of two first pairs of legs armed with three spines—two on first pair, and one on second; terminal segment of abdomen sulcated, pointed, devoid of lateral spines; penultimate and antepenultimate segments carinated—the ridge commencing on the segment before the antepenultimate, and terminating at the end of penultimate in an acute spine. Length of large specimen five inches.

The greatest affinities of this species are with *P. indicus*, Edw.

OCTOBER 3, 1871.

The President, Dr. RUSCHENBERGER, in the chair.

Eighteen members present.

Mr. THOMAS MEEHAN referred to some observations made by him last spring before the Academy in regard to the office of bud scales and involucral bracts. The general impression was that they were formed for the purpose of protecting the tender parts beneath. At that time he exhibited branches of *Fraxinus excelsior* on which some of the buds were entirely naked, and others clothed with scales in the usual manner. They could scarcely be for protection in this instance, as both were equally hardy.

He now had to exhibit an ear of corn which had been produced without the usual involucral bracts or husks, and yet was as perfect as if clothed in the usual way, showing that the husk was of not much importance as a protecting agent. An interesting point was that this ear had been formed on the end of a male panicle or tassel. It was not uncommon to find scattered grains of corn amongst male flowers, but a perfect ear like this he had never before seen. The ear was eight-rowed, and contained two hundred perfect grains. It was the variety known as "popcorn."

Dr. HOWELL announced the death of Mr. Chas. Wilson Peale.

OCTOBER 10.

The President, Dr. RUSCHENBERGER, in the chair.

Eighteen members present.

Remarks on the Minerals of Mount Mica.—PROF. LEIDY remarked that the specimens of minerals presented this evening by Mr. Bement and himself were part of a collection which they had obtained at Mt. Mica, near Paris, Oxford Co., Maine. At the invitation of, and in company with, Dr. A. C. Hamlin, of Bangor, they had recently made a visit to that locality, celebrated for its beautiful tourmalines and other interesting minerals.

The position in which these occur is a ledge of coarse albitic granite upon the brow of a hill known as Mt. Mica. The granite has been quarried in the search of mineral specimens to the extent of about forty square yards, and, thus exposed, appears mainly composed of a tough, white, amorphous feldspar, without distinct cleavage, and with quartz sparingly disseminated. The white feldspar is mottled with black tourmalines, varying in size from an inch to a foot in length. These are brittle, and so firmly fixed in position as rarely to be isolated in an entire condition. In many positions the quartz and feldspar occur more intimately intermingled in the condition of graphic granite.

Most parts of the rock are devoid of mica, but in some positions an abundance of large crystals of muscovite are mingled with the other constituents. The muscovite, of a smoky color, often contains compressed crystals of tourmaline, mostly olive-green and translucent, simple or compound, and more or less radiant.

Apparently occupying recesses in the common rock, there occur minerals of a different character. Masses of pink lepidolite, associated with laminar albite, smoky quartz, cleavable masses of amblygonite, cookeite, and variously colored tourmalines; silvery white mica containing apple-green, friable tourmalines; and usually opaque greenish or nearly white beryls.

Contiguous with these curious associations of minerals, pockets are met with filled with decomposed albite, crystals of smoky quartz, detached botryoidal masses of cookeite and tourmalines. The finest specimens of the latter are raked together with the other loose contents from the pockets. They are also found imbedded in some of the more solid associated rocks, the lepidolite, the cookeite, and the smoky quartz.

The tourmalines are remarkable, being usually partly colored of various shades of green passing into red, and partially opaque to transparent. Small crystals from half an inch to an inch and a half in length, and from half a line to the fourth of an inch in thickness, occur abundantly imbedded in the cookeite. In spongy masses of the latter, they appear closely invested with thick sheaths of the same substance. These smaller tourmalines are usually bright grass-green, and transparent, but others are nearly colorless, and green or pink at one end. Frequently they are fissured, partially decomposed, and sometimes the decomposition extends along the axis, so as to render the crystals tubular.

The tourmalines of the pink lepidolite usually occur in comparatively large crystals, firmly imbedded or even incorporated with the lepidolite and albite. These are opaque and brittle, and rarely obtained except in fractured specimens imbedded in the inclosing mineral. They are dark indigo-blue, constituting the variety indicolite, but oftener are dark olive-green with a rose-pink exterior, which at times appears gradually to pass into the condition of the surrounding lepidolite.

The largest and finest tourmalines, obtained from the loose material of the pockets previously mentioned, almost invariably occur in a fractured condition. Two pockets exposed in our presence, communicated with fissures of the surrounding rock, and the contents, as raked forth, were observed to be quite moist. During the winter their contents are probably frozen, and the freezing of water in fine fissures of the tourmalines probably accounts for their being usually found in a fractured state.

The tourmalines of the cavities occur from those of a small size up to such as measure three or four inches or more in length, and from half an inch to an inch and a half in diameter, doubly termi-

nated, with one extremity flat, and the other three-sided, with the angles or borders truncated.

Sometimes the crystals occur opaque, dark green at one end, becoming bright grass-green and transparent at the middle, and passing into cherry or rose-red and transparent at the other end. Occasionally the green color is nearly absent, and we have an achroite with a greenish hue, passing successively into a deeper shade of green and dark green, or into pink and deep cherry-red, usually sheathed with a thin layer of greenish hue at the opposite end.

In a crystal exhibited, measuring four inches in length by three-fourths of an inch in diameter, flat at one end, and three-sided at the opposite end, the first inch is dark opaque green, the second inch is bright grass-green and transparent, the third inch is pale pink within and pale green without, and the fourth inch is cherry-red within and pale green without.

A segment exhibited of a transparent prism of achroite, an inch long and an inch and a half in diameter, has upon one end a patch of cookeite. This mineral often occurs investing the ends, fractured surfaces, and sides of the tourmalines.

Another specimen exhibited consists of a crystal an inch and a half long and ten lines thick, with a three-sided termination, deeply striated, and of a dark green color. Broken across near the base, the interior exhibits a spherical nodule of transparent achroite the third of an inch in diameter.

Some magnificent crystals of the kind indicated have been for many years in possession of Dr. Hamlin and his father, who first discovered the locality from whence they were obtained. Dr. Hamlin has more recently thoroughly explored the locality and investigated the character of its tourmalines, an account of which he proposes to give us in a future essay on the subject.

October 17.

The President, Dr. Ruschenberger, in the chair.

Nineteen members present.

Remarks on Fossils from Oregon.—Prof. Leidy directed attention to some fossils, part of a collection from Oregon, submitted to his examination by Rev. Thomas Condon, and indicated in the Proceedings of October 18th, 1870.

One of the fossils, a brain cast, or rather a cast of the interior of the cranium of a large mammal, has about the same form and size as that of the horse. The cerebral hemispheres are nearly as much convoluted as in the latter, and measure about four and a half inches in length and breadth. It may pertain to a large tapiroid animal, though I suspect it belonged to an oreodont.

A large atlas, perhaps belonging to the same animal as the former specimen, measures five inches in breadth between the outer prominent borders of the articular concavities for the occipital condyles, and it is about four and a half inches from the neural tubercle to the hypapophysis. It differs in several important points from the atlas of the rhinoceros, horse, ox, etc., and the want of sufficient means of comparison prevents a determination of its near relationship.

Another fossil, labelled "Alkali Flats," consists of the greater part of the crown apparently of a last upper premolar or perhaps of a transverse pair of lobes of a true molar, of an animal as large as that to which the preceding specimens belonged. The tooth approaches in character the corresponding portion in the oreodonts, but differs in the proportionately less degree of development of the inner lobe of the crown as compared with the outer one, and in the greater degree of development of the inner basal ridge. The crown measures an inch and a third in transverse diameter. These fossils appear to indicate an unknown pachyderm, which may be designated by the name of HADROHYUS SUPREMUS.

Among the Oregon fossils there are a number of imperfect remains, of which it was formerly remarked, they indicated at least two species of rhinoceros. One of these was thought to be the same as the *R. occidentalis:* the other was suspected to be the same as the Californian species, *R. hesperius.* Some additional specimens indicate the second species to have been intermediate in size to that last named, and the *R. crassus* of the Niobrara River. One of the specimens from Bridge Creek, consisting of a mutilated upper jaw fragment with portions of the fangs of the true molars, shows these to have occupied a space of about five inches. An isolated tooth, from Alkali Flat, apparently a last upper premolar, probably belongs to the same animal. From the outer part of its crown three folds project into the bottom of the median valley. The tooth measures 1 inch and 10 lines wide. The species may be named RHINOCEROS PACIFICUS.

Another fossil specimen, labelled "Crooked River," consists of an isolated vertebral plate of a large turtle, apparently the eighth bone of the series. It has the same shape as in *Stylemys niobrarensis*, but is proportionately much shorter in relation with its breadth. It measures 2 inches wide, 1 inch 7 lines long, and 7 lines thick. The specimen probably indicates an undescribed species, which may be named STYLEMYS OREGONENSIS.

Two additional fossils are brain casts, probably of *Oreodon superbus.* The cerebral hemispheres are 10 inches 8 lines long, and together about $2\frac{1}{2}$ inches broad.

October 24.

The President, Dr. Ruschenberger, in the chair.

Eighteen members present.

October 31.

The President, Dr. Ruschenberger, in the chair.

Twelve members present.

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

ON THE FISHES OF THE AMBYIACU RIVER.

BY EDWARD D. COPE.

The collection on which the present examination is based was made by our correspondent at Pebas, John Hauxwell. It embraces fishes of the small streams tributary to the Ambyiacu, as well as those of the river itself. The Ambyiacu is an inconsiderable river, which empties into the Amazon near to Pebas, in Eastern Equador, some distance east of the Napo.

The results of the examination will be mentioned at the close of the list. As was to have been supposed, it consists almost exclusively of representatives of the three great families which abound in the neotropical region; the *Chromididæ*, representing Physoclystous fishes, and the *Characinidæ* and *Siluridæ*, representing the Physostomi. The number of new species, forty-five in a total of seventy-four, constitutes a considerable addition to ichthyology, especially as the number of new generic forms is also rather large.

I add a list of the species obtained by my friend Robert Perkins, of Wilmington, Delaware, on a trip between the mouth of the Rio Negro and the Peruvian Amazon or Ucayale River. There are several interesting novelties in this collection, but their special localities are, unfortunately, not preserved. The specimens generally were large, and in fine condition.

CHROMIDIDÆ.

PTEROPHYLLUM SCALARE, C. V.

Heckel, Ann. Wien. Mms., 1840, 334. Günther, Catal. B. M. v. 316.

Abundant in the Ambyiacu.

GEOPHAGUS AMOENUS, Cope, sp. nov.

Allied to *G. tæniatus* (*Mesops*, Günth.). Scales in three series on the cheek; on the body, 2–25–8. Fin radii D. xv. 7, A. iii. 6. Twelfth dorsal spine less than half the length of the head; spines subequal, slightly shortening anteriorly. Prolonged soft rays of dorsal and anal extending beyond the caudal. Pectoral to, ventral beyond, base of anal. Length of head less than depth of

body, nearly four inches in length (with caudal); depth, 3.5 times in the same. Orbit, twice preorbital bone, equal muzzle, one-fourth wider than interorbital space, one-third head.

Total length .063 m.; to basis anal .0335; do. ventral .019; do. dorsal (axial) .015 m. Color brown; a black band from orbit to basis caudal. A black spot at base, and one at tip of caudal. Basis of dorsal and anal brown, rest yellow. A black band from orbit to angle of interoperculum. Cheeks and operculum with blue spots separated by yellow lines. River Ambyiacu.

GEOPHAGUS BADIIPINNIS, Cope, sp. nov.

Form short oval; body deep; front steeply descending, concave between the orbits; the muzzle projecting. Depth one-half length without caudal fin; head 2.4 times in the same. Orbit 3.5 times in length of head; 1.3 times into interorbital space, which equals length of muzzle with under jaw. Preorbital bone .75 the diameter of the orbit. End of maxillary bone falling opposite the pupil. Fin rays D. xiii–12, A. iii–11. Scales 3–27–8–10; six series on the cheek; operculum scaled. Twelfth dorsal ray equal length of muzzle plus half of orbit; the rays gradually diminishing in length to the second. Caudal fin broadly scaly at base; no scales at base of second dorsal. Pectoral fin long, extending to opposite last soft dorsal ray; ventrals to third soft anal.

Color golden, blue bands on the prefrontal bone, and longitudinal shades on the scales. Dorsal fin dusky spotted, anal with numerous bay-yellow spots in vertical rows. Total length .15 m.; to origin dorsal (vertical line) .043; do. to ventral .051; do. anal .084.

This species, having the coloration of *G. jurupari*, has the orbit nearly as median as in *G. tæniatus*. I do not see the necessity of subdividing Heckel's genus *Geophagus* into three (*Geophagus*, *Satanoperca*, and *Mesops*), as has been proposed by Günther (Catal. Brit. Mus.).

GEOPHAGUS JURUPARI, Heckel.

Satanoperca jurupari, Günth. Cat. B. M. v. 313.

D. xv. 10, A. iii. 7. Scales 3–31–9; suborbitals 6 (7) rows. Preorbital bone 1.66 times orbit.

CRENICICHLA ANTHURUS, Cope, sp. nov.

A slender species, with brightly colored fins. Depth six times in total length, or 5.3 times in length without caudal fin. Length of head 3.66 in total length, five and two-third times more than the diameter of the orbit. Orbit 1.7 times in muzzle, 1.6 times in interorbital width, which is flat. Scales $4\frac{1}{2}$–36–7–13, but, as those of the lateral line are placed at intervals, the true number of transverse series of scales is 62.3; scales of cheek in nine series. Fin radii, D. xix–13; A. iii–9. Caudal cuneate rounded; pectoral and ventral coequal, not extending half-way to anal. Twelfth dorsal spine equalling from end of chin to orbit. Some rays of soft dorsal and anal prolonged, the former to near end of caudal, the latter to base.

Color leaden-brown above, fading into yellowish below. Dorsal and anal fins deep rose, with a few round small spots of pale rose on the soft portions, which become white in spirits. Caudal fin deep crimson, fading to purple at base, with a longitudinal dark shade in the centre, and series of small oval pink spots, one between each pair of rays. A black spot edged with white at the base above the lateral line, and a larger black spot, white-edged, crossing the lateral line opposite the third, fourth, and fifth dorsal spines.

Total length .215 m.; to basis dorsal (axial) .055 m.; to basis of anal .121.

This perch appears to be similar to the *C. lacustris* of Castelnau in proportions, but the coloration is very different. I have three specimens from the Ambyiacu. It is less slender than the *C. lucius*, Cope,[1] and has a considerably wider skull.

CRENICICHLA PROTEUS, Cope, sp. nov.

This species is represented by numerous specimens, which vary in many respects from an average standard, constituting several varieties, one of which may turn out to be a species. The typical or most numerous form may be thus described:—

Radii D. xix–13; A. iii. 8 or 9. Depth of body from four to four and a half times in length without caudal fin. Head 3 times in same, orbit 5 times in head, 1.25 times in muzzle, and

[1] Proceed. Amer. Philos. Soc., 1870, 570.

1.33 times to 1.6 times in interorbital breadth. Scales 4—56-3[1]—12 13, seven rows on cheek. Color olivaceous, blackish above; fins dusky, without markings, except a black ocellus at upper base of caudal fin, with pale margin. A dusky band from end of muzzle to middle of side, and dusky spot below eye. Eye red. Total length .17 m.

Var. α.—Shorter and stouter, colors paler. Eye 1.5 times in interorbital width. Depth of body $3\frac{4}{5}$ to 4 times in length less caudal. Scales 4—45-8—13. Pattern of color similar to the last. Several specimens.

Var. β.—More slender; depth 4.66 times in length without caudal fin. Radii xviii–14; A. iii–9. Scales 4–55–13. Diameter of orbit equal interorbital space. Coloration as in the types, except a large black spot marking the posterior fourth of the spinous dorsal fin. This variety has one less dorsal spine than usual in the type, but the latter occasionally exhibits but 18.

Var. γ (*argynnis*).—Short and stout as in var. α, but the orbit is as wide as the narrowed interorbital space; scales 4–43–13. Radii D. xix. 13; A. iii. 9. The coloration is like that of the type, olive, darker above, with caudal ocellus and dusky band from muzzle to opercular margin. The dorsal fin has, however, a broad orange-red band extending along its distal posterior half, the anterior part wider and with three large black spots in the centre; in a second specimen it contains four black spots.

The preceding varieties are so connected together as to be inseparable in our system. The var. β accords to some extent with Castelnau's description of his *C. lacustris*, but our most slender forms are less elongate than this species, where the depth is one-sixth the length. There are neither black dots nor vittæ in the *C. proteus*. From *C. saxatilis*, to which it is next allied, it differs in the constantly smaller number of longitudinal scales, which are given by Günther as $\frac{7}{114}$.

UARUS INSIGNIS, Heckel.

Mesonauta insignis, Günther, l. c. iv. 300.

UARUS CENTRARCHOIDES, Cope, sp. nov.

Form a compressed broad oval. Scales ctenoid 7—29-20—14, five series on the cheek; operculum scaled. Radii D. xv–14; anal

[1] Not counted on lateral line.

viii–12. Caudal fin subtruncate. The middle dorsal spines appear to be longer than the posterior, but the latter with the two anterior pointed rays have been bitten nearly off, causing a deep and regular emargination of the two fins, so that the normal form is not certain. Pectoral and ventral fins extending to near the eighth anal spine. Teeth in several series in both jaws, those of the external cylindric considerably larger. End of maxillary extending but little behind the line of the posterior nareal opening. Profile steep, concave and flat between the orbits, where its width a little exceeds the diameter of the orbit. Latter one-third of head equal length of muzzle. Depth of body 1.5 times the length without caudal fin.

Color dusky, with seven vertical blackish bars extending below the basis of the dorsal fin, which break into spots on the belly; a cross-bar through eye, and one across base of tail. Soft dorsal with whitish cross-bars, other fins blackish.

Total length .074 m.; to line of D. I. .02 m.; to line of A. I. .03; to basis of caudal .055.

This species is intermediate in characters in some respects between the species referred by Günther to *Uarus*, Heckel ("*Uaru*"), and those referred to *Mesonauta*, Günther. I fail to perceive any characters on which to establish the latter, and accordingly regard its species as referable to the present genus.

HEROS BIMACULATUS, Linn.

Acara bimaculata, Günther, l. c. 276; *A. gronovii*, *punctata et margarita*, Heckel fide Günther.

This appears to be the only species of the *Acaras* of Günther which possesses four anal spines, the remaining species possessing three. *Heros*, Heckel, is distinguished, according to the same, by the possession of five spines in the anal fin. Out of eighteen specimens of the present fish from the Ambyiacu, four possess five spines, the remainder four; I am therefore disposed to define *Acara* as having three, and *Heros* as having four or five anal spines, though it is possible that it will be found necessary to unite the two genera.

ACARA TETRAMERUS, Heckel.

Günther, Catal. iv. 277.

ACARA SYSPILUS, Cope, sp. nov.

Scales in three series on the cheek, on the body 2–26–7. Radii D. xiv–xv. 9; A. iii. 8; caudal rounded. Form elongate oval; depth of body 2.6 times in length without caudal fin, and equal depth of head. Preorbital bone half orbit (in specimen two inches long); orbit 2.5 times, head nearly twice interorbital space (doubtless much smaller in larger specimens). Profile convex; muzzle oblique; upper lip longer than mandible.

Light brown, yellow below. A straight wide black band from the upper posterior margin of the orbit to below the end of the spinous dorsal, composed of three confluent spots; a black bar from eye to angle of preoperculum, and another across the base of the caudal fin. Seven vertical brown cross shades behind the head, on sides.

ACARA FLAVILABRIS, Cope.

Proc. Amer. Phil. Soc., 1870.

Scales in two series on cheek; on body 2–24–8. Radii D. xvi. 9–10; A. iii. 7. Depth 2.25 times, head 2.8 times in length less caudal fin. Eye three times length of preorbital bone, and 2.6 times in head in specimen 2.5 inches long, jaws equal. Seventh dorsal spine as long as diameter of orbit or interorbital width. Profile gently convex, inferior outline rising to meet it.

Olive, with jointed unpaired fins yellow. A large black spot before middle of side on lateral line, a vertical shade at base of caudal.

As compared with *A. dimerus*, its closest ally, this fish differs in the fewer anal radii, the lack of cross-bars, etc. It was originally described by me as having three rows of cheek scales; but those of the interoperculum were included.

ACARA FRENIFERUS, Cope, sp. nov.

Scales of cheek in two series; of body 2—29-8—9. Radii D. xvi. 10–11; A. iii. 8. Form elongate oval, the depth entering the length (less caudal) 2.33 times. Front convex, descending, length of head one-third length. Orbit equal muzzle 3.33 times in head, 1.5 times in the flat front. Dorsal spines short, twelfth equalling

diameter of orbit. Pectoral not reaching anal; soft anal and dorsal not quite reaching end of caudal; latter rounded.

Color rich brown, with a black spot under the middle of the dorsal fin, which is connected with the orbit by a broad black band. The body is further crossed by five darker shades. Fins dusky. Below brown, under lip yellow.

Total length .117 m. to line of D. i. .027; do. of anal .058.

Several specimens from the Ambyiacu. This species is, with *A. dimerus*, Heckel, and *A. flavilabris*, Cope, the only one with two series of cheek scales. It differs from the first named in the much fewer fin radii, etc.

ACARA COMPRESSUS, Cope.

Scales 35, transverse series, seven rows on the cheek. Radii D. xiii–19; A. iii–15. Longest dorsal spine as long as muzzle and half the orbit. Form oval, depth half length less caudal, body compressed. Profile oblique, nearly straight from in front of dorsal fin. Head 2.5 times in length less caudal; orbit 3.2 times in head, larger than muzzle 1.2 times in interorbital space. Left dorsal and anal prolonged. Outer series of teeth larger. Total length .079 m.; to dorsal (axial) .024; to anal (do.) .0395; to caudal fin .0595.

Color, injured by the alcohol, at present uniform brown, with a black line from the angle of the mouth to that of the preoperculum, and two black shades, one at base and the other at end of caudal fin. Soft dorsal and anal black behind.

Two specimens from the Ambyiacu.

HYGROGONUS OCELLATUS, Agass.

Spix, Pisc. Brasil., tab. 68.

CLUPEIDÆ.

PELLONA ALTAMAZONICA, Cope, sp. nov.

No teeth on the vomer, a distinct series on the palatine bones; the whole of the hyoid axis and tongue covered with dentigerous plates. Bi-maxillary and maxillary teeth, the former considerably longer. Scales 23–77. Fin rays D. 18, A. 38–39. Dorsal fin behind the ventral, its origin nearer the basis of the caudal fin than the end of the muzzle, its last ray above the first anal ray. Length of ventral fin equal diameter of orbit. Superior caudal

lobe shorter than inferior. Orbit entering head (with chin) four times, in muzzle once, nearly double interorbital space. Pectorals reaching beyond basis of ventrals. Cranial ridges forming a closed V in front. Length of head equal greatest depth of body, entering length 3.75 times (excl. caudal fin).

Total length .186 m; to basis of anal .093 (axial); do. ventral .061.

Silver with golden and green reflections, yellow on side of head, a black epiclavicular spot.

From the Ambyiacu. The second South American species, which is found at a great distance from salt water.

OSTEOGLOSSIDÆ.

OSTEOGLOSSUM BICIRRHOSUM, Vand.

Three specimens; in one the anal and caudal fins are united.

STERNOPYGIDÆ.

This family differs materially from the *Gymnotidæ*, with which its species have been heretofore arranged. One character is to be seen in the construction of the scapular arch. The coracoid bone is well developed, and connected by the transverse column with the clavicle, as in many other physostomous families. In the *Gymnotidæ* this column is wanting, and the coracoid is rudimental.

STERNOPYGUS MACRURUS, Cuv.

STERNOPYGUS VIRESCENS, Valenc.

CARAPUS FASCIATUS, Pallas.

ERYTHRINIDÆ.

MACRODON TRAHIRA, Bl. Schn.

Günther, Catal. v. 281.

HOLOTAXIS LÆTUS, Cope, sp. nov.

Form elongate, scales very large, l. l. 26, l. tr. 5. Length head four times depth body, also four times in length without caudal fin. Orbit 3.3 times in length of head. Chin very prominent; maxillary teeth as large as the premaxillaries. Dorsal fin distant from muzzle 1.5 times distance from caudal. Radii D. I. 9; A. 1872.]

10; V. 8. Pectoral reaching ventrals, ventrals filamentous, reaching anal, commencing in front of dorsal. Dorsal with median rays, and caudal with longest rays filamentous.

Color, scales orange at base, with broad blackish margins forming rows of spots; dorsal fin with a black spot at middle and a large black saddle below and in front of it on the back; mandible black-edged; fins orange-red. Total length .0755 m.; to dorsal fin .0335; to ventrals .027; to anal .0416.

This is the second species of this genus, which was characterized by the writer, Proceedings Am. Phil. Soc., 1870, p. 563. It differs from the type *H. melanostomus*, in the larger scales, there being 5 in this, 7 in that, in a cross series.

CHARACINIDÆ.

CURIMATUS CYPRINOIDES, Linn.

Syst. Naturæ; Günther, Cat. B. M. v. 290.

CURIMATUS RUTILOIDES, Kner.

Denkschr. Wien. Acad., 1859, 141. Günth. v. 290.

Both these species quite abundant.

PROCHILODUS INSIGNIS, Kner.

Denkschr. Wien. Acad., 1859, 147. Günth. v. 296.

D. 11, A. 10. L. l. 44, l. tr. 22. Depth 2.5 times in length; head three times. Silver-leaden above; caudal with two black cross-bands forming chevrons with the angle directed distally. Dorsal with three, anal with two dark bands. A single small specimen.

ANOSTOMUS FASCIATUS, Spix.

Pisc. Braz. t. 36. Günth., Cat. B. M. v. 304.

LÆMOLYTA, Cope, gen. nov.

Allied to Schizodon (*Anostomus*) in all respects, *i. e.* with movable flat incisor teeth in the jaws, but differing in having the branchiostegal membranes entirely free from the isthmus. They are united to each other only, and the connecting membrane bridges the isthmus throughout its length. In the only species known to me the inferior teeth are truncate with entire margin, or incisor-like; the superior are crenate.

LÆMOLYTA TÆNIATA, Kner.

Schizodon tæniatus, Kner. Denkschr. Ac. Wien, 1859, 159. Gthr., v. 304.

LEPORINUS MEGALEPIS, Günth., var.

Catal. B. M. v. 307.

Three adult specimens, two with deeper, one with shallower body. First, scales $4\frac{1}{2}$–35–4; head 3.5 times, depth three times in length. Second, scales 5–37–5; head 3.75, depth three times in length. Third, scales 5–38–5; head 3.75, depth 3.6 times in length. All with anal rays 10, and a minute anterior spine. Ten dark dorsal cross-bands besides the three lateral spots; the appropriate bands descending between the spots. The young are very strongly and handsomely cross-banded.

CHARACIDIUM ETHEOSTOMA, Cope, sp. nov.

The discovery of this little fish is interesting as extending the range of this genus over the whole of Brazil, it having been known heretofore from the neighborhood of Lagoa Santa, from a tributary of the coast river, the Rio das Velhas. Prof. Reinhardt, who discovered it, called the species from that locality *Ch. fasciatum*.[1] The nares are separated, the anal fin short, the teeth are simple, acute, and fixed in a single series in each jaw; none on the maxillary. Lateral line complete.

The species here described has much the coloration of the *Poecilichthys* or *Etheostoma* of our North American streams.

Depth into length 5.25 times; head 5.75 times in same. Branchiostegal membranes fissured far forwards. Dorsal fin commencing in front of ventrals R. 11; A. 8; V. 9; P. 11, reaching ventrals, ventrals reaching anal, caudal deeply forked. Scales l. l. 33, l. tr. 8; striate. Orbit equal muzzle 3.6 times in head, equal interorbital width, and length of muzzle; profile nearly straight, lips about equal; maxillary bone to orbit.

In spirits yellowish, probably hyaline in life, with a black lateral band from end of muzzle, and nine quadrate brown dorsal spots from nape to tail. There is more or less connection between the spots and band, and shades across the under side opposite to these. Fins unicolor, light. Sides of head silver, end of chin,

[1] See K. Dansk. V. Selsk. Forh., 1866, 55, Tab. II. f. 1.

and a vertical bar at base of caudal fin black. Total length ·048 m.; to dorsal .0175; to anal .03; to basis caudal .039. The opercle of one of the specimens is white and smooth, of another punctate-rugose and yellow.

IGUANODECTES, Cope, gen. nov.

Dorsal fin originating in advance of ventrals, anal elongate. Branchiostegal membranes united across, but not with, isthmus. Teeth in two series in the premaxillary, none in the maxillary, and one row in the mandible. They are fixed, but have contracted fangs, and broad, flat, subequally denticulate crowns, and those of the mandible stand out from the dentary bones all round. Teeth of the outer row very few, minute. Caudal fin furcate.

This genus is allied to *Tetragonopterus*, but the dentition is much weaker, approaching that of the *Schizodon;* the union of the branchiostegal membranes is seen in *Læmolyta* m. In the only species there are but two minute teeth of the outer premaxillary row. The other teeth are fan-shaped and smooth, and in contact, so as to form an uninterrupted series. In *Tetragonopterus* the fangs are strong, not contracted, and the crowns are ridged.

IGUANODECTES TENUIS, Cope, sp. nov.

Slender, the depth entering the length (without caudal) 5.5 times, length of head 4.33 times in the same. Radii D. 12; A. 36; V. 9, P. 13. Pectoral reaching ventral and ventral anal. Orbit 3.2 times in head, equal interorbital width, less than length of muzzle. L. tr. al. A. i. 11–12. Caudal furcate. Distance from base dorsal to base caudal equal from former to pupil of eye. Color pale, a silver band along side; base of caudal blackish. Total length .059 m.; to basis dorsal .027; to basis anal .0275.

APHYOCHARAX PUSILLUS, Gthr.

Proc. Zool. Soc. Lond., 1868, 245.

Fins bright red in life.

TETRAGONOPTERUS CHALCEUS, Artedi.

Agass. Cuv. Val., Gthr. Catal. v. 320.

TETRAGONOPTERUS BARTLETTII, Gthr.

Am. Magaz. Nat. Hist., 1866, 30.

TETRAGONOPTERUS PHŒNICOPTERUS, Cope.

D. 10; A. 26–7; ventrals originating in front of dorsal, not reaching anal; pectoral reaching ventral. Scales $5\frac{1}{2}$–35–4. Depth of body 3.3 times in length without caudal; length of head 4.2 times. Orbit 2.5 times in head, equal the plane interorbital space.

Silvery, with lateral silver band and indistinct scapular and basal caudal blackish spots. Anal and dorsal fins vermilion; caudal with a triangular vermilion spot which surrounds the basal black spot, and whose apex reaches the caudal emargination.

Length .053 m.; to dorsal .021; to anal .0245.

Apparently very abundant. It is allied to the *T. carolinæ* of Dr. Gill (Proc. Ac. Nat. Sci., Phila.), 1870, p. 92, but is a more slender fish with smaller head.

STETHAPRION CHRYSEUM, Cope, sp. nov.

Form elevated, disciform; scales small, 19–67–16. Radii D. 12; A. 37; V. 8, very small, not reaching anal, and commencing below dorsal. Pectoral falcate reaching nearly to line of end of ventrals. Base of anal fin covered with scales, especially anteriorly; dorsal with a long decurved spine in front of it. Caudal peduncle contracted. Depth into length less caudal fin, 1.66 times, length of head 3.4 times. Orbit 2.4 times in head, much larger than muzzle's length, 1.1 times in interorbital width. Profile of head very concave. Dorsal fin elevated, caudal deeply bifurcate. Lateral line a little decurved medially.

Color silvery, a leaden shade from postscapular region to caudal fin, darkest in front at a postscapular spot. Below this band, yellow. Fins unspotted. Total length .071 m.; to dorsal fin (oblique) .03; to caudal (straight) .053; to ventrals (oblique) .032 m.

This species is near the type *S. erythrops*, Cope (Proc. Am. Phil. Soc., 1870, p. 562, fig. 5), but has larger scales and a different coloration. The genus *Stethaprion* has the physiognomy of *Myletes*, but is essentially near to *Tetragonopterus*. It differs from the latter chiefly in the decurved spine in front of the dorsal fin, a character it shares with *Serrasalmo*.

BRYCON CAPITO, Cope, sp. nov.

Scales small, L. l. 56, l. tr. 25. Depth of body one-fourth, length of head one-third of total without caudal. Radii D. 10;

A. 25; V. 7 (8?). Dorsal originating a little behind line of ventral, pectoral reaching ventral. Orbit 2.66 times in head, equal interorbital width. Middle series of premaxillary teeth continued outwards as far as the exterior. Posterior pair of mandibular teeth very small. Color leaden, head silvery, a scapular and large basal caudal black spot.

Total length .06 m., to dorsal fin .0275, to anal .034.

CHALCEUS MACROLEPIDOTUS, Cuvier.

Cuv. Val. xxii. 240. Günther, Cat. B. M. v. 333.

Two teeth only in posterior mandibular series.

CHALCEUS ERYTHRURUS, Cope.

Plethodectes erythrurus, Cope, Proc. Am. Phil. Soc., 1870, p. 563, fig. 6.

This species belongs to *Chalceus*, but differs from the type in having scales of equal size. Günther says of this genus in his analytical key, "anal fin more or less elongate," as distinguished from "anal short" of *Piabucina*, yet *C. macrolepidotus* has as many anal radii as *P. erythrinoïdes*. *Creagrutus*, with a fin of about the same length, is placed in the "elongate" anal division.

MEGALOBRYCON MELANOPTERUM, Cope, sp. nov.

Rather stout; dorsal outline arched. Length of head three and three-fifths times in total lacking caudal fin, depth three times in same. Orbit large, equal muzzle, 3.5 times in head. Radii D. 11; A. 25; V. 8, commencing opposite the third or fourth dorsal ray. Pectoral just reaching ventral. Scales l. l. 67, exposed surface striate. Interorbital width 1.6 times diameter of orbit, gently convex, less than postorbital length of head. Premaxillary teeth in three series, the outer small, not in contact, equal to the maxillaries, and simple or with a minute cusp on each side; ten in number on each bone. The posterior series is uninterrupted from side to side, including six teeth on each side; the median row forms an open ⋀, the angles forwards. Caudal fin deeply forked.

Total length seven inches, = m. .176; length to dorsal fin .071 m. (straight); to anal .10 m. Color silvery, with a black band which commences between the ventral fins, on each side of the base of the anal, across the caudal peduncle, and along the middle of the upper lobe of the caudal fin to its end; anal black at base, other

fins white. A black scapular spot, and a crimson spot at the apex of each operculum. Opercular bones with purple reflections. The Ambyiacu.

This genus was proposed by Günther, in 1869 (Proc. Zool. Soc., p. 424), on the type species, *M. cephalus*. This fish is evidently nearly allied to the species here described, but is different from them in the larger size of the external series of premaxillary teeth, since they are, according to Günther, double the size of the maxillaries, nearly in contact, and apparently more denticulate. It is about as stout as the present fish, but the arrangement of the posterior series of teeth is similar to the *M. erythropterus*. I have two specimens of the *M. melanopterus*, and they agree in every detail.

MEGALOBRYCON ERYTHROPTERUM, Cope, sp. nov.

More elongate; length of head equal depth, and one-fourth the length without caudal. Orbit large, 3.5 times in head, 1.8 times in interorbital width. Radii D. 11; A. 23; V. 8, commencing opposite a point equal to five radii in front of the dorsal fin. Pectorals 12, not reaching ventrals. Squamation injured, lateral line estimated 70. Teeth similar to the last, except that there are twelve premaxillaries on each side, and that those of the posterior row at each end, instead of being continuous with the larger median teeth of that row, are continuous with the lateral limbs of the median M-shaped row, as in *M. cephalus*.

Total length $7\frac{3}{4}$ inches, = .19 m., to dorsal fin .086 m., to anal .115. Color pale and uniform, with a black scapular and large basal caudal spot, which is prolonged as a band to the margin of the fin. Rest of caudal and all the other fins, except base of dorsal, crimson. Sides of head with pearly purple reflections.

Though the characters separating these species are few, they are important. They are found in the form of body, position of dorsal fin, anal radii, color, and dentition.

From the Ambyiacu.

TRIPORTHEUS, Cope, gen. nov.

Dorsal short, anal elongate. Teeth in three series on the premaxillary bone, denticulate, in two rows on the mandible, the posterior of the latter consisting of two convex median teeth. Pectoral region compressed and keel-shaped on account of the

development of the coracoid bones; abdomen compressed. Dorsal fin behind the line of the ventrals.

This genus has a considerable resemblance to *Chalcinus*, and is intermediate between it and *Chalcinopsis*, Kner. The former has two series of premaxillary teeth, the latter four; the present possesses three. The *Chalcinopsis alburnus*, Gthr., probably belongs to *Triportheus*.

TRIPORTHEUS ALBUS, Cope, sp. nov.

Teeth of the premaxillary closely packed, many denticulate; chin projecting beyond muzzle when the mouth is closed. Radii D. 11; A. 27; ventrals longer, extending to beyond the last ray of the dorsal. Pectorals falcate, not quite reaching end of ventrals. Caudal deeply emarginate. Scales large l. l. 28, five series above the lateral line. Head 3.5 times in length without caudal; orbit large, exceeding interorbital width a little, and three times in length of head (including chin).

Color dark ashen above, sides and below silver-white; a dark spot at basis of caudal fin. Total length m. .061; length to basis of dorsal fin .0292; from D. I. to basis caudal .02. The dorsal outline of this species is regularly arched.

From the Ambyiacu.

TRIPORTHEUS FLAVUS, Cope, sp. nov.

Premaxillary teeth spaced, the anterior series in contact only exteriorly. When the mouth is closed the chin projects but little, and the profile of the head descends obliquely from that of the back. Latter gently arched. Radii D. 11; C. 20; A. 30; V. 7; P. 11. Ventrals short, scarcely reaching the line of the last dorsal ray, pectorals sometimes attaining that point. Caudal subtruncate. Head one-fourth length without caudal, eye 3.25 times in head, equal interorbital space .75 times in muzzle. Depth at ventral fin three times in length. Scales at ventral 6–34-5–3.

Total length 6.25 inches, = .157 m. Length to D. I. .08, to anal .093; to caudal .132; depth at pectoral .044. Color brownish-yellow, with golden reflections; four shaded lines above on the middles of the scale series; above with steel-blue reflections; a black band through the middle of the caudal.

Numerous specimens. In a young one of three inches the caudal fin is deeply furcate, as in *C. albus;* perhaps in larger specimens of the latter the tail is also subequal.

[January 16,

CHALCINUS CULTER, Cope, sp. nov.

An elongate species, with very posterior dorsal fin. Height at pectoral fin 4.33 times, at ventral five times, in length without caudal fin. Head 3.75 times in the same; orbit 3.8 in head and 1.2 in interorbital space. Head above flat in one plane from end of muzzle to dorsal fin. Teeth small tricuspid, those of exterior row not in contact with each other. Dorsal fin short, its last ray opposite first anal; distance from base of caudal a little more than half distance from end of muzzle. Pectorals falcate, reaching nearly to line of dorsal. Radii D. 11; C. 19; A. 33; V. 8; P. 11. The inferior caudal rays are shorter than the median and superior; ventrals reach to line of dorsal. The operculum is nearly as long as high. Scales 7–40–3.

Color pale golden; head silver, the upper part of the operculum with steel-blue reflections, bounded by a groove. A round black spot on base of median caudal rays.

Total length .158 m.; length to dorsal fin .087, to anal .098.

This species is nearest the *C. nematurus*, Kner, but differs from it in many important respects.

GASTEROPELECUS STELLATUS, Kner.

Denkschr. Ac. Wiss. Wien., 1860, 17 Tab. I. f. 2; Günther, Catal. B. M. v. 343.

RŒBOIDES MYERSII, Gill.

Proc. Ac. Nat. Sci. Phila., 1870, p. 92.

D. 11, A. 52; scales 22–83–22. Head 3.4 times in length. Prof. Gill does not give the number of scales in his description, and our fishes differ from his in the less depth, which enters the length 2.7 times instead of 2.5, and the larger eye, which enters the head three times instead of 3.5 times.

RŒBOIDES RUBRIVERTEX, Cope, sp. nov.

Radii D. ii., its anterior rays 1.2 times as long as the head; A. 51. Depth 2.66 times in length, length of head four times in same. Scales 27–88–19. Ventral fin reaching anal, pectoral not reaching end of ventral. Length from dorsal to near end of adipose equal from same to end of muzzle (much less in *R. myersii*). Profile gently concave above, dorsal line very convex; top and sides of head rugose. Exterior teeth 3 above, 4 below; mandi-

bulars in one row, with four canines. Two rows of premaxillaries, the posterior wanting medially. In *R. myersii* the middle row of teeth is so curved as to be continuous with the posterior series.

Scapular and caudal spots indistinct; general color pink. Top of head, maxillary bone, and opercula crimson; fins immaculate. Total length .135 m.; length to anal .059; to adipose dorsal .098; to first dorsal .057. This is a larger fish with a smaller head than the *R. myersii*. It may possibly prove to be the *R. affinis*, Günth., Pr. Z. S., Lond., 1868, 246, but he describes "anal rays 55, scales l. l. 80," and the dorsal fin appears to be more posterior.

ANACYRTUS SANGUINEUS, Cope, sp. nov.

A stout species with large scales. Sc. 12–54–12; radii, D. 9; A. 43; V. 8, reaching anal; P. 16, to middle of ventrals. Back much elevated, dorsal commencing in front of anal (A. i. opposite D. 4), and nearer end of muzzle than basis of caudal by a little. Caudal deeply forked. Depth 2.6 times in length (caudal), and length of head 3.4 times in the same. Eye four times in length of head in adults, equal interorbital width. Operculum and orbital bones rugose.

Premaxillary teeth in two very distinct series, a canine at the inner, and one at the outer extremity of the bone. Maxillary toothed to the end, which is behind the line of the posterior margin of the orbit. Mandibular teeth with two (or three on one side of one) canines on each side.

Color pale, with a large black spot on the line from the front of the dorsal fin; a large black spot at base of caudal fin, from which a faint line extends towards the former spot. Sides of head with purple reflections. Dorsal, adipose, caudal, and anal fins vermilion, the anal with a black border. Total length .133 m.; to basis dorsal .0626; to basis ventral .045; to adipose .10; to basis caudal fin .115.

This brilliantly colored fish is nearest the *A. tectifer*, Cope (Proc. Am. Philos. Soc., 1870, 565), and *A. pauciradiatus*, Gthr. (Catal. B. M. v. 346). It is less elongate than the former, and has a more concave profile; the anal rays are more numerous. From the latter species it is well distinguished by its well-defined exterior premaxillary series of eight teeth, and the more anterior position of the dorsal fin.

Numerous specimens from the Ambyiacu.

[January 16,

XIPHOSTOMA TÆDO, Cope, sp. nov.

D. 10, A. 10; scales of lateral line 75. Last dorsal ray above the fifth anal. Head (without membranous flap) three times in length to basis of caudal; eye 7.6 times in length of head, of which four times enter muzzle (without flap); flap equal one diameter of eye; interorbital space flat, 1.75 times diameter of orbit. Muzzle flat above, decurved, receiving the mandibular teeth within it, striate rugose. Teeth minute, equal. A rudimental dermal flap on mandible. Pectoral fins reaching less than .3 distance to ventrals; rays 15; V. 8; extending half-way to anal. Caudal emarginate. Depth of body at ventrals 7.75 times in length without caudal.

Color light brown above, below white; two series of small brown spots on each side, above. Top of head rosy; dermal flap of muzzle vermilion, black-edged. Opercula golden, suborbital bone with purple reflections. Dorsal fin yellowish, with two brown cross-bands; anal with a median black spot. Caudal fin with middle and tips black, margin and space between, with rays, white.

Total length .203; to orbit .036; to ventral .112; to dorsal .1382; to anal .1432; to caudal fin .178.

Two specimens from the Ambyiacu.

MYLETES ALBISCOPUS, Cope, sp. nov.

Discoidal, with small head; anal rays long, the fin half covered with scales. Radii D. 17; A. 36; V. 7. Caudal fin subtruncate. Scales small, 41–100–45. Forty-seven spines in front of the anal fin. Profile scarcely concave, orbit 3.5 times in head, a little less than half the superficial width of the very convex interorbital space. Length of head 3.75 times in total, lacking caudal; depth 1.4 times in same. Anterior teeth separated from posterior. Pectoral fin to ventral, ventral commencing under dorsal. First ray small, not reaching vent. Length .16 m.; to line of dorsal (axial) .065; to line of anal (axial) .09; to caudal .125.

Color silvery, with blue reflections above, and golden below. A black spot on posterior edge of operculum; otherwise immaculate.

Numerous specimens from the Ambyiacu. Two from the Perkins collection lack the opercular spot.

MYLETES OCULUS, Cope, sp. nov.

Premaxillary series of teeth in contact. Radii D. 15; A. 24; V. 7, reaching the vent, and commencing below the first dorsal ray. Pectorals reaching base of ventrals. Preanal spines 43. Form stout ovate, dorsal and ventral curvatures equal. Depth 1.75 times in length without caudal; length of head 2.5 times in same; caudal fin bifurcate. Orbit 3.3 times in length of head (of an individual .065 m. long), 1.75 times in the rather flat interorbital space. Profile concave, operculum rugose. Depth of above individual .0275 m.; length to dorsal fin .03; to anal .037.

Color dark plumbeous, with a black spot with a wide white bordering ring just above the lateral line below the anterior part of the dorsal fin. Many specimens with vertical dark shades or fasciæ. Anal fin blood-red, black at base.

This species is well distinguished by its stout head and jaws, and especially the ocellus on the side. The details do not agree with those of any described species.

MYLETES HERNIARIUS, Cope, sp. nov.

Form subquadrangular or broad diamond-shaped from the angular elevation of the back, and the abrupt prominence of the abdomen. The thoracic outline is concave below the pectoral fins. Radii D. 18; A. 32; ventrals reaching vent, not attained by the small pectorals. Abdominal spines of unusual length, spine-shaped, 46 in number. Depth 1.4 times in length without caudal fin; length of head three times in same. Orbit (in individual of .05 m. in length) 2.6 times in head, less than the slightly convex interorbital space. Profile concave; chin and muzzle projecting. Plumbeous above, silver below; a very few small dusky dots; anal fin blackish.

Length to dorsal fin (of above individual) .022; to anal .027; depth head at preopercular angle .01 m.

The very prominent abdominal saw, and spine-like form of its teeth, distinguish this species. Two specimens.

SERRASALMO IRIDOPSIS, Cope, sp. nov.

D. 15–6; A. 34; abdominal spines prominent, forty-one. Depth of body one-half length without caudal fin; length head a little greater than one-third the same. Orbit 3.8 in head, a little less

than interorbital space. Ventral fin originating opposite front of dorsal; not reaching vent; pectoral reaching ventral. Bones of head striate. Caudal fin openly emarginate. Color pale fawn-color above, below silvery; four longitudinal series of round black spots above lateral line; several scattered spots below it. Opercular apparatus brilliantly colored; upper part of preoperculum and orbital bones green; middle golden, lower part purple and violet. Operculum purple above, vermilion below; interoperculum vermilion; anal fin the same; caudal brown, edged with pale yellow centre.

Total length .104 m.; to dorsal .0535; to ventral .0475; to anal .0615; to caudal .084.

This brilliant species is especially peculiar in the number of its abdomino-thoracic dentations.

From the Ambyiacu.

SERRASALMO ÆSOPUS, Cope, sp. nov.

Radii D. 16; A. 32; V. 7; pectoral falcate reaching basis of ventral. Form short, deep, dorsal curve greater than abdominal. Depth 1.66 times in length without caudal, length of head three times in the same. Scales 47–83–36; ventral spines 31. Muzzle very short, only half as long as diameter of bony orbit, which is contained four times in the length of the head, and twice in the interorbital space. Latter convex transversely. Lateral line slightly decurved in the middle. Dorsal fin nearer the base of the caudal (first fulcrum) than the end of the muzzle, by the length of the latter and half the diameter of the orbit.

Color bright yellow, unspotted, except a shade behind the epiclavicle. Caudal fin with a yellow margin and black band within it; anal fin with a dark margin.

Total length .147 m.; to dorsal fin .075; to ventral .065; to anal .088; depth at orbit .028; at first anal ray .073.

From the Marañon between the mouth of the Rio Negro, Brazil, and the Huallaga, Peru. Robert Perkins.

SILURIDÆ.

PSEUDORHAMDIA PISCTARIX, Cope.

Proceed. Am. Philos. Soc., 1870, 569.

This species presents slight differences in the size of the orbits and relative slenderness of the body, not dependent on age.

1872.]

PIMELODUS LATERISTRIGA, Müll. Trosch.

Günth., Catal. v. 118.

Differs somewhat from Günther's description, *i.e.*, in the longer beards and one soft ray less in dorsal and anal fin. Radii D. I. 6, A. 11, V. 6. Maxillary barbels reaching to three-fourths the length of the adipose fin; exterior mentals to end of pectorals.

DORAS GRYPUS, Cope, sp. nov.

Lateral shields twenty-eight, short vertically, and furnished with a single strong reverted spine. Tail shielded above and below from opposite the twenty-first. Head broad, flat above, with a short concavity in the position of the fontanelle. Casque broad, obtusely roof-shaped, sending a process back on each side the dorsal fin. Body slender. Pectoral spines very powerful, reaching to beyond dorsal fin (in two specimens), with strong serrations. Dorsal spine strong, longitudinally striate, not serrate. Postclavicular process long and strong, reaching as far as the process of the casque, with an external row of teeth, which are proximally in a groove. Humeral process of coracoid swollen laterally, striate grooved. Top of head rugose. Diameter of eye five times in head (to edge bony operculum), twice in interorbital space, once in muzzle. Preorbital bone with an obtuse vertical ridge. Length of head 3.66 times in length to basis caudal fin, greatest depth 4.2 in same. Radii D. I. 6; C. forked, 15; A. 12; V. reaching to anal 8; P. I. 6. Postcoracoid processes short, smooth, maxillary barbels to middle of pectoral spine.

Color above black, below light brown black-dusted, gular region yellowish. A yellow band on side, margined below by three broad longitudinal black bars. Caudal fin black, yellow medially, anal and dorsal fins black in front, yellow posteriorly; ventrals yellow, with two black cross spots.

Total length 5 inches, = 0.1264 m.; width at humeral swellings .036 m.

This species exceeds many others in the relative size of the spines and casque.

DORAS BRACHIATUS, Cope, sp. nov.

A rather large species, of slender form, with smooth front, and very large pectoral spines. Lateral scuta forty, low, flat, and wide, with a flat reverted spine on the middle, the posterior edge

with three or four serrations near the extremity; three opposite the dorsal fin much elevated, two in front of them small, spineless. Radii D. I. 6; C. + 17 +; A. 11; V. 7; P. I. 8. Dorsal spine very strong compressed, with teeth pointing downwards behind and upwards before; its length one-half length of fish anterior to it. Pectoral spine flat, striate, with strong teeth on both faces, the posterior the longer. Eye looking partly upwards, covered with rather thick cornea 8.5 times in length to bony opercular margin, a little less than half interorbital width. Muzzle flattened and narrowed, the maxillary beards leading to the middle of the humeral process, the mental beards half as long. Rugosity of the casque striate, bifurcating at the fontanelle, and sending an angle to the front of each orbit, and then ceasing. A weak serration of the small preorbital bone visible. Head flat between the orbits, the casque steeply roof-shaped, contracting and then expanding downwards opposite the dorsal spine, but not exceeding it. Humeral spine extending to opposite dorsal; flat, striate; posteoracoid short, covered with smooth skin. Ventral fin commencing some distance behind last dorsal ray, obtuse, not reaching vent, but reached by the pectoral spine. Caudal peduncle short; caudal fin deeply furcate. Adipose fin well developed, but low. Teeth numerous, brush-like.

Total length .382 m. Length to eye .037; to dorsal spine .12; to ventral fin .165; to anal fin .222; to basis of caudal fin .31. Width at humeral swellings .077; height at basis D. I. .095.

Colors bright; above brownish, sides pink, below white. Fins red, except pectoral and dorsal, which are paler.

This marked species is very different in general physiognomy and details from such short, rough, black species as *D. pectinifrons* and *D. grypus*, being elongate in form, and smooth, though well armed. Discovered by Robert Perkins between the mouth of the Rio Negro and the Huallaga, in the Marañon.

ZATHORAX, Cope, gen. nov.

Proc. Acad. N. Sci. Phila., 1871, p. 112.

Branchial fissure much contracted. Lateral shields not meeting on the middle line of the back. No adipose fin? dorsal and anal fins short. Spines and postclavicular process strong. Ventrals behind dorsal. Scapular arch dilated below and covered with a dermo-ossification.

1872.]

This genus is *Doras* with the expanded dermo-ossified sternal shield of the following genus *Physopyxis*. It forms a group connecting the two, and differing from the latter in not having the lateral scuta meeting on the dorsal line. In one specimen there is no adipose fin, in a larger there is a rudiment. As in *Doras*, the postclavicular process is more extensively developed than the postcoracoid, while in *Physopyxis* the latter is developed at the expense of the former. The *Zathorax monitor* constitutes specifically a link between such *Dorades* as *D. grypus* and the *Physopyxis lyra*, in being of stouter form than the former, but less squat and toad-like than the latter. It has the comb-like preorbitals of the latter.

Only one species is known.

ZATHORAX MONITOR, Cope, sp. nov.

Twenty-five short lateral scuta, each with one strong recurved median spine. Casque broad, furcate to receive the dorsal fin, obtusely roof-shaped to between the orbits, where it is a little concave, weakly rugulose and striate. Preorbital bones with 12 processes above, not dentate on the lower margin. Muzzle broad, short, lips even, mouth reaching to opposite front of preorbital. Beards on the chin normal. Maxillary barbel reaching to posterior margin of orbit, but possibly further in a harder specimen. Orbit 3.75 times in head, 1.66 in interorbital width; head 3.75 times in length without caudal, twice to third lateral scutum. Greatest depth (at dorsal spine) 3.5 in length. Postclavicular spine extending to line of posterior process of casque, furnished with a row of distant strong teeth on the outer edge. Humeral swelling enlarged laterally, giving unusual width to this region. Postclavicular spine short, acute, sternal shield transversely striate, twice as wide as the gular region in front of it.

Radii D. I. 6, the spine trigonal, straight, not serrate before or behind, but striate; C. ?14; A. 12. P. I. 6, the spines large, reaching beyond end of ventrals, with numerous close-set teeth or spines on both edges, and a terminal one; surface striate.

Total length .038 m., width at shoulders .013 m., at canthus oris .0053. Length dorsal spine .008, of head and casque .016. The larger specimen is .052 in length.

Color destroyed by the action of the spirits; pale brown, the pectoral spines dark-spotted.

PHYSOPYXIS, Cope.

Proceed. Acad. Nat. Sci. Phila., 1871, 112. Genus novum doradi affine.

Dorsal fin with strong pungent spine, in advance of the ventrals. Gill openings much reduced, opercular apparatus attached to clavicular arch below. No adipose dorsal; anal fin short; vent median; nares close together, the posterior minute. Barbels well developed, one maxillary and two mental on each side. Mouth terminal, teeth minute in several series.

Sides and dorsal part of the body entirely inclosed by vertical osseous shields. Head and thoracic region inclosed in a trihedral osseous box, composed of the expanded cephalic casque above, clavicular arch laterally, and the immense development of the clavicles and coracoids inferiorly. These form a shield, which extends to beneath the eyes anteriorly, and sends two postcoracoidea posteriorly, all entirely involving the derm. Pectoral spines and swim-bladder greatly developed.

This strange genus carries to its highest extreme the peculiar features of *Doras*. Thus the branchial fissures are still more reduced, the operculum being attached all along its inferior margin; the lateral osseous dermal scuta are prolonged upwards to the median dorsal line; the pectoral spines are immensely developed. It differs further from *Doras* in the greater development of the inferior elements of the scapular arch and the entire occupation of the skin by the ossification. The swim-bladder is large, and extends to the skin on each side of the casque and above the humeral processes, and between the long postcoracoid processes on the inferior surface. The osseous box inclosing the anterior half of the body protects this swim-bladder, but the teleologist will suggest that perhaps, on the other hand, the large swim-bladder is necessary to float the heavy shields and defensive spines.

The small body and immense casque give this form a very peculiar appearance, and suggest a miniature iron-clad with mast and outriggers.

PHYSOPYXIS LYRA, Cope, sp. nov.

Muzzle short and broadly truncate, about as long as the diameter of the eye, lips even. Interorbital region concave, thrice as wide as the diameter of the orbit, with an oval median fonta-

nelle. Orbit 4.2 times in length to opercular margin. The casque rises from the orbits to the dorsal spine. It is keeled obtusely, or roof-shaped, extends on the sides nearly to the lateral line, and is prolonged into a point on each side of and behind the last ray of the dorsal fin. The humeral portion of the clavicle is much enlarged and dilated horizontally, and is produced into a post-humeral (postclavicular) spine which extends to below the dorsal spine, is sharp-edged, striate, and not serrate.

The inferior aspect of the scapular arch is a transverse shield, convex in front, concave behind, and gently concave inferiorly, two-thirds of its width being composed of the coracoids; the surface punctate. The postcoracoid processes are very long, extending to beyond the bases of the ventral fins; they are curved, and the extremities dilated outwards, so as to present with the thoracic portion exactly the form of the Grecian lyre. The huge prickly pectoral spines curving round on each side, and meeting behind the ventral fins, suggest the wreath which often accompanies the lyre. The surface of the postcoracoid processes is longitudinally striate. A section of the fish in front of the pectoral fins is triangular.

The preorbital bones are well developed; they form an erect transverse crest of eleven long, sharp teeth, and are toothed laterally and below. Casque rugulose.

Radial formula D. I. 4, C. 12, A. 12; V. 6; P. I. 2. The dorsal spine is quite straight, trigonal in section, and longitudinally grooved. The inferior half in front is furnished with stout spines directed upwards; behind smooth. The pectoral spines are very large, curved, and extend to the second or third ray of the anal fin. They are spinous, and longitudinally grooved.

The lateral shields are twenty-three in number, and each is furnished below its middle with a recurved spine as in *Doras*. The surface of the plates is granular. Caudal fin truncate.

Color in front of the dorsal fin dark brown, minutely varied with lighter; a light cross-band from one humeral base to the other, and another between the orbits. Posterior part of the body yellowish, with a dark spot at the base of the dorsal fin; a band on the middle of the side, and one at the base of the tail. Fins brown-dusted; dorsal and pectoral spines brown, yellow cross-banded. Inferior surfaces deep brown, except the osseous portions, which are pale brown.

[January 16,

	M.
Total length	0.035
Length to orbit	.0015
" " opercular slit	.007
" " ventral fin	.015
" " anal fin	.0189
" " caudal fin	.028
" of dorsal spine	.0075
" " pectoral spine	.0123
" " postcoracoid	.0082
Width of muzzle	.005
" at humeral knobs	.013
" " 1st lateral shield	.003
Expanse of both pectoral spines	.031

Ambyiacu River, Equador. John Hauxwell.

The preorbital comb is like that of *Doras pectinifrons*, Cope, from the same region.

CALLICHTHYS ASPER, Q. Gaim.

Günther, v. 225.

CALLICHTHYS MELAMPTERUS, Cope, sp. nov.

The head depressed, muzzle broadly rounded. Body strongly compressed; the dorsal line rising steeply and continuously with the profile, to the dorsal fin. Caudal region much compressed; tail openly emarginate. Inferior lip little reverted, bearing no barbels; tip of the muzzle projecting but little beyond the mouth. Inferior barbel extending to near the end of the ventral fin, superior to near the end of the pectoral. Lateral shields 25–24, from supraclavicle. Azygous plates 5. Radii D. 8, A. 1, 6, V. 7, P. I. 8. Dorsal spine like other rays, pectoral toothed within, and with short tooth-like bristles without. Spine of adipose reaching to basis of caudal.

Orbit 3.5 times in length of head, twice in interorbital width. Depth of head more than two-thirds length. Length of head one-third length without caudal, equal depth. Length over all, three inches.

Color dark plumbeous; the preorbital region, and caudal and inferior fins, black.

This species is much more compressed than the *C. asper*. Besides other points, there is one more pectoral ray and a different

coloration from the *C. knerii*, Gill, from Trinidad, W. I. Numerous specimens.

DIANEMA, Cope, gen. nov.

Allied to *Callichthys*. A single barbel at the extremity of each maxillary bone; two barbels at the symphysis of the mandible; teeth minute, brush-like. Body shields in two series, as in *Callichthys*; postcoracoids dilated into two shields which meet on the median line and involve the derm, as in *Hoplosternum*. Sides of the face not shielded; parietal not reaching base of dorsal fin, but separated by two transverse shields of the sides. Dorsal and pectoral fins with powerful spines, caudal subtruncate. Adipose fin present, pungent.

This new genus, it will be seen, combines in an interesting manner the characters of *Hoplosternum*, Gill, *Brochis*, Cope, and *Corydoras*, Lac. The shielding is of the first, and the fin radii of the last two, while in the peculiar barbels it resembles no other. The relation of these to the double maxillary barbels of *Corydoras* appears to be explained by the structure in the genus *Brochis*, and will be mentioned under that head.

DIANEMA LONGIBARBIS, Cope.

Form rounded compressed; head depressed, wide, but abruptly narrowed in front of the nares. Maxillary barbels not reaching the opercular margin, mental to the middle of the pectoral fins. Shields 25–24, azygos four, all nearly smooth. Radii D. I. 7 I.; C. 12; A. 7; V. 7; P. I. 6. The pectoral spine is long and straight, terminating in a point, and is finely and strongly serrate on the inner, and finely bristled on the outer faces. Dorsal spine acute, not serrate. Length of head 3.66 in length without caudal fin, equal depth at dorsal fin. Postorbital width equal .70 length of head, width at nares equal length from muzzle to orbit; orbit 3.75 times in head, 2.5 times in interorbital width. Total length $3\frac{1}{2}$ inches, or .09 m. Color light yellowish-brown, fins unspotted. The specimen has, however, lost all coloration it might have had, in the spirits.

The dorsal spine is less developed than in the species of *Corydorus*. The posttemporal region is perforated by a few pores.

[January 16,

BROCHIS, Cope, gen. nov.

Allied to the last genus. Two barbels at the extremity of the maxillary bone, united by a beard-like looped cord to the symphysis mandibuli, the cord being thus attached at both ends. Teeth rudimental or wanting. Body with two longitudinal series of shields, the postcoracoids expanded and meeting on the median line. Head compressed, the parietal shield only separated from the dorsal spine by the basal azygos shield of the latter. Sides of head shielded to the mandibles. Dorsal and pectoral fins with strong spines; adipose present, purgent. Caudal fin emarginate.

This genus is allied to *Corydoras*, but differs from it as *Hoplosternum* does from *Callichthys* with the addition of the peculiar pendent dermal loops of the mandible. These loops are confluent at the symphysis mandibuli, and from that point to their union with the maxillary barbels resemble exactly the mental barbels of *Dianema*. It is difficult to avoid believing that these loops are homologically the recurved inferior lips of *Corydoras*, separated from the greater part of the ramus, but joining again at the canthus of the mouth and giving rise to the inferior barbel. It then follows with much probability that this connection also is severed in *Dianema*, and the inferior maxillary barbel remaining as before continuous with the mandibular loop, becomes the mental barbel. In the shielding of the head, *Brochis* is like *Corydoras*, while *Dianema* is like *Hoplosternum*, so that the affinities are complicated and not readily expressed by a linear arrangement.

BROCHIS COERULEUS, Cope, sp. nov.

Form short, stout, elevated, and compressed. Head steep, gently convex above the orbits and concave above and below them, and tapering to a very narrow muzzle, which overhangs the mouth a little. Scuta, 23–21, smooth, with one oval supratemporal shield only. Nares small, close to the orbits. One large combined pre- and suborbital shield; a large subtriangular loreal plate. Maxillary barbels extending to opposite the middle of the orbit. Shields of the head, with the postcoracoids, slightly rugose.

Length of head one-third length without caudal fin, 1.33 times in greatest depth at basis of dorsal. Orbit four times in head, more than twice in muzzle, which equals the width of the convex interorbital space. The dorsal outline is strongly arched, de-

scending behind from the middle of the dorsal fin. Radii D. I. 11, I., without adipose portion; C. 14; A. 8; V. short, 6; P. I. 9. Dorsal spine moderate, serrate behind and smooth before, pectoral stronger, finely but strongly serrate behind, smooth in front; it extends to or a little beyond the middle of the ventral in all our specimens. Length, three inches; depth, one inch.

Color of body and sides above, with sides of head, metallic blue; below, yellowish. Fins unspotted.

This elegant species appears to be very common in the tributaries of the Ambyiacu.

BROCHIS DIPTERUS, Cope, sp. nov.

This species is represented by a single specimen, which differs in several points from the type of the genus. These are: 1st, the existence of a well-developed adipose membrane to the adipose fin; 2d, the existence of only ten rays in the first dorsal fin; 3d, the thick attached inferior lip with two median beards. The lateral shield of the muzzle is more completely united with the surface of the ethmoid than in similar specimens of the *B. coeruleus*, but not more so than in larger specimens. Scuta 24 above. Pectoral and dorsal spines serrate within. Color and proportions as in *B. coeruleus*, the added adipose fin having a black border behind.

The characters of seven specimens of the type species are constantly different from this one.

CORYDORAS, Lacep.,

Differs from *Callichthys* in the prolongation of the supraoccipital shield upwards between the lateral shields to near the base of the dorsal ray, and in the possession of strong dorsal and pectoral spines.

The species of this genus are referred to a section of *Callichthys* by Dr. Günther, which he characterizes by the compressed form of the head. I think they constitute a natural genus characterized as above, and would admit species having the above peculiarities into it, no matter what the form of the head. The new species here described, however, agree with those already known in this compression of the head and body. The genus differs from *Brochis* in the non-shielding of the intercoracoid re-

gion, and of the sides of the muzzle, these regions being inclosed by membrane only.

One species, *C. semiscutatus*, Cope, has the postcoracoid processes much widened and with a superficial rugose ossification of the derm, thus approaching *Brochis*. The median portion of the thorax is, however, not inclosed. The sides of the head are also more fully ossified than in other species.

The typical species present interesting modifications of the inferior lips. Thus, that of *C. ambiacus* is broadly reflexed, of equal thickness, and furnished on its posterior border with two short barbels. In *C. trilineatus* the lip is recurved, and without barbels, but the margin is thickened into a cord, which is connected with the edge of the mandible by a membrane so attenuated as to be easily ruptured, when the arrangement resembles closely that seen in *Brochis*. In the third group the inferior lip appears to be entirely wanting. I add to the characters of the four new species here described those of the three recorded by Günther, as far as I can learn them.

Group I.

Head longer than high; barbels to middle of orbit; "A. 6." C. PALEATUS.

Head higher than long; barbels to operculum; A. I. 6. Muzzle long; dorsal spine moderate serrate; irregularly spotted. C. AMBIACUS.

Group II.

Muzzle short, convex; barbel to posterior edge of orbit; dorsal and anal spines shorter, former smooth; a light lateral band, divided and margined by a black line. C. TRILINEATUS.

Group III.

Muzzle produced, acute, concave; barbel to middle of orbit; dorsal and anal spines short, former serrate; no azygus shields; uniform, with a pale lateral band. C. ACUTUS.

Muzzle short, acute, concave; barbels to middle of orbit; dorsal and anal spines very long, former smooth; four azygus shields; olive, black-dotted. C. AMPHIBELUS.

Group ? ?

"Head high as long; barbels to gill opening; A. 8." C. PUNCTATUS.

"Similar to *C. paleatus*, but fins immaculate; A. I. 6." C. AENEUS.

"Head higher than long, muzzle short convex; barbels to below eye; dorsal spine long, serrate; anal short, four or five azygus plates; anterior scutes with vertical rows of black spots." C. ARMATUS.

CORYDORAS SEMISCUTATUS, Cope, sp. nov.

Radii D. I. 11, I., no adipose portion; A. I. 6; V. 6; P. I. 10. Scuta 23 above, including postcephalic, no azygus shields. Preorbital bone and shield single, large, extending half way from orbit to maxillary, and downwards, .4 way to line of mandible. Postcoracoid processes wide, with convex inner margins which are separated by a wide fissure, the surface striate rugose, no lateral shield separates them from the base of the ventral fins.

Profile steep, arched in front of nares; muzzle contracted, pointed. Orbit 3.5 times in head, 1.66 times in muzzle and interorbital space. Head 2.8 in length without caudal fin; depth 2.4 times in same. Inferior lip beaded on margin, which easily separates, forming a loop; no median barbels visible.

General color above pearly or nacreous-blue, with metallic reflections on postclavicle and operculum.

This species shows a marked tendency to the genus *Brochis* in the increased extent of the osseous shields of the thorax and sides of the head. The enlarged number of dorsal fin rays is another indication of such affinity. It represents very closely, I have no doubt, a young stage of *Brochis cœruleus* in the incompleteness of the shield development, and might, by some, be regarded as that animal itself. Specimens of the latter of nearly the same size betray no approach to it in characters, and experience elsewhere warrants the opinion that the parallelism will be seen at a far younger age than any of our specimens represent.

CORYDORAS PALEATUS, Jen.

Callichthys paleatus, Jenyns Voyage Beagle Fishes, p. 113. Günther, Catal. B. M. v. 230.

CORYDORAS AMBIACUS, Cope, sp. nov.

Form stout, compressed, dorsal line arched, front convex at orbit, slightly concave on the elongate muzzle. End of muzzle a little projecting beyond mouth, its outline gradually expanding to orbit. Interorbital region transversely convex. Lower lip widely reverted, its marginal barbels each shorter than the diameter of the eye. Latter 3.33 times in length of head, 1.75 times into muzzle and interorbital width. Length of head 3.2 times in length without caudal fin, and 1.25 in depth of body.

Lateral shields 22–21; azygus shields one basal and one flat.

[February 13,

Radii D. I. 7. A. I. 6; V. 6; P. I. 9, the spine acute, serrate on inner side, reaching half-way along ventral. Anal spine short, weaker than adipose dorsal spine. Latter with adipose appendage.

Straw color, with numerous indefinite brown spots on the sides. Dorsal fin with a large black spot covering anterior half, which also expands on the dorsal region round the base of the fin. Four vertical brown bands on caudal fin; anal spotted. Cheeks with blue reflections. Length .058 m.; depth at D. I. .018 m.

CORYDORAS TRILINEATUS, Cope, sp. nov.

This species is easily distinguished from the other species here noticed, by the short, abruptly decurved muzzle, and three longitudinal lateral lines.

The head is much deeper than long, and enters the length without caudal fin 3.5 times, and the greatest depth 1.5 times. Orbit 2.75 in head, 1.5 in convex interorbital space. Lateral shields 21–20; two highly keeled azygus. Radii D. I. 7; A. I. 6; V. 6; P. I. 6, the spine acute, without serrations; the dorsal spine serrate throughout behind, not extending to the base of the adipose spine. Latter much larger than anal spine, attached to an adipose portion.

Light straw-colored, brownish above, a yellowish lateral band with rather faint brown margin above and below, and blackish median line. A very black spot on *the ends* of the soft dorsal rays; tail deeply forked, with five vertical bands; anal spotted. Some longitudinal lines on the side of the face. Length .049 m., depth .015 m.

The mouth in this species is quite inferior. The peculiar structure of the lower lip, which is a festoon supported by a thin membrane, I have verified on two individuals. The thick margin on each side bears a very short barbel.

CORYDORAS ACUTUS, Cope, sp. nov.

A stout species, differing from the others, especially in the attenuation of the muzzle, which viewed from above is narrow, and contracted abruptly from the general outline. Mouth inferior, lower lip wanting or not reverted. Head 3.1 times in length without caudal, 1.33 times in depth. Orbit three times in head, 1.33 times in the nearly flat interorbital space. Lateral scuta 22–21; no azygus plates. Radii D. I. 7; A. I. 6; V. 6; P. I. 5, the

spines serrate on the inner side. Dorsal spine serrate posteriorly on the distal half. Adipose spine without fin, stouter than anal spine. Caudal fin furcate.

Color olive (faded), a faint pale band on each side; a large black spot on distal part of dorsal rays. Caudal with four vertical bars; clavicle and operculum with blue reflections. Length .051 m., depth .0155 m.

CORYDORAS AMPHIBELUS, Cope, sp. nov.

A species much like the last, but differing in its longer spines, short muzzle, and numerous azygus shields, etc. Form the stoutest in the genus, profile descending steeply from the dorsal fin to below the nares, then concave, and descending to the narrow muzzle. Head three times in length lacking caudal, 1.4 times in depth. Orbit 3 times in head, 1.6 times in interorbital width. Lateral shields 21–19, four flat azygus. Radii D. I. 7; A. I. 6; V. 6; P. I. 6, the spine serrate within. Dorsal spine serrate posteriorly, elongate, reaching the adipose spine when depressed. Adipose long without fin, but shorter than the slender spine of the anal. Total length .037 m.; depth .0124 m.

Color light olive, face with blue reflections. Numerous small black dots on the side shields, which are only wanting on the middle line of the side. Dorsal with a black spot on the ends of its radii, and another at the base of its spine. Caudal with four vertical cross-bars.

CORYDORAS PUNCTATUS, Bloch.

C. geoffroyi, Lacep. *Callichthys punctatus*, D'Orb. Cuv. Val. Günth. v. 229.

Surinam, Monte Video.

CORYDORAS ÆNEUS, Gill.

Hoplosoma æneum, Gill., Ann. Lyc. N. Y., 1851, p. 403. *Callichthys*, do. Günther, l. c.

Trinidad, W. I.

I cannot learn the structure of the lips in this and the following species:—

CORYDORAS ARMATUS, Günth.

Callichthys armatus, Gthr., Pro. Zool. Soc., Lond., 1868, p. 230. Fig. 1.

Xeberos on the Huallaga, Peru.

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CORYDORAS SPLENDENS, Cast.

Callichthys splendens, Castelnau, Anim. Nouv. Rar. Am. Sud. 39, Tab. 18, f. 3.

Rio Tocantins.

OTOCINCLUS, Cope.

Proc. Acad. Nat. Sci., Phila., 1871, p. 112.

Subfamily *Hypostomatina* of Günther's system. Ventral fins immediately below the front of the short dorsal; branchial fissures extending a little below pectoral fins. Vent a little behind the middle of the body. Body shielded with several series of plates, the anterior less numerous. Thoracic and abdominal regions with numerous shields. No adipose fin; dorsal with weak, pectoral with strong spine. Inter-operculum horizontal, beneath the orbit, unarmed. No barbels. The teeth as in allied genera. Post-temporal region pierced with numerous foramina, forming a sieve, which only separates the water from a large cavity on each side of the modified anterior vertebræ, by the thin skin which covers it.

This genus is allied to *Hypoptopoma*, and apparently to *Rhinelepis*. The arrangement of the opercular bones is like that seen in the former (see figure of *H. bilobatum* in Proc. Am. Phil. Soc., 1870, p. 567), while the absence of adipose fin and general rugosity are seen in the latter. Neither exhibits the remarkable perforation of the post-temporal plate. This is, in the only known species, so extensive as to cover the whole plate to the orbit, which becomes thus a skeleton sieve of some beauty, through which the cavity within may be plainly seen. Its use is unknown, but may be connected with the function of hearing, as the genus has no swim-bladder.

OTOCINCLUS VESTITUS, Cope, sp. nov.

Body compressed, head elongate oval, neither elevated. Muzzle rounded-acuminate, projecting much beyond mouth, nareal opening near orbit. Loreal region vertical, a canthus rostralis; muzzle a little convex between nares and orbits; profile gently arched from dorsal fin to end of muzzle. Scales obtusely angulate behind, the exposed surface covered with distant elongate prickles. Four rows on the caudal peduncle, the third from above bearing some tubes of the lateral line, and becoming more elongate and oblique anteriorly, until from the point of the pectoral

they occupy the entire inferior half of the side. The second does not enlarge till near the postcephalic plates, where two or three occupy the upper half of the side. Longitudinal line containing twenty-one. Those of the superior and inferior series are angulate near the margin of the peduncle, and meet on the superior and inferior median lines by a straight suture. Thus these faces form distinct but slightly convex, narrow planes. Parietal shield broader than long, postparietal large, its apex separated from D. I. by two cross-shields, the first wider. A large shield on each side the postparietal. The whole of this region swollen, greatest width of head at the sieve.

Orbit three times in head, twice in interorbital width; head 3.5 times in length, without caudal fin; depth 4.5 times in same. Caudal fin well developed, deeply forked. Dorsal elevated in front; radii I. 6; C. 17; A. I. 5; V. I. 5; P. I. 5; the spine flat, reaching the basal fourth of the ventrals, with short spines outside which become teeth at the end; within smooth. Scapular arch rather narrow below, followed by three series of shields, of which the lateral are long and narrow. These gradually diverge and admit three series of small scales, which again diminish and terminate in an obtuse point between the ventral fins. This leaves with the ends of the lateral shields a Y-shaped naked space, at the end of which is situated the vent. These are covered with numerous short bristles, like the scales of the dorsal region. The head, especially the muzzle, and more particularly the sides of the latter, are covered with many short, closely set, spiny bristles, which give the whole fish a hoary appearance when dry. Spines of fins also hirsute. Teeth bristle-like, those of the mandibular rami opposed to each other.

Yellowish-brown above, browner on the head, darkest on the lores. Sides and below bright yellow, a weak dark shade on lateral line, and large black spot at base of caudal. Fins unspotted. Total length .04 m.; length to anal fin .02; width of head behind .007.

Tributaries of the Ambyiacu.

LIPOSARCUS VARIUS, Cope, sp. nov.

Radii D. II. 13, I.; C. I. 14, I; A. 5; V. I. 5; P. I. 6. Dorsal longer than high, basis nearly equal length in front of it. Pectoral spine to middle of ventral; superior caudal ray shorter

than inferior. Scuta l. l. 28, l. tr. 4. Inferior regions granular; dermo-ossification of head extending to inferior plane all around, Orbit small, three times in interorbital width, five times in head, width a little greater than length. A marked canthus rostralis to beyond nares; loreal region steep, concave. An occipital keel, nuchal shields two-keeled. Elevation at latter, equal length muzzle and orbit.

Scales rugose, with a serrate median keel ending in a point.

Above, brown; below, yellowish-brown, closely spotted with dark brown, most coarsely on the belly, and finely on the head, leaving vermicular interspaces; eight rows of black spots on the dorsal fin. Other fins, except the caudal, closely black-spotted.

Length .18 m.; to anal fin .085; to mandible .01.

Numerous young specimens of this species, the largest .085 m. in length, display the following characters of immaturity. The inferior surfaces are smooth, and in the smaller the dermo-ossification of the loreal region exists only in spots, and in still smaller is wanting.

Two large specimens from Perkin's expedition have the humeral width and the total length, the base of the dorsal fin enters the same 3.75 times, and is equal the length of the pectoral spine, and the greatest depth of the body enters six times. The specimens agree with Castelnau's *L. pardalis* in having dorsal radii 1.12, but differ in having no keel on each side of the back posterior to the dorsal fin, and in having large spots on the belly, not "punctæ." The former character I derive from Castelnau's figure only.

The young of a second species of this genus occurs in the collection.

PLECOSTOMUS BISERIATUS, Cope, sp. nov.

Radii D. I. 7; A. 5; V. I. 5; P. I. 6. Lateral series of scuta 28, three rows between ventral and dorsal fins. Elevation of first dorsal ray equal length of head; length of basis equal to distance from spine of adipose, and 1.66 times length of head and nape. Scuta between dorsals 8, between anal and caudal 16. Pectoral spine to basis of ventral. Scuta not carinate, coarsely striate, the striæ terminating in a few small spines.

Head short, entering length without caudal fin 4.5 times, and a little less than width. A postorbital and orbito-nareal angle, rim of orbit elevated above front. An obtuse median occipital

elevation, nuchal scuta not keeled. Orbits four times in head, 2.5 times in interorbital space. Muzzle regularly acuminate, a triangular spot on extremity, smooth. Margins of muzzle not spinous. Inferior surfaces rugose, except a smooth band surrounding posterior lip, and a quadrate area within ventral fins. Lip entire; barbels short.

Inferior caudal ray one-quarter longer than superior, no long bristles on it or the ventral.

Total length 1.55 m.; do. to dorsal fin .045; to anal ; humeral width .07. Color yellow; below white, immaculate. Above with three rows of ill-defined blackish spots at the unions of scales, the inferior wanting behind the line of the dorsal fin. Head above with many close brown dots. Dorsal fin with two rows of blackish spots between each pair of rays; one series between the caudals. Twenty-eight teeth on each ramus mandibuli.

From the Amazon, from Robert C. Perkins. This species is especially distinguished by its short head, and by the characters of squamation of lower surface, color, etc.

PLECOSTOMUS SCOPULARIUS, Cope, sp. nov.

Proc. Acad. Nat. Sci., Phila., 1871, p. 55.

Is represented by a number of similar young individuals. They differ in having a more slender muzzle, and dorsal radii II. 12, I. Ventrals also I. 5.

CHÆTOSTOMUS, Tsch. Heckel.

There appear to be five nearly related species in the collection from the Ambyiacu, and I cannot find that any of them have been noticed by authors. Their characters may be summarized as follows:—

I. Muzzle naked, D. I. 7.

Muzzle with tentaeles; eye 3.33 times in interorbital space; head $3\frac{1}{3}$–$\frac{1}{2}$ times in length (without caudal). Head wide. Black below, white-dotted.
C. ALGA.

II. Muzzle with a broad naked marginal band; no tentacles; D. I. 7.

Eye three times in interorbital width; head broad, short, 3.75 times in length; l. l. 23. Brown, with indistinct pale spots; uniform below.
C. MALACOPS.

Eye three times in front, head wedge-shaped, roofed in front, 3.5 times in length; naked band narrower; blackish, white-dotted below.
C. TECTIROSTRIS.

Eye 2.33 times in front; head short, contracted at the front, four times in length; canthus rostralis vertical concave; brown, with many large oval pale spots above only. C. VARIOLUS.

III. Unossified margin of muzzle exceedingly narrow, no tentacles, D. I. 7.

Head short, broad, 4.25 times in length; eye 2.66 in front. Black, below brown; small. C. SERICEUS.

The smallest of these species, it will be observed, has the most complete dermo-ossification, and the largest the least. The next largest species, *C. tectirostris*, is next most fully ossified, while the *C. malacops*, with but little ossification, is after *C. sericeus*, and *C. variolus* the smallest. So there is no relation between the ossification and the size.

It may be observed that these species all agree in many points not above mentioned, viz.: Anal radii V.; V. I. 5; P. I. 6; and in having the inferior lobe of the caudal longer than the superior. Thorax and belly naked; lateral lines 23–4.

CHÆTOSTOMUS ALGA, Cope, sp. nov.

Width of head 3.33 times in length without caudal. Preopercular spines thirteen, of which two posterior are longer, and extend a little beyond the line of the orbit. Muzzle with numerous tentacles on the margin and sides, and a V-shaped series above of larger size, the largest in front at the apex of the V. Dorsal spine a little longer than base of fin, one-half length; pectoral spine extending to basal third or two-fifths of ventral spine. Scuta with ten serrate subequal ridges, each terminating in a spine. The ossification of the derm forms only a narrow band in front of nares and orbit.

Total length .165 m. I associate with this species a second specimen, which agrees in every respect except in wanting tentacles. This is probably, as Günther states of *C. cirrhosus*, the female.

This species is apparently near the latter species, but has a shorter body.

CHÆTOSTOMUS MALACOPS, Cope, sp. nov.

The lores are naked to near the nares, but the ossification extends in an angle to the middle of the muzzle. Width of head

3.4 in total without caudal. Ten principal bristles, the longest not extending to hinder margin of orbit. Dorsal spine longer, 1.5 times in length anterior to it; pectoral reaching beyond base of ventrals. Ten plates from anal to caudal, five between dorsals. Color brown, with many closely placed yellow spots. Length .097 m. With the last; two specimens.

CHÆTOSTOMUS VARIOLUS, Cope, sp. nov.

This species has a much narrower unossified labial margin than the last, the muzzle being entirely covered above to near the lip. Thirteen principal opercular spines which do not extend beyond the line of the orbit; three of them longer and subequal. Loreal region vertical. Scuta between dorsals 6, between anal and caudal 10. Dorsal spine 1.5 times length from its base to muzzle. Pectoral spine a little beyond base of ventral. Ridges of scuta represented by rows of bristles, which give them a hoary appearance. No keels.

Length .068 m. Color bright brown, with numerous large round yellow spots; belly unspotted. With the last.

CHÆTOSTOMUS TECTIROSTRIS, Cope, sp. nov.

Naked labial band as wide as space between nares and orbit. Only eleven preopercular spines, of which two posterior are subequal, longer, and reaching a little beyond line of orbit. Loreal region oblique, nearly plane. Dorsal spine 1.66 times in length in advance of it. Pectoral spines to a little beyond ventral. Scuta between dorsals 5, behind anal 10. The scuta are serrate ridged as in *C. alga*. The muzzle is ridged on the median line, and the sides slope gradually on each side; no other ridges on the head.

Black, with minute yellow dots above and below. Length .13 m., greatest width of head .031. Two specimens.

CHÆTOSTOMUS SERICEUS, Cope, sp. nov.

This species has a more elongate body than the others here described, the length containing that of the head 4.25 times, and the width 3.5 times. The head is thus wide and flat, and the naked portion is reduced to a very narrow band along the margin of the muzzle. Latter convex in section, loreal region concave. Eleven spines, the posterior not quite reaching line of posterior

rim of orbit. Dorsal spine 1.5 times in length in front of its base; pectoral scarcely beyond base of ventral. The ridges of other species are represented by rows of bristles. No ridges on the head. Color black, unspotted, or in a smaller specimen with faint pale spots above. Length .067 m. Two specimens with the preceding.

This species and the *C. malacops* might have been regarded as the young of *C. tectirostris* and *C. alga*, respectively, were it not that the larger individuals possess the characters of immaturity exhibited by other animals, viz., larger head, and less ossification of the derm of the muzzle.

LORICARIA ACUTA, Cuv. Val.

XV. 472; Gthr., Catal. B. M. v. 258.

From the Ambyiacu.

PARIOLIUS, Cope, gen. nov.

Allied to *Trichomycterus*. Ventral fins present, anterior to the short dorsal. Anal fin short; vent situated beneath the dorsal fin; no adipose fin. No nasal barbel, one maxillary and two lateral mentals. No armature on any of the opercular bones. Teeth in brush-like series.

This genus is allied to *Trichomycterus* in the extensive branchial fissures and other characters, but differs in the absence of armature of the head, and number and position of tentacles.

PARIOLIUS ARMILLATUS, Cope, sp. nov.

Head flat rounded, eyes small, superior, covered by the skin. Head 4.5 times in length to basis of caudal fin. Depth at D. I. one-half length to basis pectoral fin; width of head two-thirds the same distance. Interorbital width 3.66 times in length of head. Maxillary and external mental barbels extending beyond basis of pectoral; inner mental barbel on half the same. Radii D. 7; P. 8; V. 6; A. 11; caudal acuminate. Skin entirely smooth.

Color dark-brown, nearly black on the top of the head; under surfaces from anus brownish-yellow, brown punctulate. A broad yellow collar extends from the under surface on each side across the bases of the pectoral fins and the vertex. A vertical dark spot on base of caudal; fins brown-spotted.

	M.
Total length	0.041
Length to opercular edge	.0078
" pectoral fin	.008
" dorsal	.0158
" anal	.0245
" caudal	.033

From the Ambyiacu, Jno. Hauxwell.

PARIODON MICROPS, Kner.

Sitzungsb. Wien. Acad., 1855, p. 161. Günther, Catal. B. Mus. v. 275.

A fine specimen of this fish was obtained by Robert Perkins. It is nearly allied to *Stegophilus* Rhdt., and belongs to the *Stegophilina* of Günther. The latter author, however, places it in his *Trichomycterina*, a step calculated to mislead the student, as it contradicts its natural characters. Günther does not appear to have seen the fish, and perhaps Kner omits mention of the characters necessary to decide the question. It possesses the very posterior vent, and the gill covers united with the throat found by Günther to define the *Stegophilina*.

SYMBRANCHIDÆ

SYMBRANCHUS MARMORATUS, Bl.

The fishes of the Ambyiacu, so far as made known by the preceding investigation, are referable to eight families, fifty genera, and seventy-four species. These are distributed as follows:—

	Gen.	Species.
Chromididæ,	7	15
Clupeidæ,	1	1
Osteoglossidæ,	1	1
Sternopygidæ,	2	3
Erythrinidæ,	2	2
Characinidæ,	21	29
Siluridæ,	15	24
Symbranchidæ,	1	1

Forty-seven of the above species and nine of the genera are new to science, and are referable to the following families:—

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	Gen.	Species.
Chromididæ,	0	9
Erythinidæ,	0	1
Characinidæ,	3	16
Siluridæ,	6	20

The general character of this list is that of any other part of the Amazon basin, presenting peculiarities in peculiar species and in genera not found in the lower Amazon. Such genera among Characindæ are *Triportheus*, *Megalobrycon*, *Aphyocharax*, *Iguanodectes*, and *Stethaprion:* among Siluridæ, *Dianema*, *Brochis*, *Zathorax*, *Physopyxis*, *Otocinclus*, and *Pariolius*. A genus (*Characidium*) previously only known by one small species from a Brazilian coast stream, has its range greatly extended by the discovery of a species in the Ambyiacu.

The species contained in the Perkins collection are as follows:—

CHROMIDIDÆ.

Pterophyllum scalare, C. V.

Symphysodon discus, Heck.

Cichla ocellaris, Bl. Schn.

Geophagus proximus, Cast. Radii D. XVII–XVIII–11; A. III–8. Scales 6–34–12, upper and lower halves caudal fin scaly to near end.

Hygrogonus ocellatus, Agass.

SCIAENIDÆ.

One species.

PLEURONECTIDÆ.

One species.

OSTEOGLOSSIDÆ.

Osteoglossum bicirrhosum, Vand.

CHARACINIDÆ.

Curimatus cyprinoides, L.

Hemiodus microlepis, Kner.

Tetragonopterus chalceus, Artedi.

Myletes albiscopus, Cope.

Myletes bidens, Spix.

Myletes, sp. nov.

Serrasalmo æsopus, Cope.
Serrasalmo humeralis, Kner.
Serrasalmo nattereri, Kner.
Hydrolycus scomberoides, Spix.
Rœboides rubrivertex, Cope.

SILURIDÆ.

Cetopsis cœcutiens, Licht.
Pariodon microps, Kner.
Piramutana, sp. nov.
Callophysus lateralis, Gill.
Phractocephalus hemiliopterus, Bl. Schn.
Rhinodoras niger, Valenc.
Doras brachiatus, Cope.
Plecostomus scopularius, Cope.
Plecostomus biseriatus, Cope.
Liposarcus varius, Cope.

EXPLANATION OF THE PLATES.

PLATE III.

Fig. 1. *Doras pectinifrons* Cope.

PLATE IV.

Fig. 1. *Zathorax monitor* Cope; *b* from below; *c* from front.
" 2. *Otocinclus vestitus* Cope; *b* from above; *c* head, side view.

PLATE V.

Fig. 1. *Physopyxis lyra* Cope; *b* from below; *c* from front.
" 2. *Chatostomus malacops* Cope; *b* from below.

PLATE VI.

Fig. 1. *Corydoras semiscutatus* Cope; *b* from below.
" 2. *Corydoras trilineatus* Cope; *b* from above; *c* from below.

PLATE VII.

Fig. 1. *Dianema longibarbis* Cope; *a* from above; *b* from below.
" 2. *Brochis coeruleus* Cope; *a* from above; *b* from below.

PLATE VIII.

Fig. 1. *Iguanodectes tenuis* Cope (adipose fin omitted by artist); 1*a* dentition.
" 2. *Characidium etheostoma* Cope; dentition.
" 3. *Triportheus albus* Cope; dentition.

PLATE IX.

Fig. 1. *Anacyrtus sanguineus* Cope.
" 2. *Serrasalmo iridopsis* Cope.
" 3. *Brochis coeruleus* Cope.

PLATE X.

Fig. 1. *Crenicichla anthurus* Cope.
" 2. *Megalobrycon erythropterum* Cope.

PLATE XI.

Fig. 1. *Geophagus badiipinnis* Cope.
" 2. *Uarus centrarchoides* Cope.
" 3. *Acara syspilus* Cope.
" 4. *Acara flavilabris* Cope.

Plate XII.

Fig. 1. *Myletes albiscopus* Cope.
" 2. *Myletes oculus* Cope.
" 3. *Myletes herniarius* Cope.

Plate XIII.

Fig. 1. *Megalobrycon melanopterum* Cope.
" 2. *Xiphostoma tædo* Cope.
" 3. *Characidium etheostoma* Cope.

Plate XIV.

Fig. 1. *Triportheus flavus* Cope.
" 2. *Triportheus albus* Cope.
" 3. *Chalcinus culter* Cope.
" 4. *Callichthys melampterus* Cope.
" 5. The same; head from above.

Plate XV.

Fig. 1. *Doras grypus* Cope.
" 1*a*. *Do.* from below.
" 2. *Chætostomus tectirostris* Cope.
" 3. *Chætostomus alga* Cope, from above.

Plate XVI.

Fig. 1. *Plecostomus scopularius* Cope; one-fourth natural size.
" 2. Same from below.

Plate XVII.

Fig. 1. *Nothopsis rugosus* Cope.
" 2. *Do.* head from side.
" 3. *Do.* " " above.
" 4. *Do.* " " below.
" 5. Dentition of upper jaw and palate.
" 6. *Trigonocephalus atrox* Cope, var. from Central America.

NOVEMBER 7.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-four members present.

The death of Wilhelm Ritter von Haidinger, a correspondent of the Academy, was announced.

Prof. COPE exhibited a specimen of a *Galeodes*, probably *G. pallipes* of Say, taken in the town of Denver, Colorado, by Dr. Gehrung. According to that gentleman, it was common in that place in houses, and was an enemy and destroyer of the *Cimex lectularius* (bedbug). In captivity, it showed a preference for them as food, and crushed them in its short cheles, preliminary to sucking their juices.

Mr. THOMAS MEEHAN said that while travelling through a wood recently he was struck in the face by some seeds of *Hamamelis virginica*, the common Witch Hazel, with as much force as if they were spent shot from a gun. Not aware before that these capsules possessed any projecting power, he gathered a quantity in order to ascertain the cause of the projecting force, and the measure of its power. Laying the capsules on the floor, he found the seeds were thrown generally four or six feet, and in one instance as much as twelve feet away. The cause of this immense projecting power he found to be simply in the contraction of the horny albumen which surrounded the seed. The seeds were oval, and in a smooth bony envelope, and when the albumen had burst and expanded enough to get just beyond the middle where the seed narrowed again, the contraction of the albumen caused the seed to slip out with force, just as we would squeeze out a smooth tapering stone between the finger and thumb.

NOVEMBER 21.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-six members present.

The following paper was presented for publication:—

"Notes on Feldspars and some other Minerals of Philadelphia and vicinity." By Theo. D. Rand.

Mr. THOMAS MEEHAN said that of all the problems that faced the botanist, few seemed more impenetrable than the law which governed the angular divergence in the branches of plants. Some

grew quite prostrate, and others, though closely allied species, might be strictly erect. At the present season of the year we may note plants with prostrate leaves or branches, which in spring will have them of a sharp, upright angle. The verbascums at the present time, especially *V. blattaria*, had their root leaves so firmly pressed against the ground, that on lifting they would fall back with a spring; as soon as the central axis grew, the leaves from that would be almost upright. In some respects, erection or prostration became almost specific characters. The *Rubus villosus* usually grew erect even from infancy, and the *Rubus canadensis* generally trailed; yet the last-named would sometimes throw up strong erect stems, which could scarcely be distinguished in that stage from *R. villosus*. Again, the same species of tree would often produce individuals quite erect, and at other times very pendent, and hence we had in Horticulture the class of weeping trees. All trees seemed to have this power of producing pendent individuals. The oaks, ashes, poplars, elms, all furnished familiar examples.

It was usual with botanists to pass these things over as "weaknesses." But the term weakness explained nothing. To say that these plants had lost the power of erection, was simply restating the primary fact. Moreover, some of these prostrate forms had apparently more vigor than the erect ones. *Rubus canadensis* was weaker than *R. villosus*, truly; but, on the other hand, some of the Russian trailing junipers were far more vigorous than any of the upright forms. The weeping beech also was in appearance more vigorous than the ordinary forms. All beeches had their young growth pendent. As the growth matured, the branches became erect; but in the weeping form erection did not come with maturity, and hence it remained pendent. In the ashes, however, there was no pendency in the young growth; but the "weeping ash" was one of the most decided of all drooping trees. In such cases as these, the law which governed the angles of divergence must either be different in each case, or operate at different stages of the development of the branches.

In his late travels in the Rocky Mountains, he came on a tract covered profusely with one of the small creeping *Euphorbias*, probably *E. cordata*, in which a large quantity grew perfectly erect. Sometimes only a portion of the plant exhibited this character, at other times all the plant was upright. The specimens he exhibited were of the erect class. In all these cases the plant was attacked by a small fungus, *Æcidium euphorbiæ, hypericæfolia* of Schweinitz. He thought that the fact that this little fungus should be able to make a usually creeping plant, rooting from every joint, entirely lose this character and become erect, was worthy of some notice by students in this branch of botany.

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Flies as a Means of Communicating Contagious Diseases.—Prof. LEIDY remarked that at this time, during the prevalence of smallpox, he was reminded of an opinion he had entertained that flies were probably a means of communicating contagious disease to a greater degree than was generally suspected. From what he had observed in one of the large military hospitals, in which hospital gangrene had existed, during the late rebellion, he thought flies should be carefully excluded from wounds. Recently he noticed some flies greedily sipping the diffluent matter of some fungi of the *Phallus impudicus*. He caught several, and found that on holding them by the wings they would exude two or three drops of liquid from the proboscis, which, examined by the microscope, were found to swarm with the spores of the fungus. The stomach was likewise filled with the same liquid, swarming with spores.

NOVEMBER 28.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-three members present.

The deaths of Rev. E. E. Adams and Gen. F. F. Cavada, correspondents of the Academy, were announced.

Prof. COPE made some remarks on the fauna of the Wyandotte Cave in Southern Indiana. He stated that the blind fish of the Mammoth Cave (*Amblyopsis spelæus*) was not rare in waters flowing from it, and that an *Astacus*, probably *A. pellucidus* also occurred. He had detected two species of *Anophthalmus*, both of which were new, according to Dr. Horn; and three *Staphylinidæ*, two of which were to be described by Dr. Horn. A cricket of the genus *Raphidophora*, and two species of flies, were also common. There were two species of spiders, one a true *Aranean*, the other allied to *Opilio*. A centipede allied to *Pseudotremia* was very abundant. A curious aquatic crustacean with external egg-pouches was found in an old trough. The most remarkable animal is a crustacean of the Lernæan division, found parasitic on the upper lip of the *Amblyopsis*. It had an elongate cephalothorax, oval abdomen separated by a constriction, not distinctly segmented, and with short egg-pouches. The anterior limbs modified into a *single* strong peduncle. The form appeared to be allied to *Achtheres*, but the single undivided peduncle distinguished it generically. He called it *Cauloxenus stygius*.

Prof. Cope exhibited a number of specimens of fossil reptiles recently procured by him in Western Kansas, in the Cretaceous Chalk. They consisted of two specimens of *Liodon proriger*. Cope, and portions of jaws with teeth of four new Pythonomorph

reptiles, viz.: *Edestosaurus tortor*, Cope; *Holcodus coryphæus*, Cope; *H. ictericus*, Cope; and *Liodon curtirostris*, Cope. The first was regarded as a very slender form, with a cranium two and one-half feet in length, and with compressed teeth. The others were much stouter species, the *H. coryphæus* having a high occipital crest and long acute teeth. Length thirty feet. The two remaining species were about the same size.

The following gentlemen were elected members: Richard Day, Thos. E. Parke, M.D., Commodore John P. Gillis, U.S.N., Samuel W. Pennypacker, Richard A. Lewis, W. Grier Hibler, Louis Stillé, M.D., Jas. A. Ogden, Roland G. Curtin, M.D., Allen Shryock.

The following were elected correspondents: Geo. Stewardson Brady, M.D., of Sunderland, Eng'd., Prof. W. C. Kerr, of Raleigh, N. C., Dr. Jos. K. Corson, U.S.A., J. Van A. Carter, M.D., of Fort Bridger, Wyoming.

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

NOTES ON FELDSPARS AND SOME OTHER MINERALS OF PHILADELPHIA AND VICINITY.

BY THEODORE D. RAND.

Orthoclase, from the ravine three-quarters of a mile west of Media, the locality mentioned in Dana's Mineralogy as Mineral Hill. Color pale-greenish, two cleavages highly perfect, giving a prism four inches, by one and a half, by one and a half, 90°. Four other specimens from the same locality, one quite green, the others grayish and greenish, all with two perfect cleavages, 90°.

Oligoclase, from same locality, and intermixed with the former and with quartz, but showing opalescence, and sometimes chatoyant reflections, and, rarely, both on the same surface, the brachydiagonal cleavage $\infty P \breve{\infty}$. These cleavages were by no means so perfect as in the former, and but few specimens would admit of accurate measurements. The basal plane generally showed distinct but very fine striæ. The measurements are given below.

Oligoclase, from two miles west of Media, and southwest of the Black Horse Hotel. This is the whitish, translucent moonstone, occurring in very brilliant specimens. In this, as in the former, the cleavage surface parallel to $\infty P \breve{\infty}$ is frequently irregular and sometimes curved. There was also observed, in both this and the former, a third cleavage, still more imperfect. The measurements (with the common goniometer) were as follows:—

	Oligoclase,	1	2	3	4	5	6	7	8
0P on $\infty P \breve{\infty}$	93.50	93	...	...	94	95	...	94	...
	86.10	87	88	...	87	...	86	87	...
0P on 3d cleavage	(If $\infty P'$ 114.40)	...	...	...	112	111	113	115	114
	65.20	...	67	67	69	70	68	...	65
$\infty P \breve{\infty}$ on 3d cleav.	(If $\infty P'$ 120.24)	119	120	...	119	118	120	120	...
	59.56	...	63	...	64	60	63	62	60

1, 2, 3, and 4 are from the ravine near Media; 5, 6, 7, and 8 from near the Black Horse Hotel.

It seems probable that this third cleavage, which has not, I believe, been noticed before, is parallel to the plane $\infty P'$ ($1'$ of Dana), similar to that of orthoclase and albite.

Sunstone, from a ravine immediately north of that first described, 90°. Near this the Delawarite is found. My specimens

1872.]

do not admit of accurate measurements, but in one specimen it graduates into oligoclase, and it is perhaps but an alteration of that species. It has distinct triclinic striations.

Cassinite, from Blue Hill, Providence Township, Delaware County, measures 90°.

Lennilite, Lenni, Delaware County, a very perfect cleavage gave 86–87, but the absence of triclinic striæ would indicate that this is an orthoclase.

Bluish transparent veined Feldspar, from Van Arsdale's quarry, near Feisterville, Bucks County, Pa., two cleavages, highly perfect, and giving finely polished surfaces, 90°. The opalescent feldspar from the same quarry, called labradorite, is probably the same.

Orthoclase, from Frankford, Philadelphia, nearly pure white in color, and translucent. Besides the ordinary cleavages, 0P and ∞ P $\bar{\infty}$, the more unusual, ∞ P ∞ and ∞ P, are occasionally well developed, giving rise to two rhombohedra, one with the faces parallel to the axes, the other derived from this by the development of the plane ∞ P, as shown in the annexed section on a plane parallel to 0P (Fig. 1). Rhombohedra of the first form have been found also at the quarries on the Pennsylvania Railroad, near the west end of the Fairmount dam.

Fig. 1

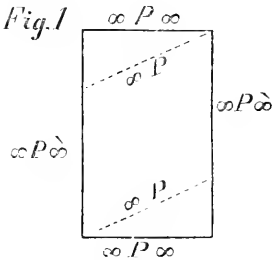
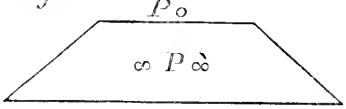


Fig. 2



In three specimens of the Frankford orthoclase, a fifth cleavage appears, quite imperfect, truncating the angle between ∞ P, 0P and ∞ P $\bar{\infty}$, or the edge between 0P and ∞ P ∞ forming with 0P an angle of about 135, and with ∞ P $\bar{\infty}$ nearly 90°, Fig. 2. If this is not a mere accident, it is not easy to explain.

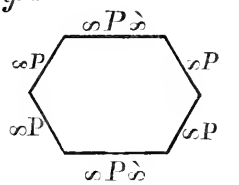
Rhombs from the quarries mentioned on the Pennsylvania Railroad have been found, with the following angles for the face of unusual cleavage on 0P and ∞ P $\bar{\infty}$:—

	0P	$\infty P \breve{\infty}$
1	72	103
2	{ 112 69 } { 114 66 }	{ 101 80 } { 100 81 }
3	{ 112 68 } { 116 69 }	{ 100 80 } { 107 70 }
4	{ 112 69 } { 107 72 }	{ 100 83 } { 103 }
5	111 70	98 81
The angle of $\infty P \infty$ is	116 64	90 90

It is, however, most probable that this is a distortion of $\infty P \infty$.

In the cutting of the Pennsylvania Railroad, northwest of the wire bridge, an orthoclase was found, somewhat decomposed and chalky in aspect, cleaving into rhombohedra of the second kind, and also into six-sided prisms, terminated by the 0P plane, and from a slight distortion in angle the prism angles each measuring exactly 120° (Fig. 3).

Fig. 3



In Frankford, the orthoclase occurs in a granitic vein on the southern portion of the bed of hard hornblendic gneiss, the N. E. outcrop of which is at this point, and which is exposed also near Wayne St. on the Germantown Railroad, and on Rittenhouse Lane near the Wissahicon, and which crosses the Schuylkill at the hill through which the Flat Rock Tunnel on the Reading Railroad is pierced. This gneiss throughout is very hard, and in its fissures occur several species of zeolites, with calcite, and at Frankford crystallized epidote in fine specimens, and also fluor spar in a vein of calcite, and well-crystallized molybdenite in a vein of orthoclase. The calcite contains also yellow crystals so minute as to be detected only by examination with the microscope, of the portion insoluble in hydrochloric acid. Their nature has not been determined, the quantity being very small. There also occurs a yellow hyaline coating, in veins of the gneiss, which is probably a hyalite, colored by uranium.

This gneiss, except near Wayne Station, is bedded with great regularity, and affords a most excellent curb and building stone; its fracture in one direction, owing to cleavage, is smooth and

plane, but in the others, when not jointed, irregular and sometimes conchoidal.

At a quarry on the northern edge of this gneiss, north of Frankford, Apophyllite was found; its only place of occurrence in the neighborhood.

At the line between Philadelphia and Montgomery counties, the well-known steatite bed, beginning on the west side of Chestnut Hill, about three miles distant, crosses the Schuylkill and continues in a nearly southwest by south direction (exactly S. 54 W.), beyond that river about two miles and a half, where it crosses the valley of Mill Creek, and ends, or sinks beneath the surface. Perhaps the most conspicuous and remarkable rock of this belt is a steatite, containing a black serpentine. This rock in many places projects above the surface of the ground in immense masses, particularly at Mill Creek, seeming to have resisted erosion and decomposition to a remarkable degree. It lies on the northwest side of the steatite proper. The whole aspect of this curious formation suggests a rock originally containing crystals of some mineral, but metamorphosed almost beyond recognition. To this mineral I believe no clue has heretofore been obtained. Nearly all these black masses, which vary in size from a half inch or less to several inches, are irregular in form, and adhere so closely to the matrix that sections only can be obtained, which, however, rarely show any angles or other than a nodular form, so that the rock has by some been considered a conglomerate. Even in weathering, the two, except in one place hereafter mentioned, seem to weather so much alike that no clue to the form can thus be had.

About two years ago, however, I found near the soapstone quarry, on the northeast bank of the Schuylkill, one of these serpentine masses presenting a stellated form of six rays, or of one large crystal crossed by two smaller at angles of about 60 and 120 on the section plane, suggesting staurolite. A few days ago, while with Prof. E. J. Houston examining this rock on the southwest side of Mill Creek, a piece was found containing a broken crystal $4\frac{1}{2}$ inches $\times 1\frac{1}{2} \times 1\frac{1}{2}$, presenting two well-defined sides, and upon a cross-fracture, these sides were found to continue to another forming with one of the sides an angle of about 75° on the section, which approximated a plane at right angles to the

faces. The steatite in which it was imbedded, and the serpentine itself, contained ferruginous dolomite or breunnerite.

On the northeast side of Mill Creek, a portion of the rock in place was found very much weathered on the surface, the steatite being cavernous and decomposed, and very soft and brittle, owing, probably, to a large admixture of ferruginous dolomite, but the serpentine gone entirely, save a little pulverulent oxide of iron; the cavities were nearly all lenticular in shape, but too regular to be other than matrices of crystals, while in two cases distinct cruciform cavities with angles of about 60° were observed. The portions of rock containing these were cut out, and in one of them lead was poured, and a cast obtained, which, while irregular and rough, was a fac-simile in metal of the common cruciform twins of staurolite. Portions of the same rock which had not altered were found containing the serpentine in distinct crystals, irregular in outline, but twinned at angles of about 60°.

Serpentine.—About a half mile above the soapstone quarries on the Schuylkill, occurs a ridge of serpentine which I believe has never been described. Its first appearance is at a slight cutting of the Philadelphia and Reading Railroad, opposite and a little above Lafayette station on the Norristown Railroad, and just below the vein of granite which crosses the Schuylkill below Spring Mill, and crops out at several points on the elevated hill of gneiss, which crosses the Schuylkill at Spring Mills. About a hundred yards S.W. from the river, it has been cut through by a small stream, and here it has been quarried as a building-stone, and is well exposed. The serpentine is very compact, at times slaty, of a very dark green, almost black, color, unlike that of any other ridge of the neighborhood, and resembling that of the Hartz. Intermixed, and also at the bottom of the quarry on the northwest, is a foliated mineral resembling Schiller spar, or serpentine, pseudomorphous after Pyroxene or Hornblende. The serpentine dips steeply toward the southeast, and at this point rises probably one hundred and fifty feet above the valley, abruptly and precipitously on the N.W., sloping on the S.E., where talcose and micaceous schists rest against it. About a half mile from the river, the ridge widens, the slopes are more gentle, and, for a short distance, the serpentine is hidden; but it again crops out about one mile from the river, where a road, parallel to the river, crosses the stream which has been mentioned, and which skirts

the ridge on the west. From this point it is narrower and well defined for a quarter of a mile to the next road parallel with the Schuylkill. Here the stream seems to have denuded it for about fifty yards, and a stream from the east joins that on the west. Beyond this it rises abruptly in a grove of cedars, and then continues, as a narrow, well-defined ridge, to its termination, which is abrupt, about one and three-quarter miles from the Schuylkill. In this part, as also in that between the two roads, it has almost the regularity and appearance of an old railroad embankment.

Hisingerite, from the Gap Mine, Lancaster County, Pa. Black amorphous; lustre between resinous and vitreous; streak, brown. Fracture conchoidal, brittle H $2\frac{1}{2}$–3 S. G. 2.11.

Analysis omitting 1.13 per cent. gangue:—

Water at 212	14.30	
" at redness	9.89	24.19
Silica		35.40
FeO		12.53
Fe_2O_3		27.46
		99.58

In a cutting through decomposed mica shists, on the new line of the Philadelphia, Wilmington, and Baltimore Railroad, about a half mile southwest of Gray's Ferry, there is a white efflorescence, alkaline to the taste. It consists chiefly of sulphate of soda, an unlooked-for mineral in such location.

PHILADELPHIA, November 21, 1871. THEO. D. RAND.

DECEMBER 6.

Mr. TRYON in the chair.

Twenty-three members present.

The death of Mr. Jas. H. Orne was announced. The death of Sir Roderick J. Murchison, a correspondent of the Academy, was also announced.

The following paper was presented for publication:—

"Descriptions of new Western Palæozoic Fossils, mainly from the Cincinnati Groups of the Lower Silurian Series of Ohio." By F. B. Meek.

Prof. COPE made some remarks on a peculiar habit recently observed by Alfred R. Wallace, in the *Phrynosomas*, in the Zoological Gardens in London. These animals eject from their eyes, in self-defence, a red fluid like blood. On inquiry of Dr. Edw. Palmer, of the Smithsonian Institution, who had spent some years in Arizona, whether he had observed such a habit in any of the species, he handed me the following extract from the "Arizona Miner" of August 20th, 1869:—

"Dr. Palmer and party got back here Wednesday evening last, from Bill Williams' Mountain, E. J. Cook, one of the Prescott party that accompanied the expedition, informs us that a [horned] toad was found on the top of the mountain, which, when made mad, spurted blood from its eyes. It was secured by the doctor. The Prescott party did not find game as plenty as they had expected, yet they succeeded in killing one bear, eight or ten turkeys, and a deer. They say the country is the most beautiful ever seen by them. The valleys are many and large; pine, oak, and other timber covers the entire region, and the grass was waist-high. The region of country visited by them lies about 60 miles north of this place, on the line of the 35th parallel railroad route."

This specimen is in the doctor's collection, now in my hands, and belongs to the species *Phrynosoma ornatissima*, Gird.

DECEMBER 12.

The President, Dr. RUSCHENBERGER, in the chair.

Thirty-five members present.

Notice of some Worms.—Prof. LEIDY remarked that Prof. Hayden reports the brook trout, *Salmo fontinalis*, of the headwaters 1872.]

of the Yellowstone River, to be much infested with a species of tapeworm. A number of specimens of the worm, collected by C. Carrington, have been submitted to his examination, but, unfortunately, most of them are so far decomposed as nearly to be reduced to the condition of pulp. The worms are stated to have been taken from the abdominal cavity, but not from the intestinal canal, and often were found beneath the skin, extended among the muscles or inclosed in oval sacs. Several cysts preserved entire contained worms in a better condition for examination than the others, and from these the characters of the parasite have been ascertained. It belongs to the old genus *Bothriocephalus*, and to that section now named *Dibothrium*. Two species of this genus have long been known as infecting the salmon and other members of the same genus of fishes in Europe, but the parasite of the Yellowstone trout appears to be a different one.

Two of the best preserved specimens measured five inches long by a line wide at the broadest part. The head, about a fourth of a line in diameter, is obcordate. The two suckers or bothria are thick and discoidal, placed back to back, obcordate in outline, and directed with their broad and slightly depressed surface towards the margins of the body. The body is flat, thick, with rounded margins, and is narrowly annulated or segmented. The annulations due to muscular bands measure about ten to the line. Segments, independent of the annulations if existing, could not be distinguished, perhaps on account of the badly-preserved condition of the specimens. No genital apertures are visible at the sides nor at the margins. No internal organs are visible, but the soft solid interior tissue is filled with round corpuscles resembling starch granules. These are, however, composed of carbonate of lime, as they are dissolved by acetic acid with an abundant evolution of carbonic acid.

From the form of the head, the worm was named DIBOTHRIUM CORDICEPS.

Numerous leeches collected by Prof. Hayden's assistants, Messrs. Carrington and Dawes, in a lake in Wyoming Territory, appear to belong to the species *Aulastomum lacustris*, first discovered several years ago in Twin Lake, Minnesota.[1] Mr. Carrington informs us that the head of a horse, which was thrown into the lake, in a few hours appeared black from the quantity of these leeches which adhered to it. It is barely probable that this leech is the one described by Thomas Say, in Long's Expeditions, under the name of *Hirudo marmorata*, though the characters do not accord with his description of the latter. It is not improbable that the two are quite distinct. *H. marmorata*, together with another species, *H. lateralis*, was obtained from small lakes on the high land between Lake Superior and Rainy

[1] Proc. Acad. Nat. Sci., 1868, p. 229.

Lake. Neither of these appears to have been obtained since their first discovery.

Several large hair worms from Fish Creek, Montana, pertain to the species *Gordius lacutris*, previously described[1] from specimens obtained in Kansas. It is the largest known *Gordius*. The females of the Kansas specimens ranged from 10 inches to $2\frac{1}{2}$ feet in length; the males, from 8 inches to upwards of 2 feet. The females of the Montana specimens measure from $1\frac{1}{4}$ to $2\frac{1}{4}$ feet in length; a male, $8\frac{1}{2}$ inches in length. The females are pale brown; the males dark brown, and with a strongly-forked tail.

DECEMBER 19.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-one members present.

DECEMBER 26.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-five members present.

The following gentlemen were elected members:—
Andrew H. Miller, Dr. A. L. Gihon, U.S.N.

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

[1] Proc. Acad. Nat. Sci., 1851, p. 275; 1857, p. 204. Amer. Entomol., vol. ii., p. 194.

DESCRIPTIONS OF NEW WESTERN PALÆOZOIC FOSSILS, MAINLY FROM THE CINCINNATI GROUP OF THE LOWER SILURIAN SERIES OF OHIO.

BY F. B. MEEK.

FULL illustrations and descriptions of the fossils described in this paper are in course of preparation for the report of the Ohio Geological Survey, now being prosecuted under the direction of Prof. J. S. Newberry, the State geologist.

RADIATA.

ECHINODERMATA.

HETEROCRINUS EXIGUUS, Meek.

Body small, obconoidal, or tapering from above to the column, near which it becomes pentagonal in consequence of the flattened surface of each of the basal pieces. Sub-basal pieces obsolete, or very minute. Basal pieces (subradials of some) of moderate size, about as wide as long, pentagonal, and almost perfectly flat. Left posterior ray bifurcating first on the fifth piece, the first piece being comparatively large and irregularly hexagonal, in consequence of having a short sloping side on its upper right edge for the reception of one side of the first anal piece; the four succeeding pieces much narrower, about as long as wide, and rounded, and more or less constricted in the middle, with expanded upper and lower ends. Right posterior ray bifurcating first on the eighth piece, the first piece being decidedly smaller than that of the left posterior ray, pentagonal in form, and slightly longer than wide; while the second is of the same breadth but shorter, rounded on the dorsal side, and irregularly pentagonal in form, the fifth angle being formed by a short side on the left above, for the reception of the first anal piece; succeeding pieces about as long as wide or slightly longer, rounded and constricted in the middle, and expanded at the ends. Right anterior lateral ray bifurcating first on the sixth piece, the first piece being distinctly larger than the others, apparently a little longer than wide, and subpentagonal in form; while those above are smaller, and of the

same form as the corresponding pieces of the other rays described. (Other rays unknown.) Arms very long, slender, and bifurcating at least four times at irregular distances above the first divisions of the rays; pieces of the lower divisions generally longer than wide, rounded and constricted in the middle, and expanded at the ends; while those of the smaller terminal divisions are usually from three to four or five times as long as wide, and scarcely expanded at the ends. Surface smooth. Pinnulæ not seen.

First anal piece small, about as long as wide, and, as usual, resting between the superior sloping sides of the first radial on the left, and the second on the right, and bearing three or more others, in direct succession above, that doubtless form a part of the walls of the ventral extension.

Column small, distinctly pentagonal near the base, where it is composed of alternately thin and slightly thicker pieces.

Length of body, to top of the larger radial pieces forming a part of its walls, 0.14 inch; breadth, about 0.12 inch; length of rays and arms above the body, 1 inch; thickness of column near base, about 0.07 inch.

At the same time that I propose to name and describe this delicate little Crinoid as a new species, I suspect that it *may* not be distinct from *H. exilis* of Hall, which has not yet been illustrated, and has, unfortunately, been only briefly described. If Prof. Hall's description is *strictly accurate*, however, in several important characters, the form under consideration must be clearly distinct, as he states that the posterior lateral rays of *H. exilis* bifurcate on the *second* pieces, and the anterior lateral on the *fourth;* while, in the form here described, one of the posterior lateral rays bifurcates first on the *fifth* piece, and the other on the *eighth;* and, in the only one of its anterior lateral rays seen, the first division takes place on the sixth or seventh piece. He also says that the arms of *H. exilis* bifurcate *once* or *twice*, while in our type they bifurcate at least four times above the primary division of each ray. Again, he describes the body plates of *H. exilis* as having the general curve of the body; but in our type the subradial plates are so flattened as to impart a pentagonal form to the lower part of the body.

This species will be at once distinguished from *H. simplex*, by its frequently bifurcating arms and other well-marked characters. From *H. heterodactylus*, which also has its arms several times

divided, it will be readily distinguished by its very differently formed body, its more slender and more frequently divided as well as longer arms, and its more slender column.

Locality and position.—Cincinnati group, 100 feet below tops of hills, at Cincinnati, Ohio. Mr. Dyer's collection.

HETEROCRINUS SUBCRASSUS, M. & W.

Heterocrinus subcrassus, Meek & Worthen, 1865. Proceed. Acad. Nat. Sci. Philad., p. 145; Illinois Report, vol. III., p. 325, pl. 4, fig. 5, *a*, *b*, *c*, *d*.

Heterocrinus (*Iocrinus*) *polyxo*, Hall, 1866?. Descriptions of some new species of Crinoidea and other fossils, from the Silurian Strata, etc., p. 5; *dated*, Nov. 1866.

A careful comparison shows the proposed species *H. polyxo*, Hall, 1866?, to be in all respects identical with *H. subcrassus*, M. & W., 1865. Prof. Hall places it under a subgenus *Iocrinus*, and, if there be sufficient grounds for so doing, the name of the species, when written in full, would be *Heterocrinus* (*Iocrinus*) *subcrassus*.

POTERIOCRINITES (DENDROCRINUS) DYERI, Meek.

Body small, obconic, or tapering regularly to the column from above. Basal pieces longer than wide, the greatest breadth being across between the superior lateral angles; all pentagonal. Subradial pieces a little longer than the basals, longer than wide, and, excepting the one on the anal side (which is largest and heptagonal), all hexagonal. First radials of about the size of the subradials, but proportionally broader, being a little wider than long, with a general pentagonal outline, though all, excepting the one on the right of the anal series, have the superior lateral angles a little truncated; while the second piece in that ray, which, as is usual in the group, corresponds to the first in the other rays, also has these angles truncated. Succeeding radials in all the rays much narrower, about as long as wide, or slightly longer, and numbering from five to six or seven pieces below the first bifurcation. Arms remarkably long and slender, laterally compressed, more or less angular on the dorsal side, and giving off, alternately on opposite sides, at distant intervals above the first bifurcation of each ray, from three to four or more scarcely diverging divisions that are slightly more slender than the arms, from which

they spring, and sometimes themselves bifurcate once or twice; divisions composed of pieces about as long as wide.

First anal piece nearly as large as one of the smaller subradials, resting on the superior truncated edge of the largest heptagonal subradial, between the first radial on the left and the first and second on the right, while it supports others above that form the base of the ventral extension. Interradial pieces with the lowest piece of the ventral part resting between the truncated superior-lateral angles of the first primary radials so as to appear as minute interradials. Surface without costæ or sculpturing of any kind.

Ventral extension very long, or nearly or quite equalling the length of the arms, and as wide as the body below; composed of the usual small hexagonal plates apparently without costæ, and separated by punctured sutures. Column slender, slightly tapering downward just below the base, near which it is more or less pentagonal, and composed of short alternately thicker and exceedingly thin segments. Farther down, it becomes nearly or quite cylindrical, and composed of more uniform very short pieces, with a very small nearly or quite round perforation.

Length of body, from the lower end of base to the top of first primary radials, 0.24 inch; breadth of do., at top, 0.16 inch; length of rays, from top of body to first bifurcation, 0.20 inch; length of arms, above this bifurcation, 2.30 inches; diameter of column, 0.04 to 0.05 inch.

This delicate little species seems to agree exactly, in structure as well as in physiognomy, with *Dendrocrinus*, excepting that it *appears* to have the small pieces forming the lower part of its ventral extension above the first anal piece, and those seen in the interradial spaces above the large first radials that form a part of the walls of the body, connecting laterally with the succeeding smaller radials, nearly or quite up to the first bifurcation. This arrangement, if it really exists, would make these smaller primary radials, above the body proper, as it were, a part of the walls of the body or ventral extension; so that the rays would only become free at the first bifurcation. The specimens seen are not in such condition as to remove all doubts on this point; but, in some conditions, these little pieces between the rays give that part of the fossil somewhat the appearance of a *Glyptocrinus*. The presence of well-developed subradials and a long ventral extension of the

body (to say nothing of other differences), remove it, however, at once from that genus, as well as from *Mariacrinus*, from which latter it also differs materially in the structure of its arms and in other important characters. I suspect that it may be found to present sufficiently marked differences in this apparent fusing of the rays, as it were, into the walls of the body, up to the first bifurcation, to entitle it to rank as the type of a new group; but, without better specimens for study and examination, I prefer to refer it provisionally to *Dendrocrinus*, which can scarcely be regarded as more than subgenerically distinct from *Poteriocrinites*.

In general appearance, it seems to resemble most nearly *Dendrocrinus acutidactylus* and *D. gregarius* of Billings. It differs from the first, however, in having a more slender body, with proportionally longer arms, much less diverging at the bifurcations, as well as in having the two branches at each division unequal. From the latter species it also differs in the nature of its arms, as well as in having its column composed of very short pieces not presenting a bead-like appearance.

Locality and position.—Cincinnati group of the Lower Silurian, in the lowest beds seen at Cincinnati, Ohio. The survey is under obligations to Mr. C. B. Dyer, of Cincinnati, for the use of the only known specimens of this species.

POTERIOCRINITES (DENDROCRINUS) CINCINNATIENSIS, Meek.

Body of about median size, obconic, or tapering to the column from above, nearly or quite as wide at the top of the first radials as the height to the same. Base forming a rather rapidly expanding cup, nearly twice as wide as high. Basal pieces of moderate size, wider than high, pentagonal in form, and each provided with a minute notch at the middle of the under side, corresponding to a furrow extending up each side of the column. Subradial pieces about twice as large as the basals, as wide as long or slightly wider, all hexagonal excepting the one on the anal side, which is heptagonal and a little larger than the others. First radial piece in the ray on the right of the anal series a little smaller than the subradials, and pentagonal in form, supporting on its upper truncated edge a rather shorter piece, corresponding to the slightly larger first radials in the other rays, and, like the latter, rounded on the outer side, with a pentagonal outline, and a somewhat narrowed facet above for the reception of the first free

radials. Succeeding or free radials distinctly narrower than those forming a part of the walls of the body, rounded on the dorsal side, and, in the two posterior lateral rays, all shorter than wide, while the fifth one in each of these rays (other rays unknown) is an axillary piece supporting two arms.

First anal piece nearly as large as the subradial upon the upper side of which it rests; connecting on the left with the first radial piece, and on the right with the first and second radials; while it supports others above, forming the base of the ventral extension, which is composed of small pieces strengthened by radiating ribs.

Arms of the two posterior rays rounded, composed of pieces slightly wider than long, and each bifurcating at least twice (and perhaps oftener) at unequal distances above their origin on the last primary radial.

Column of only moderate size for an inch or so below the base, where it is very distinctly pentagonal, the angles being a little rounded, with a rather deep furrow between on each side, composed of short pieces, which near the base seem to alternate with much thinner ones.

Length of body, 0.28 inch; breadth of same, 0.26 inch; thickness of column at its junction with the body, 0.09 inch; breadth of free rays below the first bifurcation, 0.07 inch.

So far as the specimens afford the means of making a comparison, this species would seem to be nearly related to *Poteriocrinus gracilis* of Hall, described in the first vol. of Palæontology of N. Y., p. 84. His diagram and figure, however, do not show whether that species has two of the primary radials of the right posterior ray included as a part of the walls of the body, as in *Dendrocrinus*, or whether it has more properly the structure of *Homocrinus*. He represents the first anal piece, however, proportionally much smaller than it is in our crinoid, while, to the right, and partly beneath the anal piece, he shows in his diagram a small piece that *seems* to occupy the position and relations to other parts of the subanal in true typical *Poteriocrinites*.[1] His speci-

[1] Prof. Hall also ranges it under *Potcriocrinus* in his corrected list of the New York Fossils, published in 1859, after he had proposed the genera *Homocrinus* and *Dendrocrinus*, and included this form in the former group in 1852; from which we may infer that his type has more recently been found to possess the structure of *Poteriocrinites*. In that case, it would of course

men had only a segment or two of the column attached; but an end view of it, in his diagram, represents it as being *round*, while in the form under consideration it is very distinctly pentagonal. As he does not *say* that it differs in the form of the column from his *P. alternatus* (which has a decidedly round column), in pointing out the distinctions between the two, I also infer that it is round in both. In addition to this, *Poteriocrinites gracilis* of Hall is stated by him to be found only at the base of the Trenton limestone, while our crinoid is only known to occur in the middle part of the Cincinnati group. From these facts, and from the usual very restricted vertical range of the species of *Crinoidea*, I infer that our Cincinnati form is specifically distinct from the New York species.

Locality and position.—One hundred feet below tops of hills at Cincinnati, Ohio. Cincinnati group of the Lower Silurian. Mr. C. B. Dyer's collection.

POTERIOCRINUS (DENDROCRINUS) POLYDACTYLUS, Shumard (sp.).

Homocrinus polydactylus, Shumard, 1867. Trans. Acad. St. Louis, vol. I. p. 78, pl. I. fig. 6.

An examination of good specimens of this species shows that it has the structure of the body seen in *Dendrocrinus*, and that it is related to *D. Jewettii* of Billings more nearly than to any other of the species known to the writer.

This is a rather common species in the upper part of the Cincinnati group at Richmond, Indiana.

GLYPTOCRINUS DYERI, Meek.

Body globular-subturbinate, being wider than high, with sides rounding under to the base. Sub-basal pieces obsolete, or, if present, not exposed externally. Basal pieces (subradials of some) very small, and projecting as a thin rim below, much wider than

differ *specifically* from our crinoid; but if either a *Poteriocrinites* proper, or a *Dendrocrinus* (if we view the latter as only a subgenus of *Poteriocrinites*, as Prof. Hall has since done in describing other species), then the name *P. gracilis* could not stand for the New York fossil, because Prof. McCoy had used that specific name for a species of this genus from the Carboniferous rocks in 1844. For this reason, D'Orbigny proposed the name *P. subgracilis* for the New York species, which will have to be retained if it belongs to any mere section of that genus.

high, and presenting a trigonal general outline, though the lateral angles are doubtless minutely truncated. First radial pieces of moderate size, heptagonal in form, and wider than long; second and third a little smaller, the second being hexagonal, and the third pentagonal, and supporting on its superior sloping sides the first divisions of the rays. Secondary radial or supraradial series each composed of from eight to eleven pieces, rapidly diminishing in length upward to the second bifurcation or commencement of the arms, just below which a few of the smaller pieces seem to be free and bear pinnulæ on their inner sides; farther down, the second and fourth secondary radials of each ray give off, alternately on each side, small divisions that do not become free, but are soldered into the interradial walls, though they can be traced to the summit of the body, where they merely give origin to pinnules.

Anal area a little wider than the interradial areas. First anal plate of about the same size as the first radials, hexagonal in form, and supporting in the next range three pieces, arranged with the middle one higher than the others; while, above these, three smaller pieces can be seen arranged in the same way in the third range, and three to four or five in the fourth, which is as far up as they can be traced. The middle plates of this series form a direct vertical row, that have a rather prominent mesial, rounded ridge extending all the way up from the middle of the lowest piece, of about the same size as those passing up the primary and secondary radial series, while the other plates on each side and other parts of the lowest pieces are ornamented with radiating costæ of smaller size, like those on the interradial pieces.

Interradial areas not excavated below, but becoming moderately concave above; first interradial pieces of about the size of the second primary radials, hexagonal in form, and supporting two other somewhat smaller pieces in the next range, that bear between their superior sloping sides a fourth smaller piece, while above these there are two pieces in the next range that connect with the pieces of the little lateral divisions of the secondary radials, and perhaps some other small intercalated pieces filling the upper part of the interradial areas.

Axillary areas flat, and each occupied below by a hexagonal or heptagonal piece of about the size of the second piece of each

secondary radial, while the space above is occupied by several much smaller pieces.

Arms four to each ray, rounded on the dorsal sides, slender, of moderate length, very gradually tapering, simple, and composed of very short, slightly wedge-formed pieces, each of which bears a pinnule at its larger inner lateral end; pinnules slender, rather closely arranged, deeply furrowed on the inner side, and apparently composed of rather long joints.

Surface of body plates all ornamented with distinct radiating costæ, starting from the centre of each piece, and passing one to each of its sides so as to connect with others on each contiguous piece: of these costæ, those passing up the middle of each of the radial series are a little larger and more prominent than those of the interradial plates, while they bifurcate with the rays so as to send a division up each of the secondary radial series, toward the upper part of which they become more prominent and rounded, being there of about the size of the free arms. Column unknown.

Height of body, 0.60 inch; breadth, about 0.68 inch; length of arms, 1.05 inch; thickness of same, 0.05 inch; number of joints, in a space of 0.10 inch near the base, eight.

This very beautiful species reminds one, by its sculpturing, of the common typical species *G. decadactylus*, from which, however, it may be at once distinguished by its proportionally broader and shorter body, with sides rounding regularly under to the column instead of being obconical. It also has proportionally more slender arms, and differs materially in having, in each secondary radial series, from nine to eleven pieces between the first bifurcation of each ray and the arm bases, instead of only two. In the form of its body, it agrees more nearly with *G. ornatus* of Billings; but it differs materially from that species in having twenty arms instead of only ten, as well as in less important details.

The specific name is given in honor of Mr. C. B. Dyer, of Cincinnati, Ohio, to whom I am indebted for the use of the very fine specimens from which the description was made out.

Locality and position.—Cincinnati group of the Lower Silurian, 100 feet below tops of hills at Cincinnati, Ohio.

GLYPTOCRINUS DYERI, *var.* **SUBGLOBOSUS**, Meek.

There is, in Mr. Dyer's collection, a specimen showing the whole of the anal side of the body, all the way up, and more or less of

six of the arms, that seems to agree exactly, in structure, ornamentation, and form, with the last, excepting that its body is not quite so rounded below; and it has a more robust appearance, in consequence of having the ridges up the radial and secondary radial series (particularly the latter), as well as that up the middle row of the anal plates, rather decidedly stouter and more prominent. Its arms are also proportionally stouter, and composed of shorter pieces.

This may be specifically distinct from the last; but, with the present means of comparison, I prefer to range it provisionally as a variety of the same, under the name *Glyptocrinus Dyeri*, var. *subglobosus*.

Locality and position.—Same as last.

MOLLUSCA.

POLYZOA.

PTILODICTYA (STICTOPORA) SHAFFERI, Meek.

Polyzoum small and delicate, consisting of slender, compressed divisions, that give off on each side rather closely arranged, regularly alternating, lateral branches of the same breadth as the main stems, from which they diverge at an angle of about forty degrees; lateral branches in the same way giving off on each side very short lobe-like, alternating projections; lateral margins of all parts very narrow, sharp, and minutely striated longitudinally, in well-preserved specimens; pores apparently without raised margins, more or less oval longitudinally, alternately disposed in longitudinal and oblique rows, so as to present a quincuncial arrangement; the number of longitudinal rows varying from five to about seven in the breadth of a stem or branch; spaces between the pores, measuring transversely to the stems and their divisions, about equal to the breadth of the pores, but greater, measuring in the direction of the oblique and longitudinal rows; all the interspaces ornamented, in perfectly preserved specimens, by very minute, more or less waved or flexuous striæ.

Size of entire polyzoum unknown; breadth of stems and branches, 0.05 inch; number of pores in 0.05 inch, measuring in the direction of the oblique rows, about 4 to 6, and, in the same space, measuring longitudinally, from 3 to 4.

1872.]

This very delicate little form will be readily distinguished from the other known Silurian species by its small size and peculiar plumose mode of growth, and particularly by its very minute striæ between the pores. *Stictopora raripora*, Hall, from the Clinton group of New York, is as delicate a form, but differs materially in its mode of growth, and particularly in its very much less numerous pores.

The specific name is given in honor of Mr. D. H. Shaffer, of Cincinnati, Ohio, to whom I am indebted for the use of a very fine specimen of it; I also have good specimens from Mr. Dyer's collection.

Locality and position.—Toward the lower part of the Cincinnati group of the Lower Silurian at Cincinnati, Ohio.

BRACHIOPODA.

RETZIA (TREMATOSPIRA) GRANULIFERA, Meek.

Shell transversely oval, the length being about four-fifths the breadth, moderately convex, the convexity of the two valves being very nearly equal; lateral margins rather narrowly rounded in outline; front and anterior lateral margins broadly rounded, or perhaps the former sometimes straight or slightly sinuous in outline in the middle; cardinal margin nearly straight on each side, and sloping at an angle of about 140° from the beaks toward the lateral extremities. Dorsal valve nearly evenly convex, its greatest prominence being perhaps slightly behind the middle; provided with about thirteen simple, angular, radiating plications or costæ, five of which on the middle are smaller than the others (the middle one being smallest and not continued to the beak), and form together a very low, flattened mesial elevation, scarcely rising above the general convexity; beak rather strongly incurved. Ventral valve of much the same form as the other, excepting that its beak is somewhat more prominent, perforated,[1] and incurved upon that of the other valve; while two of the middle costæ are much smaller than the others, and the first one on each side of these is intermediate in size between the smallest central ones and the largest on the lateral slopes; these four

[1] The immediate point of the beak of the ventral valve seems to be slightly broken in the specimen, though it has the appearance of having been naturally perforated before receiving the slightest injury.

smaller ones being a little depressed so as to form a shallow mesial sinus that is not continued to the beak. Crossing all of these plications of both valves, are numerous fine lines of growth; while the entire surface, as seen under a magnifier, is occupied by minute projecting points, like grains of sand; and, between these, a higher magnifying power shows the whole surface to be very minutely and regularly punctate.

Length, 0.37 inch; breadth, 0.50 inch; convexity, 0.27 inch.

Until the distinctions between the genus *Retzia*, and the proposed genus *Trematospira* (if any exist) are better defined, and the interior of the species here described can be determined, it is not possible to say to which of these groups it most properly belongs.

Specifically, however, it seems to be closely allied to *Trematospira gibbosa* of Hall, from the Hamilton group. Yet it differs, not only in having two to three more plications on each side, but also in having five instead of three a little raised to form the mesial fold of the dorsal valve (the middle one being also much smaller), and four depressed to form the mesial sinus (the middle two being much smaller than the others). It so nearly resembles the New York form, however, that I should almost be inclined to suspect that it might be only a variety of the same species, if it were not found at a so much lower horizon. It must be very rare, as I have only heard of the single typical specimen being found.

Locality and position.—Cincinnati group of the Lower Silurian; from the basal beds at Cincinnati, Ohio. Mr. Dyer's collection.

LAMELLIBRANCHIATA.

AMBONYCHIA (MEGAPTERA[1]) ALATA, Meek.

Megapteraa Casei?, James, 1871. Cat. Fossils of Cincinnati Group (not Meek and Worthen).

Shell attaining a moderately large size, subtrigonal in general outline, compressed postero-dorsally, and more convex in the um-

[1] In first proposing the name *Megaptera*, for these great winged species, in 1866, Mr. Worthen and the writer were not aware that this name had been previously used by Dr. Gray for a genus of Whales. Naturalists do not agree in regard to the propriety of retaining the same name for different genera or subgenera in such cases. Where the groups belong to the same

bonal and antero-central regions; umbonal slopes ranging at an angle of about fifty degrees below the hinge line, and broadly rounded; hinge line straight, very nearly or quite equalling the greatest antero-posterior diameter of the valves, and ranging nearly at right angles to the anterior side of the same; posterior alation very large, not separated from the swell of the umbonal and central regions by any defined sulcus, slightly rounded at its immediate extremity above; posterior margin faintly sinuous for a little below its intersection with the hinge margin above, thence sloping forward and downward, and finally rounding into the regularly rounded base; anterior side more or less concave, and nearly vertical above, but rounding regularly into the base below; beaks terminal, rather pointed, rising little above the hinge line, and directed a little obliquely upward and forward, with more or less inward curvature.

Surface ornamented by about twenty-four to twenty-eight simple, strong, radiating costæ to each valve, that are nearly equal in breadth to the furrows between; those on the central portions of the valves passing nearly straight from the beaks obliquely to the posterior basal margins, those on the anterior side curving more or less forward below, and those near the cardinal margin curving a little upward behind. Crossing all of these costæ, and the furrows between, are numerous fine crowded lines, and, at regular distant intervals, a few strongly defined imbricating marks of growth that curve parallel to the basal and posterior margins.

Height, 2.30 inches; breadth, 2.20 inches; convexity, about 0.80 inch.

This species was referred by Mr. James, with a mark of doubt, to *Megaptera Casei* of Meek and Worthen; but, after a comparison of these shells, I can find no reason for doubting that they

class, nearly all agree that only the name first given can stand; but, where they belong to different classes or subkingdoms, some would retain both names, while others would change the later name, even where one of the genera belongs to a different class, subkingdom, or kingdom of nature. If it should be thought desirable to substitute another name for this group, as typified by *M. Casei* and the species here described, I would propose to call it *Opisthoptera*. As yet very little is known in regard to the hinge of these shells; and consequently we have not the means of determining whether they should be ranged as a subgenus under *Ambonychia*, or as a distinct genus, though I at present incline to the former opinion.

are really distinct specifically, the *M. Casei* being marked by very numerous alternating larger and smaller radiating striæ, while *M. alata* is ornamented with large, strong radiating ribs. *M. Casei* also differs in having its umbonal slopes distinctly angular, instead of broadly and evenly rounded, as in the species under consideration; while its ventral margin is angular in outline, at the termination of the umbonal ridge, instead of being rounded. Its marks of growth also show that the extremity of its wing was rather acutely pointed, instead of being a little rounded.

Locality and position.—Clinton County, Ohio, in upper part of the Cincinnati group of the Lower Silurian. Mr. James's collection.

MEGAMBONIA JAMESI, Meek.

Megambonia? Spinneri? James, 1871. Cat. Fossils Cincinnati Group, p. 12. (Not *M. Spinneri*, Hall.)

Shell attaining a rather large size, a little obliquely subovate in general form, rather convex, the most gibbous part being somewhat above and in front of the middle, more or less abruptly cuneate posteriorly and below; basal outline regularly rounded; posterior margin rounding into the base, and ascending with a convex curve and forward inclination to the posterior extremity of the hinge, which is not in the slightest degree alate; anterior margin rounding into the base below, and slightly sinuous under the lobe-like protuberance, or rudimentary wing above, which is convex, slightly more prominent than the margin below, and defined from the swell of the umbonal regions on each side, by an oblique sulcus extending to the hinge margin in front of each beak; hinge equalling about two-thirds the antero-posterior diameter of the valves; beaks rather prominent, or rising distinctly above the hinge line, but slightly oblique, and distinctly incurved; umbonal slopes broadly rounded; longer axis of the valves moderately oblique to the hinge line. Surface ornamented by very regular, rounded, simple, and depressed radiating costæ, a little wider than the furrows between, and numbering about five in a space of 0.30 inch, near the middle of the lower margin.

Height, about 2.05 inches; antero-posterior diameter, 2.16 inches; convexity, 1.50 inch.

The only specimen of this species I have seen is a cast of the exterior, with portions of the ventral and anterior ventral mar-

gins broken away. The beak of its right valve projects rather decidedly above that of the left; but I think this is due to accidental displacement of the valves, rather than to any inequality in their size. It shows distinct indications of a well-defined, moderately wide cardinal area, widest under the beaks, and narrowing to the extremities of the hinge.

Mr. James referred this species, in his list of the Cincinnati fossils, with a mark of doubt, to the Lower Helderberg species, *M. Spinneri* of Hall. But, in addition to the rather widely different geological horizons from which these two shells were obtained, they seem to me to differ so materially in form as to be clearly distinct species, even if similarly marked, while the typical specimen of *M. Spinneri* shows no traces of the regular radiating costæ seen on the species here described. It is true that the specimen of that species figured is an internal cast, and ours a cast of the exterior, which might account for the difference of surface characters, but this would not produce the degree of difference in form, obliquity, and general physiognomy. To me, it appears to be much more nearly like the typical species *M. cardiiformis*, from the New York Upper Helderberg limestone, though clearly distinct in having much larger costæ as well as a wider and more defined cardinal area.

The group *Megambonia* of Hall, 1859, seems, so far as yet known, scarcely more than subgenerically distinct from the typical forms of *Cypricardites:* and Mr. Billings thinks it exactly agrees with the group for which he proposed the name *Vanuxemia*, in 1855, and placed as a subgenus under his genus *Cyrtodonta*, 1858, a species of which is the type of Conrad's *Cypricardites*, 1841. If the name *Vanuxemia* should be retained for the type under consideration, and that group placed as a subgenus, then the name of our fossil, when written in full, would be *Cypricardites* (*Vanuxemia*) *Jamesi:* but, if *Megambonia* is distinct from *Vanuxemia*, and a subgenus under *Cypricardites*, then its full name would be *Cypricardites* (*Megambonia*) *Jamesi.*

Locality and position.—Cincinnati group of the Lower Silurian, at Cincinnati, Ohio, about 350 feet above low-water mark of the Ohio. Collection of Mr. U. P. James's, in honor of whom the species is named.

[February 13,

SEDGWICKIA? FRAGILIS, Meek.

Shell rather small, apparently very thin, longitudinally oblong or suboval, rather distinctly convex along the umbonal slopes from the beaks toward the posterior basal margin, and down near the anterior side, while just under the beaks a rather strongly marked impression descends, widening and deepening as it approaches the base; basal margin subparallel in its general outline to the dorsal, but diverging more or less posteriorly, where it is most prominent and distinctly sinuous toward the front; posterior margin wider than the anterior, and more or less truncated; anterior extremity very short, and rounded or somewhat truncated; hinge line straight, and shorter than the entire length of the valves, apparently very slightly inflected behind the beaks, which are raised a little above the cardinal margin, incurved, contiguous, flattened on the outer sides, and placed near the anterior end, with a slight forward inclination. Surface ornamented with moderately distinct lines and irregular minute wrinkles of growth.

The only specimens of this species yet known to me are too imperfect to afford exact measurement, though they seem to have been, when entire and undistorted, about 0.90 inch in length, 0.73 inch in height, and 0.40 inch in convexity. They present some appearance of having been gaping behind and in the anterior ventral region. One specimen looks as if it had been truncated, with a backward obliquity from below upward behind, but this may be due to distortion.

I am far from being satisfied that this shell is congeneric with the forms for which Prof. McCoy proposed the name *Sedgwickia*, as nothing can be determined from the specimens yet known, in regard to its hinge and muscular and pallial impressions. Possibly it would be nearer right to call it *Modiolopsis fragilis;* but there is something in its physiognomy that suggests affinities to Carboniferous types referred to *Sedgwickia* and *Allorisma*.

Locality and position.—Cincinnati group of the Lower Silurian, at about 350 feet above low-water mark of the Ohio River, at Cincinnati, Ohio. Mr. U. P. James's collection.

SEDGWICKIA? COMPRESSA, Meek.

Anatina sinuata, James, 1871. Catalogue Fossils Cincinnati Group, p. 12. (Not *Anatina? sinuata*, Hall.)

Shell longitudinally oval, compressed, about one-fourth longer than high, cuneate posteriorly, and more convex in the central and anterior regions, with a slight concavity descending from the beak to the base of each valve; posterior margin regularly rounded; base straight, and parallel to the cardinal margin in the middle, and rounding up to the anterior and posterior margins; anterior side short, rounded or somewhat truncated, but apparently most prominent below; hinge line shorter than the valves, straight behind the beaks, but rounding into the posterior margin at the extremity, erect behind, with some appearance of a narrow space for an external ligament farther forward; beaks about one-fourth the length of the valves from the anterior margin, raised a little above the cardinal margin, nearly contiguous, but not much incurved. Surface of a cast, that seems to be a little weathered or smoothed by attrition, showing obscure marks of growth.

Length, 0.77 inch; height, 0.59 inch; convexity, 0.29 inch.

I have only seen a single specimen of this species; and, as it is a mere cast, not showing clearly even the surface markings, little can be said in regard to its affinities. I am even left in some doubts whether its shorter side may not be the posterior instead of the anterior, as there is some appearance about the points of the beaks of their being rather directed toward the longer than toward the shorter side. The appearance, however, of a narrow space along the cardinal margin on the longer side, as if for an external ligament, seems to indicate that this is the posterior. The margins of the valves on the anterior? (shorter) side are a little defective above in the specimen, so as to leave room for some doubts whether it was regularly rounded in outline or not.

Although the specimens of the last-described species are much distorted, it is evident, I think, that they are quite distinct from this, as it would seem impossible to make this shell assume the shape and convexity of the last by any conceivable degree of distortion.

Mr. James referred this species, in his list, to the Upper Silurian form *Anatina? sinuata*, Hall, which it resembles in form. Still, it seems to me to differ too much in its more elevated beaks,

shorter anterior, and straighter basal outline, to be referred to that species, even if found in rocks of the same age, while the rather wide interval between the horizons at which the two forms occur, renders it still more improbable that they belong to the same species.

It is extremely difficult to arrive at correct conclusions in regard to the generic affinities of such shells, from the study of mere casts, and it is, therefore, only provisionally that I have referred this and the last-described species to the genus *Sedgwickia*. We may rest quite well assured, however, that palæozoic forms of the kind cannot be properly referred to the existing genus *Anatina*.

Locality and position.—Same as last. Mr. James's collection.

SEDGWICKIA (GRAMMYSIA?) NEGLECTA, Meek.

Shell transversely ovate, about one-third longer than high, rather distinctly compressed, most convex and most elevated in the central and umbonal regions, and compressed-cuneate behind; anterior margin rounding from the lower end of the lunule into the base, which forms a nearly semi-oval curve, its most prominent part being near the middle; cardinal margin apparently straight, and declining posteriorly from the beaks; posterior margin rather narrowly rounded; beaks moderately prominent, and scarcely one-third the length of the valves from the anterior margin. Surface ornamented with regular, distinct, but not very prominent concentric costæ, that become suddenly obsolete on the posterior third of the valves. Lunule narrow, but sharply defined.

Length, about 1.04 inch; height, 0.67 inch; convexity, about 0.35 inch.

The only specimen of this species I have seen is an external cast of the right valve, which has evidently been, to some extent, accidentally compressed in the region of the beak, but the shell was certainly never very convex. It has almost exactly the general aspect and kind of ornamentation seen in the typical forms of *Sedgwickia*, a group which, since it was first proposed by Prof. McCoy, has been included by him in his genus *Leptodomus*, which seems to me to have been originally founded on a very distinct type.

Our shell also resembles rather closely some forms apparently

falling into the genus *Grammysia*. That is, some of the species presenting the aspect of that genus, excepting that they want the characteristic oblique ridge of the typical species. Until other specimens can be examined, and more is known in regard to the hinges of *Grammysia* and *Sedgwickia*, as well as that of the shell under consideration, its generic relations cannot be satisfactorily determined.

Locality and position.—Upper part of the Cincinnati group of the Lower Silurian, in Clinton County, Ohio. Mr. James's collection.

DOLABRA? CARINATA, Meek.

Shell small, rhombic-cordate, very convex along the oblique umbonal slopes, posterior margin apparently obliquely truncated; posterior basal extremity more or less angular in outline; basal margin rounding and ascending obliquely forward from the posterior basal angle; anterior side extremely short, or with its margin descending and curving backward into the base from immediately in front of the beaks; hinge line short, and a little inflected so as to form a kind of small area or escutcheon behind the beaks; beaks prominent, rather oblique, nearly terminal, strongly incurved or subspiral, and distinctly compressed antero-posteriorly so as to be sharply keeled on top, the keel being continued as a less angular umbonal ridge backward and downward to the posterior basal extremity; flanks in front of the umbonal ridge evenly convex, while the space above and behind it, near the beaks, is somewhat concave. Surface only showing obscure traces of lines of growth. (Hinge and interior unknown.)

Length, measuring obliquely from the posterior basal angle to the most prominent part of the umbonal keels, 0.65 inch; antero-posterior diameter, measuring parallel to the hinge line (the specimen being defective behind), 0.40 inch; convexity of the united valves, 0.50 inch; length of hinge, about 0.30 inch.

The only specimen of this species I have seen has lost, by erosion, some portions of the posterior margin, so as to leave doubts in regard to its exact outline, though it has the appearance of having been, when entire, more or less truncated behind. The most remarkable features of the species are its prominent subspiral, and very strongly carinated beaks, short hinge, and nearly obsolete anterior side. Its front margins seem to have been a

little gaping; and the posterior side may have been more or less so, though the specimen is not in a condition to show whether this was the case or not.

Although I refer this shell, for the present, provisionally, to *Dolabra* of McCoy, I really have very little idea that it properly belongs to that genus (as typified by *Cucullæa angustata* of Phillips), to which I have in some other cases referred similar shells, the generic relations of which could not be determined. On the contrary, I strongly suspect that it will hereafter be found necessary to establish a new genus for such forms, when specimens showing the hinge can be examined. If so, I would propose for the group the name *Rhynchotropis*, in allusion to the sharply carinated character of the beaks in the typical form now under consideration. The group, whatever name may be retained for it, evidently includes *Dolabra? Sterlingensis* of Meek and Worthen.

Specifically, the form under consideration will be distinguished from *D.? Sterlingensis* by its much smaller size, and more spiral and much more sharply keeled beaks, as well as by its shorter anterior margin. It must be very rare, as I have only seen among all the collections the single typical specimen.

Locality and position.—Cincinnati group, about 175 feet below tops of hills at Cincinnati, Ohio. Mr. Dyer's collection.

CARDIOMORPHA?? OBLIQUATA, Meek.

Shell small, rhombic-cordate, very convex, higher than long; posterior margin sloping rather abruptly, and subtruncate, or a little convex in outline from the posterior extremity of the hinge to the posterior basal extremity, which is more or less angular, or narrowly rounded; basal margin short, nearly straight or a little convex from the posterior basal extremity to the front; anterior margin short or truncated from immediately in front of the beaks obliquely downward and backward to the base, which it joins at an obtuse, slightly rounded angle; hinge line very short, ranging at an angle of about fifty degrees to the umbonal axis, and apparently having its margins a little inflected behind the beaks; beaks very prominent, oblique, nearly or quite terminal, and strongly incurved; posterior umbonal slopes subangular near the points of the beaks, but becoming rounded below, while the dorsal region between this and the hinge is a little concave; anterior umbonal slopes, forming a kind of ridge that extends, at

something less than a right angle to the hinge, to the anterior basal margin, the anterior side, thus circumscribed, being somewhat flattened, and, as seen from the front, presenting a cordate outline. Surface ornamented with small, very regular, simple concentric costæ, that seem to be obsolete on the anterior and posterior portions of the valves. (Hinge and interior unknown.)

Length, parallel to the cardinal margin, about 0.45 inch; height, at right angles to hinge, to the tops of the beaks, about 0.45 inch; length, measuring from the points of the beaks obliquely to the posterior basal extremity, 0.57 inch; convexity, 0.39 inch.

I have referred this shell provisionally to *Cardiomorpha*, rather because it seems to present at least as many external points of resemblance to some species of that genus as to any known palæozoic group, than from any strong impression that it really belongs to the same. In some respects, its general physiognomy suggests affinities to the group of secondary shells for which Prof. Agassiz proposed the name *Ceromya*, though I do not think it would fall into that genus. When all of its characters can be determined, it will probably be found to belong to an undescribed genus. If so, I would propose for the group the name *Ceromyopsis*, from its resemblance to some species of *Ceromya*.

Although presenting some points of resemblance to the last-described species, this shell may be distinguished at a glance, not only by its small distinct concentric costæ, but by its much less sharply carinated beaks, and more rounded posterior umbonal slopes, as well as by its flattened anterior side; this flattening imparts a subangular character to its anterior umbonal slopes, not seen in the last.

Locality and position.—Cincinnati group of the Lower Silurian in same bed as the last at Cincinnati, Ohio. Mr. Dyer's collection.

GASTEROPODA.

MACROCHEILUS KLIPPARTI, Meek.

Shell attaining a large size, elongate-fusiform, the length being sometimes from two and a half to three times the breadth; spire pointed at the apex, forming about half the entire length, with its lateral slopes concave above and convex below; volutions six to eight or nine, the upper five or six being very compactly coiled, and forming comparatively but a small part of the entire shell,

while those below suddenly increase in size much more rapidly than the others, particularly in the direction of the longer axis of the shell, and form most of its bulk; these larger turns, in large adult examples, sometimes assuming together a subcylindrical outline; the last or body whorl comparatively long, subcylindrical or more or less oval, and somewhat produced below; suture moderately distinct, almost transverse between the smaller upper turns, but becoming decidedly more oblique below; aperture comparatively small and narrow, apparently subrhombic; inner lip much thickened all the way up; columella twisted so as to form a single prominent fold below the middle of the aperture. Surface nearly smooth, or only showing very obscure lines of growth. (Outer lip unknown.)

Length of one of the largest, most elongated specimens, 2.23 inches; breadth, 0.87 inch; length of aperture, about 1 inch.

This fine species most nearly resembles *M. Newberryi* of Stevens, but may be readily distinguished by its form, the slopes of the upper part of its spire being distinctly concave, and the lower part convex in outline, instead of being evenly and moderately convex all the way down. This peculiarity is caused by the sudden enlargement of the middle and lower volutions, and the greater obliquity of their spiral curve; while, in *M. Newberryi*, the volutions increase in size regularly, and have the same uniform spiral curve from the apex throughout the whole length of the spire. Young examples of the form under consideration are proportionately shorter, the elongation being to a considerable extent produced by the obliquity and prolongation of the last two volutions. These less elongated younger shells, however, will be distinguished from *M. Newberryi* by the concave slopes of their spires, and the greater proportional breadth of their body volutions. This is also a larger and more robust species than *M. Newberryi*.

As none of the specimens yet seen have the outer lip and lower part of the aperture entire, the form of the aperture cannot be made out; and there may even be room for some little doubt whether or not it is, in perfect examples, narrowed and produced into a canal below. If this is the case, the name of the species should be *Soleniscus Klipparti*, as it appears to present very nearly the other characters of the type of that group.

The specific name is given in honor of John H. Klippart, Esq., of Columbus, Ohio, Secretary of the State Agricultural Society, 1872.]

and one of the assistant geologists of the Ohio Survey, who discovered the specimens from which the foregoing description was made out.

Locality and position.—Base of Coal-measures, near Somerset, Perry County, Ohio.

CEPHALOPODA.

ORTHOCERAS ORTONI, Meek.

Shell rather rapidly expanding from the posterior toward the aperture; section oval or more or less nearly circular; septa rather closely arranged; siphuncle lateral, being at one of the narrow ends of the compressed section, but not quite marginal, of comparatively moderate size, and apparently beaded; surface of cast showing traces of regular, obscure, longitudinal ridges, that would probably not have been defined on the exterior of the shell, which is unknown.

I have seen but two specimens of this species, and they are accidentally compressed, and incomplete at both extremities. The more nearly complete one of these specimens is about 2.30 inches in length, and septate throughout. At the larger end, it measures about 1.37 inches in breadth, and only 0.44 inch in its smallest diameter; while, at the smaller end, its greater diameter is 0.38 inch, and its smaller 0.24 inch. It has manifestly, however, been accidentally compressed, more strongly at the larger end, which gives the appearance of more rapid expansion toward the aperture than the natural form. The septa near the larger end are separated by spaces measuring 0.15 inch, and at the smaller end measuring 0.07 inch. At the larger end, the very obscure longitudinal ridges measure each about 0.05 inch in breadth, with furrows of the same breadth between, and both diminish proportionally in size, and become nearly obsolete toward the smaller end.

This species evidently belongs to the section of the genus consisting of rather rapidly expanding shells, with a nearly marginal siphuncle, sometimes showing faint longitudinal ridges on the internal cast, that are not defined on the external surface; such, for instance, as *O. compulsum*, *O. robustum*, *O. indocile*, &c. &c., of Barrande. It resembles several of Dr. Barrande's Bohemian species of this type; but, after repeated comparisons, I have been unable to identify it with any of the numerous species described

by him; and it seems to be equally distinct from all of those described in this country and Canada.

The specific name is given in honor of Prof. Edward Orton, of the Ohio Geological Survey.

Locality and position.—Cincinnati group, at Cincinnati, Ohio. Mr. Dyer's collection.

ARTICULATA.

CRUSTACEA.

CYTHERE CINCINNATIENSIS, Meek.

Carapace-valves varying from transversely suboval to subcircular; moderately and rather evenly convex, the greatest convexity being in the central and anterior regions; without any visible tubercle or nodes; ventral margins rounded or semioval, and but slightly unequal or thickened; anterior and posterior margins more or less rounded, the former being more broadly rounded generally than the latter; hinge margin very short, very slightly sinuous just behind the umbones, and rounding into the posterior margin so as scarcely to produce any visible angularity; umbones, near the anterior, a little tumid, rising very slightly above the hinge, and rounding off regularly into the anterior margin. Surface nearly smooth.

Length of one of the larger nearly circular specimens, 0.21 inch; height, 0.17 inch; convexity, 0.11 inch. Length of a smaller more oval specimen, 0.14 inch; height, 0.08 inch; convexity, 0.07 inch.

This species seems to vary a good deal in form, some specimens being, as the above measurements indicate, proportionally higher, and thus presenting a more rounded outline. It is possible that these forms may belong to two distinct species; but, with the specimens yet accessible for study, I have not felt warranted in separating them.

Locality and position.—Cincinnati group, at Cincinnati, Ohio. Mr. Dyer's collection.

The following interesting Crustacea were discovered by Prof. Frank H. Bradley, of Knoxville, Tennessee, at the base of the Waverley group, at Danville, Kentucky. As the same species will doubtless yet be found at this horizon in Ohio, they are here 1872.]

described along with Ohio fossils, and will be described and illustrated in the report of the geological survey of that State.

CERATIOCARIS (COLPOCARIS) BRADLEYI, Meek.

Carapace-valves rhombic-subelliptic, more than twice as long as high, moderately convex; dorsal margins forming a very broad depressed arch from end to end, ventral margin more deeply arched, the most prominent part being near the middle, along which it is abruptly inflected, while its entire length, owing to the obliquity of the posterior end, is shorter than the dorsal margin; posterior deeply and obliquely sinuous, so as to cause the posterior extremity of the dorsal margin to terminate in an acute, downward curved projection, that extends decidedly farther back than the more obtuse termination of the lower margin; anterior end narrowed, with its margin rounded up from below, so as to connect with the dorsal nearly at right angles above. Surface smooth, but showing, under a magnifier, very minute reticulated markings. Ocular spots wanting.

Length, about 2.75 inches; height, about 1.25 inch.

This species agrees most nearly in size and form with *Ceratiocaris? sinuatus*, Meek and Worthen, from the lower coal-measures of Grundy County, Illinois; and was found by Prof. Bradley, enveloped in exactly the same way, in concretions. It differs, however, in being proportionally narrower in its vertical diameter, with the most prominent part of its basal margin more nearly central. The posterior extremity of its dorsal margin also differs in being more produced and more pointed, as well as more curved downward; while that of its lower margin is proportionally shorter, owing to the obliquity of the deep sinus of the posterior end of the valves. The *C.? sinuatus*, however, belongs evidently to the same group.

On first examining this and the following species, I was at once impressed with the general resemblance of the specimens to the genus *Ceratiocaris* of McCoy. On carefully comparing them, however, with the original typical species of that genus, such as *C. solenoides*, *C. ellipticus*, and the more recently described *C. ornatus* of McCoy, from the Silurian, I observed certain differences that led me to doubt the propriety of referring our species to the same group. Consequently, I sent some of the specimens to Prof. Dana, of New Haven, for examination, and he writes that both

Dr. S. I. Smith, of that city, and himself, concur in the opinion that they do not properly belong to the same genus as the typical forms of *Ceratiocaris*.

The differences to which I have alluded consist, first, in the form of the carapace-valves, which, instead of being truncated, with a nearly straight outline from below forward and upward, are truncated from above forward and downward, with *a profoundly sinuous outline*, the sinus being directed forward and upward, while the posterior extremity of the dorsal margin is produced, pointed, and curved downward. Again, they show a peculiar flexure of the ventral margin, so as to form a kind of linear carina. In the species *Bradleyi*, this margin is always inflected along this line, at an acute angle inward and upward; while in the species *elytroides*, it is less strongly deflected, though the linear carina is equally well defined, and sometimes minutely crenated. This species also shows another minutely crenated, obscurely defined carina below the dorsal margin, and would therefore bear some resemblance to *Dithyrocaris*, in this respect, but otherwise, particularly in form, its carapace-valves are quite different from those of that type.

It is also worthy of note, that none of the several specimens of these species show any traces of the ocular spot or tubercle, constantly seen in the typical species of *Ceratiocaris;* and that they show a clean, smooth outline to the dorsal margins of the carapace-valves, indicating that they were only united by a membrane; while those of *Ceratiocaris* were supposed by Prof. McCoy to be anchylosed, and rigidly united at a fixed angle along the dorsal margin.

I have no doubt in regard to the importance of some, if not all, of these points of difference, but, knowing how slow many geologists (who are generally far behind zoologists in the discrimination of genera) are to accept such divisions, I have merely distinguished these species for the present, as belonging to a subgenus of *Ceratiocaris*, under the name *Colpocaris*, in allusion to the sinus of the posterior margin.

Locality and position.—Base of the Waverley group, at Danville, Kentucky. Prof. Bradley's collection.

CERATIOCARIS (COLPOCARIS) ELYTROIDES, Meek.

Carapace-valves narrow-subelliptic, about two and a half to three times as long as high, anterior end narrower than the other, and subangular above; dorsal margin gently arcuate from end to end, and terminating behind in a pointed projection that extends a little farther backward than the lower margin, and curves distinctly downward; posterior margin truncated obliquely from above forward and downward, and very deeply sinuous, the sinus being directed a little upward and forward; basal margin most prominent near the middle, and behind this straight, or sometimes very faintly sinuous and ascending to the rather obtusely pointed posterior basal extremity, while from near the middle forward it ascends gradually, at first with slight convexity of outline, and farther forward with a stronger upward curve, until it intersects the dorsal margin above, at a more or less obtuse angle. Surface with an obscure linear, sometimes minutely crenate carina, or raised line along near the lower margin, but not exactly parallel to it (being most remote from it along near the middle), and another similar but more distinctly crenate carina, running along parallel to, and about one-fifth the height of the valves below, the dorsal margin; otherwise appearing to the unassisted eye as if perfectly smooth, but, when examined in a favorable light, by the aid of the highest power that can be conveniently used as a hand magnifier, seen to be very beautifully and minutely striated, the striæ being very regular, closely arranged, and more or less divaricating from the carinæ.

Length of carapace-valves, 1.25 inches; height, 0.46 inch; convexity of each valve, 0.09 inch.

This species may be readily distinguished from the last, not only by its smaller size, but by its narrower form, and its two minutely crenate longitudinal carinæ, and particularly by the different nature of its microscopical sculpturing, that of the last-described species presenting a delicate reticulated appearance, instead of minute hair-lines. The basal margins of its valves, below the carina, are also only a little deflected inward and downward, while in all the specimens of the latter, yet seen, they are abruptly deflected at an acute angle inward and upward.

Locality and position.—Same as last.

CERATIOCARIS (SOLENOCARIS) STRIGATA, Meek.

Carapace-valves narrow, and elongated, rather convex, with length about four times the height; dorsal and ventral margins nearly straight and parallel, anterior extremity very narrowly rounded, being most prominent at the middle; posterior end very obliquely truncated from below backward and upward so as to impart a more or less angular or pointed character to the posterior dorsal extremity, which, however, is not curved. Surface of internal cast showing rather well-defined marks of growth parallel to the margins; while moulds of the exterior show impressions of coarse, more or less anastomosing, longitudinal striæ, that do not curve exactly parallel to the free margins, particularly of the ends. No ocular spot or tubercle visible.

Length, 1.24 inch; height, about 0.30 inch; convexity, about 0.25 inch.

I did not submit this form to Professor Dana, but as it differs quite as materially (though in other respects) from *Ceratiocaris* as those I sent to him do, and as widely, or even more widely, from those I sent than the latter do from *Ceratiocaris* proper, I have ventured to suggest for it at least a subgeneric name, *Solenocaris*. It shows no traces of ocular spots, and merely has the posterior end subtruncated obliquely backward from below, without any traces of a sinus. At a first glance, it looks like the valves of a narrow bivalve mollusk; but its sculpturing is decidedly of crustacean type, being like that of some species of *Ceratiocaris*.

Locality and position.—Same as preceding.

ARCHÆOCARIS VERMIFORMIS, Meek.

The specimens of this fossil yet known are too imperfect to be systematically characterized, but they may be described, in a general way, as follows; the description being intended to apply to a side view of individuals as seen more or less compressed laterally in concretions.

Cephalothorax or head, about equalling the length of the first three and a half of the body segments behind it; subtrigonal in form, being somewhat pointed in front, with the posterior margin wider and obliquely truncated from above backward and downward, so as to give more or less angularity to the posterior basal extremity; basal margin apparently with a kind of ridge or fold

along most of its length, and ascending with a slightly convex outline forward so as to meet the dorsal margin, which is more nearly horizontal, at a rather acute angle in front; eyes, if there are any, unknown. Abdomen or body, with the six segments of nearly equal size, and strongly imbricating. Telson apparently as long as three of the abdominal segments, flattened, of moderate breadth anteriorly, and tapering behind. Stylets not clearly seen, but apparently one on each side of the telson; other abdominal appendages unknown. Surface of all parts smooth.

Length of head or cephalothorax, from the anterior to the posterior basal extremities, 0.34 inch; height, 0.18 inch; length of the six body or abdominal segments, 0.51 inch; height, 0.16 inch; length of telson unknown.

In one of the specimens, there is a leg-like appendage, seen in the matrix extending close along under and parallel to the basal margin of the head or cephalothorax. This appendage, or rather what can be seen of it, consists of three joints, two long and one short. The posterior joint, although apparently broken at the posterior end, is 0.13 inch long, and rather stouter than the next in front of it, which is of the same length. The third joint only shows a little of one end, which connects with the anterior end of the forward one of the two longer joints, and is flexed at right angles to the latter, so as to pass under the anterior margin of the cephalothorax. This may possibly be one of the abdominal appendages, bent forward, but it has more the appearance of a stout antenna bent backward. Prof. Dana thinks it most probably the latter.

In regard to the affinities of this type, not much can be said without better specimens for comparison. Prof. Dana suggests, however, that it may possibly have some relations to the recent genus *Cuma*. Being unable to find any defined genus to which it can be properly referred, I propose for its reception a new genus, under the name *Archæocaris*, in allusion to the ancient period of its existence.

Locality and position.—Same as preceding.

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, 1871, inclusive, amounts to 1236.

Of these 165 were volumes, 1060 pamphlets and parts of periodicals, and 11 maps and charts. They were derived from the following sources:—

Societies 462, Editors 206, Wilson Fund 94, Authors 92, Publishers 60, Dr. H. C. Wood 31, Isaac Lea 28, Norwegian Government 18, Secretary of Treasury 15, Geological Survey of Sweden 12, Government of Chile 8, Geological Survey of Italy 7, Geological Survey of India 5, Thos. Meehan 5, J. B. Lawes 5, Minister of Public Works in France 5, J. S. Newberry 3, T. Guilford Smith 2, Smithsonian Institution 2, Chief of Engineers U.S.A. 2, Dep. of Interior 2, Dr. Jos. Leidy 1, Dr. H. C. Chapman 1, Col. Jas. Greer 1, Jos. Jeanes 1, P. P. Carpenter 1, Commissioner of Fisheries 1, D. F. Boyd 1. 85 were purchased and 80 presented through the Conchological Section.

These additions were distributed to the different departments of the library as follows: Journals 761, Geology 80, Bibliography 92, Entomology 47, History and Statistics 45, Conchology 39, General Natural History 25, Ornithology 11, Ichthyology 9, Physical Science 8, Botany 7, Anatomy and Physiology 7, Helminthology 7, Agriculture 6, Mineralogy 6, Voyages and Travels 2, Medicine 2, Chemistry 1, Mammalogy 1. 251 volumes have been bound.

During the year the revised and numbered catalogue of the Conchological Department has been completed, and is now in the hands of the binder.

Thirty-two applications for books wanting in the library were made by means of the blanks provided for the use of members. Fourteen of the required works have been received, and the others have been ordered.

Estimating the number of volumes formed by the pamphlets

and periodicals received during the last two years, the whole number of volumes now in the library is 22,693.

All of which is respectfully submitted,

EDWARD J. NOLAN, *Librarian.*

REPORT OF THE CURATORS.

The donations to the Museum of the Academy during the year are as follows:—

Vertebrates.—A fine specimen of a Manatee, *Manatus latirostris*, from St. Domingo, was presented by Mr. William M. Gabb. It has been mounted, and now occupies a place in the museum. We may also state that the Sea lion, *Eumetopias Stelleri*, from California, presented last year by George Davidson, has also been prepared and placed in the museum.

Mr. B. A. Hoopes presented a hybrid between the domestic Brahma cock and the Guinea fowl, raised by himself. A peculiar variety of the *Bernicla canadensis*, from Indiana, was presented by Gen. L. E. Yorke, of Cincinnati, Ohio. A parrot and a toucan were presented by Miss LeClair, and a Snow Bunting from Alaska, by S. R. Roberts.

A collection of fishes, in eighteen jars, from St. Domingo, was presented by William Gabb; a collection, in eight jars, from the Delaware river, by Dr. C. Arrott, and a *Hippocampus*, by W. A. H. Allen, U.S.N.

Miscellaneous Collections.—A collection of reptiles, marine fishes, mollusks, crustaceans, and echinoderms, from the vicinity of Fort Macon, N. C., was presented by Dr. H. C. Yarrow, U.S.A. A second collection, consisting of four bottles of fishes, mollusks, crustaceans, and insects, together with some marine shells, and two skulls of Loggerhead turtles, was presented by the same gentleman.

A collection of five jars of reptiles and fishes, a skeleton of a fish, four species of shells, several corals and echinoderms, eggs of the Alligator, and a case of lepidoptera, from the Isthmus of Darien, were presented by Dr. H. C. Eckstein, U.S.A.

Invertebrates.—A Scorpion with young, and several spiders from Mexico, were donated by Prof. A. Du Bois; a large crab, from Alaska, by Dr. John M. Kollick; a small collection of lepidop-

tera, from Texas, by Dr. G. Linceeum; and a small collection of coleoptera, by J. R. Willis, of Halifax, N. S.

The spawn of a mollusk from the Pacific was presented by Dr. Geo. Davidson, and a specimen of *Pheronema Grayi*, by W. Saville Kent.

Osteological, Ethnological, and Miscellaneous Specimens.—A well-preserved mummy from near Aneon, Peru, was presented by Mr. Edm. W. Sartori. Two skulls of Caciques, of the Peguenche tribe, of Chili, were presented by Dr. S. Wier Mitchell. The skull of a Flat-head, from Washington Territory, was presented by Dr. J. M. Kollick. The skull of a Walrus, from Sable Island, N. S., was presented by J. R Willis, of Halifax, N. S.

The following specimens were also received: A shark's jaws, from Capt. Westcott, U.S.N.; the dermal covering of a large Alligator Gar, from Mr. Swaim; three ancient stone hammers from the copper region of Keweenaw Pt., L. S.,from Francis R. Abbott; a section of a birch tree, fifteen inches in diameter, cut by beavers, from Keweenaw Pt., L. S., from B. A. Hoopes; and the fangs of a large Rattlesnake from California, from Prof. A. Du Bois.

Dr. H. C. Yarrow presented a small collection of shells, bones, and fragments of pottery from ancient shell heaps on Hawkins's Island, N. C.

Fossils.—Dr. J. Van A. Carter and Dr. Joseph K. Corson, U.S.A., of Fort Bridger, Wyoming, presented a collection of remains of extinct mammals, crocodilians, and chelonians, and some shells, from an early tertiary deposit of Wyoming. These remains pertain to species described during the year in the Proceedings of the Academy. Dr. Showalter presented a large portion of the skeleton, including the skull of *Clidastes iguanavus*, from the cretaceous formation of Alabama. Dr. Isaac Lea presented a portion of the lower jaw of *Rhinoceros tichorhinus*, and a molar of *Elephas primigenius* from near Florence, Italy. Mr. S. R. Roberts presented a small collection of mosasauroid remains from Kansas. There were also presented the following: Six fossils, by J. W. Queen; five by Mrs. R. Hoffman; two by T. Guilford Smith; three by Thomas Meehan; two by Dr. H. C. Chapman; two by Lotta Town; one by Guy Bryan; one by C. S. Westcott; one by C. S. Bement; one by Mr. Castor; and one by an unknown donor.

Plants.—Sixty-seven species of Mexican plants were presented by C. Mohr, of Mobile. A collection of plants from the vicinity

of Fort Tejon, Cal., was presented by the Smithsonian Institution. Twenty-three species of African plants were presented by Wm. M. Canby. One species was presented by D. P. Rosenmiller and two by C. F. Parker.

Minerals.—Dr. F. A. Genth presented a huge mass of dog-tooth spar, from Morgan mine, Ken. Alfred Deshong presented four groups of large feldspar crystals from Leiperville, and Jacob Swayne two large crystals of muscovite, from Pennsbury, Pa.

Of other minerals there were presented, three by W. S. Vaux, two by C. S. Bement, two by B. S. Lyman, two by I. Lea, two by E. Goldsmith, and one by each of the following: Dr. F. A. Genth, G. A. Nicolls, H. Veeder, T. D. Rand, and W. L. Mactier.

Respectfully submitted by

JOSEPH LEIDY,
Chairman of Curators.

REPORT OF THE BOTANICAL COMMITTEE.

To the President and Members of the Academy:—

During the past year the Committee have devoted themselves to distributing the valuable specimens contained in the various collections through the general and the North American Herbariums.

In our last report it was stated that owing to the cases being full, and not permitting from their structure any additions, these specimens were temporarily arranged in a supplemental herbarium. By the consent of the curators these old cases will be abandoned, and simple portfolio cases employed in their stead. This has enabled the Committee to distribute the plants in their proper places in the general herbarium.

At the beginning of last year the index of the general herbarium contained the names of 3239 genera. By the labors of the Committee 170 new ones have been added. The work during the next month will be entirely finished.

THOMAS MEEHAN, *for the Committee.*

The Treasurer's Report was read and referred to the Committee on Finance.

RECORDING SECRETARY'S REPORT.

The Recording Secretary would respectfully report that, during the year ending November 30th, 1871, there have been elected thirty-five members and eight correspondents.

The announcement has been made of the death of the following members and correspodents:—

Four members, namely: Dr. Charles M. Wetherill, Benjamin Marshall, William P. Turnbull, Stephen Morris, Esq.

Six correspondents, namely: Wilhelm Ritter von Haidinger, Prof. E. E. Adams, D.D., F. F. Cavada, Mr. J. J. Cohen, Prof. Constant Duméril, Dr. John Edward Holbrook.

The number of papers contributed and ordered to be printed in the Proceedings of the Academy during the year, has been nineteen, as follows:—

Prof. L. B. Buckley	1	Prof. F. B. Meek	3
Robert Ridgway	1	T. Meehan	1
Elliott Coues, M.D.	2	Edward D. Cope	2
Prof. A. Newton	1	Prof. C. Thomas	1
Isaac Lea, LL.D.	2	J. A. Ogden	1
T. Hale Streets	2	G. N. Lawrence	1
		Theodore D. Rand	1.

All of which is respectfully submitted,

SAMUEL B. HOWELL,
Recording Secretary.

REPORT OF RECORDER OF MICROSCOPICAL AND BIOLOGICAL SECTION.

Extract from the Minutes of the Biological and Microscopical Section at the meeting held December 4th, 1871.

"The Report of the Recorder being in order, it was called for, and after being read was, on motion of Dr. Tyson, adopted and directed to be transmitted to the Academy at its approaching annual meeting, as the Report of the Section," to wit:—

In accordance with that regulation of the Section which requires the Recorder to lay before you a written report of the transactions during the year in our department, I have the honor to submit the following summary of scientific labor accomplished within the past twelve months; and whilst it is incontestably true that

this exhibit cannot compare favorably with those of other like periods, it must, I think, be admitted that evidence is thereby afforded of an earnest determination to keep alive some interest in the study of microscopy.

Valuable donations have been from time to time received from Dr. J. J. Woodward, of the Surgeon-General's Office, at Washington, consisting of specimens of his admirable micro-photographs of histological preparations, test objects from the Diatomaceæ, &c. &c.

Among the more important contributions laid before the department may be mentioned one from Dr. James Tyson, on a method of demonstrating the reversal of light and shade occurring in the red blood-corpuscles under microscopical examination, which was subsequently printed in the *Philadelphia Medical Times*. One from Dr. J. H. McQuillen, upon a remarkable example of hypertrophy of the root of a tooth, the specimen being first exhibited to the members in its natural state, and its construction being afterwards demonstrated by carefully prepared and mounted sections. Another from the same gentleman on imperfections in the enamel of teeth, producing microscopical fissures which constituted predisposing causes of caries, his remarks being published in the *Medical Times* and *Dental Cosmos*, and subsequently reprinted in the *London Microscopical Journal*. An interesting contribution (also illustrated by specimens) upon intermittent hæmaturia, from Dr. James Tyson, which likewise appeared in the *Medical Times*, and was republished by various medical periodicals. One from Dr. Tyson, on the existence of true Haversian canals in hypertrophied cementum. Communications from Dr. Tyson and Dr. Richardson in regard to the use of acetate of potash solution as a preservative fluid for microscopical specimens, and one from the latter observer, on the Detection of Pulmonary Elastic Tissue in the *Sputum* of Phthisis.

In conclusion, I would, unless *we determine to abandon* our efforts, respectfully *urge* upon my fellow-members the adoption of the proposed change in our existing arrangement for holding the meetings of the Department, in the hope that by reducing the frequency of our meetings the *diminished* number of earnest students of microscopy who remain will be able to present in rotation, according to a systematic plan, on each stated meeting, some written or oral communication, illustrated by specimens, which

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may serve as a subject for discussion, and render the proceedings of sufficient value and interest to secure the general attendance of our own members as well as of other scientific men.

Jos. G. Richardson, *Recorder.*

REPORTS OF THE CONCHOLOGICAL SECTION.

RECORDER'S REPORT.

The Recorder would respectfully report, that during the past year there have been elected three correspondents.

The deaths of the following members and correspondents have been announced: Charles W. Peale, member, October 5th; M. de la Saussaye, Bordeaux, correspondent, October 5th; F. F. Cavada, Cuba.

Twenty papers have been accepted for publication, by the following authors: W. Harper Pease, 6; Wm. H. Dall, 4; Bland and Binney, 4; Geo. W. Tryon, Jr., 3; R. E. C. Stearns, 2; F. B. Meek, 1.

Appended is a list of the correspondents elected during 1871.

Respectfully submitted by

S. R. Roberts, *Recorder.*

Correspondents elected in 1871:—

February 2d. H. E. Van Rijgersma, St. Martins, West Indies.
" " G. Nevill, Calcutta, India.
April 6th. Hugh Nevill, Point de Galle, Ceylon.

CORRESPONDING SECRETARY'S REPORT.

To the Conchological Section of the Academy of Natural Sciences, Philadelphia:—

The Corresponding Secretary would respectfully report that letters have been written as follows, viz.:—

Feb. 3.—To Hugh Nevill, Galle, Ceylon.
To Dr. H. E. Van Rijgersma, St. Martins, W. I.

And letters have been received as follows, viz.:—

March 14.—From Albany Hancock.
March 20.—From H. E. Van Rijgersma.
July 15.—From Dr. Fred'k Stolizka.
Nov. 3.—From New York Lyceum of Natural History.
Smithsonian Institution, four letters.

Boston Natural History Society.

Dec. 6.—American Museum Natural History, of New York, (Nov. 1.)

Dec. 6.—H. Cross, Paris, Sept. 20. (Publications sent.)

All of which is respectfully submitted,

E. R. Beadle, *Cor. Secry.*

Philadelphia, Dec. 7th, 1871.

LIBRARIAN'S REPORT FOR 1871.

The Librarian respectfully reports that there have been presented, during the past year, to the library of the Conchological Section, 73 pamphlets and 7 volumes. Of these, 23 were received from Societies, 20 from Editors, 22 from Authors, 5 from the Publication Committee, 2 from Isaac Lea, 2 from George W. Tryon, Jr., 2 from H. Neville, 1 from J. Gwynn Jeffreys, and 3 were purchased.

In addition, 3 volumes and 36 pamphlets have been presented during the same time to the Academy.

There are now in the Conchological Library 668 volumes. There are 807 titles on the catalogue.

During the year the transcription of the revised and numbered catalogue of this department has been completed, and is herewith presented.

All of which is respectfully submitted,

Edward J. Nolan, *Librarian.*

CONSERVATOR'S REPORT.

The Conservator of the Conchological Section respectfully reports that the donations to the Cabinet, during the past year, have been as follows:—

From Rev. E. R. Beadle. Twenty-five species of shells, principally from Ceylon.

P. P. Carpenter. A large lot of duplicate species in exchange for some of the publications of the Section.

T. A. Conrad. Numerous specimens of *Unio viridis*, from Trenton, N. J.

Geo. Davidson. Egg-cases of *Chrysodomus liratus*, Mar.

Dr. H. C. Ecstein. Three species of *Strombus*, from Central America.

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ANDREW J. GARRETT, of Papeiti, Tahiti. One hundred and fifty-four land, fresh-water, and marine shells of Polynesia, including types of many new species.

S. S. HALDEMAN. *Nautilus umbilicatus*, List.

J. GWYNN JEFFREYS. *Fusus Bernicensis*, King; *Lima excavata*, Chem., and eighteen other species of rare marine mollusca from Norway and Great Britain.

Dr. SAMUEL LEWIS, through W. L. MACTIER. Eggs of *Bulimus hæmastoma*.

W. HARPER PEASE. Thirty-six species of land and marine shells from the Pacific Islands.

SAMUEL POWEL. Egg-cases of *Fusus Islandicus*, from Newport, R. I.

J. H. REDFIELD. Eleven species of *Marginella*, mostly new to the collection; also twenty species of *bivalve mollusca*, new to the collection.

S. R. ROBERTS. Four species of *Clausilia* and one species of *Bulimus*, from Greece.

T. HALE STREETS. *Bulimus Powisianus*, from Isthmus of Tehauntepec.

GEO. W. TRYON, JR. Twenty species of *bivalve mollusca* new to the collection.

Dr. H. C. YARROW. Numerous specimens of *Lingula pyramidata*, Stimp., in alcohol. One hundred and fourteen species of shells from Beaufort, N. C.

WM. S. VAUX. Twenty-seven species of *Cypræa*, *Ovulum*, and *Solen* new to the collection.

One hundred species, numerous specimens of shells from Panama, including a number of species in alcohol, and fifty-six species from the coast of Nicaragua were presented by the subscribers to the McNeill Expedition to Central America.

Eighty-five species of Polynesian mollusca, principally new, collected by the Godeffroy Natural History Expedition, were purchased, together with thirty species of bivalve mollusca, new to the collection, and selected by the Rev. Dr. Beadle during his recent visit to London.

During the year the Committee on the Arrangement of the Cabinet, consisting of Messrs. Parker, Hassler, Roberts, Tryon, and Nolan, has cleaned, mounted, and labelled 6881 specimens in

1898 trays. This includes the *Cardiidæ*, *Lucinidæ*. *Chamidæ*, *Petricolidæ*, *Melanidæ*, *Tridacnidæ*, *Terebratulidæ*, North American *Helices*, and *Corbiculadæ* in part. The current additions to the families already arranged have also been mounted and placed in the cases as soon as received.

The sale of duplicate specimens has furnished sufficient funds for the purchase of about sixty additional drawers, which have been procured and placed in the museum.

The total number of species mounted and arranged to date is 4031; number of trays and labels prepared, 7169; total number of specimens prepared and mounted, 20,941.

All of which is respectfully submitted,

EDWARD J. NOLAN, *Conservator.*

The election of Officers for the ensuing year was held, in accordance with the By-laws, with the following result:—

President . . .	W. S. W. Ruschenberger, M.D.
Vice-Presidents . .	Wm. S. Vaux.
	Jos. Carson, M.D.
Recording Secretary .	Samuel B. Howell, M.D.
Corresponding Secretary	Edward D. Cope.
Librarian . . .	Edward J. Nolan, M.D.
Curators . . .	Joseph Leidy, M.D.
	Wm. S. Vaux.
	Geo. W. Tryon, Jr.
	Edw. D. Cope.
Council	Isaac Lea.
	Robert Bridges, M.D.
	Edw. S. Whelen.
	Isaac Hays, M.D.
Publication Committee .	Jos. Leidy, M.D.
	Robert Bridges, M.D.
	Wm. S. Vaux.
	Geo. W. Tryon, Jr.
	Edw. J. Nolan, M.D.
Committee on Finance .	Wm. S. Vaux.
	Aubrey H. Smith.
	Robert Bridges, M.D.

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ELECTIONS FOR 1871.

The following Members and Correspondents of the Academy of Natural Sciences have been elected during the year 1871:—

MEMBERS.

February 28.—Henry T. Peck, Archibald McIntyre, John McLaughlin, Lewis Thompson, George Thompson, Rachel L. Bodley, Lt. Clarence Edward Dutton, U.S.A., S. J. W. Mintzer, M.D., Elizabeth Shreve, J. B. White, M.D., Charles C. Phillips, Richard Morris Smith, T. Warren O'Neil, Charles T. Yerkes, Jr., Caleb Cresson, Wm. P. Jenks.

March 28.—Gustavus A. Nicholls, J. Price Wetherill.

April 25.—B. F. Quimby, A. Crawford Coates.

May 30.—Wm. Campbell Gatzmer, Samuel P. Wetherill.

June 27.—Frederick W. Endlich, Edward K. Williams, Frederick Gutekunst.

November 28.—Richard Day, Thomas E. Parke, M.D., Commodore J. P. Gillis, U.S.N., Samuel W. Pennypacker, Richard A. Lewis, W. Grier Hibler, Louis Stillé, M.D., James A. Ogden, Roland G. Curtin, M.D., Allen Shryock.

December 26.—A. L. Gihon, M.D., U.S.N., Andrew H. Miller.

CORRESPONDENTS.

February 28.—S. B. Buckley, of Austin, Texas.

March 28.—Hon. H. Nevill, of Gallee, Ceylon; John Hauxwell, of Pebas, Equador.

June 27.—Gen. L. E. Yorke, of Cincinnati, Ohio.

November 28.—Dr. J. Van A. Carter, of Fort Bridger, Wyoming; Dr. Joseph K. Corson, U.S.A.; Prof. W. C. Kerr, of Raleigh, N. C.; George Stewardson Brady, of Sunderland, England.

CORRESPONDENCE OF THE ACADEMY

For 1871.

January.—W. H. Wahl, acknowledging receipt of notice of election as member.

Geological Society of London, acknowledging receipt of American Journal of Conchology.

Société des Sciences Naturelles de Neuchatel;

Neues Jahrbuch für Mineralogie; each acknowledging receipt of Journal.

Verein für vaterländische Naturkunde in Württemberg, acknowledging receipt of publications.

February.—Magyar Tudomanyos Akadémia;

Bureau de la Recherche Geologique de la Suède;

Senckenbergische Naturforschende Gesellschaft in Frankfurt-am-Main; severally sending publications.

Bureau de la Recherche Geologique de la Suède;

The Naturforschende Gesellschaft of Basel;

The Verein der Freunde der Naturgeschichte in Mecklenburg;

Senckenbergische Naturforschende Gesellschaft in Frankfurt-am-Main; severally acknowledging receipt of publications.

J. M. Kollock, with specimens.

March.—American Geographical and Statistical Society;

Die Königlich Sächsische Gesellschaft der Wissenschaften;

Asiatic Society of Bengal; severally acknowledging receipt of publications.

American Legation, The Hague;

Museu de Lisboa Secção Zoologica; with publications.

H. A. Dreer, resigning membership.

D. F. Boyd, regarding catalogues of museum.

Prof. Igino Cocchi, acknowledging receipt of notice of election as correspondent.

April.—Essex Institute;

Das Bibliothekariat der Königlich Bayerischen Akademie der Wissenschaften; each acknowledging receipt of publications.

J. B. Blair, regarding "Birds of the World."

Die Gesellschaft Naturforschende Freunde zu Berlin; with publications.

May.—Lyceum of Natural History, New York;

Academy of Sciences of Chicago; each acknowledging receipt of publications.

W. M. Gabb, with specimens.

June.—Die Königliche Gesellschaft der Wissenschaften zu Göttingen, acknowledging receipt of publications.

Naturforschende Gesellschaft zu Halle a. d. S.; with publications, and acknowledging receipt of publications.

Die Kaiserliche Akademie der Wissenschaften, Wien; with publications.

July.—A. S. Herschel, announcing the death of Sir John Herschel.

Smithsonian Institution;

Essex Institute;

American Geographical and Statistical Society; each acknowledging receipt of publications.

August.—Die Königl. böhmische Gesellschaft der Wissenschaften, Prag;

Secretär des Nassauischen Vereins für Naturkunde, Wiesbaden; acknowledging receipt of publications.

Universidad de Chile;

Fra Museets Direction, Bergen;

Der Naturforscher Verein zu Riga; with publications.

G. Burmeister, forwarding Anales del Museo Publico de Buenos Aires.

Madame Claparède, announcing death of Edward Claparède.

The Society of Natural and Physical Science, Leavenworth, asking for copy of Constitution and By-Laws of the Academy.

Consulat de Grèce, New York, regarding package sent.

Archivio per l'Antropologia E La Etnologia, proposing exchanges.

September.—Fra Museets Direction, Bergen;

Naturhistorischer Verein der preussischen Rheinlande und Westphalens, Bonn;

Geological Survey of India, Calcutta;

Die Naturforschende Gesellschaft, Freiburg; acknowledging receipt of publications.

Real Observatorio de Madrid;

Geological Survey of India, Calcutta;

Die Naturwissenschaftliche Gesellschaft zu Chemnitz;

Italian Society of Natural Sciences, Milan;

Société des Sciences de Finlande; with publications.

Der Naturforschende Verein in Brünn, acknowledging receipt of publications, and forwarding others in return.

Hugh Nevill, acknowledging receipt of notice of election as correspondent.

October.—Naturforschende Gesellschaft in Emden;

Der Naturwissenschaftliche Verein für das Fürstenthum Lüneburg; each acknowledging receipt of publications.

William Garley, regarding fossils.

Prof. Gegenbauer, Jena;

Société Linnéenne de Bordeaux; with publications, and acknowledging receipt of others.

Die Kaiserliche Akademie der Wissenschaften, Wein, with publications.

November.—Lyceum of Natural History, New York;

British Museum, London; acknowledging receipt of publications.

Det Kongelige Danske Videnskabernes Selskab, with publications.

Announcement of death of Sir R. I. Murchison.

George Davidson, with photographs.

George Davidson, with specimens for museum.

J. C. Jay, regarding collection of shells.

American Museum of Natural History, New York, specifying days it is open for special study.

F. B. Meek, with paper for publication.

December.—Anthropological Institute of Great Britain and Ireland;

Die Königlich Sächsische Gesellschaft der Wissenschaften, Leipzig;

Lyceum of Natural History, New York;

Physicalisch-medicinische Gesellschaft in Würzburg; acknowledging receipt of publications.

L. E. Yorke;

W. C. Kerr;

J. A. Van Carter;

J. K. Corson; each acknowledging receipt of notice of election as correspondent.

Number of letters received, 1871 110

" of correspondents elected 8

EDW. D. COPE,
Corresponding Secretary.

DONATIONS TO THE LIBRARY, 1871.

JOURNALS AND PERIODICALS.

NORWAY.

Bergen. Sondre Bergenhus Amtsformandskabs Forhandlingar i Aaret 1867–70. From the Bergen Museum.

Christiania. Forhandlinger i Videnskabs Selskabet. Aar 1869–70. From the Society.

Det K. Norske Frederiks Universitets Aarsberetning for Aaret 1869–70. From the University.

Nyt Magazin for Naturvidenskabernes. 7de Binds, 2et Hefte; 8de Binds, 3e Hefte. From the editors.

Den Norske Turistforenings Arbog for 1870. From the Society.

Norsk Meteorologisk Aarbog for 1869, 3die Aargang, 1870. From the Meteorologiske Instituut.

Det Norske Meteorologiske Instituuts Storm-Atlas, 1870. From the Institute.

DENMARK.

Copenhagen. Videnskabernes Meddelelser fra Naturhistorisk Forening for Aaret, 1870, No. 12–28. From the Society.

Oversigt over det K. D. Videnskabernes Selskabs Forhandlinger og dets Medlemers Arbeider i Aaret, 1870, Nos. 2–3; 1871, No. 1. From the Society.

Videnskabernes Selskab Skrifter, 5 Raekke, Naturvid, og Mathem. Afd. 9 Bd. II. III. and IV. From the Society.

HOLLAND.

Leeuwarden. Nederlandsch Kruidkundig Archief. Vijde Deel, Vierde Stuk, 1870. From the editors.

RUSSIA.

Dorpat. Archiv für die Naturkunde Liv-Ehst und Kurlands. 1ste Series, 6er Band, 1ste Lief. 2e serie; 7er Band, 2e Lief. 1870. From the Publishing Society.

Sitzungsberichte der Dorpater Naturforscher Gesellschaft, 3er Band, 1ste Heft. From the Society.

Helsingfors, Acta Societatis Scientiarum Fennicae. Tomus IX. 1871. From the Society.

Moscow. Bulletin de la Société Impériale des Naturalistes de Moscou. Année, 1870, No. 2. From the Society.

St. Petersburg. Horæ Societatis Entomologicæ Rossicæ. Tome VI., No. 3 and supplement; Tome VII., Nos. 1–3; Tome VIII., No 1. From the Society.

Mémoires de l'Académie Impériale des Sciences. 7e Série. Tome XVI., Nos. 1–8. From the Academy.

Bulletin de l'Académie Impériale des Sciences. Tome XV., Nos. 3–5; Tome XVI., No. 1, 1871. From the Society.

Repertorium für Mineralogie. Band I., Heft 2. From the same.
Annales de l'Observatoire Physique Central de Russie. Année, 1866. From the Observatory.
Ofversigt af Finska Vetenskaps-Societetens Forhandlingar XIII., 1870–71. From the Society.
Bidrag till kännedon af Finlands Natur och Folk, utgifna af F. Vetenskaps-Societen. Sjuttonde Häftet. From the Society.
Riga. Arbeiten des Naturforscher-Vereins, Neue Folge. 3es and 4es Heft. From the Society.
Correspondenzblatt des Naturforscher Vereins. 18er Jahrg., 1870. From the Society.
Denkschrift of the same. Marz, 1870. From the Society.

GERMANY.

Berlin. Entomologische Zeitscrift. 14er Jahrg.; 3es and 4es Vierteljahresheft; 15er Jahrg.; 1es—4es Viert. From the Society.
Zeitscrift für die Gesammten Naturwissenschaften. Juli, August, September, October, November, and December, 1870. From the editor.
Zeitschrift der Deutschen Geologischen Gesellschaft. XXII. Band, 4 Heft; XXIII. Band, 1–2 Heft. From the Society.
Archiv für Naturgeschichte. 34er Jahrg., 6es Heft, to 37 Jahrg., 1es Heft. From the editor.
Sitzungsberichte der Gesellschaft Naturforschender Freunde in Berlin im Jahre, 1870. From the Society.
Monatsbericht der K. P. Akademie der Wissenschaften. April, 1870–August, 1871. From the Society.
Physikalische Abhandlungen of the same aus dem Jahre, 1869–70. From the Society.
Mathematische Abhandlungen of the same, 1869. From the Society.
Verzeichniss der Abhandlungen der K. P. Akad. der Wissen. von 1710–1870, in alphabetischer Folge der Verfasser. From the Academy.
Wochenschrift des Vereines zur Beförderung des Gartenbaues. XIII. Jahrg. From the Society.
Bonn, Verhandlungen des Naturhistorischen Vereines der Preussischen Rheinlande und Westphalens. 27 Jahrg., 1870. From the Society.
Braunschweig. Archiv für Anthropologie. 4er Band, 3es und 4es Vierteljahrsheft. Purchased.
Bremen. Abhandlungen herausgegeben von Naturwissenschaftlichen Vereine. 2 Bd., III. Heft. From the Society.
Brünn. Verhandlungen des Naturforschenden Vereines. Band VIII., 1 und 2 Heft. From the Society.
Cassel. Malakozoologische Blätter. Banden 16, 17, und 18; Bg. 1–10, und Jan., 1871. Purchased.
Chemnitz. Dritter Bericht der Naturwissenschaftlichen Gesellschaft, 1871. From the Society.
Danzig; Schriften der Naturforschenden Gesellschaft, Neue Folge. 2en Bandes. 3es und 4es Heft. From the Society.
Darmstadt. Notizblatt des Vereins für Erdkunde und verwandte Wissenschaften. III Folge, 9 Heft. From the Society.
Dresden. Sitzungsberichte der Naturwissenschaftlichen Gesellschaft Isis. 1870, July to 1871, Marz. From the Society.
Emden. 56er Jahresbericht der Naturforschenden Gesellschaft, 1870. From the Society.
Kleine Schriften der Naturforschenden Gesellschaft, XV. From the Society.
Erfurt. Jahrbücher der K. Akademie gemeinnutziger Wissenschaften. Neue Folge, Heft VI., 1870. From the Society.

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Frankfurt, A. M. Bericht über die Senckenbergische Naturforschende Gesellschaft, 1869–70. From the Society.

Abhandlungen, herausgegeben von der Senckenbergischen Naturforscenden Gesellschaft. 7en Bandes, 3es und 4es Heft. From the Society.

Der Zoologische Garten. XI. Jahrg., Nos. 7–12; XII. Jahrg., Nos. 2–6. From the editor.

Freiburg, J. B. Berichte über die Verhandlungen der Naturforschenden Gesellschaft. Heft III. and IV., 1870. From the Society.

Göttingen. Nachrichten von der K. Gesellschaft der Wissenschaften und der Georg-Augusts Universität aus dem Jahre, 1870. From the Society.

Halle. Abhandlungen der Naturforschenden Gesellschaft. 11en Bandes, 2es Heft; 12en Bandes, 1es und 2es Heft. From the Society.

Hannover. Zwanzigster Jahresbericht der Naturhistorichen Gesellschaft, 1871. From the Society.

Heidelberg. Verhandlungen des Naturhistorisch-Medicinischen Vereins. 5er Band. From the Society.

Kärten. Jahrbuch des Naturhistorischen Landesmuseum. 8 and 9 Heft. From the Society.

Leipzig. Zeitschrift für Wissenschaftliche Zoologie. Vols. 12, 13, 14, 15, and 21er Band, 1es–3es Heft. Purchased.

Jahrbuch für Wissenschaftliche Botanik. 17er Band, 4es Heft; 18 Band, 1es and 2es Heft. Purchased.

Jenaische Zeitschrift für Medicin und Naturwissenschaft. 6er Band, 1–4 Heft. From the Publishing Society.

Archiv für Anatomie, Physiologie, und Wissenschaftliche Medecin. 1869. No. I. to 1871, No. II. Purchased.

Journal für Ornithologie. XVIII. Jahrg., Heft IV. to XIX. Jahrg., Heft III. Purchased.

Berichte über die Verhandlungen der K. S. Gesellschaft der Wissenschaften. Mathematisch-Physische Classe, 1867, Nos. II.—IV.; 1870, Nos. I. and II. From the Society.

Abhandlungen of the same. IX. Band, Nos. IV. and V., 1870. From the Society.

Munich. Sitzungsberichte der Math.—Phys., Classe der K. B. Akademie der Wissenschaften. 1870, II. Heft, 1–4; 1871, Heft I. and II. From the Society.

Neubrandenburg. Archiv des Vereins der Freunde der Naturgeschichte in Meklenburg. 24 Jahr. From the Society.

Pesth. Magyar Tudom. Akadémiai Almanach, 1869–70. From the Society.

A. M. T. Akadémia Erkönyvei Tijenharmadik Kötet. I. and IV. Darab. From the Society.

Mathematikai es Termeszettudomanyi Közlemenyek vonatkozolag a hazai viskonyokra. Kiadja A. M. T. Akadémia. V. Kötet 1867. From the Society.

A. M. T. Akad. Értesetôje. Második Evfolyam 12 Szam 1868—Negyedik Evfolyam, 11 Szam 1870. From the Society.

Értezesek a Termeszettudomanyi Osztály Köréböl kiadja a M. T. Akad., 1868–70. From the Society.

Prag. Sitzungsberichte der K. B. Gesellschaft der Wissenschaften. Jahrg. 1870, Jan.—Dec. From the Society.

Abhandlungen of the same. 1870, 6ste Folge, 4er Band. From the Society.

Regensburg. Flora, herausgegeben von der K. botanischen Gesellschaft. Neue Reihe, 28 Jahrg. From the Society.

Correspondenz-Blatt des Zoologisch-Mineralogischen Vereins. 24er Jahrg. From the Society.

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Stettin. Entomologische Zeitung. Herausgegeben von dem Entomologischen Vereine. 31er Jahrg. 1870. From the Society.

Stuttgart. Neues Jahrbuch für Mineralogie. Jahrg., 1870, 6es Heft to 1871, 5 Heft. From the editor.

Württembergische Naturwissenschaftliche Jahreshefte. 26er Jahrg., 1es, 2es, und 3es Heft, 1870. From the editor.

Allgemeines Repertorium der Mineralogie, Geologie, und Paläontologie für das Decennium, 1860–69. Index zu den in Leonhard und Geinitz's Jahrbuch. 1870. From the editor.

Vienna. Verhandlungen der K. K. Zoologisch-Botanischen Gesellschaft. Jahrg., 1870. XX. Band. From the Society.

Sitzungsberichte der K. Akademie der Wissenschaften. Mathem.—Naturwiss. Classe. 60 Band, 1ste Abth, III.—V. Heft; 2e Abth, III.—V. Heft; 61 Band, 1ste Abth, I.—V. Heft; 2e Abth, II.—V. Heft; 62 Band, 1ste Abth, I. and II. Heft; 2e Abth, I.—III. Heft; Register zu den Banden 51–60. From the Society.

Denkschriften der K. Akademie der Wissenschaften. Mathem.-Naturwissenschaftliche Classe. 30er Band. From the Society.

Schriften des Vereins zur Verbreitung Naturwissenschaftlichen Kenntnisse in Wien. IX. and X. Band. From the Society.

Verhandlungen der K. K. Geologischen Reichsanstalt. Nos. 1–18, 1870. From the Society.

Jahrbuch of the same. Jahrg. 1870, XX. Band, Nos. 3 and 4; XXI. Band, No. 1. From the Society.

Abhandlungen of the same. Band V., Nos. 1 and 2. From the Society.

Mittheilungen der Anthropologischen Gesellschaft. I. Band, Nos. 4–11. From the Society.

Wiesbaden. Jahrbücher des Nassauischen Vereins für Naturkunde. Jahrg. XXIII. und XXIV. From the Society.

Würzburg. Verhandlungen der Physikal-Medicin. Gesellschaft. Neue Folge, II. Band, 1 and 2 Heft. From the Society.

SWITZERLAND.

Geneva. Mémoires de la Société de Physique et d'Histoire Naturelle de Genève. Tome XX., seconde partie. From the Society.

Bibliothèque Universelle et Revue Suisse. Archives des Sciences Naturelles. Nouvelle Période. Tome 29me, Nos. 153–156. From the Editor.

Lausanne. Bulletin de la Société Vaudoise des Sciences Naturelles. Vol. X., Nos. 63 and 64.

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[April 9,

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GENERAL INDEX.

BIOLOGICAL AND MICROSCOPICAL DEPARTMENT

OF THE

ACADEMY OF NATURAL SCIENCES.

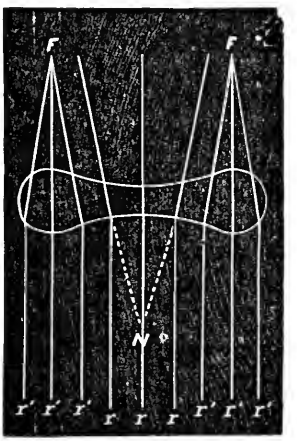
JANUARY 16.

CONVERSATIONAL MEETING.

Prof. J. H. McQUILLEN in the chair.

Twelve members present.

The attention of the Section was asked by Prof. James Tyson, to a simple diagram which he had been in the habit of using in his lectures, for several years past, to impress upon students the circumstances under which the reversal of lights and shadows takes place in red blood-corpuscles while under microscopic examination. The familiar "cracker shape" of the corpuscle being acknowledged, and supposing the entire corpuscle in focus when there is the least shadow, it is plain that the central portion is a double concave lens, while the periphery will act as a double convex lens. The centre of the corpuscle will therefore cause the parallel rays *r r r* to disperse and pass beyond the corpuscle,



diverging as though coming from the negative focus N, which is the point to be focussed by the object-glass to make the centre bright. But to do this, the object-glass must approximate the corpuscle, hence it becomes within the focus for the entire corpuscle. But when this is the case the periphery of the corpuscle is dark, because acting as a double convex lens it causes the parallel rays r' r' r' coming from the mirror to converge and to come to a focus at the point P, above the corpuscle. Now, to make the periphery appear bright, the point P must be focussed. But to focus this, the object-glass must be removed from the corpuscle, since the rays must again diverge before they can again be made to form an image, and in so doing the object-glass is placed "beyond the focus." When this is the case, however, the centre is no longer in focus, and, therefore, appears dark while the periphery is bright. In the opposite position, or when the objective is within the focus, the centre is bright and the periphery dark. The diagram can easily be carried in the mind's eye, and at once the facts can be thought out without troubling with their recollection the memory, which is here particularly apt to be treacherous. Indeed, the speaker said that he could never recollect the circumstances under which the centre was bright and the periphery dark, and *vice versa*, until he had called to his aid this diagram. And that the exact circumstances are liable, at least, to escape attention, is seen in the fact that in a work of no less acknowledged value than the seventh edition of "Carpenter's Human Physiology" (1869) is contained a misstatement of the facts. We find, on page 200, the object-glass described as being *rather beyond* the focus of the microscope when the periphery is dark and the centre bright, and *within the focus* in the opposite appearance—that is, when the centre is dark and the periphery bright. They should be reversed. In the last edition (1868) of Carpenter on the Microscope, however (pages 166, 167), we find the principle applied and the fact correctly stated, though a few lines further we find it stated that the hexagonal areola in diatoms appear dark when the surface is slightly beyond the focus, when they are described as hexagonal *elevations;* if the latter be the case, then *they should appear dark when within the focus*, as is the case with the periphery of the corpuscle. So, too, on page 710 of the latter volume there is reproduced the same drawing referred to

in the text-book on physiology, but with the description reversed; and therefore correct. The corpuscle is, however, described as in focus when the periphery is in focus. Of the other text-books now within our reach, Dalton has it correctly on page 214 of his third edition; Flint, Kirke, Ranke in his "Grundzüge der Physiologie," and Stricker in his "Handbuch der Lehre von den Geweben," refer to the reversal of light and shadow, but do not state the circumstances under which it takes place. Marshall makes no allusion to it.

Dr. McQuillen exhibited five microscopical specimens prepared by Dr. George D. Harriman, of Boston, consisting of dentine, cementum, and bone, which had been acted upon by dilute muriatic acid removing the earthy salts and leaving the cartilaginous basis of which those structures are composed, the latter of which had then been stained with carmine. These specimens had been prepared with a view of demonstrating that dentine does not consist of tubular and intertubular structures; also that in cementum and bone the lacunæ and canaliculi are not empty spaces, but occupied by a soft solid body or substance.

February 6.

Director S. W. Mitchell in the chair.

Sixteen members present.

Mr. William H. Walmsley exhibited slides showing the difference between the torn edge of our ordinary paper and that of the thick, strong paper used by the Chinese for the manufacture of clothing. Both appeared to be composed of cotton, but the foreign article bore the aspect of being made directly from the cotton fibres, instead of from comminuted woven fabrics.

Fig. 1.

Dr. McQuillen directed attention to a remarkable specimen of hypertrophy of the roots of a left superior molar measuring $2\frac{1}{2}$ inches in length by $2\frac{5}{8}$ inches in circumference, and weighing $12\frac{1}{2}$ dwts. (Fig. 1), which he had exhibited at a previous meeting and of which he had promised to make a microscopical examination. This he had done, and now sub-

mitted the results under the microscope in three sections taken from the same locality, one being under the other.

As he had anticipated, the growth proved to be hypertrophy of the cementum, one of the three hard structures entering into the formation of the human tooth, viz., enamel, cementum, and dentine. The term exostosis, frequently applied to this growth, was open to exception on account of the fact that there are certain characteristic differences between cementum and bone, which any one at all familiar with the microscopical anatomy of these two structures will readily recognize.

With a view of making these differences apparent to those unacquainted with the subject, he had placed under one of the microscopes a section of bone. This specimen shows a transverse section of the Haversian canals with the lacunæ and canaliculi arranged around them in concentric laminæ. In the cementum, on the contrary, canals for the passage of blood-vessels are rarely seen, while the lacunæ and canaliculi are quite numerous.

The three sections from the hypertrophied structure differ from each other in a somewhat remarkable manner, when taking into consideration the fact that they had been in such close contiguity.

In the first or outer section the lacunæ and canaliculi are presented in the usual arrangement of cementum. In the second section, taken immediately under it, there are, in addition to the lacunæ and canaliculi, a number of irregular spaces; while in the

Fig. 2.

third section (Fig. 2) the lacunæ are largely increased, and the canaliculi are more numerous and increased in length, running

in a spiral direction analogous to dentinal tubuli in secondary dentine.

Dr. F. W. Lewis inquired what difference there was between these exostoses and epulis.

Dr. James Tyson remarked that, microscopically, true epulis is a fibrous tissue, and springs from the mucous membrane, although the giant-celled myeloid tumor (giant-celled sarcoma of Virchow) generally springs from bone, and is sometimes incorrectly called epulis. With regard to the nature of cementum, Dr. T. suggested that it seemed more philosophical to place it in the same category with bone, since it only differed from true osseous tissue in the absence of Haversian canals for minute bloodvessels, which were unnecessary on account of the close contiguity of the structure (cementum) to its vascular supply.

Dr. Tyson also showed an ingenious *gastric canula*, improved by himself by the addition of a cover and catch for preventing the loss of gastric juice, an accident which is constantly occurring with the ordinary canula in consequence of the animal's scratching out the cork after the instrument is adjusted in the fistula from the stomach.

February 20.

CONVERSATIONAL MEETING.

Seven members present.

March 6.

Director S. W. Mitchell, M.D., in the chair.

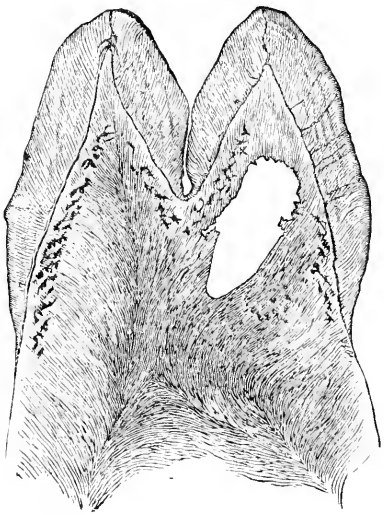
Eight members present.

The Corresponding Secretary presented photographs of the test Diatoms *Surirella gemma* and *Amphipleura pellucida* (the latter exhibiting 91,000 striæ to the inch) from Col. J. J. Woodward, of the Army Medical Museum at Washington, and moved a vote of thanks for the same, which was carried unanimously.

Dr. J. H. McQuillen exhibited half a dozen microscopical slides, handed to him by Dr. R. W. Varney, of New York, viz.: Transverse section of the maxilla of a cat, with the incisors, canines, and molar teeth in position; nodules of secondary dentine; sec-

tion of hypertrophied root of a molar tooth; hemipterous insect (*Tingis arcuata*); longitudinal section of a deciduous incisor and of a molar tooth. Dr. McQuillen directed particular attention to the last-named specimen as having a practical significance bearing upon the diseases and treatment of the teeth. Under the microscope a fissure (Fig. 3) inappreciable to the naked eye could

Fig. 3.



be seen passing through the enamel and enlarging into an oval cavity near the junction with the dentine, also a number of interglobular spaces in the dentine in close proximity to the fissure in the enamel. This fissure and the interglobular spaces, being due to defective formation, are therefore predisposing causes of decay. While such a fissure would be inappreciable to the naked eye, a delicate probe would readily pass into it, and a tooth found in such a condition should be filled immediately, so as to prevent the development of caries; for so long as acids, decomposed food, and other exciting causes are prevented from coming into contact with the defective dentine, the predisposing cause remains dormant. This specimen closely demonstrates the importance of promptly filling the small cavities formed in the depressions on the grinding, buccal, and lingual surfaces of the bicuspids and molars, and on the palatine surface of the incisors and canines.

April 3.

Director S. W. Mitchell, M.D., in the chair.

Eight members present.

A donation from the Surgeon-General's office of Dr. J. J. Woodward's interesting report, entitled "A Memorandum of the Test Podura, with Five Photo-micrographs," was received.

Dr. James Tyson exhibited slides of the deposit from two specimens of urine from a so-called *intermittent hæmaturia*, which were interesting, if not important, from the fact that the first specimen, though containing granular casts, did not contain blood-corpuscles, and that the second, between which and the first the urine had become quite clear, contained, in addition to granular casts, blood-corpuscles and blood-casts. The importance of this observation lies in the circumstance that in the cases of intermittent hæmaturia reported by Harley (*Medico-Chirurgical Transactions*, vol. 48, 1865), blood-corpuscles were exceedingly rare, being found in but a single case, and not more than one or two in the field of the microscope. So rarely, indeed, have corpuscles been present, that Dr. Beale, in the first volume of the *Practitioner*, August, 1868, says that "it is therefore improbable that in these cases there is any hemorrhage as in acute inflammation of the kidneys, and they ought not to be spoken of as cases of hæmaturia."

In the present case all the other phenomena of intermittent hæmaturia attend, and in the second specimen of urine there are many free blood-corpuscles and blood-casts, while in the first the most careful searching detected none.

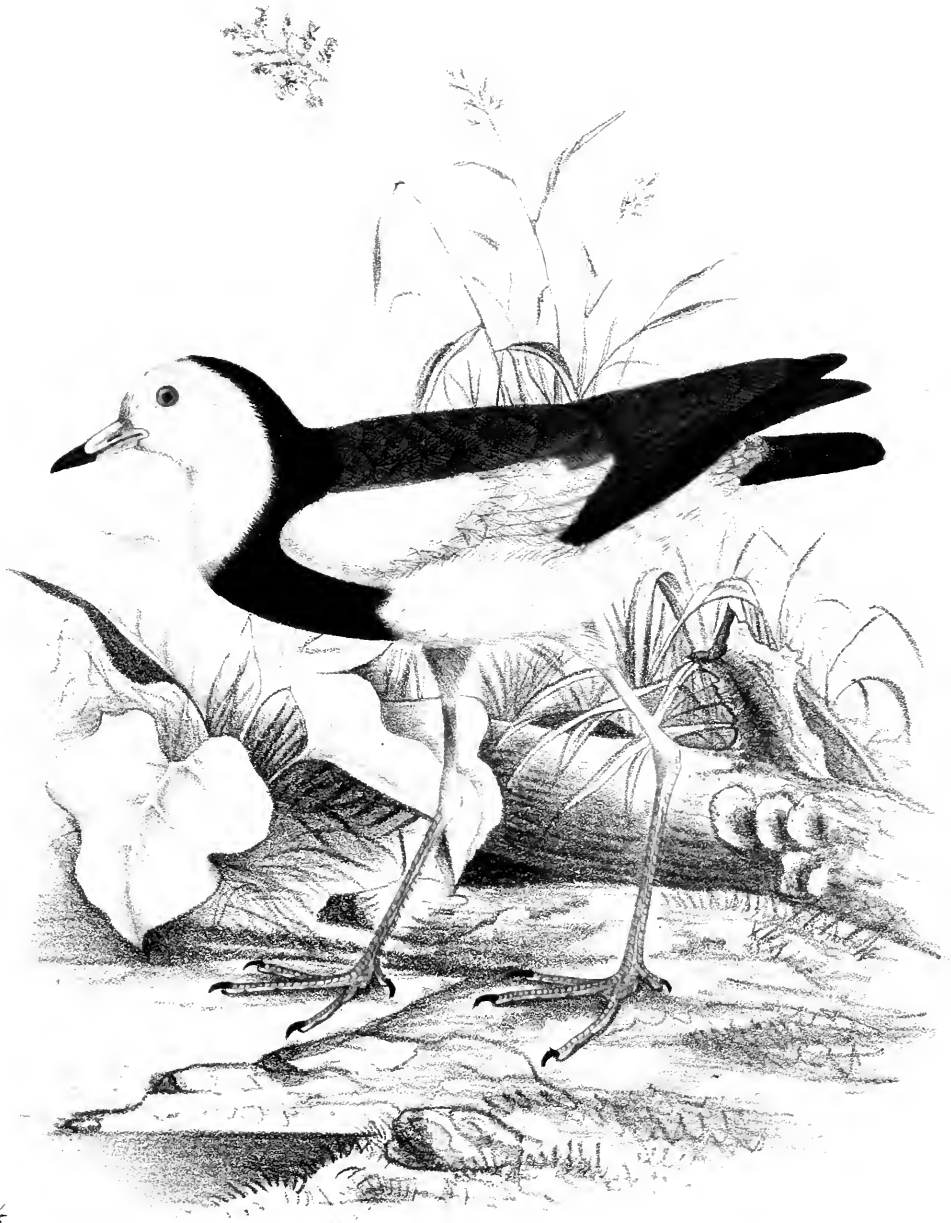
The treatment found most useful in intermittent hæmaturia, that by antiperiodic doses of quinia, preceded by a purgative dose of calomel, has been the most satisfactory, there being no recurrence since its adoption, although three weeks have elapsed, while other modes of treatment adopted since October, 1870, when the affection first appeared, have signally failed.[1]

Dr. Joseph G. Richardson exhibited a slide charged with *pulmonary elastic tissue* from the boiled sputa of a phthisical patient in the Episcopal Hospital, and called the attention of the

[1] July 1st, 1871. The patient has since quite recovered under this treatment.

Section to some characteristics of the elastic fibres, to wit, first, the Delta (Δ) rather than simple *Y* shape frequent among the fragments, which he attributed to the greater resistance at the meeting-point of the walls of three air-vesicles to any disintegrating process; and second, the transverse fracture of its component elastic filaments, resembling that of an India-rubber thread, instead of displaying a frayed-out appearance similar to that presented at the extremity of a broken cotton or linen string.

By these peculiarities pulmonary elastic tissue can generally be distinguished from folds in the walls of boiled-starch corpuscles; from mycelial threads of fungi (which, when dichotomous, often have stem and branches of nearly the same size); and from vegetable fibres, which seldom break transversely, and which, when split, generally assume the *Y* and not the *Delta* shape. (*Vide paper on the Detection of Lung Tissue in Sputum, in the New York State Medical Society's Transactions for* 1871.)



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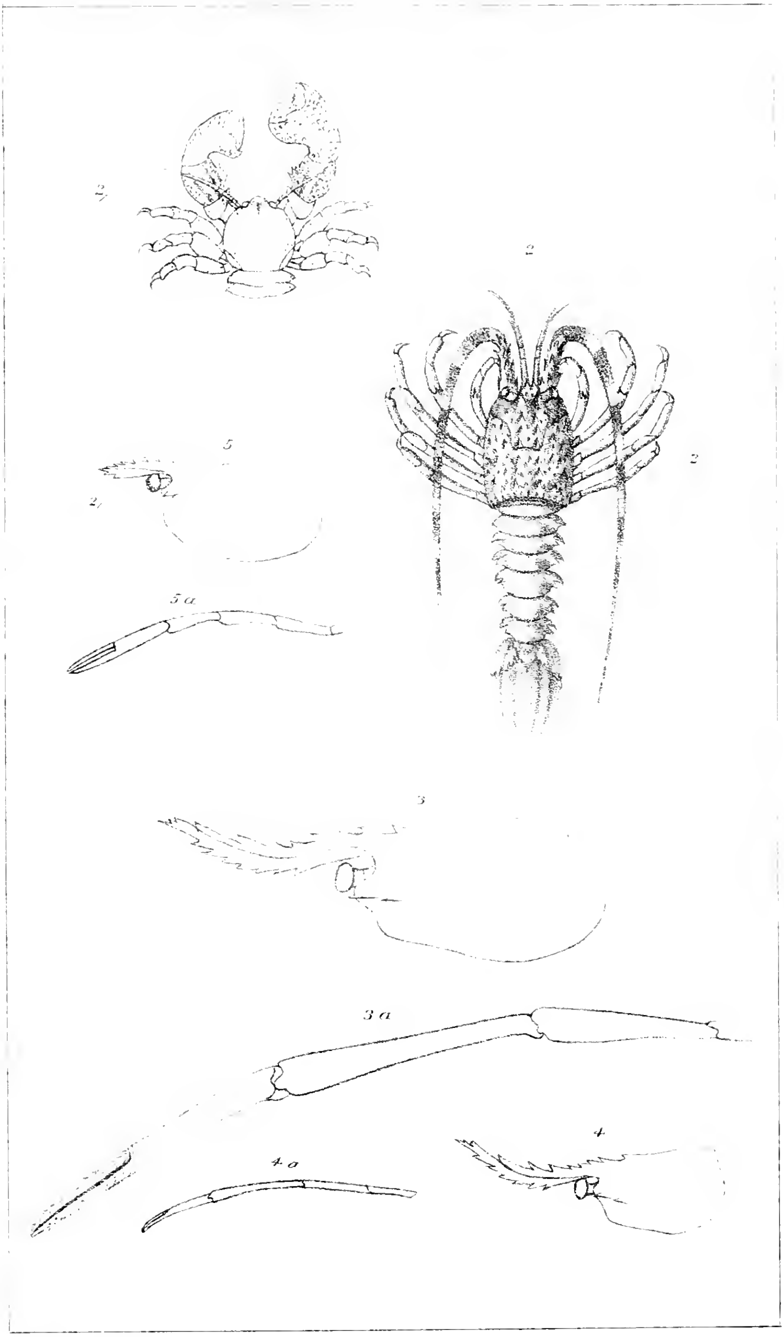
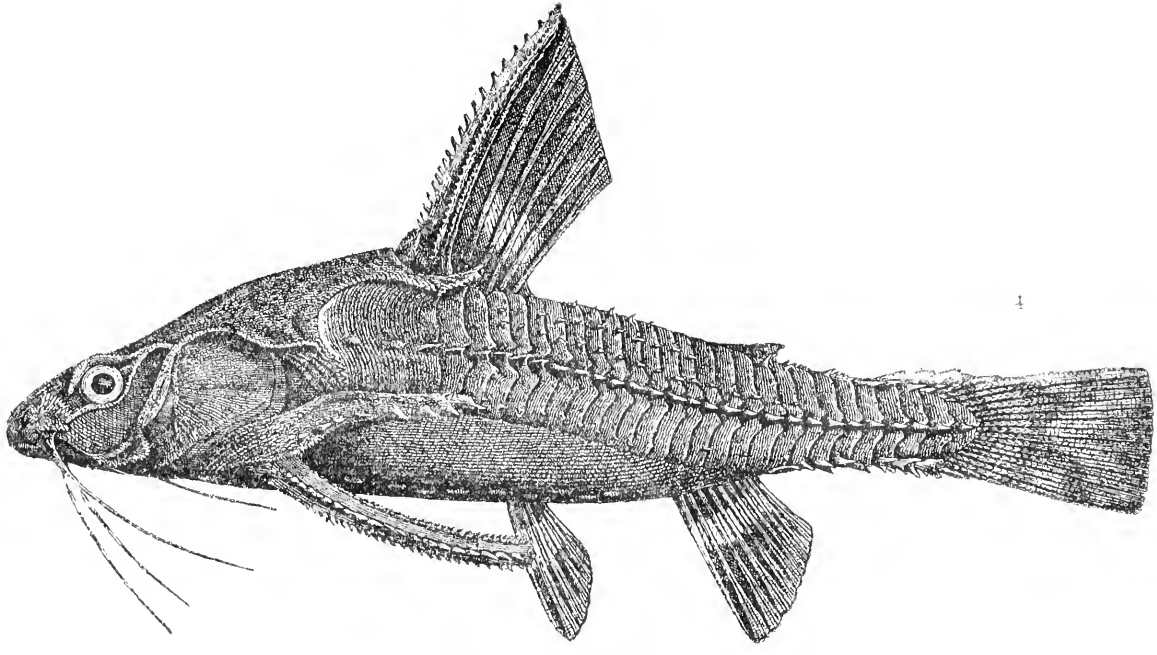
HANNAH T. SMALLWOOD

Chettusia nivifrons, Ogden

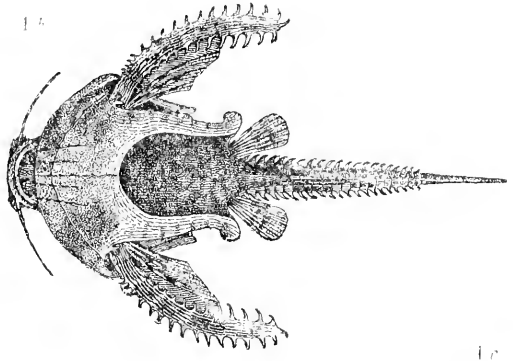


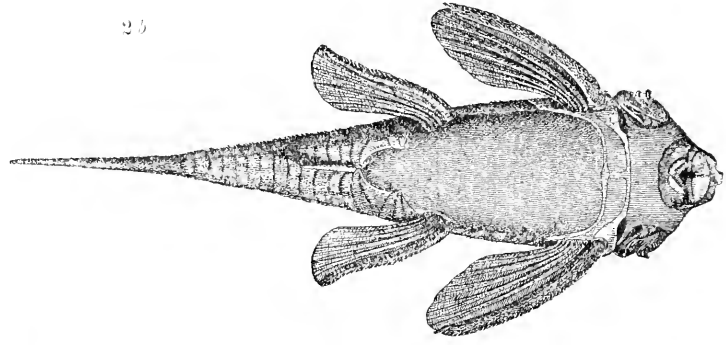
HANNAH T. SMALLWOOD

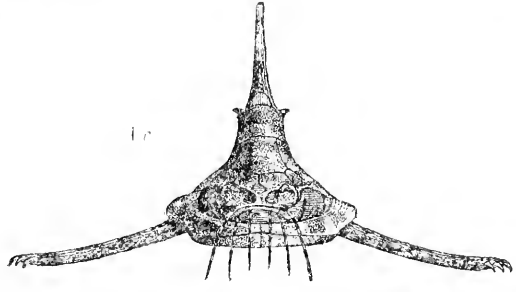
Streets on New Mexican Crustacea

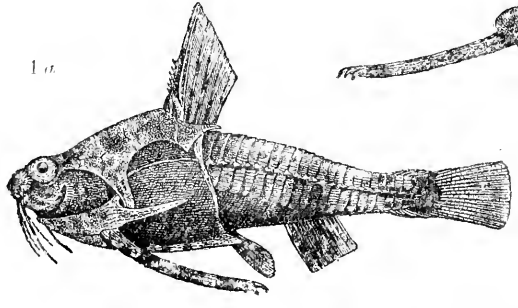


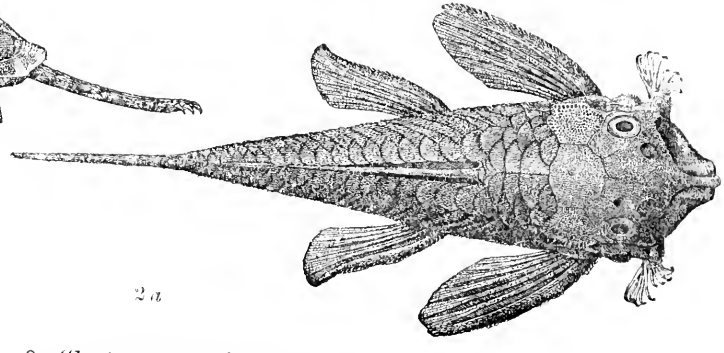
Doras pectinifrons, Cope.



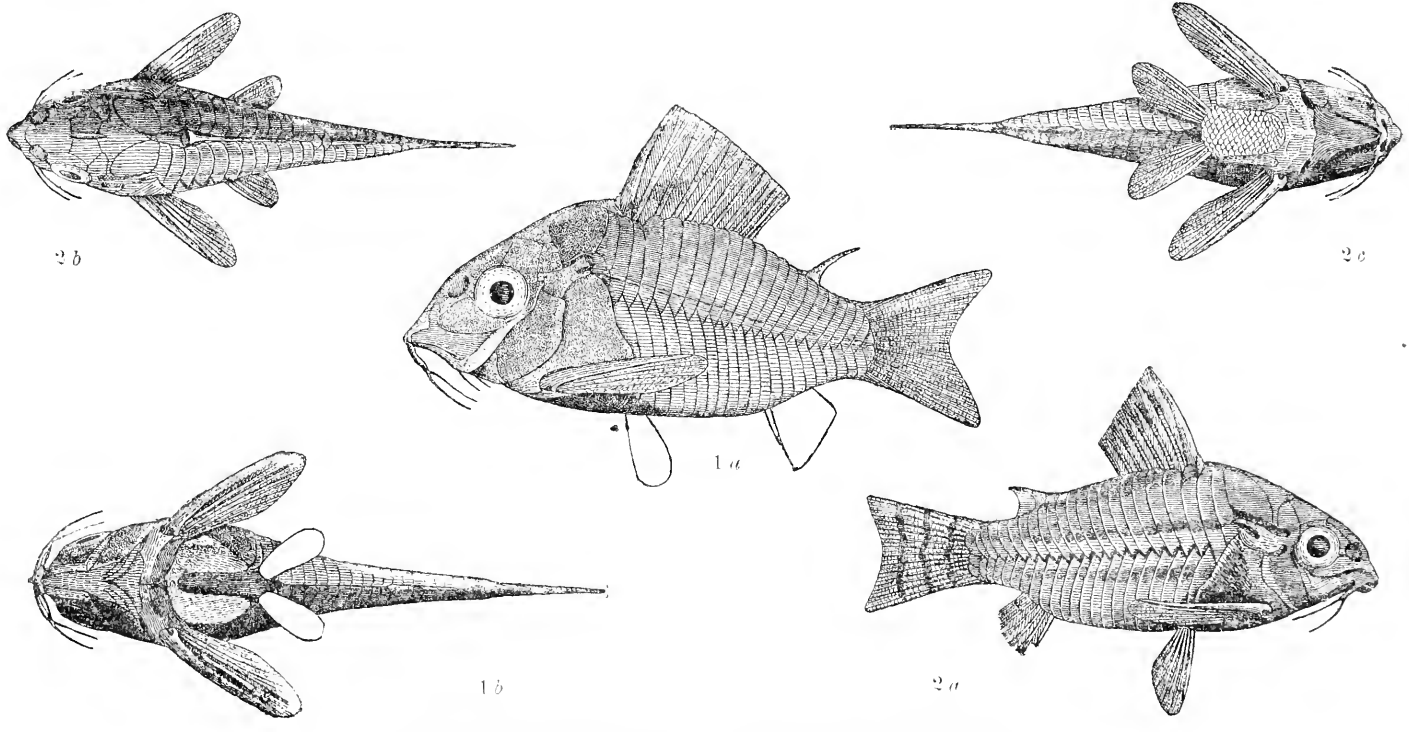




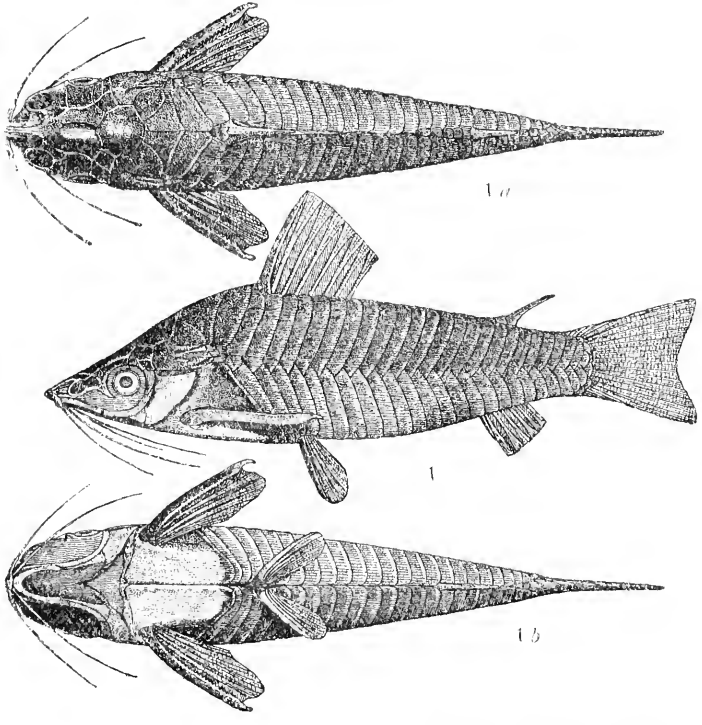


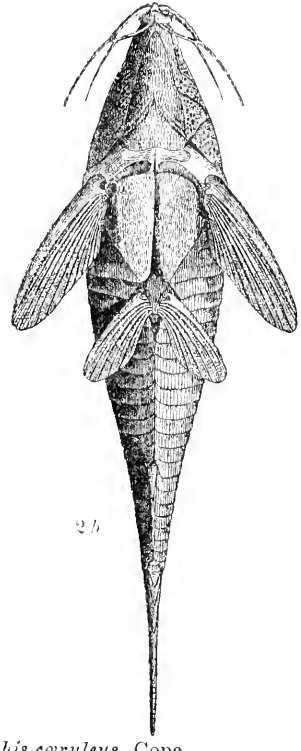


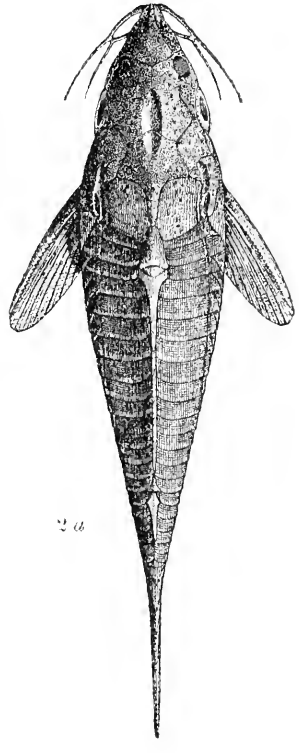
1. *Physopyxis lyra*, Cope. 2. *Chaetostomus malacops*, Cope.



1. *Corydoras semiscutatus*, Cope. 2. *Corydoras trilineatus*, Cope.

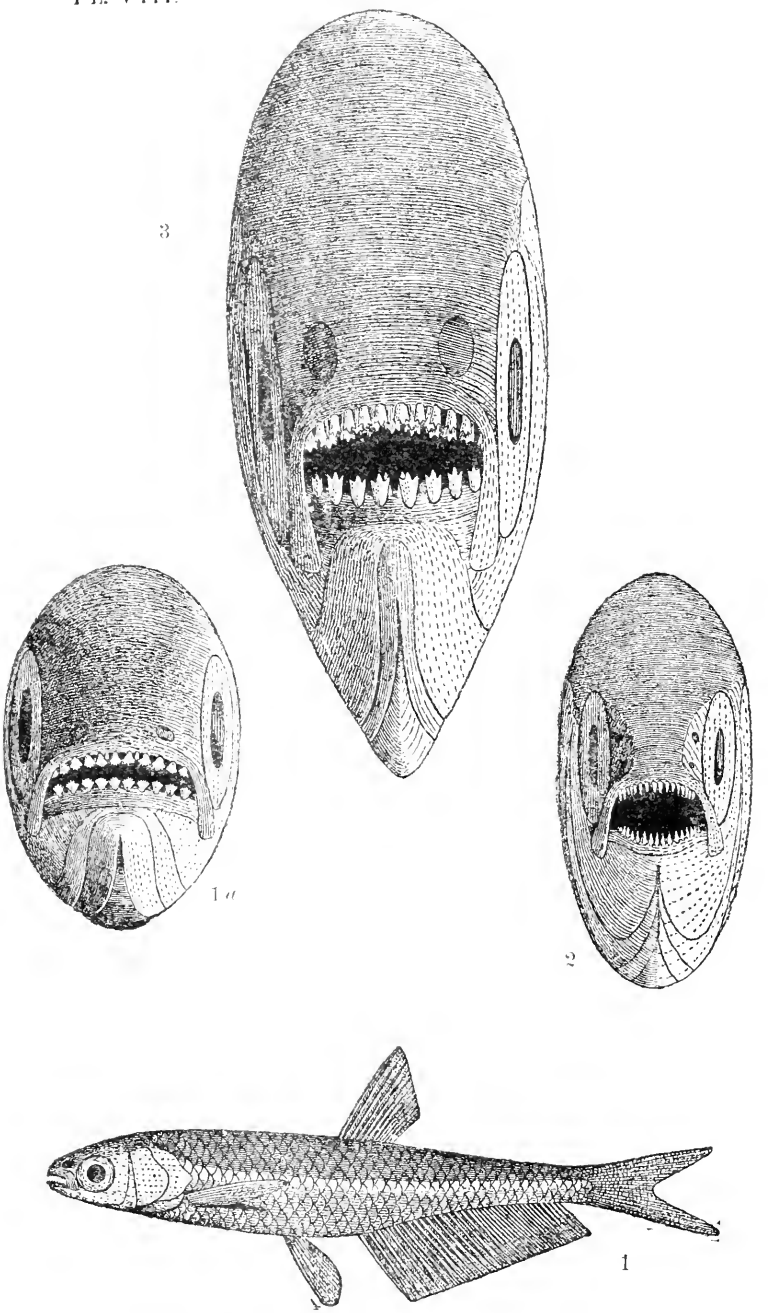




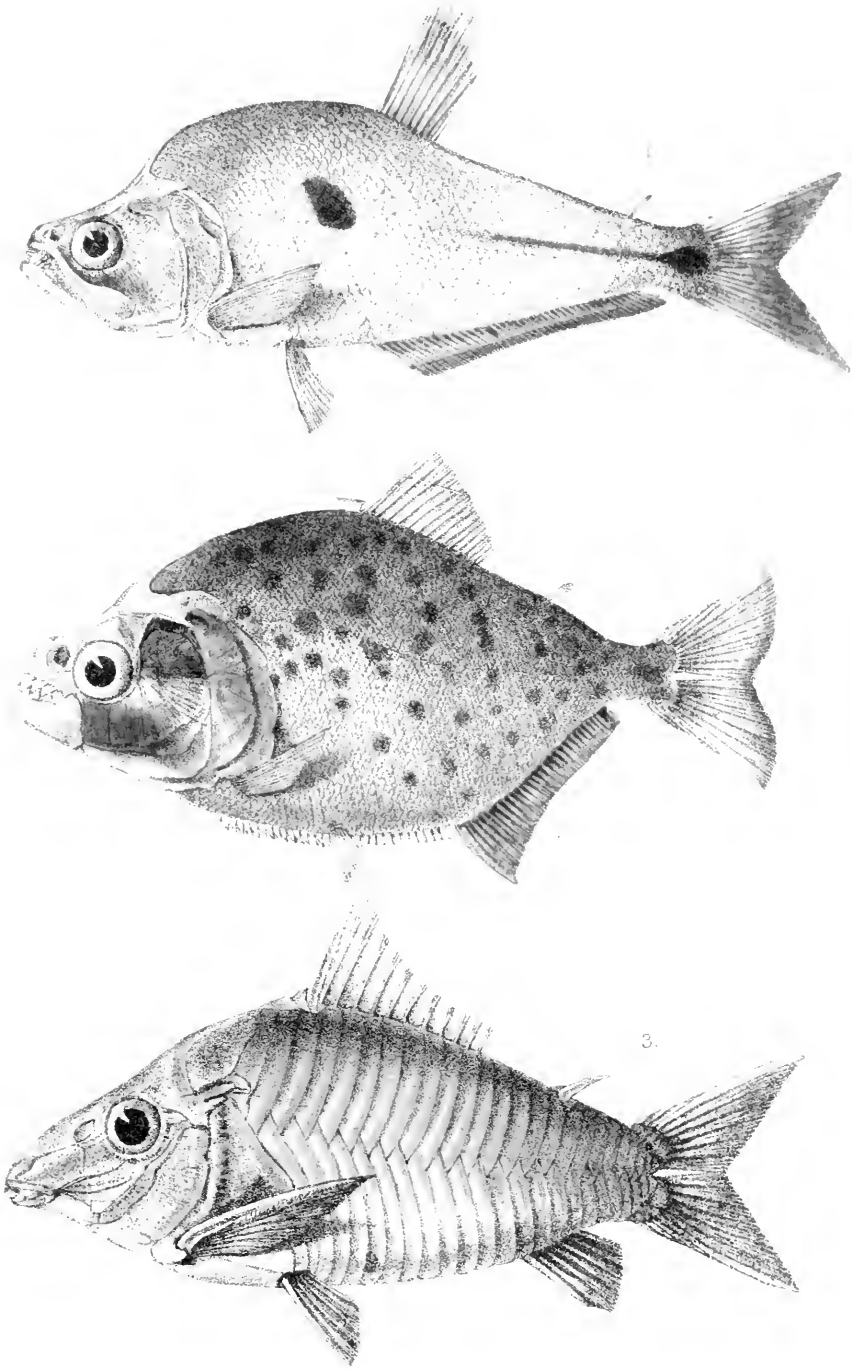


1. *Dianema longibarbis*, Cope. 2. *Brochis cæruleus*, Cope.

Pl. VIII.



1. *Iguanodectes tenuis.* 1 *a. Dentition.* 2. *Characidium etheostoma, dentition.* 3. *Triportheus albus, dentition.*



1 Anacyrtus sanguineus 2 Serrasalmo irridopsis 3 Brochis coeruleus

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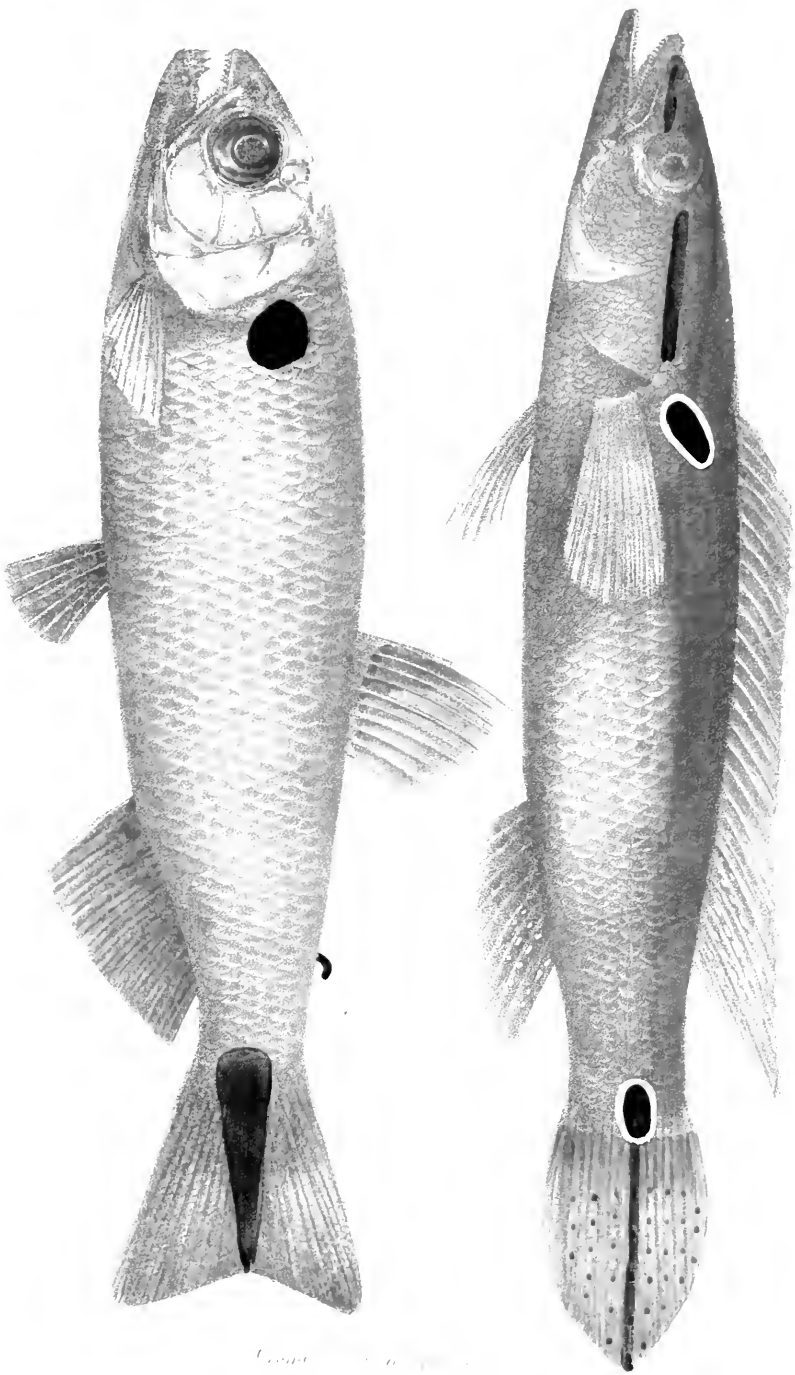
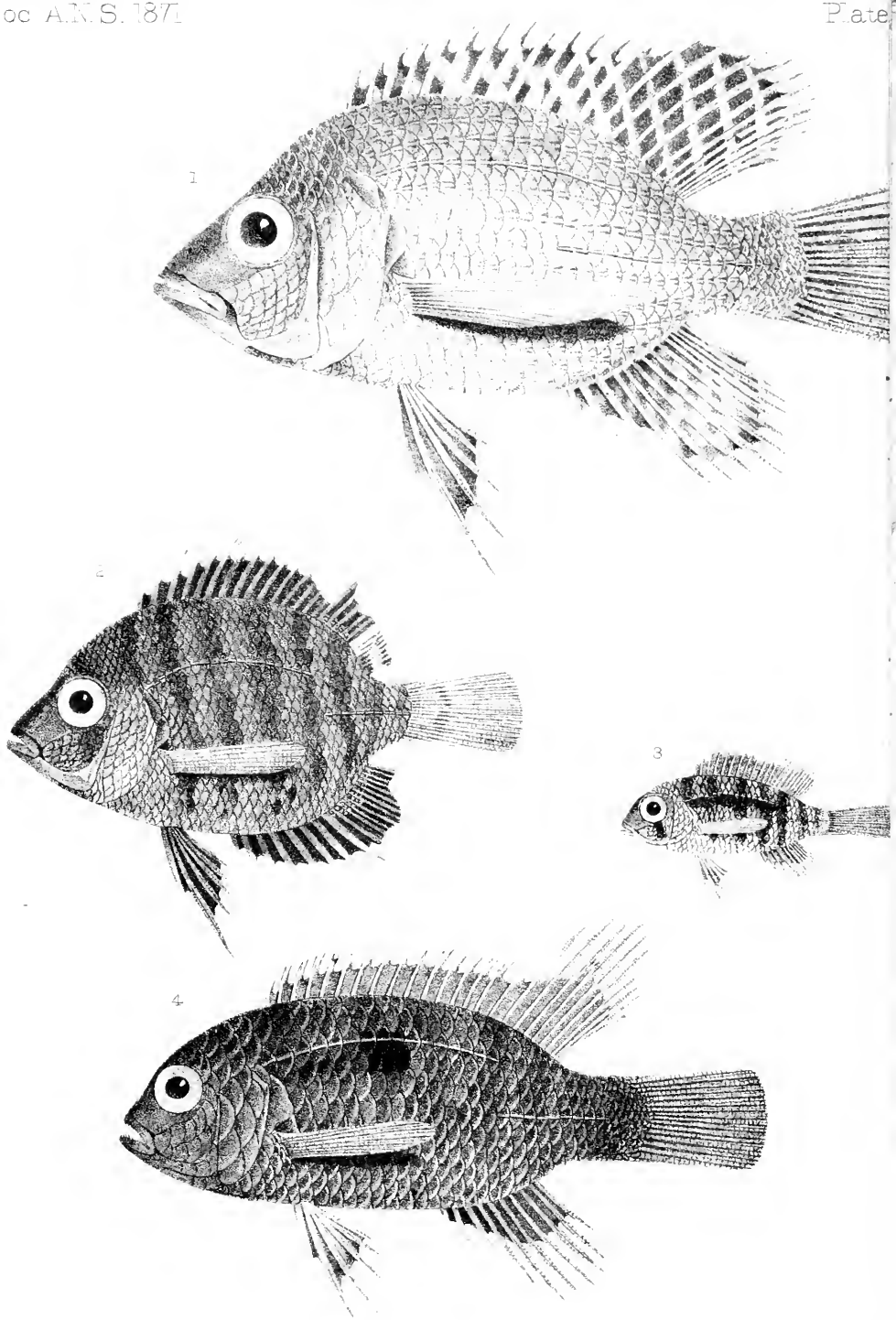
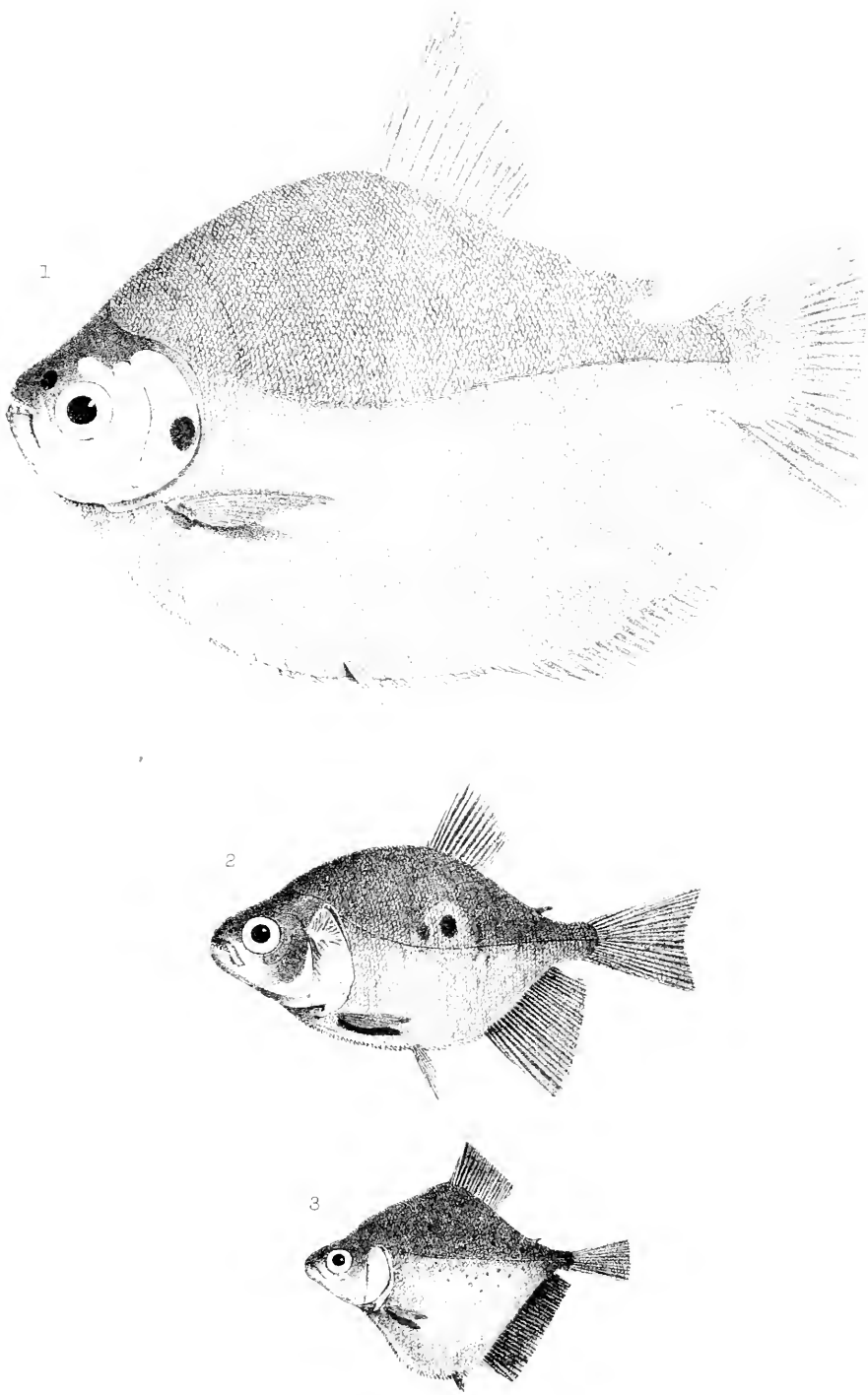
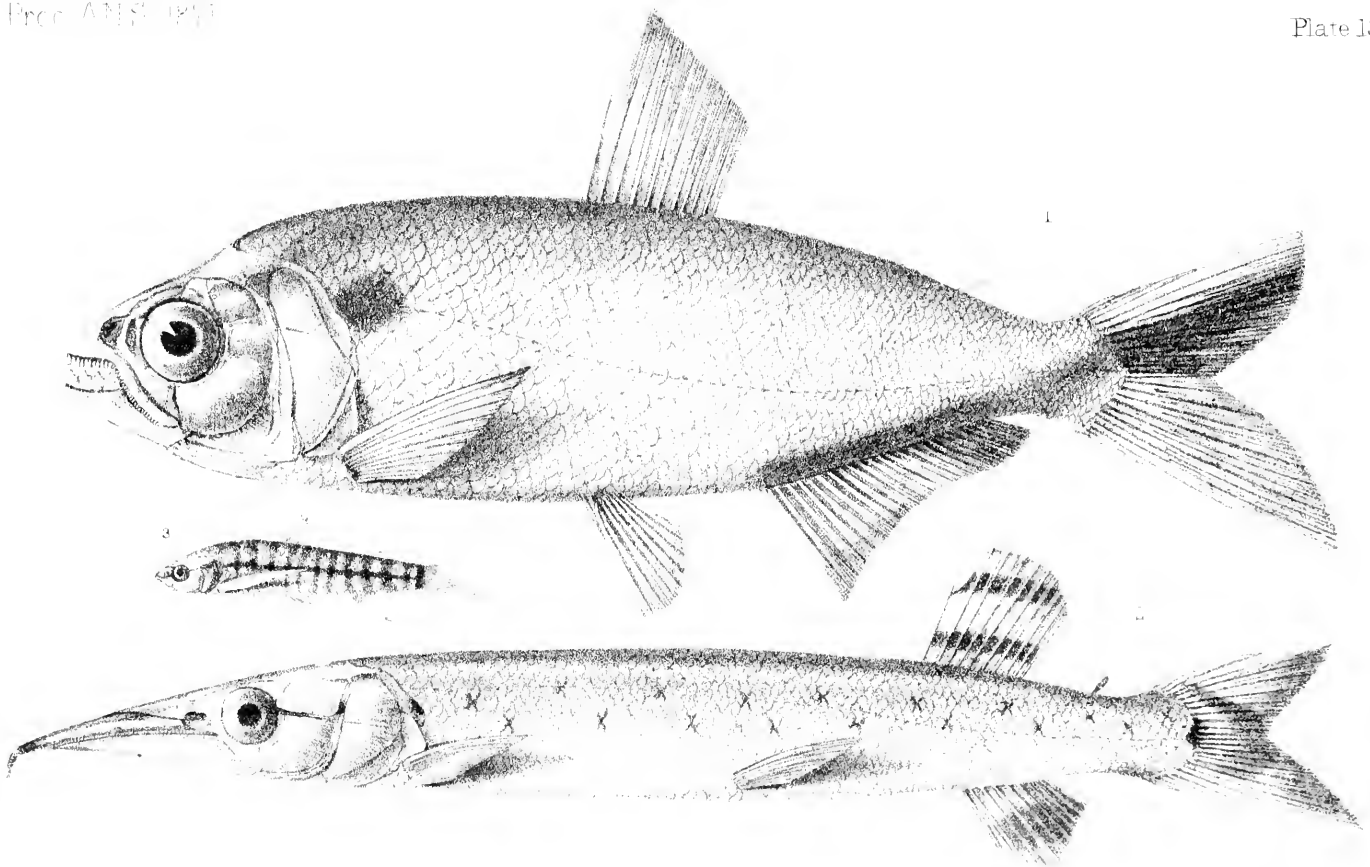




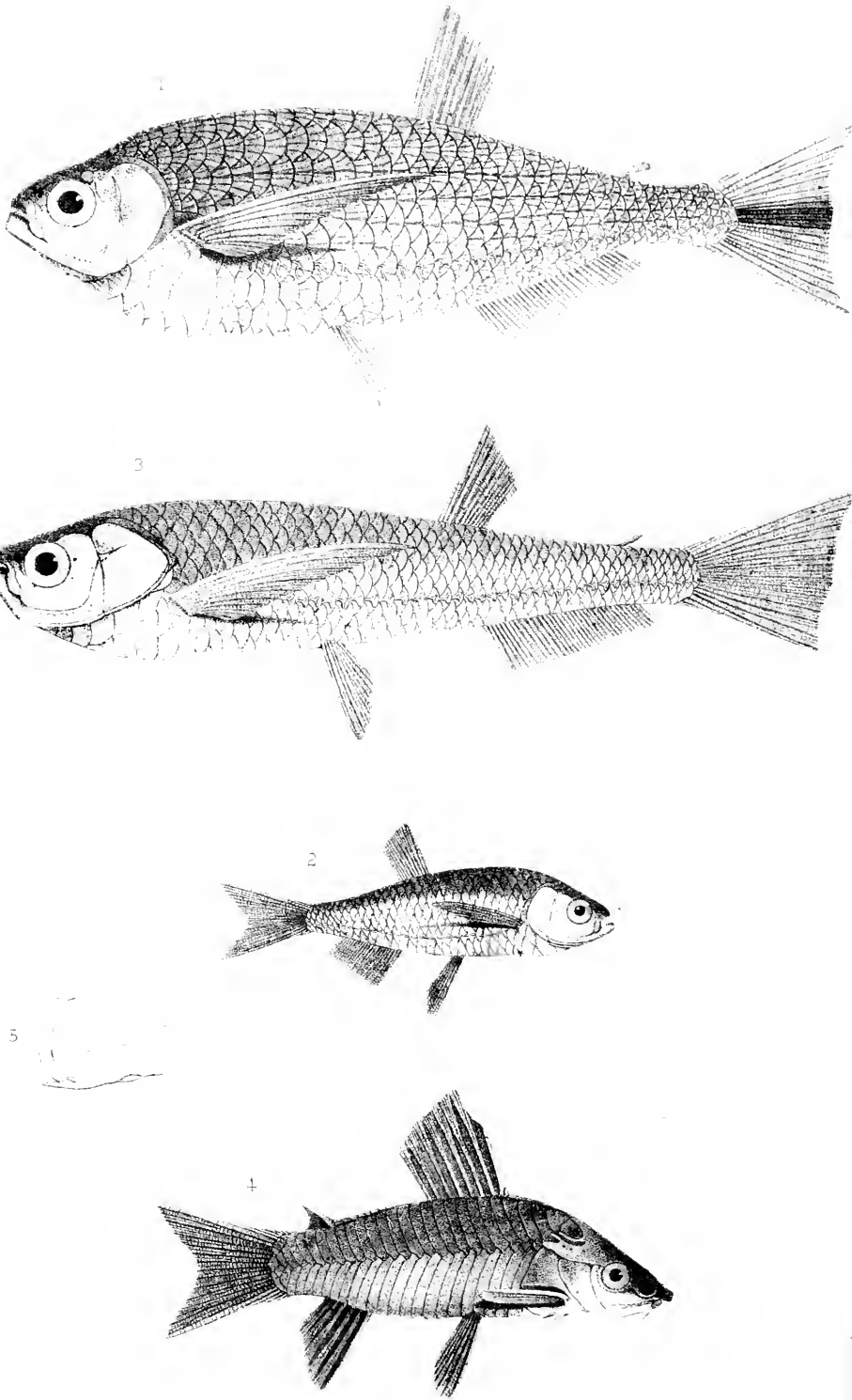
1. Geophagus badupinnis. 2 Varuscentrarchoides. 3 Acara sysphus
4 Acara flavilabris Cope.



1 Myletes albiscopus 2 M. oculus
3 M. hemiurus Cope.

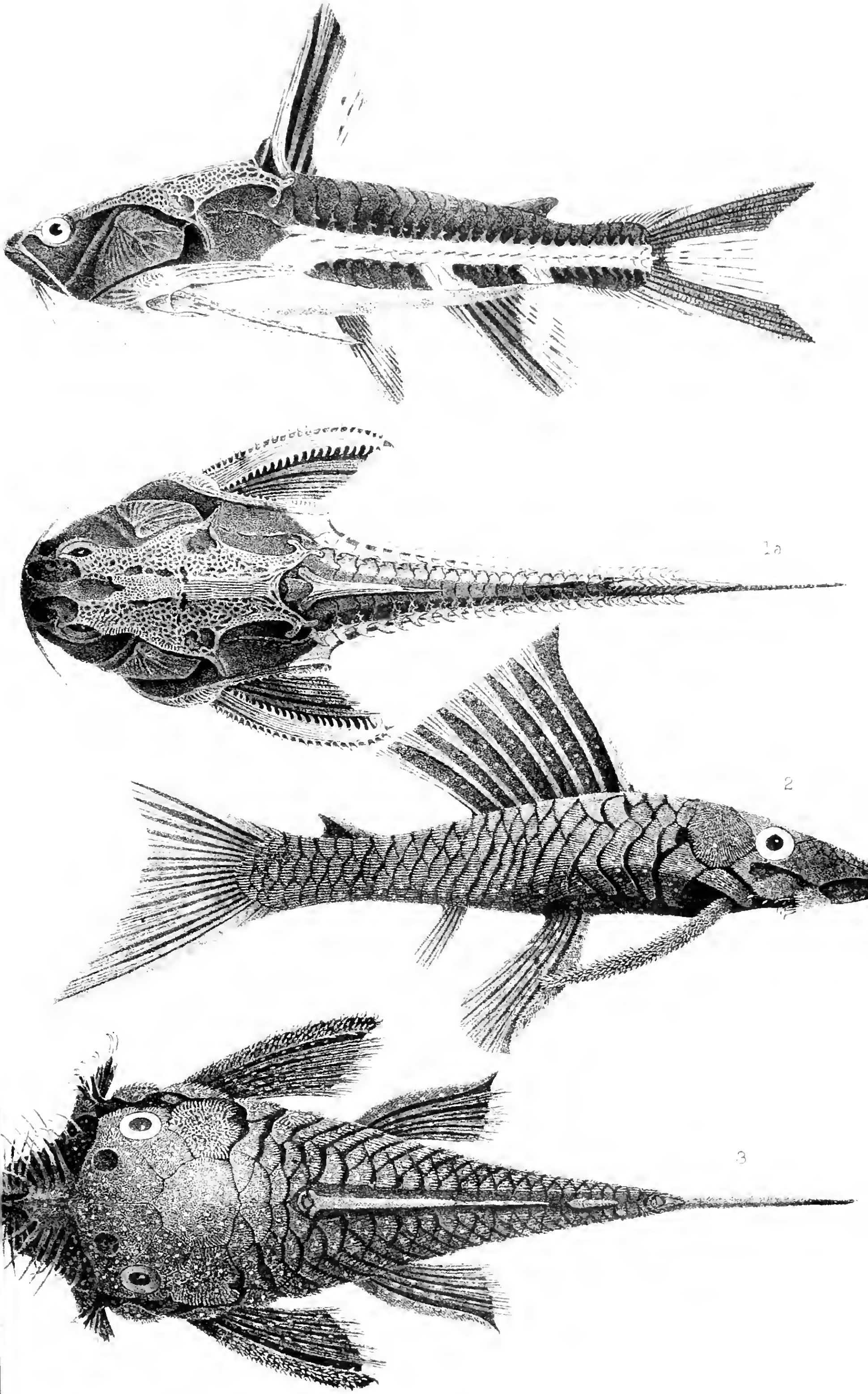


1 *Megalobrycon melanopterum* 2 *Xiphostoma taedo* 3. *Characidium etheostoma*



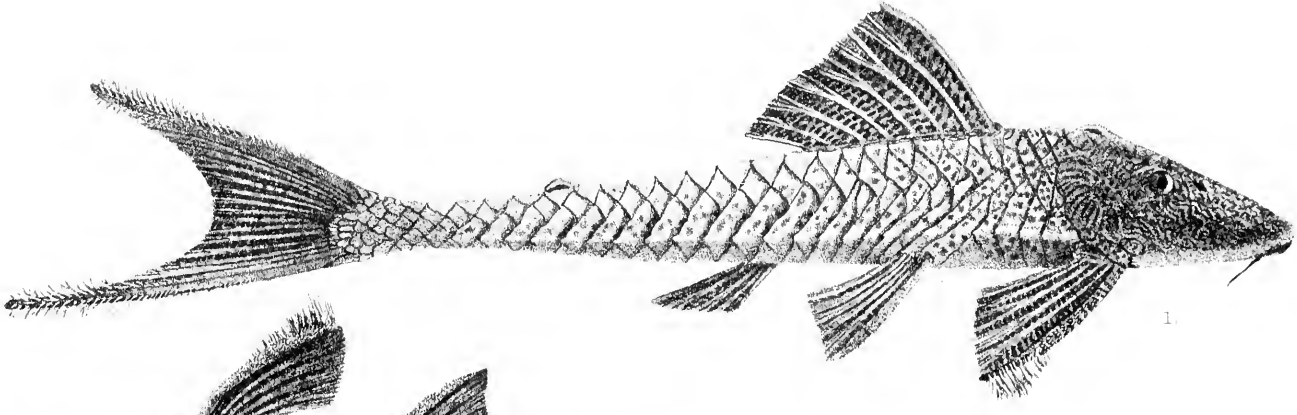
1 Tryportheus flavus. 2 T olbus. 3 Chalcinus cultter.
4.5. Callichthys melampterus Cope

EDWIN SHEPPARD L.



1 Doras grypus. 2 Chaetostomus tectirostris 3 Chaetostomus alga Cope

HEPP.



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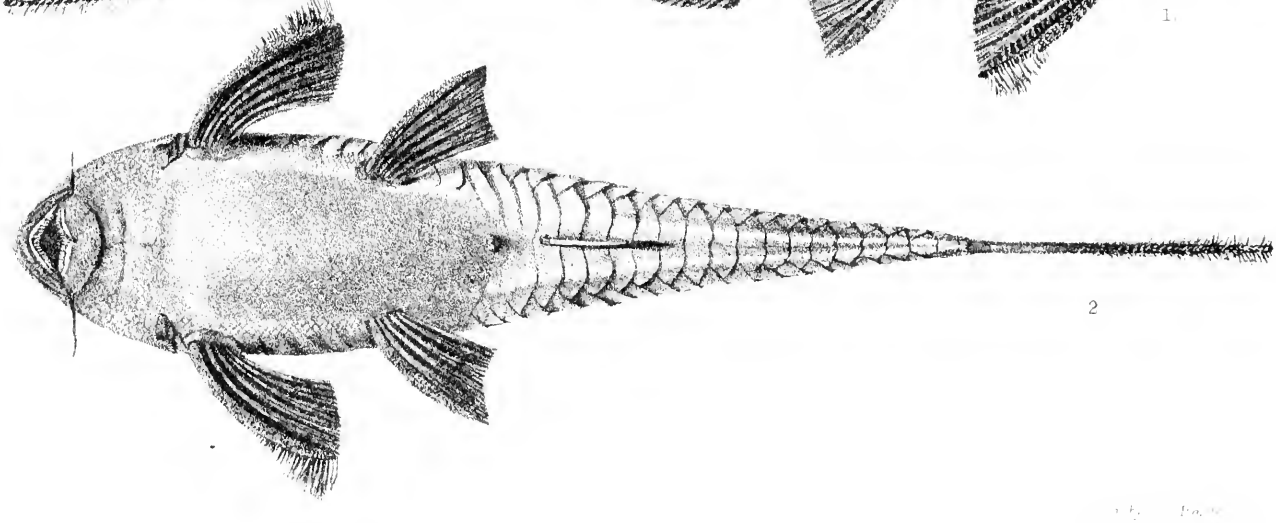

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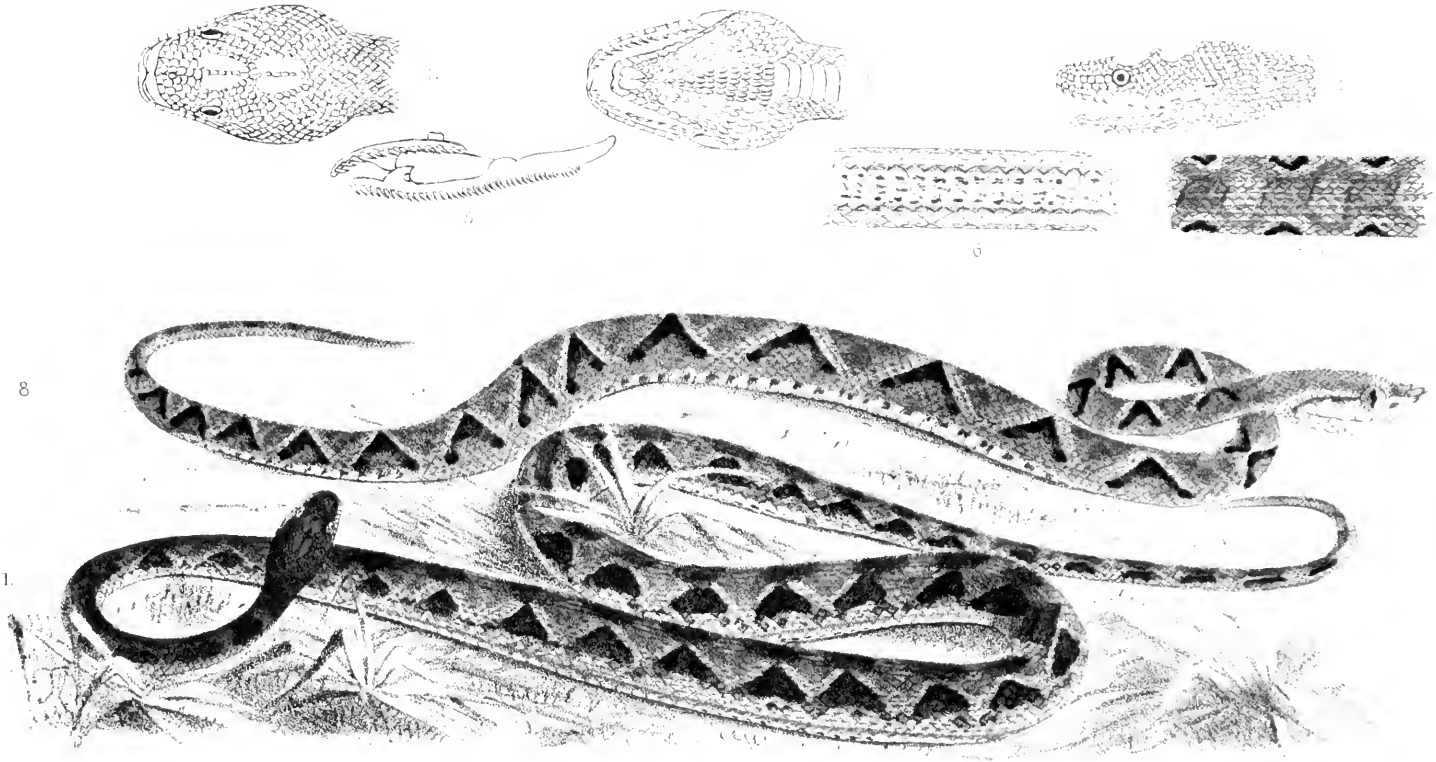
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1.