PROCEEDINGS

OF THE

BOSTON SOCIETY OF NATURAL HISTORY.

TAKEN FROM THE SOCIETY'S RECORDS.

January 1, 1862.

The President in the chair.

Mr. Wilder described the muscles which move the snout of the hog. The elevator has a very long tendon, and its muscular attachment is very far back, protected by a long ridge, and safe from all ordinary accidents; the depressor, on the contrary, is very short, and attached very near the terminal cartilage, both muscles of the important organ being thus protected from injury. He remarked that while we consider the long snout of the hog, compared with that of common animals, as a sign of what we know to be his beastly nature, yet the same organ, still further prolonged into the trunk of the elephant, changes its function with the nature of the animal so as to be capable of executing very various and delicate motions. So that it is not always safe to take a single organ as an index of the nature of the possessor.

Mr. Marcou observed, in regard to deep-sea soundings, that a Norwegian naturalist had recently obtained, by means of the same instruments used by Capt. McClintock and Dr. Wallich, between Cape North and Spitzbergen, living animals from a depth of 8400 feet (more than 1½ miles); at this

depth, where the temperature was only three-tenths of a degree centigrade (nearly the freezing point), were found living polyps, mussels, tunicata, annelides, and bright-colored crustaceans. The same naturalist had found ammonites (probably Jurassic), and leaves resembling those of the palmetto (probably miocene), at Spitzbergen.

Mr. Stodder read a paper "On the structure of the Valve of the Diatomaceæ," and exhibited specimens of great beauty under the microscope.

ON THE STRUCTURE OF THE VALVE OF THE DIATOMACEÆ. BY CHARLES STODDER.

There are recorded a few observations which mention the existence of more than one plate of silex in the valve of some three or four species of Diatoms. Mr. Shadbolt (Trans. Mic. Soc. 1st series, vol. iii., p. 49) describes the valve of *Arachnoidiscus Japonicus* as consisting of two layers. Mr. Ralfs (Pritchard's Infusoria, 4th ed., p. 839) says the valves of *Actinoptychus undulatus* "frequently consist of two dissimilar plates, one having the usual character, the other being triradiate and minutely punctate, and which has been described as a new species by Mr. Roper, who first observed it detached from the true valve. He and others have since found the plates *in situ*." Dr. F. W. Lewis (Notes on new and rarer species of Diatomaceæ, Phil., 1861, p. 6), describing *Navicula marginata*, speaks of "the outer silicious plate." Schleiden (Pritchard, 4th ed., p. 41) speaks of "two leaves lying one over the other." Mr. Brightwell says of the lorica of *Triceratium* that "the valves are resolvable into several distinct layers of silex, dividing like the thin layers of talc." (Pritchard, p. 49.) These are all the authorities I can find that intimate the existence of more than one plate of silex in the valve.

Ehrenberg describes several species of Diatoms as "veiled," — a most happy term as expressive of the appearance of those species to which it is applied. Neither Ehrenberg nor any other microscopist has offered any explanation of the cause of this appearance. Among the species thus distinguished, are the four species of *Heliopelta*, though the fact is not mentioned in any of the published descriptions, all of which are more or less imperfect.

Some time ago I found a broken specimen of *Heliopelta*, which exhibited clearly portions of the valve with the normal characters of the genus, and, extending beyond the broken edges, portions of another and inner plate of an entirely different structure. A few months since, Mr. J. S. Melvin gave me specimens of a Diatom, as possibly a new species. On examination of these I found that he

had obtained the inner plate of the valve of *Heliopelta Lewenhoeckii* entire and perfect. I have since found other specimens in my own collection. This plate under low or medium powers shows only exquisitely fine lines; but with a high power ($\frac{1}{12}$) it is resolved into minute spherical granules of silex, arranged in parallel rows, radiating toward the margin of the disc, placed in contact with each other, and cemented together at their peripheries, the cement filling the interstices. There is a distinct line corresponding to the divisions of the compartments of the outer plate; a triangular blank at the junction of these lines with the margin, a conspicuous feature in the view of the perfect frustule; a star-shaped blank in the centre, the rays of the star being in number one-half of that of the compartments of the disc. *Heliopelta* has the disc divided into six to twelve rays or compartments, one-half of them having distinctly hexagonal areolæ, the alternate half having an entirely different kind of mark, which has never been perfectly described or figured. Dr. Carpenter's description is, perhaps, the best, but his figure is one of the most inaccurate. (Carpenter on the Microscope, Phila., p. 290.) The blank star of the inner plate is also a conspicuous feature of the perfect disc, and the rays of this star always coincide with the compartment last described. The inner plate also shows marks indicating the position of the marginal (improperly so called) spines; and under a high power shows also faint impressions of the areolæ of the outer plate, which I consider proof that the two plates were in actual contact. It is this inner plate that gives the veiled appearance to this and other Diatoms, and I take the "veil" in all cases as a visual proof of the existence of the inner plate. Dr. Carpenter says of *Heliopelta*, that a minute granular structure may be shown to exist over the whole of the valve, — "that the circular areolation exists in a deeper layer of the silicious lorica."

Now, I am certain that Dr. Carpenter was mistaken in this last remark, though, perhaps, not in what he saw. He had simply observed a valve with the inside toward the eye. I have repeatedly seen them in this position, and with the same effect. I have also found what I take to be the inner plate of an *Omphalopelta* entire; but the evidence of its connection with that genus is not quite complete.

A few weeks since I found a broken specimen of *Coscinodiscus;* the hexagonal areolæ were large and distinct, and extending beyond the broken edges, just as described in the *Heliopelta*, was another part of the disc which was simply granular, with a milky aspect. This is the inner plate of the valve of that genus. Since that I have found numerous examples of the same kind, and am now satisfied that they are quite common, and that others as well as myself must have seen

them often before, without being aware of their nature. Like the corresponding plate of *Heliopelta*, this is composed of spherical granules of silex, but instead of being in close contact, they are distant, and joined or cemented together by a thin plate of silex, the arrangement and place of the particles being governed by that of the hexagons of the outer plate, one granule being placed against each hexagon. By careful adjustment of the focus of the instrument, with a power proportioned to the size of the areolæ, the granules can be seen in the centre of the hexagons; care must, however, be taken not to confound an optical effect with the appearance of the granules; each areola is a minute lens, and so refracts the light as to give a bright or dark dot as the focus is changed, and the granules themselves contribute to this effect. Practice, however, will enable one to distinguish these effects.

The species *Eupodiscus Argus* and *Rogersi* present strong evidence of the inner plates; so, also, do some specimens of *Isthmia nervosa*, of *Epithemia*, *Achnanthes*, and *Polymyxus coronalis*. I think I have seen indications of them in several other genera. In some of the *Pinnularia* and *Navicula* there are appearances which I can explain only on the supposition that the valve is composed of two plates, as suggested by Schleiden. Sufficient, I think, has been proved to warrant the generalization that the valve of the Diatomaceæ consists of at least two plates of silex, the inner one of a structure more or less differing from that of the outer, giving that peculiar appearance to those species described as veiled, — partly the cause of the dots in the hexagonal areolæ of some species, — and often, probably, explaining the varying descriptions and figures of different writers.

There is a difference of opinion among Diatomists as to the shape of the dots or marks of the very finely marked kinds, such as the whole of the genus *Pleurosigma* (Smith), — *Gyrosigma* (Hassal), Mr. Wenham, by magnifying photographs of *P. angulatum* to 15000 diameters, has proved, as I think, that the areolæ of that species (and undoubtedly of all the species with diagonal lines) have hexagonal areolæ, exactly like those of *Coscinodiscus*. Professor O. N. Rood, of Troy, by the same process, has obtained photographs of the same species (7000 diameters), which he thinks prove the areolæ to be circular. Professor Rood's photographs show some indications of the hexagonal form, and I believe the difference between his figures and Mr. Wenham's must be owing to some difference in the manipulation. The areolæ of the coarsely-marked forms being unquestionably hexagons, it is probable, from analogy, that those of the finer forms are so also. Mr. Wenham, as quoted by Professor Rood, "states that he has ascertained by a $\frac{1}{60}$th that the markings of this object are due to spherical particles of quartz." (Am. Jour. Science,

Nov., 1861, p. 336.) This observation, with the discovery of the inner plate of the *Coscinodiscus*, and its structure, makes the analogy of the structure of the two genera complete, and may be considered as proving the existence of the inner plate in this genus.

Another point in the structure of the valve has been a subject of much difference of opinion — some contend that the areolæ are elevations, others that they are depressions. Dr. J. W. Griffiths gives, in the Micrographical Dictionary, his reasons for considering them to be depressions. I have reasons for thinking that neither party has the true explanation of the structure. My opinion is that the exterior of the shell is smooth or nearly so, and that the borders of the hexagons, or other shaped areolæ, and costæ of the costate forms, are internal projections from the outer plate, as on the under side of the leaf of the *Victoria Regia*, intended to give strength to the cell with the smallest quantity of material. This will explain the trace of the hexagons seen on the inner plate of *Heliopelta*, as only the projecting wall of the areolæ would come in contact with the inner plate. Dr. Griffiths reasoned that the areolæ were depressions because they were the thinnest parts of the shell; the facts are correct, but the inference may not be, as there is another explanation of the phenomena.

In company with Dr. C. T. Jackson, I have dissolved a shell of *Coscinodiscus* under the microscope, with caustic potash, and found that the area of the cellules was dissolved before the walls, and that therefore they are the thinnest parts, as Dr. Griffiths judged from the optical effect.

Mr. Marcou stated that the last steamer for Europe from this port had taken out clams, oysters, lobsters, and other marine animals of our coast, for the purpose of acclimatizing them on the Atlantic and Mediterranean coast of France.

A donation of insects, fish, crustaceans, a snake, and a specimen of the wild potato, from the island of St. Lorenzo, on the coast of Peru, opposite Callao, was presented in the name of Dr. C. F. Winslow. A letter accompanied the specimens, from which the following are extracts:—

The potato is the most important, which I send with the hope that some of you will cultivate it. It is the wild potato, and the same as those which were found by the early Spanish settlers in this country, and first taken from St. Lorenzo for cultivation, and from which have probably sprung all the varieties of potatoes cultivated by civilized nations. Its favorite haunt seemed to be in light, fine soil, near or under the edge of stones. It is not very abundant on that part of the island which I explored. Helices abound

in countless numbers. They are observed scatteringly at first, about four hundred feet above the sea, on the dry, loose sand attached to some loose stone or lump of sand hardened by the mists. They gradually increase in number as you ascend, over enormous areas of drifting sand brought by the strong south-west winds from the western coast of the island. On the higher slopes of the highest ridge, the soil looks dark as observed from below, and in the numerous gulleys that can be seen to descend from the summit there is a line of white color following the tortuosities of their course. These lines would deceive the thirsty pilgrim with the delusion of foaming torrents, did he not know that it never rains on this coast. I could not imagine what produced such an appearance of dashing foam. However, on coming upon the higher altitudes, and upon the dark and ashy soil 600 or 800 feet high, I found the helices much more numerous, and attached in vast colonies to clusters of mosses, and upon stones, and upon each other; and, on suddenly coming to the end of one of the gulleys above described, I was astonished to find what appeared to be narrow, dashing torrents, to be in reality infinite myriads of dead helices which had blown from the slopes down into the gulleys.

Darwin visited this island during his voyage in the Beagle. He gives a brief description of his observations in his published memoirs. I, also, saw many shells on the island lying loose upon the surface of the hills, all the way from fifty to eight hundred feet above the sea. But they seemed to me to have been dropped by birds, for where I saw very old ones partly decayed, I also saw fresh ones which, to all appearances, had not been dropped many hours.

On the Isthmus I made extensive observations and dissections of cocoanuts, from the youngest fruit upwards, the results of which confirm all my own conclusions expressed the last evening I met the Society, and disprove wholly the possibilities suggested by Professor Agassiz. I will communicate on this subject hereafter.

Mr. L. Lincoln Thaxter was elected Resident Member of the Society, and Mr. George Mixter, of Harwich, Mass., a Corresponding Member.

January 15, 1862.

The President in the chair.

Mr. Alexander Agassiz gave a description of a remarkable annelid found in considerable numbers along the coast of Massachusetts, *Autolytus cornutus* (*Sacconereis*), presenting

the phenomena of alternate generation. (See Journal, vol. vii., part iv.)

A valuable donation of objects of Natural History, and specimens of the manufactures of the East Indian and Pacific nations, was presented by the Boston Marine Society. It comprised between fifty and sixty birds, mostly East Indian and African, many of them rare, and new to the Society's collection — jaws, teeth, horns, skulls, reptiles, fishes, shells, and several botanical specimens. Also a large collection of the handicraft of savage and semi-civilized nations — such as models of canoes and junks from China, Malacca, Burmah, the Pacific Islands, and the North-west Coast; war clubs and insignia of office; Malay, African, and Pacific Island cutting weapons, spears, bows and arrows, quivers, and paddles; native cloth and tanned skins; head-dresses, and other articles of wearing apparel; gourds, bags, cups, pipes, fans, and ornaments; a Feejee Island pillow of wood, and miscellaneous articles too numerous to mention.

The following resolutions were adopted: —

Resolved, That the thanks of the Boston Society of Natural History be given to the Boston Marine Society for the very valuable collection of birds, and other objects of Natural History, articles of East India manufacture, &c., presented January 15, 1862.

Resolved, That the Members of the Boston Marine Society be invited to visit the rooms of the Boston Society of Natural History, in the present, or new building, whenever it may suit their convenience.

Resolved, That the Boston Marine Society are entitled to the thanks of this Society, and of the community, for their efforts to procure, through the instrumentality of their organization, objects of natural science and curious specimens of human art from all parts of the world, and that they be earnestly requested to continue these efforts, in all the commercial enterprises in which they may be interested, — that Boston may be second to no other city in the country for its collection of objects of nature and art, gratuitously opened to public inspection.

Messrs. Philip R. Uhler, of Baltimore, and Joseph A. Clay, of Philadelphia, were elected Corresponding Members.

February 5, 1862.

The President in the chair.

The following paper was presented, and referred to the Publishing Committee.

DESCRIPTION OF NEW SPECIES OF FOSSILS FROM THE DEVONIAN AND CARBONIFEROUS ROCKS OF THE MISSISSIPPI VALLEY, BY CHARLES A. WHITE, OF BURLINGTON, IOWA.

ECHINODERMATA.

CRINOIDEA.

Genus CYATHOCRINUS Miller.

CYATHOCRINUS RIGIDUS (n. s.) Body subglobose, basal plates rather small, tumid in their centres, presenting a somewhat pentapetalous appearance; subradials rather large, convex and protuberant, about as wide as high; first radials as wide as high, about the same size as the subradials, a little wider below than above; articulating facet occupying the greater part of the width of the plate, and reaching down nearly half its length, slightly excavated, and having a good-sized notch in its upper margin; second radials small and short; third radials wider and larger than the second, and upon these the arms strongly diverge; in a part of the arms the second bifurcation takes place upon the same plate which rests upon the third radial, and the third bifurcation, in some of these, occurs on the second plate from the second bifurcation. The lower arm-plates are short and strong, the upper ones are long and rather slender, and, being slightly curved in different directions, give the arms a rigid appearance, which is increased by slight angularities on their backs. Surface of the body-plates covered with numerous small, irregular nodes, which are sometimes rather sharp and prominent, and have a tendency to arrange themselves in radiating lines from the centres of the plates. Suture lines distinct, giving a prominent appearance to the plates. Column round, moderately strong, and composed of rather thin joints of alternating width.

This species is of about the same size and general form as *C. viminalis* of Hall, but its surface-markings and peculiar arms will readily distinguish it from any other described species in these rocks.

Locality and position, in the lower division of the Burlington Limestone, Burlington, Iowa. — My own cabinet.

CYATHOCRINUS KELLOGGI* (n. s.) Body robust, wider than high; basal plates of moderate size, rounded, truncated, and slightly exca-

*Dr. G. M. Kellogg, Keokuk, Iowa.

vated for the attachment of the column, which is not large, and has a small central perforation; subradials about as wide as high, very tumid, projecting from the body as fine strong nodes; first radials massive, prominent in the middle, wider than high, bending inward a little between the arms; arm facets prominent, subcircular, slightly excavated, with a moderate-sized notch in the upper side, and the lower margin sharply projecting; anal plate quadrangular (?), nearly as wide where it rests squarely on the subradial as at the top; suture lines not very distinct; four or five indistinct, parallel, radiating ridges pass from the middle of each subradial plate to each of the adjacent plates, being more distinct where they cross the suture lines than on the more prominent parts.

This species may be easily distinguished from others with which it is associated by its radiated surface, very tumid subradial plates, subcircular arm facets, and its having the true structure of *Cyathocrinus*, not approaching *Poteriocrinus*, as do some of the Keokuk Limestone species.

Locality and position, in the Keokuk Limestone, near Burlington, Iowa. — Cabinet of Rev. W. H. Barris.

Genus Poteriocrinus Miller.

Poteriocrinus ob-uncus (n. s.) Body cup-shaped, about one third wider than high, upper edge of the calyx much bent in between the arms; basal plates small, truncated for the attachment of the column, which is of medium size, with a small central perforation, bent up at the sides to meet the subradials, which are moderately large, about as wide as high; first radials larger than the subradials, wider than high, prominent at the base of the arms, giving the calyx a sub-pentagonal outline; arm facets occupying about one-third of the width of the first radials, subcircular, with a broad notch in their upper margins, and a minute perforation in the centre just below the notch, with a fine groove connecting them. Anal plates, two visible in our specimen, one quadrangular, rather small, and situated partly beneath the first radial of the right posterio-lateral ray. Surface granulose, with a tendency of the granules to form radiating lines. Suture lines distinct, with depressions at the angles of the body-plates.

This species has the aspect and form of *Cyathocrinus*, but approaches *Poteriocrinus* more nearly in the number and oblique position of the anal plates. It is the first specimen I have observed which shows the subcentral perforation in the arm facet, in rocks of this age, although this peculiarity is not uncommon in species of this genus in rocks of the age of the Upper Helderberg Limestones.

Locality and position, in the lower division of the Burlington Limestone, Burlington, Iowa. — Collection of Rev. W. H. Barris.

POTERIOCRINUS SALIGNOIDEUS (n. s.) Body small, deeply cup-shaped, height about the same as the width at the arm bases, spreading very gradually with a slight outward curve from the base, which is truncated and excavated for the attachment of the column, which latter is proportionally large; basal plates rather short, bent up abruptly at their outer edges; subradials moderately large, higher than wide, three hexagonal, and two heptagonal; first radials a little broader than high; arm facets sub-semicircular, with a broad notch in their upper margins, prominent, occupying a little more than one-half the width of the plate, the upper edges of the plates between the arms slightly bent in; second and third radials small, about equal in size, wider than high; fourth radial of about the same size as the second and third, but is pentagonal in outline and supports the arms, and from which they diverge rather abruptly; above this the arms, which are long and slender, again bifurcate three or four times. Surface smooth or finely granulose; sutures not distinctly marked. Resembles *P. tenuibrachiatus* of Meek and Worthen, but the body is less globose in form; the arms are not so broadly rounded on their backs; each ray has four primary radials, the anterior one in their species having five; the second division of the arms takes place on the third piece from the fourth radial, while in their species this division takes place on the fourth piece.

Locality and position, in the upper division of the Burlington Limestone, Burlington, Iowa. — Collection of Mr. Charles Wachsmuth.

POTERIOCRINUS BURSÆFORMIS (n. s.) Body in the form of an inverted, truncated cone, spreading directly to the arm bases, where it is broader than the height; basal plates of moderate size, bending upward in a direct line with the other plates; subradials about as high as wide, three hexagonal, and two heptagonal; first radials much wider than high, almost straight across their upper edges, the second radials occupying the full width, and are, with the exception of the anterior one, short and pentagonal, supporting an arm of six broad, short plates on each of their upper sloping sides, above which they again bifurcate once or twice; second anterior radial quadrangular, about as high as wide; third and fourth short, more than twice as wide as high, the latter largest, and supporting two arms, which bifurcate twice, making six arms for this ray; the full number for each of the other rays seems to have been eight, making thirty-eight arms in all. The arms, except at their upper ends, are flat on the back, and join each other closely at their sides, as in *Bursacrinus*, except at their upper ends. Anal plates three, or more (?); first pentangular, and situated partly beneath the right posterio-lateral first radial. Surface smooth, or finely granulose; suture lines not very distinct; column round, of medium size.

This species not only resembles *Zeacrinus* above the base, but possesses those characters which have been regarded as peculiar to that genus, of having but two radials to four of the rays, and a greater number to the anterior one, yet the body has the true form and development of *Poteriocrinus*.

From *P. calyculus*, Hall, it differs in the peculiarity of the radials just mentioned, and the proportions of the body-plates. From *P. lepidus*, Hall, it differs in having a less number and less massive radials, and being without the distinctly marked suture-lines and the depressions of the angles of the body-plates which that species has.

Locality and position, in the lower division of the Burlington Limestone, Burlington, Iowa. — Collection of Rev. W. H. Barris.

Genus BURSACRINUS Meek and Worthen.

BURSACRINUS CONFIRMATUS (n. s.) Body rather rapidly spreading to the top of the second radials, which are prominent, and pointed at their upper extremities, giving the body at this point a stellate outline when viewed from below. Basal plates unknown; subradials small, about as wide as high; first radials nearly twice as wide as high, the lower angle made somewhat acute by the slight concavity of the lower sides; upper margins broadly concave, or nearly straight; second radials rather larger than the first, the lower sides slightly convex, the upper sides sloping with an obtuse angle, which is made to appear more acute than it really is, by the forementioned projections; arm-plates about twice as wide as high, convex transversely, leaving a distinct depression of the arm-sutures, and having a small angular prominence at the middle of their upper sides.

The only known specimen of this species was in the cabinet of the writer two years before the publication of the genus to which it is now referred. It was known to possess new generic characters, but the specimen was thought too imperfect to found a new genus upon; yet it affords specific characters which cannot be mistaken, and is referred without doubt, and with much satisfaction, to the genus *Bursacrinus* of Messrs. Meek and Worthen, since it conforms to and fully confirms that genus, which was founded upon a single specimen.

Locality and position, in the lower division of the Burlington Limestone, Burlington, Iowa.

Genus ZEACRINUS Troost.

ZEACRINUS PERANGULATUS (n. s.) Calyx more than twice as wide as high, base rather broad, deeply excavated; basal plates very small, covered by the column, which is not large, round, and composed of thin, alternating joints; subradials of medium size, about as wide as high; first radials the largest, plates of the calyx wider than high; second radials a little larger than the first, pentagonal, and supporting each a pair of arms, except the anterior one, which is quadran-

gular, and supports three other smaller radials; the two first are also quadrangular, and the last pentangular, supporting two arms, which bifurcate on the eighth plate, giving four arms to the anterior ray; on each of the anterio-lateral rays the second bifurcation takes place on the sixth arm-plate from the second radial, one arm being simple from this point to the end, but the other again bifurcating on the eighth plate from the second bifurcation, making six arms from each of these rays; and as the posterior rays doubtless had the same number, the whole number of arms was probably twenty-eight. The plates of the calyx are marked by radiating ridges diverging from each plate to the others, except within the basal depression, which is smooth. The body-plates are also depressed at the angles, which gives it a still more angular appearance. The second radials are constricted in the middle, sharply angular on their backs, and truncated below, abruptly sloping to the sutures between them and the first radials. The backs of the arms, particularly on their lower parts, are very angular, with deep depressions between them; and small angular projections garnish their sides where they abut together, giving them a serrated and very angular appearance. Tentacles strong, not very closely arranged. One specimen shows part of an inflated proboscis, which is composed of small angular plates, and extended far up within the arms. This species is too conspicuously different from any other to need comparison.

Locality and position, in the upper division of the Burlington Limestone, Burlington, Iowa.—Collections of Rev. W. H. Barris and B. J. Hall, Esq.

ZEACRINUS SACCULUS (n. s.) Body subglobose, contracted at the junction of the arms; concavity of the base small, taking in but a small part of the subradials; basal plates small, covered by the last joint of the column; subradial plates six; five of them reaching the basal plates, one of which is large, being situated beneath the right posterio-lateral ray; the sixth smaller than the others, quadrangular, not reaching the basal plates, and situated nearly beneath the right anterio-lateral ray; first radials broader than high, straight on their upper sides, one hexagonal, three pentagonal, and one subquadrangular, which last is on the right posterio-lateral ray; second radials much broader than high, their upper lateral angles depressed, their upper central ones prominent; four of them pentangular, supporting two arms each; one quadrangular, supporting two other small radials, the latter supporting two arms, which bifurcate once, on the sixth or seventh plate from the fourth radial, giving four arms to this ray; each of the arms of the other rays bifurcate on the sixth plate from the second radial, and a part of the arms thus thrown off bifurcate again farther up, giving six arms to each of these rays,—twenty-eight arms in all. These abut together laterally, leaving but

a slight depression along the sutures, giving the whole the appearance of a small pouch, a little inflated in the middle, and contracted at the top and the base of the arms, leaving no space except the anal area, which is neatly filled with two or three anal plates, the lower one the largest, pentangular, and forming a part of the calyx. Suture lines of the body-plates not very distinctly defined. Surface smooth or finely granulose.

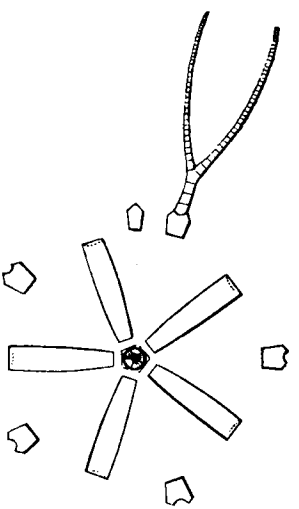
Locality and position, in the upper division of the Burlington Limestone, Burlington, Iowa. — Collection of Rev. W. H. Barris.

ZEACRINUS SACCULUS var. CONCINNUS. Another specimen, apparently younger, from the same locality and position, presents no differences from the preceding species above the radials; the subradials, however, are only five, a little tumid, and proportionally smaller, making the calyx a little lower; the anal series also consists of one more plate; it is probable, however, that the quadrangular subradial of the preceding species is of abnormal development, and that, were this absent, the number of anal plates would be one more.

Several specimens of a species of crinoid belonging to the family of *Cyathocrinidæ* have been discovered in the upper division of the Burlington Limestone, at Burlington, which is so peculiar in its form and structure, as to render its reference to any known genus quite improper, for which I propose the generic name of *Belemnocrinus*.

The following diagram and outline figure will show its structure and form: —

FIG. 1.



BELEMNOCRINUS TYPUS.

FIG. 2.
The dotted line shows the depth of the visceral cavity.

BELEMNOCRINUS TYPUS.

Genus BELEMNOCRINUS (n. g.)

βελεμνον, a dart; *Κρινον*, a lily, in allusion to its resemblance to a Belemnite.

Generic formula.

Basal pieces, five; short.

Subradial pieces, five; long, narrow, forming a cylinder which is solid, except that it has a central perforation, and an excavation at its upper end, forming part of the visceral cavity.

Radial pieces, one; large, $\times 5$, and smaller ones, four, more or less.

Anal pieces, one or more, the first situated between two of the first radials.

The position of the first anal plate is like that of *Cyathocrinus*, but this genus, in the form and proportions of the body, differs widely from all others of the family. Its conspicuous features are its long, solid, cylindrical body (the greater portion of which seems to have performed the functions only of the column), the proportionally long subradials and short basal plates, and the small visceral cavity. In *Agassizocrinus* we have the nearest approach to these peculiar characters of the body-plates, while in *Zeacrinus* we see the farthest remove from them which the family presents. It is probable that in *Agassizocrinus* the thickening of the lower plates of the body was the result of an excrescent secretion of solid matter, which took place as those soft parts of the body were absorbed which were no longer necessary in the animal economy after its separation from the column; but in *Belemnocrinus* the thickening of the body-plates, and the retreating upward of the vital parts, could not have been the result of such a cause, as the column is well developed, and its communication with the visceral cavity uninterrupted.

The only known species of the genus is the following, which, from the simplicity of its form, will probably be appropriately considered its type, should other species be discovered.

BELEMNOCRINUS TYPUS (n. s.) Body resembling a *Belemnite*, or *Belemnitella*, in form, truncated at the base for the attachment of the column, which is proportionally large, composed of alternating thicker and thinner joints, with a small central perforation, round, or indistinctly pentagonal at the upper end, where it has a diameter nearly equal to the basal plates; the sides sloping with gentle outward curves to the column, with only a slight constriction at the junction; basal plates small, and not longer than the thickness of the larger joints of the column, and from which they are not readily distinguishable; subradial plates about four times as high as wide, forming a slightly-inflated cylinder, smallest at the lower end, as solid as the column, except that it has a slight excavation in the upper end which forms a part of the visceral cavity; first radial plates about as

wide as high, the arm facets occupying more than half the width of the plates, shallow and somewhat protruding below; second, third, fourth and fifth radials small, about as wide as high, subcylindrical, except the fifth, which is pentangular in outline, and upon which the arms bifurcate, which are composed of a single series of joints with parallel sutures; arms not large, and apparently ten in number.

Surface smooth, or finely granulose.

Four specimens, more or less perfect, of this species have been discovered, presenting very constant characters.

Locality and position, in the upper division of the Burlington Limestone, Burlington, Iowa. — Cabinets of B. J. Hall, Esq., and Rev. W. H. Barris.

Genus ACTINOCRINUS Miller.

ACTINOCRINUS QUADRISPINUS (n. s.) Body small, flat below, the rays passing out horizontally; basal plates nearly as large as the first radials, slightly depressed in the centre for the attachment of the column; first radials hexagonal and heptagonal, wider than long; second radials a little shorter than the first, but reaching the outer part of the body, and much bent upward at the sides to meet the inter-radial plates, and to conform to the convexity of the under side of the projecting part of the rays, which are broken off in our specimen; inter-radial series consisting of three plates, the largest below which is hexagonal, and supports the other two; anal series consisting of seven plates, the first about the size of the first radials, the others smaller, in two arching rows of three abreast. Dome much elevated, composed of very numerous small plates, and surmounted by a strong, tumid plate at the apex, which is surrounded by four adjacent, short, strong, diverging spines, situated directly over each inter-radial space, and by a comparatively large proboscis which passes up from the anal side, all of which adjoin the summit plate; the anal space and proboscis being proportionally broad, the spines occupy but little more than the anterior half of the summit of the dome.

This species approaches *A. planobasalis* and *A. inflatus* of Hall, but differs from them in its general form, the arrangement of the plates, the four summit spines and side proboscis.

Locality and position, in the lower division of the Burlington Limestone, Burlington, Iowa. — Collection of Mr. Charles Wachsmuth.

ACTINOCRINUS WACHSMUTHI* (n. s.) Body somewhat pentalobate in outline at the arm bases; broadly spreading from the base, which is small; basal plates rather short, but projecting downward, forming a rim around the column, which is notched at the sutures; cicatrix for

*Mr. Charles Wachsmuth, Burlington, Iowa.

the attachment of the column small, about half the diameter of the cavity formed by the projecting rim; first radial plates moderately large, each having a prominent node occupying a large portion of the surface of each, as also of the first anal plate; second radials short, about twice as wide as high; third radials a little larger than the second, and supporting one brachial plate on each of their upper sloping sides, and they, in their turn, supporting two arms each, giving the arm formula $\frac{4}{4\,4}=20$ arms. A more or less prominent ridge runs along the centre of each ray from the nodes of the first radials, which bifurcate on the third radials, and again on each brachial plate, passing off to the base of each arm. Anal series, five; inter-radial series, three; the lower one, which is the largest, is somewhat tumid, forming a centre around which the radial ridges diverge. Dome about as high as the depth of the body below the arms, covered by numerous tumid plates, and surmounted by a central proboscis.

This species somewhat resembles *A. rusticus* of Hall, with which it is associated, but differs from that species in its more compact and less pentalobate form, the number of arms to each ray, the arrangement of the plates, and the surface-marking.

Locality and position, in the upper division of the Burlington Limestone, Burlington, Iowa. — Collections of Mr. Charles Wachsmuth and Rev. W. H. Barris.

ACTINOCRINUS NASHVILLÆ Troost, var. *subtractus*. The upper division of the Burlington Limestone, at Burlington, furnishes an *Actinocrinus* which has the general appearance, and answers the description, of *A. Nashvillæ* (Troost), as given by Prof. Hall, in the Iowa Reports, from the Keokuk Limestone, except that it generally lacks the supra-interradials, one only appearing in the only perfect specimen discovered, which is on the right postero-lateral ray, this position indicating an irregularity. Another specimen shows a single supra-interradial; but the specimen is too imperfect to determine to which ray it belongs. This slight or non-development of supra-interradials is not regarded of specific importance, although the form and appearance are thereby considerably modified. — My own collection and that of Mr. Charles Wachsmuth.

Genus MEGISTOCRINUS Owen and Shumard.

MEGISTOCRINUS PLENUS (n. s.) Body subglobose, a little broader than high, base rather narrow, somewhat regularly rounded; basal plate prominent, extending considerably below the first radials; cicatrix, for the attachment of the column rather large, slightly concave, from the margin of which the plate is bevelled abruptly to the sutures between it and the first radials; first radials hexagonal, a little wider than high; second radials smaller than the first, about as wide as

high; third radials about as large as the second, having upon each of their upper sloping sides three supra-radials, and upon these the thin, broad brachials rest which complete the edge of the calyx; the arms bifurcating at about their point of junction with the body. Dome broadly convex, composed of numerous small, tumid plates. Inter-radial series consisting of about fourteen plates; anal series twenty or more. Surface granulose-? with distinct grooves at the sutures of the body-plates.

From *M. Evansi* and *M. crassus*, it may be distinguished by its convex base, prominent basal plate, channeled sutures, and the proportion of the body plates.

Locality and position, in the upper division of the Burlington Limestone, Burlington, Iowa. — Cabinet of Mr. Charles Wachsmuth.

MEGISTOCRINUS CRASSUS (n. s.) Body large, plates massive, base rather broad, much depressed; basal plate thick, articulating facet of the column large, slightly concave, from near the margin of which the plate is abruptly bevelled to the sutures between it and the first radials; first radials very massive, much elevated from the general surface, with nearly perpendicular sides, leaving deep channels at the sutures, somewhat regularly hexagonal, with the longest side adjoining the basal plate, a little wider than high, with a few very coarse, irregular corrugations on their upper surfaces; second radials hexagonal, about as wide as high, widest above, not so large and thick as the first radials, tumid in the centre; third radials about half as large as the second, wider than high, much convex. All the plates of the lower part of the body are very thick, and have their sides sloping abruptly to the sutures, while higher up they are more or less regularly convex to the sutures. This species is readily distinguished by its extremely massive plates and deep sutures.

Locality and position, in the lower division of the Burlington Limestone, Burlington, Iowa. — Collection of Mr. Charles Wachsmuth.

Genus PLATYCRINUS Miller.

PLATYCRINUS PLEUROVIMENUS (n. s.) Body broadly cup-shaped, with broad bevelled depressions at the sutures; dome elevated, and covered with numerous tumid plates; basal plates anchylosed, forming a broad, pentagonal, concavo-convex disc, with a moderately deep depression in the centre, in which is sometimes observed a still deeper, nearly circular excavation for the attachment of the column; a broad groove marks the line of the sutures, but does not extend quite to the margin. An incipient ridge runs from the inner margin of the central depression to each of the angles of the disc; first radials massive, about one-quarter wider

than high, the sides of which extend with an obtuse angle above the articulating arm-facet. This is quite prominent, subcircular, occupying about one-third of the width of the plate, with a narrow, deep notch in the centre of the upper sides; surface of the broad bevelled edges of the plates marked by parallel ridges, and the surface between these and the articulating facet faintly and coarsely corrugated. Arms strong, broadly rounded on the back, bifurcating upon the second radial, yet not separating from each other immediately, but continued as a compound arm, composed of three pairs of strong plates which gradually increase in width, and abut obliquely against each other by their inner edges, except the third pair, which abut by only about one-half their height, and from which the arms diverge, being composed of fourteen or fifteen other plates, broad and strong, extending clear across the back of the arm, with straight or slightly oblique sutures, the articulating faces of which are crenulated. Beyond this, they bifurcate again. A series of small plates arch over the upper side of the arms. from the sides of which numerous armlets diverge, which bear the tentacles, and are composed of a double series of plates like the usual simple arms of Platycrinus.

Column subcircular at the upper ends, but rapidly assuming a twisted, oval form, and composed of thin joints, gradually increasing in thickness from the body. This species is probably the same to which the large plates belonged which Messrs. Owen and Shumard referred to their *P. discoideus*, and may also be the same as that figured by Prof. Hall in the Iowa Reports, and referred also to *P. discoideus;* yet the latter presents some important differences from our specimens, and, it is not improbable, will prove to be a different species, as separate plates are frequently found, showing this constant variety. I should not question the conclusions of these eminent men, were it not that lately-discovered specimens of *P. discoideus*, as figured and described by Messrs. Owen and Shumard, show the arms to have been simple, like those of *P. Shumardianus*, *P. Wortheni*, &c., as seen figured in the Iowa Reports, while our species has arms so differently constructed that it may yet be found expedient to consider this difference of generic importance.

Locality and position, in the upper division of the Burlington Limestone, Burlington, Iowa. — My own cabinet.

PLATYCRINUS QUINQUENODUS (n. s.) Body cup-shaped, spreading above, base truncated, having five distinct nodes situated at the outer margin of the truncation, and directly beneath each perpendicular suture of the first radials; basal plates bent upward at the edges, their slightly concave sides joining the convex ends of the first radials, showing a shallow depression at the sutures; first radials hexagonal in outline, slightly convex, a little depressed at the sutures; articulating arm-facet

shallow, or nearly flat, subtriangular in outline; arms bifurcating upon the second radials, which are short, but cover the whole facet of the first radials, and are continued as a compound arm by two pairs of short, strong arm-plates, abutting each other by their inner sides, upon the last pair of which the arms again bifureate; a high, narrow, tumid interradial plate rests in each of the retreating angles, formed by the upper slopes of the first radials, against which the dome-plates and those which arch over the compound arms abut; these latter plates are tumid or subspinose. Anal series consisting of one rather large plate resting in the angle between the first radials, which is surmounted by numerous small plates surrounding the anal opening, which is situated about half way between the first radials and the summit of the dome.

This species resembles *P. pileatus* of Goldfuss, as figured by De Koninck and Le Hon, in "*Recherches sur les Crinoids du Terrain Carbonifère de la Belgique*," Pl. VI., fig. 3, but differs in the truncated and nodose base. the different shape and proportions of the arm-plates and articulating facets of the arms with the first radials.

Locality and position, in the upper division of the Burlington Limestone, Burlington, Iowa. — Collection of Mr. Charles Wachsmuth.

Genus DICHOCRINUS Munster.

DICHOCRINUS ANGUSTUS (n. s.) Body rather small, about twice as high as wide, in the form of a narrow, slightly truncated cone; basal plates higher than the diameter at their junction with the first radials, sloping direct to the column, which is small and round; first radials and anal plates of about the same size, nearly twice as high as wide; the anterior first radial and first anal plates a little widest below; arm-facets occupying the greater part of the width of the first radials, very slightly excavated and narrow; second and third radials short, with two indistinct nodes abreast on each; arms bifurcating on the third radial, and continued by two short plates, which are also indistinctly nodose to the second bifurcation, beyond which the arms are composed of a single series of small plates with slightly oblique sutures. Surface apparently smooth.

This species differs from *D. scitulus* of Hall in its much greater proportionate length, with its plates differently proportioned; the place of attachment of the column is round, and not protuberant and oval, as in that species. It is the smallest described species in these rocks except *D. pocillum*.

Locality and position, in the upper division of the Burlington Limestone, Burlington, Iowa. — Collections of Mr. Barris and Mr. Wachsmuth.

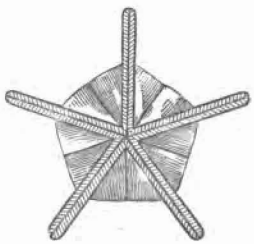
DICHOCRINUS CRASSITESTUS (n. s.) Body obconical, spreading with

gentle curves to the arms, about one-third higher than wide; base about one-third the height of the body, truncated and slightly excavated for the attachment of the column which is round and moderately small; lateral first radials about twice as high as wide, sides nearly parallel, or a little narrower at the lower ends, which are slightly rounded; anal and anterior first radial plates wider below than above, their lower ends angular, fitting into the retreating angles at the sutures of the base; arm-facets shallow, narrow, and occupy the greater part of the width of the plates; second radials *very* short, scarcely reaching so high as the tops of the first radials; third radials also very short; upon these the arms rest, being composed of two short plates, each, when they bifurcate, and are continued to the ends by a single series of short plates with parallel sutures, giving twenty arms in all, which are about twice the length of the body, and very small. A strong proboscis extends far up within the arms, based upon the large anal plate. Plates of the body smooth, or finely granulose.

This species differs from all others with which it is associated in the thickness of its plates; other marked peculiarities are its small arms, very short second and third radials, and strong proboscis.

Locality and position, in the upper division of the Burlington Limestone, Burlington, Iowa. — Collections of Rev. W. H. Barris and Mr. Charles Wachsmuth.

FIG. 8.



PENTREMITES SIRIUS (*summit view*) twice enlarged.

Genus PENTREMITES Say.

PENTREMITES SIRIUS (n. s.) Body depressed turbinate, pentagonal in outline, looking down on the summit, which is broadly convex to the sides, from which it slopes abruptly to the base; this is narrow, and has a small truncation for the attachment of the column; basal plates proportionally high; radials longer than wide, but are much bent, following the shape of the body; ambulacrals are as narrow, extending outward from the body in a horizontal direction, their full length from the summit being about equal to the transverse diameter of the body, leaving about half of their length projecting from the sides, and are

supported by a narrow process, which is about twice as deep as the width of the area, becoming somewhat pointed at the ends. Poral plates numerous, situated obliquely to the direction of the area; median furrow distinct; outer margins of the area very narrow. Interradial plates and summit openings unknown.

Locality and position, in the upper division of the Burlington Limestone, Burlington, Iowa. — Collections of Rev. W. H. Barris and Mr. Wachsmuth.

MOLLUSCA.

GASTEROPODA.

Genus PORCELLIA Leveille.

PORCELLIA OBLIQUINODA (n. s.) Shell broadly umbilicate, volutions contiguous; a row of numerous, moderately raised, oblique nodes running along each side of the shell a little nearest the back, giving it a somewhat angular appearance there, from which point the shell is regularly rounded on the back, and sloping with a curve to the next inner volution. A distinct linear depression runs along the back of the shell. The oblique position of the nodes, and the direction of some faint striæ of growth, seem to indicate that the dorsal notch was broadly V-shaped. Our specimen is a fine sandstone cast, preserving about three volutions and the matrix of part of another; the full number was probably four or five.

From *P. nodosa* Hall and *P. crassinoda* White and Whitfield, the only other described species of this genus known to us in the American rocks, it differs in the shape, size, and number of the nodes, and the general proportions of the shell.

Locality and position, in the sandstone of the Chemung beds at Burlington, Iowa.

Genus BELLEROPHON Montfort.

BELLEROPHON PANNEUS (n. s.) Shell subglobose, gradually expanding, except at the lateral margins, where it expands abruptly; transverse section of the volution opposite the aperture an irregular ellipse; umbilici narrow and deep, which, when not filled with the imbedding material, display the rounded sides of the volutions, which are three or more in number. The back of the shell is somewhat flattened, and has a central longitudinal elevation, which becomes a distinct carina at the front; surface marked by strong, irregular, undulating lines of growth, becoming very rough towards the front margin.

Locality and position, in the Chemung beds, at Burlington, Iowa.

BELLEROPHON SCRIPTIFERUS (n. s.) Body of shell rather small; volutions few, rounded, closely coiled; cross section elliptical; umbilici small, rather deep; last volution extremely expanded into a broad subheart-shaped disc, the back margin not reaching quite so far back as the

body of the shell, and rounding gradually in on each side to meet it. A narrow carina runs along the back of the shell, which is quite distinct at the front, but farther back it is hardly perceptible; front margin emarginate, and the fine striæ of growth, which are more or less visible on the front of the shell, bend gently back to meet the carina. A few very faint longitudinal ridges are observed on each side of the back of the shell, running out upon the expanded disc.

This species bears a close resemblance to *B. patulus* Hall, of the Hamilton group of New York, but it differs in the deeper umbilicus, the general outline of the margin, and its strong carinæ.

Locality and position, in the Chemung beds, at Burlington, Iowa.

Genus EUOMPHALUS Sowerby.

EUOMPHALUS ROBERTI* (n. s.) Shell discoid, of moderate size; volutions three or more, which gradually enlarge from the apex; aperture subovoid, or subcircular, its diameter twice that of the adjacent whorl at that point; umbilicus shallow; spire umbilicate; a strong carina running along the upper side of the shell, from which it is regularly rounded on the outer and under sides of the adjacent whorl in the umbilicus. Inside sloping with a slight concavo-convex curve from the carina to the adjacent whorl in the spiral depression. Surface marked by the usual lines of growth.

This species closely resembles *E. pentangulatus* Sowerby, the type of the genus, but differs in the less angular outline of the aperture, the greater depression of the spire, and the more rapid increase in the size of the volutions.

Locality and position, in the upper division of the Burlington Limestone, Burlington, Iowa.

PTEROPODA.

Genus CONULARIA Miller.

CONULARIA BYBLIS (n. s.) Shell large, in the shape of a truncated pyramid, length twice ? the width of the base; apex broadly-rounded, smooth, sides depressed, convex; grooves at the angles narrow; a faint longitudinal depression along the middle of each side; transverse ridges narrow, distinctly raised, forty-five or fifty to the inch, but slightly curved in passing from the salient angles to the faint central depression, at which they meet with an obtuse angle and cross with slight interruption; sometimes, however, they alternate for a short distance, and then cross continuously as before. Spaces between the ridges finely crenulate.

Locality and position, in the Chemung beds at Burlington, Iowa.

CONULARIA VICTA (n. s.) Shell of moderate size, gradually sloping

* Prof. Jos. T. Robert, Burlington University, Burlington, Iowa.

from the base; transverse ridges forty-five or fifty to the inch, finely nodose, sweeping downward with gentle curves to the central depression, where they meet with a very obtuse, rounded angle, and cross with little interruption, except where they slightly alternate; spaces between them smooth; grooves at the salient angles distinct, at which the ends of the transverse ridges regularly alternate, having a small pit at the end of each, giving the appearance of a finely-stitched suture.

Partially decomposed fragments of this species have been observed in small concretionary masses, having the appearance of coprolites, indicating the probability that they were the victims of the fishes whose remains are frequently found in the same strata.

Locality and position, in the upper division of the Burlington Limestone, Burlington, Iowa.

BRACHIOPODA.

Genus RHYNCHONELLA Fischer.

RHYNCHONELLA CAPUT TESTUDINIS (n. s.) Shell large, subtriangular, subcuneate, front rather fully rounded, meeting the lateral slopes at an obtuse angle; sides somewhat concave, free from plications near the beaks, and sloping to them with gentle incurvatures, giving the shell an angular appearance about the beaks, which are small, and at which the sides meet at an acute angle; both valves regularly and nearly equally convex; dorsal beak closely incurved beneath the ventral beak, which is slightly incurved. Foramen and deltidium unknown. Surface marked by from sixteen to eighteen distinct, somewhat rounded plications on each valve, which mostly reach the beak with some distinctness, but are occasionally increased, both by implantation and bifurcation. These are traversed by fine radiating lines, and crossed by fine concentric lines of growth.

Mesial fold and sinus scarcely defined, but the front is slightly emarginate in the older specimens, by the elevation of the lingual extension of the lower valve with a gradual curve, which includes five or six of the plications.

Locality and position, at the base of the Burlington Limestone, Burlington, Iowa.

RHYNCHONELLA OTTUMWA (n. s.) Shell rather small, variable in form, somewhat triangular, subpentagonal or subovoid in outline; valves subequally convex; ventral valve regularly convex along the centre from beak to front, broadly convex across the centre from side to side; beak rather large, long, projecting much backward, pointed, and curving upward with rather more than the regular curvature of the valve, the space beneath it a little flattened, giving somewhat the appearance of an area; deltidial plates occupying a rather large, equilateral triangular space, with a moderately large, oval foramen. Dor-

sal valve broadly convex, beak broad, closely incurved, umbonal parts a little flattened.

Surface marked by eight or ten simple, somewhat angular plications, which are visible only on the front part of the shell; two of these are depressed on the ventral valve for the mesial sinus, the tongue of which, in the older specimens, is considerably elevated; the mesial fold has three plications, and is slightly elevated at the front; the plications on each side of the mesial fold and sinus are usually indistinct. Nearly half the length of the shell from the beaks is free from plications, and only marked by fine concentric lines of growth, so that the half-grown specimens present very little appearance of a plicated shell. Shell structure distinctly fibrous.

Locality and position, in the St. Louis Limestone at Ottumwa, and near Oskaloosa, Iowa.

Genus SPIRIFER Sowerby.

SPIRIFER GLANS CERASUS (n. s.) Shell very small, globose, subcircular in outline, front border slightly emarginate, hinge line less than the width of the shell; ventral valve with a rather broad, faintly-impressed sinus; beak high, arcuate, incurved; area narrow, indistinctly defined; foramen about as wide as high. Dorsal valve somewhat regularly convex, without a distinct mesial fold; umbo rather prominent; beak small, prominent, and projecting a little back of the hinge line. Surface marked by concentric lines of growth, but no radiating striæ, or ribs, have been observed.

This species is of the type of *S. lineatus* of Martin, but differs from that species, as identified in our Coal Measures, by its more circular and globose form, shorter ventral beak, and less convex dorsal valve. From the young of *S. dubius* of Hall, with which it is associated, it differs in its much more globose and circular form, higher area, and more prominent ventral beak.

Locality and position, in limestone of the age of the Hamilton group of New York, Iowa City, Iowa.

OBSERVATIONS ON THE

Genus SPIRIFERINA D'Orbigny.

In the Chemung and lower carboniferous rocks of the West, are several species of shells which have been referred to the genus *Spirifer*, which probably ought to be referred to *Spiriferina*. One of these, *S. spinosa* of Norwood and Pratten, possesses all the characters of *Spiriferina*, — the punctate structure, spinulose surface, pseudo-deltidium, and internal septum, — and was referred to that genus by Prof. Hall, in 1856. *Spirifer solidirostris* White has the punctate structure, internal septum and pseudo-deltidium of *Spiriferina*, but is

not spinulose. *Spiriferina? subtexta*, herein described, has the internal septum and punctate structure, but our specimens do not show the pseudo-deltidium, and the species is destitute of spines. A single ventral valve from the Lithographic Limestone of Clarkesville, Mo., probably referable to the latter species, shows the interior septum, but no other definite character of *Spiriferina*.

The punctate structure of the shell in all these species is coarser than is usual in *Terebratula Retzia*, &c., and is hardly distinguishable, except in weathered and exfoliated conditions. The outer layer, and lamellæ, appear not to possess this character, and to hide that of the substance beneath, so that it does not appear in the better preserved specimens. The pseudo-deltidium might easily have been removed from *S. subtexta*, while *S. solidirostris* is known to possess it. Thus these two species, doubtless, possessed all the characters of *Spiriferina*, except the spinulose surface; and, as this latter character is considered of only specific importance in some other genera, these two species are referred with a query to that genus.

SPIRIFERINA? SUBTEXTA (n. s.) Shell rather small, subglobose, hinge line varying in length from less than the width to the greatest width of the shell. Dorsal valve subsemicircular in outline, somewhat regularly convex, umbonal parts rather prominent, beak small, incurved over the hinge line. Ventral valve deeper than the other, arcuate from beak to front, area large, not distinctly defined on its upper margins; foramen narrow, reaching to the beak, which is acute, and incurved; five or six prominent plications on each side of the mesial fold and sinus; sinus moderately large, distinctly defined to the beak; mesial fold scarcely raised above the general convexity of the shell except at the front; the ribs bordering the sinus, and the depressions bordering the mesial fold, larger than the others.

Surface marked by fine concentric lamellæ of growth, which are most conspicuous near the front margins. Shell structure conspicuously punctate, when exfoliated or much weathered.

This species most nearly resembles *Spirifer (Spiriferina?) solidirostris* White, but differs in its more globose form, less number of ribs, higher area, and having its foramen open to the beak.

Locality and position, in the upper and lower divisions of the Burlington Limestone, Burlington, Iowa.

Genus CYRTIA Dalman.

CYRTIA CURVILINEATA (n. s.) Shell rather small, greatest width forward of the hinge line; ventral valve much elevated; beak small, more or less incurved, and pointing backward beyond the cardinal border; the sloping sides of the area about equalling the length of the hinge line; deltidium forming an elliptic arch over the foramen,

which is narrow, and slightly open at the base; nine or ten simple, rounded plications on each side of the sinus, which is shallow, and contains two slightly raised plications. Dorsal valve subelliptical in outline, depressed convex, a little flattened at the cardinal extremities; eight or nine plications on each side of the mesial fold, which is very slightly elevated, and contains three plications, which are a little larger than the others, the middle one being the largest, and sometimes a little flattened near the front. The front border of the mesial fold in the older shells is bent abruptly upward, giving an emarginate appearance to the front of the shell.

The plicated mesial fold and sinus, the subelliptical outline of the dorsal valve, and the pointing obliquely backward of the beak of the ventral valve, are the more prominent features of this species, and by which it may be readily distinguished.

Genus AMBOCŒLIA Hall.

AMBOCŒLIA (SPIRIFER ?) MINUTA (n. s.) Shell very small; hinge line a little shorter than its greatest width; outline of dorsal valve subcircular, depressed convex, most elevated near the umbo, flattened at the front margin; beak small, projecting a little back of the hinge line; ventral valve much elevated, arcuate; beak broad, obtuse, incurved; foramen about as wide as high, its sides sloping with a slight outward curve; area indistinctly defined. Surface covered with numerous fine setæ, which, when removed, leave a pustulose appearance to the surface, yet the shell structure appears to be fibrous.

I have not seen a specimen of this species exceeding a line in transverse diameter.

Locality and position, in limestone equivalent to the Chemung beds at Burlington, Hamburg, Ill., and Hannibal, Mo.

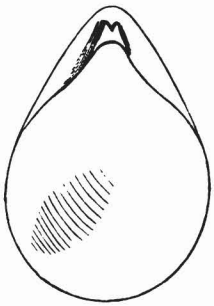
I am indebted to B. J. Hall, Esq., of Burlington, Iowa, for a single specimen of a shell, the only one I have seen, except some fragments, which cannot be satisfactorily referred to any established genus, and for which I propose the generic name of *Acambona*. The figures accompanying the generic description are restorations only in part of the outline, as the specimen has been somewhat eroded, but fortunately preserves every external generic character, besides showing one of the internal spires. Following the specific description of this shell, is the specific description of another, which may prove to belong to this genus, when more perfect specimens have been obtained. My cabinet also contains a fragment, specifically different from either of these, which must either be referred to *Retzia*, or to the genus proposed.

All these are from the rocks at Burlington, Iowa.

FIG. 1.

ACAMBONA PRIMA,
(side view.)

FIG. 2.



ACAMBONA PRIMA,
(dorsal view.)

Genus ACAMBONA (n. g.)

Ἀκη, a point; *Ἀμβων*, umbo.

Generic description.

Shell of the general appearance and surface characters of *Retzia;* furnished with internal spires, pointing outward and downward (?). Beak of ventral valve prominent, incurved, pointed; area emarginate in front, or V-shaped, reaching to the point of the beak, and extending forward of the beak of the dorsal valve on each side of it. Beak of the dorsal valve closely incurved, filling, or nearly filling, the forked space or emargination in the front part of the area, being itself without angular, winged extensions, or area, to meet that of the opposite valve.

Shell structure punctate.

The punctate structure and internal spires fully separate this genus from all the *Rhynchonellidæ;* its punctate structure, curved hinge line, and general form, separate it from the usual forms of the *Spirifidæ;* from *Retzia*, which it most resembles, it differs in having a pointed ventral beak, curved hinge line, and no angular cardinal wings on the dorsal valve; from *Uncites* it differs in having an area and punctate structure; from *Trematospira* it differs in its pointed ventral beak and true area; and from *Stringocephalus*, in its internal spires, gibbous dorsal valve, proportionally small area, and want of ventral septum.

ACAMBONA PRIMA (n. s.) Shell ovate in outline, regularly rounded in front; dorsal valve most convex; beak somewhat narrow, closely incurved; beak of ventral valve prominent, strongly incurved and sharply pointed; area small, distance across the forward points about

the same as from the apex to the points, distinctly defined, with a flange-like projecting border on each side, and presenting a neatly-curved outline, as seen in profile. Surface marked by strong lines of growth near the front, and by numerous, rounded, slightly raised costæ, which become indistinct on the upper part of the shell, particularly on the ventral beak, at the sides, — on the former, scarcely appearing at all, and on the latter assuming the character of fine striæ.

Locality and position, in the lower division of the Burlington Limestone, Burlington, Iowa.

Genus RETZIA King. ACAMBONA Mihi.

RETZIA (ACAMBONA?) ALTIROSTRIS (n. s.) Shell sub-ovoid in outline, valves nearly equally convex. Dorsal valve most convex near the umbo; beak prominent, small; beak of ventral valve strong, much elevated, incurved. Area about as high as wide.

Surface marked by from twenty to twenty-two prominent, simple, rounded ribs on each valve, which gradually enlarge towards the front, the spaces between which are narrower than the ribs, the central one on the ventral valve being a little wider than the rest, and giving the appearance of a faint, narrow, mesial sinus; the rib on the other valve, immediately opposite, is also a little broader than the rest, but scarcely raised above them. The only specimens obtained are casts in fine-grained sandstone; two of these seem to show indications of an apical foramen, yet the direction of the incipient costæ on the ventral beak would seem to lead to the conclusion that it was pointed. This, with the great elevation of the ventral beak, the outline of the area, and its apparent extension forward of the dorsal beak, renders it not improbable that this species properly belongs to the genus *Acambona*.

Locality and position, in the sandstone of the Chemung beds at Burlington, Iowa.

Genus STREPTORHYNCHUS King.

STREPTORHYNCHUS LENS (n. s.) Shell broadly subelliptical, a little wider than long; hinge line not quite equalling the greatest width of the shell, but sometimes extended outward, forming salient angles at the cardinal extremities; valves subequally convex, the ventral valve deepest, somewhat regularly convex; beak prominent, usually incurved, and not twisted or flattened; area rather narrow, extending fully to the cardinal extremities; height of the callosity a little less than the breadth of its base; dorsal valve a little flattened at the cardinal extremities, usually having a slight central depression, producing a slight emargination of the front.

Surface marked by numerous, abruptly raised, somewhat rugose,

rounded striæ, which are frequently increased by implantation; these are crossed by fine concentric striæ and imbricating lines of growth, the latter being numerous near the margin in the older shells.

This species presents all the characters of *Streptorhynchus*, except that the ventral beak is not distorted in any of the specimens examined, as is usual in this genus. This peculiarity, with the sub-lenticular form of adult shells, which is also unusual in species of this genus, renders it comparatively easy to distinguish it.

Locality and position, in limestone of the age of the Chemung beds at Burlington, Clarkesville, Mo., and Hamburg, Ill.

Genus PRODUCTUS Sowerby.

PRODUCTUS VIMINALIS (n. s.) Shell moderately large, thin; ventral valve much elevated in front, where it is about as wide as its length, broadly rounded in front, from which it is somewhat regularly arcuate at the beak; this is rather small, prominent, and incurved; hinge line equalling, or nearly equalling, the greatest width of the shell. Surface marked by numerous, somewhat rugose, tubular costæ, showing the bases of tubular spines on their backs, which are more numerous near the front and at the sides; near the front margin the costæ branch off into prominent, rough, irregular fascicles. The costæ are crossed by fine striæ of growth, and a few more or less distinct concentric undulations.

Locality and position, in the upper division of the Burlington Limestone, Burlington, Iowa.

Genus CHONETES Fischer.

CHONETES GENICULATA (n. s.) Shell small, sub-oval in outline; hinge line scarcely equal to the greatest width; dorsal valve moderately concave, a little flattened at the cardinal extremities, not closely following the curvature of the ventral valve, which in the older specimens is very geniculate near the umbo, the beak being small, and the umbonal parts flattened. Area narrow, slightly concave; that of the ventral valve about twice the width of the other, having about three small spines along its outer margin, on each side of the beak; deltidial callosity about as wide as high. Surface marked by about forty-five or fifty slightly elevated, rounded striæ, which are crossed by fine lines of growth.

Locality and position, in the Chemung beds at Burlington, Iowa (?), and their equivalents at Hamburg, Ill., and Clarkesville, Mo.

Genus CRANIA Retzius.

CRANIA SHELDONI* (n. s.) Dorsal valve circular or subcircular in outline, irregularly convex; beak somewhat elevated, smooth,

* Prof. D. S. Sheldon, Griswold College, Davenport, Iowa.

inclined backward, and situated near the posterior margin. Surface marked by numerous distinct, fine, somewhat rugose striæ. Ventral valve unknown.

This species bears some resemblance to *C. crenistriata* Hall, of the Hamilton group of New York, but is distinct from that in the character of the striæ, the convexity of the ventral valve, and the position of its beak.

Locality and position, in Calcareous Shales of the age of the Hamilton group of New York, New Buffalo, and Iowa City, Iowa.

CRANIA REPOSITA (n. s.) Shell varying from subcircular or subelliptical to transversely subquadrate in outline; interior of ventral or attached valve having a narrow, continuous elevation around the margin; adductor muscular impressions distinctly elevated, the anterior pair close together, and situated a little back of the centre; the posterior pair situated near the posterior margin, and about as far apart as their distance from the anterior pair.

The only specimens of this species discovered are attached, by the full breadth of the ventral valve, — the dorsal valve absent, — to a valve of *Spirifer Grimesi.*

Genus DISCINA Lamark.

DISCINA CAPAX (n. s.) Shell subcircular in outline, dorsal valve much convex, apex small, prominent, eccentric, and pointing backwards. Surface having a rather smooth appearance, but marked by fine lines of growth, and these crossed by very faint, somewhat distinct, radiating striæ.

This species bears some resemblance to *D. Vanuxemi*, Hall, of the Lower Helderberg group of New York, but differs in the more eccentric position of the apex and the character of the surface-markings.

Locality and position, in the sandstone of the Chemung beds at Burlington, Iowa.

Genus LINGULA Bruguière.

LINGULA HALLI* (n. s.) Shell elongate, oval in outline, about twice as long as wide; valves not very gibbous; beaks small, prominent. Surface marked by fine striæ of growth; yet its appearance is usually smooth and bright.

It most nearly resembles *L. Spatula* Hall, of the Genessee Slate of New York, but differs in being proportionally shorter, and narrower near the beaks, and has a smoother surface.

Locality and position, in the upper and lower divisions of the Burlington Limestone, Burlington, Iowa.

*B. J. Hall, Esq., Burlington, Iowa.

CONCHIFERA.

Genus AVICULOPECTEN McCoy.

AVICULOPECTEN GRADOCOSTUS (n. s.) Shell large, a little inequilateral, broader than high; left valve rather flat; right valve more convex; umbones large, prominent, shell on the anterior slope bending abruptly down to the anterior wing, which is faintly radiated. Hinge line and full length of wings unknown. Surface marked by about twenty-five broad, flat, compound ribs on the body of each valve, which are well developed near the basal margin, but more indistinct on the umbones and slopes. These ribs are separated by a narrow groove, and surmounted by a distinct carina of about the same width as the groove, giving the sides of the ribs somewhat the appearance of minute steps.

Locality and position, in the sandstone of the Chemung beds at Burlington, Iowa.

Genus CARDIOMORPHA DeKonnick, CARDIOPSIS Meek and Worthen.

CARDIOMORPHA (CARDIOPSIS ?) PARVIROSTRIS. Shell subcircular in outline, slightly inequilateral; valves broadly and moderately convex; base more broadly rounded than the front and oval margins; beaks small, incurved, pointing little, if any, forward. Surface marked by fine radiating lines.

This species is associated with C. *ovata* Hall, which Messrs. Meek and Worthen regard as belonging to their genus *Cardiopsis*. If so, our species should probably be referred to the same genus. It differs specifically from that shell in its less oblique and more circular outline, its much smaller umbones, and less incurved and deflected beaks.

Genus GERVILLIA Defrance.

GERVILLIA STRIGOSA (n. s.) Shell long and very narrow, posterior end abruptly rounded, back slightly concave, base a little more convex than the concavity of the back, most ventricose a little behind the umbones, one or two faint ridges running along the back on each side; anterior ear rounded at the front end, inflated, leaving an oblique depression between it and the body of the shell, which reaches the base, making it a little emarginate; posterior ear small, and but slightly elevated from the back of the shell. Surface marked by a few concentric wrinkles, more visible on the anterior parts. Length 4, height 1.

Locality and position, in the Chemung beds at Burlington, Iowa.

ZOOPHYTA.

Genus ZAPHRENTIS Rafinesque et Clifford.

ZAPHRENTIS ELLIPTICA (n. s.) Coral in the form of an elongated, reversed cone, curved and laterally compressed, more so below than at the upper part; sometimes this compression is so great as to produce a

strong carina on the outer curve below, and to give a subelliptical outline to the calyx. Septal fossette rather large, but variable in size, extending to the outer wall on the incurved side, where it is deepest. Radiating lamellæ strongly defined, somewhat slightly and irregularly curved, numbering at the margin from thirty-two to forty, occasionally uniting in fascicles; outer wall thin. Surface marked by the usual lines of growth.

Locality and position, in the lower division of the Burlington Limestone, Burlington, Iowa.

ZAPHRENTIS GLANS (n. s.) Coral small, general form subglobose; apex small, prominent; border of the calyx very oblique; radiating lamellæ well developed, usually extending above the outer border so as to make the top convex instead of concave, as is usual in this genus. They are from thirty to forty in number besides partially developed ones alternating with those well developed. Septal fossette moderately large, but shallow, extending to the outer wall on the outer or most convex side, and deepest near its centre. Outer wall thin, and marked by undulating lines of growth.

Locality and position, in the upper bed of Burlington Limestone, Burlington, Iowa; where it is frequently met with in a water-worn or eroded condition, giving it a glandular shape.

Genus SYRINGOPORA Goldfuss.

SYRINGOPORA HARVEYI * (n. s.) Tubes flexuous, round, usually somewhat radiating, rather closely arranged, connected by not very numerous, rather strong side tubules, and sometimes coalescing; funnel-shaped prolifers rather numerous, deep, thin. Surface of tubes marked by somewhat strong wrinkles of growth.

Locality and position, in the Chemung beds, and the lower division of the Burlington Limestone, Burlington, Iowa.

Genus STRIATOPORA Hall.

STRIATOPORA CARBONARIA (n. s.) Coral ramose, very gradually tapering; cells deep, closely arranged in alternating series opening upward; walls thin and somewhat projecting on the lower margins. The general characters of this species seem to place it without doubt in the genus *Striatopora* of Hall, yet our specimens do not show the interior striation of the cells which is characteristic of that genus; probably on account of their weathered condition, and the probability that they are outer branches, and were not fully matured.

Locality and position, in the upper and lower divisions of the Burlington Limestone, Burlington, Iowa.

* Dr. Philip Harvey, Burlington, Iowa.

NULLIPORA? OBTEXTA (n. s.) In the Chemung rocks at Burlington, a peculiar incrustation is met with, which appears to possess the characters of *Nullipora*. It usually commences on the convex side of a small shell, completely encrusting it, and apparently permeating its substance, and then flowing out from it on every side in irregular undulations, giving a subcircular outline, and preserving about the same thickness beyond the border of the shell that it has where that forms a part, except at the outer margin of the incrustation, where it is thin. The upper surface is covered with fine, distinct, irregular, granular corrugations, showing undulating wrinkles of growth. Its general aspect is like the upper valve of *Crania*, and when it encrusts an *Orthis*, as it frequently does, the deception is quite complete, as the striation of the shell is not fully obscured by the incrustation, and the beak of the encrusted shell gives the usual appearance of the umbo of *Crania*.

They have been observed encrusting the separate valves of *Nucleospira Barrisi*, *Orthis Thiemei*, and *Nucula Iowensis*, all small shells, but the overflowing part has been observed to reach to an inch and a quarter in diameter.

February 5, 1862.

The President in the chair.

A paper was presented in the name of Mr. Charles A. White, of Burlington, Iowa, entitled, "Descriptions of new species of Fossils from the Devonian and Carboniferous rocks of the Mississippi Valley." Referred to the Committee on Publication.

Mr. A. E. Verrill made a report on the coral incrusting the bell, olive jar, and decanter, from the wreck of the frigate Severn, lost in 1793, and presented at the last meeting by Messrs. Sampson and Tappan. It proved to be a species of *Heliastrea*, resembling both *H. stellulata* and *H. annularis* of M. Edwards, but probably distinct from either.

Mr. Marcou read the following communication:—

OBSERVATIONS ON THE TERMS "PÉNÉEN," "PERMIAN," AND "DYAS." BY JULES MARCOU.

In an article published simultaneously in three or four English periodical scientific journals,* Sir Roderick Impey Murchison expresses

* See "*On the Inapplicability of the new term 'Dyas' to the 'Permian' Group of Rocks, as proposed by Dr. Geinitz.*" *By Murchison. Edinburgh New Philosophical Journal*, Jan., 1862; *The Geologist*, No. 49, Jan., 1862; *The London, Edinburgh, and Dublin Philosophical Magazine*, Jan., 1862, and also *The Illustrated London News*, Jan., 1862.

himself as follows: "I suggested to my associates (de Verneuil and Von Keyserling), when we were at Moscow in October, 1841, that we should employ the term *Permian* to represent, by one unambiguous geographical term, a varied mineral group, which neither in Germany nor elsewhere had then received one collective name." The author adds, in a foot-note, "It is true that the term *Pénéen* was formerly proposed by my eminent friend, M. d'Omalius d'Halloy; but as that name, meaning *sterile* (M. d'Omalius does not translate *Pénéen* by *sterile*, but by *poor*. — J. M.), was taken from an insulated mass of conglomerate near Malmédy in Belgium, in which nothing organic was ever discovered, it was manifest that it could not be continued in use, as applied to a group which was rich in animal and vegetable productions."

After stating the reasons which, according to his view, show the "inapplicability of the new term Dyas," Mr. Murchison adds: — "I claim no other merit on this point for my colleagues de Verneuil and Von Keyserling, and myself, than that of having propounded, twenty years ago, the name of "Permian," to embrace in one natural series those subformations for which no collective name had been adopted. I trust that, in accordance with those rules of priority which guide naturalists, the word "Permian" will be maintained in geological classification."

In answer to this, I beg geologists to read the following extract: —

"Pénéen Formation. — The formation that we designate by the epithet *pénéen* (poor) has for its principal type the deposits of Thuringia (M. d'Omalius does not mention the conglomerate, near Malmédy, as a principal type. — J. M.), commonly known by the German names, *Zechstein*, *Kupferschiefer*, and *Todtliegende*. The fossils are chiefly the *Paleoniscus*, *Platysomus*, *Pygopterus*, *Spirifer*, etc." . . "Thuringia being the classic ground of the *Pénéen formation*, we shall cite it as the type, etc." (See *Eléments de Géologie*, by J. J. d'Omalius d'Halloy, 3d edition, Paris, 1839; pp. 415–416.)

In the second edition of his *Eléments de Géologie*, published in 1834, M. d'Omalius already uses the term "*Pénéen*" to designate the Zechstein and the Rothliegende.

This settles the question of priority.

1834. — M. d'Omalius unites under the term *Pénéen Formation*, the Zechstein and the Rothliegende.

1839. — M. d'Omalius continues the term *Pénéen*.

1840. — M. Kittel unites the Zechstein and the Rothliegende in one formation. (See *Lehrbuch der Geognosie*, by Naumann.

1842–45. — Mr. Murchison proposes the term "*Permian*" to designate the vast series of beds of marls, schists, limestones, sandstones, and conglomerates, east of the Volga (Russia), which correspond to the whole of the Trias, and also to the upper part only of the *Pénéen*.

1850. — M. Haussman uses the term *Thuringer formation.*

1853. — M. d'Omalius continues the term *Pénéen.*

1854–56. — M. Dumont uses the term *Pénéen.*

1854–59. — Mr. Murchison applies the term *Permian*, with its signification, as a Russian type, to the *Lower New Red Sandstone*, *Magnesian Limestone*, and *marl slate* of England; and also to the *Rothliegende*, *Zechstein*, and *Bunterschiefer*, containing the *Calamites arenaceus* of the Trias of Germany. (*Siluria;* 2d and 3d edition.)

1859. — M. Marcou shows the objections to the term *Permian*, with its Russian signification, as a type, and proposes the terms, *Saxonian formation*, *Thuringian formation*, *Eislebenien formation*, or "*Dyas.*"

1861. — M. Geinitz publishes the first volume of his monograph of the "*Dyas,*" in association with Messrs. Eisel, Ludwig, Reuss, and Richter.

1862. — M. Murchison shows what he calls "the inapplicability" of the terms *Pénéen*, *Dyas*, *Trias*, *Grauwacke.*

My Memoir, *Dyas and Trias* (see *Archives de la Bibliothèque Universelle de Genêve*, 1859), treats two questions entirely distinct.

The first and the principal one, since it is a reply to the demand for an explanation which Sir R. I. Murchison did me the honor to address to me, shows the numerous and grave objections which arise from the use of the geographical term "*Permian,*" with its signification, as explained by Mr. Murchison, in his work, *Russia in Europe and the Ural Mountains*, 1845, whether it be applied to Russia itself, or Germany, England, Asia, or America.

Mr. Murchison has declined answering these objections, for the reason that "the author had not been in Russia" (see *Silliman's Journal*, 1859, and *Edinburgh New Philosophical Journal*, 1862). One of the associates of Professor Geinitz, M. Ludwig, has been to Russia, and the results of his researches will be published in the 2d volume of the monograph of the "*Dyas.*" Other observers will follow, and, before many years have passed, we shall better understand the Russian Dyas and Trias.

The second question is the union of the Dyas and Trias, as a great geologic period, under the name of "The New Red Sandstone;" a period which I consider, in time and space, as of the same importance with the Grauwacke or Paleozoic, Carboniferous, Secondary (Jurassic and Cretaceous), Tertiary, and recent periods.

I have never united the New Red Sandstone with the Secondary, or with the Carboniferous.

In order to work out the classification of the stratified rocks into those grand periods, I have made use of all the geological characters

of the rocks, — that is, their stratigraphy, paleontology, lithology, orography, and their geographical distribution; and, after all, it is very nearly the same classification as those proposed and employed by Werner, Smith, Brongniart, De la Bêche, De Buch, Humboldt, d'Omalius, and Elie de Beaumont.

Some observers, relying exclusively on Paleontological evidence, and putting aside all other geological characters, have proposed the classification of all the stratified rocks into three or four great periods, under the names of Azoic, Paleozoic (Grauwacke, Carboniferous, and Dyas), and Neozoic (Trias, Jurassic, Cretaceous, Tertiary, and recent,) or Mesozoic (Trias, Jurassic, and Cretaceous), and Cainozoic (Tertiary and recent).

If the class of Molluscs, especially the Brachiopods, and the plants, are alone considered in Paleontology, it is true that, in the *actual state of our knowledge*, the preceding classification is well founded; but if we study also the Radiates, the Echinodermata, the Crustacea, the Fishes, Reptiles, and the Mammalia, to place the Dyas in the Paleozoic is no longer so justifiable, and several learned Paleontologists place the Dyas even in the Mesozoic.

While I understand and respect these different Paleontological classifications, I think that I follow the true principles and methods of natural history in keeping to the ancient classification, as I have learned it in the works of the founders of Geology, and as I have seen it in the two hemispheres.

Mr. Wilder made a verbal communication on the muscular differences existing between the hands and feet of man and those of the Quadrumana, showing, in particular, that though in general appearance and power of grasp the so-called hind-hand of the monkey resembles rather the hand than the foot of man, yet there is this important structural difference, that the great toe of the monkey has no separate long flexor muscle, but its tendon is closely connected with the tendons of the other toes; so that it has little independent motion, but is flexed at the same time with the rest, in the simple act of grasping a branch or other object.

In accordance with a suggestion from the Council, it was voted to establish a Curatorship of Ethnology.

Voted, that a committee be appointed to nominate a candidate for the Curatorship; the President designated Drs. Gould, White, and Kneeland, who nominated Dr. Charles Pickering, and he was unanimously elected.

The Treasurer notified the members present that he should propose an alteration in Article 3d of the Constitution, fixing the sum necessary to make any one a patron of the Society, at one hundred, instead of fifty dollars.

On motion of the Treasurer, the following alterations were made in the By-Laws, as in the printed copy of 1855:

In Section I. Art. 1, the first sentence to end with the word "thereof," in the third line, and the second sentence to be stricken out.

Art. 2. After the word "pay," in the second line of the first sentence, to read "any assessments."

In Section III. Art. 1, to read, "Every resident member shall be subject to an annual assessment of five dollars, payable on the first of October of each year."

Art. 2. "Any member who shall pay into the treasury at one time the sum of fifty dollars, may become a Life Member, and be exempt from the annual assessments."

In Art. 3, in line four, after "inability," to strike out "to become a member should an initiation or assessment fee be demanded," and substitute "to pay the annual assessments."

On behalf of the Building Committee, Dr. White announced that ground had been broken on the site of the Society's new building, preparatory to driving piles, and that some of the materials were upon the ground.

The Corresponding Secretary read the following letters recently received, namely: —

From the K. K. Geologische Reichsanstalt, Wien, September 13th, 1861; the Dublin University Zoological and Botanical Association, November, 1861, acknowledging the receipt of the Society's publications; K. Akademie der Wissenschaften, Wien, October 4th, 1861, acknowledging the same, and asking that some deficiencies may be supplied; Bibliokariat der K. Bayerischen Akademie der Wissenschaften, December 2d, 1861, acknowledging the same, asking for missing numbers, and presenting various publications; K. Preussische Akademie, Berlin, August 31, 1861; Verein für Naturkunde, Wiesbaden, October 1, 1861; Royal University of Norway, Christiania, October 26, 1861; K. Akademie der Wissenschaften, Wien, October 28, 1861, presenting their various publications; Verein für Naturkunde zu Offenbach, July, 1861; Pollichia zu Dürkheim, presenting their publications, and desiring exchange.

Messrs. George Jaques, of Somerville, and John Jeffries, Jr., of Boston, were chosen Resident Members.

February 19, 1862.

The President in the chair.

Mr. C. J. Sprague read the following communication: —

Is the Heath Indigenous to the United States? By C. J. Sprague.

Mr. E. S. Rand, Jr., has contributed an article to the January number of the American Journal of Science, 1862, entitled "The Heather a native of the United States." It is a very clear and precise statement of the facts regarding the recent discovery of Scotch Heath (*Calluna vulgaris*) in Tewksbury, Mass., where it must have been more than fifty years. The evidence obtained inclines Mr. Rand to the belief that the plant was not introduced, but is really indigenous to the country. Notwithstanding the facts stated, we cannot, as yet, come to the same conclusion, which, it appears to us, is based on insufficient evidence.

The vicinity of Boston is notorious for the great number of introduced plants which have become acclimated. Most of these, it is true, are herbs, whose seeds might readily be transported in various ways. The Barberry and the Privet, however, are shrubs. These, although planted by man, have not become extensively spread, being still stragglers on the borders of cultivation. The Heath in question has been found only in one locality, of not more than half an acre in area, and has been confined to that limited area for more than fifty years. It grows in a soil and situation which, instead of being peculiar to that locality, are found throughout the whole breadth of the country. It grows in company with the common Alder and the *Myrica Gale*, which are also European plants, and which are among the commonest of our swamp shrubs. If the Heath be a native plant, there is no reason why it should not be as common as either of these, for there are no peculiar circumstances about this locality which do not exist elsewhere. There are some native plants which are only found in isolated spots; but the cause of this isolation is generally apparent. Many of our Alpine plants are similar to those of Europe; but they are confined, necessarily, to the few localities which are favorable to their growth. On the other hand, some of our trees and shrubs are identical with those of Europe, and, not being circumscribed by peculiar circumstances, grow broadcast over the country. The Chestnut and the Juniper grow everywhere; and there is no reason why the Heath should not, if indigenous, be equally spread. The Rose-Bay (*Rhododendron maximum*) and the Magnolia (*Magnolia glauca*) are only found in isolated spots in New England; but

they are common Southern plants which gradually thin out northward, and reach their northern limit here. It is climate which prevents their growth. But this is not the case with the Heath. For it is an inhabitant of regions equally cold with ours, and, if it be naturally associated with the Alder, the Cranberry, the Laurel and the Azalea, it ought to be found with them elsewhere, as they exist all over the country in a range of thousands of miles, precisely similar in habit and locality.

Out of sixty-two species of *Ericaceæ* recorded in Dr. Gray's Manual of the Northern States, eighteen are common to Europe; showing that the general circumstances attendant on the growth of plants of this order must be very nearly similar in both places. Of the *Ericineæ* proper, the *Cassandra calyculata*, which grows with the Heath at Tewksbury, a very common New-England plant, is European also. The Bear Berry (*Arctostaphylos Uva-ursi*), very common here, is also European. The *Andromeda polifolia*, a bog plant, also, is common to both countries, as also the *Ledum latifolium*. These instances are mentioned to prove that there can be no natural preventives to the broadcast occurrence of a plant, if native, whose associates are excessively common, and which are also natives of a country where this plant does grow in equal abundance. It would be very strange that in the whole belt of our Northern country, remarkably homogeneous in character, and having a flora almost identical throughout, we should find a native plant growing only on one single half-acre of ground, when there are thousands of acres precisely similar in character everywhere throughout those thousands of miles.

Mr. Rand says: —

"May not this be the last vestige, or one of the last, of what was once an American Heath?" But why must we presuppose that the Heath has died out from the country? Why, when its associates, the Alder, the Cranberry, the Cassandra and the Azalea, are as common as ever, should this one plant, a long-lived, tough, tenacious plant too, have perished? The efforts of man have rarely been exerted to extirpate these plants, because they frequent localities unfavorable to the use of man, and, besides, no necessity has existed for this extirpation.

Let us now examine the facts which have been obtained as to the existence of this Heath. Its occupancy has been traced back fifty years. An old farmer remembers in his boyhood to have seen patches "as big as a bushel basket or larger," of a plant with long, tough roots, which caught the plough. And then it was in precisely the same locality as now, and equally circumscribed. The size of the patches cannot be accurately known. A boy's observation is not very close; and we all know how small the objects appear to our

mature eyes which our childish notice thought to be quite grand. Besides this, memory adds compound interest for the time which intervenes, especially when a new-found importance attaches to the principal. Besides this, it is by no means a settled thing that the farmer's boy's plant was *Calluna vulgaris*. Taking Loudon's estimate of the annual growth of heath, "three or four inches a season," or even reducing this to two, twenty years would suffice for a seedling plant to grow forty inches, which would make a respectable bushel basket of branches. So that we need not suppose, with Mr. Rand, that these plants might in Mr. Livingstone's boyhood have been a century old. Neither is Tewksbury such an "out-of-the-way place." Billerica was settled in 1653, and we must not presume that a thickly-settled population is necessary to introduce a foreign plant. One stray seed from the pocket or bundle of a European immigrant may have done it. Many instances have occurred where European plants have been brought over in this way. Foreign plants frequently spring up around paper mills from seeds brought in the rags used there. They do not spread extensively, because the circumstances are not favorable to their acclimation. In the case of the Heath, this is an important point. Because, if native, there is no reason why it should not be broadcast; if it be introduced, there may be nice, unperceived causes why it should not be acclimated here everywhere. The European violet even, common as it is in gardens, has never established itself as an acclimated plant. If our gardeners should sow the Heath everywhere, it might grow where it was sowed, as it has done at Tewksbury, and thoroughly established itself, in spite of harrowing and mowing. This would prove pretty conclusively, that were it a native, it would not have died out, as circumstances would favor its growth as much now as ever. Instances are very rare of an indigenous plant being confined, in any country, to one half an acre of ground.

A whole century and a half elapsed after the settlement of Billerica before the Heath was seen there. The botanico-historic period did not commence for a century and a half after its settlement. How many opportunities might have occurred during that time for the accidental sowing of a foreign heath, when we know that there was constant immigration from Europe, and know, also, that "the seeds retain their vitality for many years."

It is a question of considerable importance, as regards botanical geography, whether the plants of Europe are identical, to any extent, with those of America; and therefore all the evidence bearing on the nativity of the *Calluna* should be examined, whether in Tewksbury or elsewhere. This evidence does not seem to be very direct or conclusive. It does not certainly prove it to be an inhabitant, either in

great quantity or frequency. It is mentioned in De la Pylaie's catalogue of Newfoundland plants, and also in De Candolle's Prodromus, as occurring there. Dr. Gray was told by Dr. Don, some twenty years ago, that a surveyor had brought a specimen from the interior of the island. Loudon gives it as a native of New Brunswick, on unknown authority. This is all the evidence we have to prove the *Calluna* a native of the northern regions of America.

If we find one single fossil animal in a stratum where its remains must have been deposited at its death, we may take it as a positive proof that animals of that species lived there at the geological epoch during which that stratum was deposited. But one specimen of a plant said to be gathered in a certain region does not equally prove that the plant is indigenous there; particularly when that region has been for years the dwelling-place of emigrants from the very country where that particular plant does grow luxuriantly in a wild state. At any rate, whatever may have been the origin of the few specimens of which a rather uncertain record exists, it is very certain that the *Calluna vulgaris* is, at present, no known denizen of any part of this continent. Nor can we understand why it should be destroyed, if native, by any special causes, when it thrives so well under disadvantageous circumstances at Tewksbury. If it should be found growing freely and abundantly at Newfoundland, there might be ground for thinking it indigenous, in view of the record made of it by De la Pylaie as a Newfoundland plant; yet these very regions were long ago settled by French immigrants. We imagine that the state of the country there has not changed, since his day, so much as to eradicate from existence a native shrub. Were the Heath a plant growing naturally isolated, we might more readily accord to it an occasional existence in remote localities; but this is not the case. It is gregarious in habit, robust in growth, and tenacious of life. Until it is found in such places and in such quantity as to prove undoubtedly that it is a native of North America, we must remain somewhat doubtful of the secondhand evidence now on record.

We therefore incline to the opinion that the *Calluna* is an introduced plant, at least in Tewksbury, for the reasons that it occurs in a very limited area, while every circumstance is favorable to its growth, if native, over the whole face of the northern country; because it grows luxuriantly in similar situations where it is native; because, after a known occupancy of this area for many years, it has not extended itself into surrounding places of a like character; because kindred native plants, growing in precisely the same situations, are profuse throughout the country; and because it is found near grounds used, from early times, for agricultural purposes.

Prof. W. B. Rogers read the following paper in behalf of the author: —

NOTES ON THE SURFACE GEOLOGY OF THE BASIN OF THE GREAT LAKES. BY DR. J. S. NEWBERRY.

The changes which have taken place in the physical geography of the country surrounding the great Lakes, geologically speaking, within a recent period, have been very great; how great, and dependent upon what causes, we cannot as yet definitely state, as much more study than has hitherto been given to the subject will be necessary before all its difficulties and obscurities shall be removed.

These changes to which I have referred apparently include (a) great alterations in the level of the water-surface in the lake basin, and (b) in the elevation of this portion of the continent as compared with the sea-level, with (c) corresponding alternations of temperature, all followed by their natural sequences.

The facts which lead to these conclusions are briefly as follows: —

(1) The surfaces of the rocks underlying all portions of the basin of the great lakes, except where affected by recent atmospheric action, are planed down, polished, scratched, and furrowed, precisely as those are which have been observed beneath heavy sheets and masses of moving ice.

The effect of this action is strikingly exhibited in the hard trap ledges of the shores of Lake Superior; by the *roches moutonnés* of the granitic islands in the St. Mary's River and Lake Huron; by all the hard, rocky margins of Lake Huron and Lake Michigan; by the Devonian limestones underlying the surface deposits of the peninsulas of Canada West and Michigan; by the planed and grooved surfaces of the Coniferous limestone beneath the west end of Lake Erie, and composing the group of islands off Sandusky; by nearly all the surface rocks, when hard enough to retain glacial furrows, of Ohio, Indiana, Illinois, Iowa, Wisconsin, &c.

(2) Upon these grooved and polished surfaces we find resting, —

First, *A series of blue laminated clays* in horizontal beds, containing few shells, as far as yet observed, but, in abundance, water-worn trunks of coniferous trees with leaves of fir and cedar, and cones of a pine (apparently *Abies balsamea*, *Juniperus Virginiana*, and *Pinus strobus*).

Second, *Yellow clays, sands, gravel, and boulders.* Among the latter are granite, trap, azoic slates, silurian fossiliferous limestone, masses of native copper, &c., all of northern origin, and generally traceable to points several hundred miles distant from where they are found.

(3) Millions of these granite boulders and masses of fossiliferous limestone, often many tons in weight, are now scattered over the *sur-*

face of the slopes of the highlands of Ohio; and, in some places, collections of them are seen occupying areas of several acres, and numbering many thousands, all apparently having been brought here together and from one locality.

(4) At various points are found remarkable pits, conical depressions in the superficial deposits, which have been attributed to icebergs stranding and melting, dropping their loads of gravel and stone around their resting-places.

(5) The beds of clay and other transported materials mentioned above are several hundred feet in thickness, extending from at least one hundred feet below the present water-level in the lakes to points five hundred feet or more above that level.

(6) During the "glacial period" to which I have referred, the whole country must have been relatively higher than at present, and the drainage much more free; for, during this epoch, the valleys of the streams were excavated to a far greater depth than they are at present. This is proven by the explorations which have been made in all the country bordering Lake Erie in search of rock oil. The borings made upon the Upper Ohio and its tributaries, as well as along the rivers emptying into Lake Erie, show that all these streams flow above their ancient beds, — the Mahoning and Shenango, at their junction, one hundred and fifty feet, the Cuyahoga at its mouth over one hundred feet above the bottom of their rocky troughs. The valley of the Mississippi at St. Louis and Dubuque, and the Missouri at and above Council Bluffs, exhibit precisely similar phenomena, — deep troughs excavated in the rock by the ancient representations of the present streams, subsequently submerged and filled up with drift clay, gravel, or loess; these troughs having been but partially cleared of these accumulations by the action of the rivers during what we call the present epoch.

(7) Along the margins of the great lakes are distinct lines of ancient beaches, which show that in comparatively recent times the water-level in these lakes was full one hundred feet higher than at present.

The facts enumerated above seem to justify us in the following inferences in regard to the former history of this portion of our continent. (A) At a period corresponding with, if not in time, at least in the chain of events, the glacial epoch of the Old World, *the lake region, in common with all the northern portion of the American continent, was raised several thousand feet above the level of the sea.* In this period the fiords of the Atlantic (and probably Pacific) coasts were excavated, as also the deep channels of drainage which, far above their bottoms, are traversed by the Mississippi and its branches, and indeed most of the streams of the lake country.

During this period Lake Erie did not exist as a lake, but as a valley, traversed by a river to which the Cuyahoga, Vermillion, Chagrin, &c., were tributaries. In this "glacial epoch" all the lake country was covered with ice, by which the rocky surface was planed down and furrowed, and left precisely in the condition of that beneath the modern moving glaciers in mountain valleys. Could we examine the surfaces upon which rest the enormous sheets of ice which cover so much of the extreme arctic lands, we should doubtless find them exhibiting the same appearance.

(B) *At the close of the glacial epoch all the basin of the great lakes was submerged beneath fresh water, which formed a vast inland sea.*

From the waters of this sea were precipitated the laminated clays, the oldest of our drift deposits, containing trunks and branches of coniferous trees, a few fresh-water and land shells, but no oceanic fossils. Parallel beds on the St. Lawrence, as shown by Prof. Dawson, generally contain marine remains. It would seem, then, that this was a period of general subsidence throughout the northern portion of our continent, and that the Atlantic then covered a large part of New England and Canada East.

(C) *Subsequent to the deposit of the blue clays, an immense quantity of gravel and boulders was transported from the region north of the great lakes, and scattered over a wide area south of them.*

That these materials were never carried by currents of water is certain, as their gravity, especially that of the copper, would bid defiance to the transporting power of any current which could be driven across the lake basin; indeed, that such was not the method by which they were carried is conclusively proved by the fact, that, between their places of origin and where they are now found, the blue clay beds previously deposited now lie continuous and undisturbed. By any agent, ice or water, moving over the rocky bottom of the lake basin, carrying with it gravel and boulders, these clay beds would have been entirely broken up and removed. The conclusion is, therefore, inevitable, that these immense masses of Northern drift were *floated* to their resting-places.

All the facts which have come under my observation seem to me to indicate that, during countless years and centuries, icebergs freighted with stones and gravel were floating from the northern margin of this inland sea, melting and scattering their cargoes on or near its southern shores. Subsequently, as its waters were gradually withdrawn, these transplanted materials, rolled, comminuted, and rearranged by the slowly retreating shore-waves, were left as we now find them, heaps and imperfectly stratified beds of sand and gravel.

(D) In the lake ridges (ancient beaches), which have been so

fully described by Col. Whittlesey and others, we have evidence that the water of the lakes remained for considerable intervals much higher than at present. By careful study of these ridges we may hereafter be able to map the outlines of the great inland sea, of which our lakes are now the miniature representatives, and to determine by what causes, whether by local subsidence of some portion of its shores, or the cutting down of channels of drainage, this great depression of the water-level was effected.

If, with the topography of the basin of the lakes remaining precisely what it now is, the water-level were raised one hundred feet, to the ancient beach which runs through the city of Cleveland, the whole of the chain of lakes would be thrown together and form a great inland sea.

By this sea, a large portion of the State of New York would be submerged, much of Canada lying in the basin of the St. Lawrence, most of the peninsula of Canada West, the greater part of Michigan, and a wide area south and west of the lakes in the States of Ohio, Indiana, Illinois, Wisconsin, &c.

Indeed, raised to this level, the water of the lakes would submerge deeply the summit between Lake Ontario and the Mohawk, and escape at once through the Hudson to the ocean, as well as by the outlet of the St. Lawrence. At the west a similar state of things would exist; the Kankakee summit, the divide between Lake Michigan and the Mississippi, now scarcely more than twenty feet above the lake level, would be deeply buried, and the whole valley of the Mississippi flooded. We apparently have proof that the lake waters *did* once flow over this summit, as it is said that lake shells are found beneath the soil over nearly all parts of it.

While it is entirely possible that the low points in the rim of this great basin have been worn down to the present inconsiderable altitude by the action of the water flowing from it, and that the former inland sea was drained by the simple process of the wearing down of its outlets, we may well hesitate to accept such an explanation of the phenomena until conclusive evidence of its truth shall be obtained.

Geological history affords us so many examples of the instability of our *terra firma*, that we can readily imagine that local changes of level in the land have not only greatly affected the breadth of water-surface in the lake basin, but have perhaps in some instances produced what we have supposed to be proofs of great and general elevations of the water-level, which are, in fact, only indications of a local rise of the land.

Nothing short of years of patient observation and study will enable us to write anything like a complete history of the great changes which have taken place in the physical geography of the basin of the

great lakes, within a comparatively recent period. Yet we may hope, and fairly expect, that by carefully tracing the lake ridges, measuring their elevation above the present water-level at various points, examining minutely the present and former outlets through which the surplus water of the lakes escapes or has escaped, that much more than we now know will be learned of this interesting subject. To stimulate inquiry in this direction, is the main purpose for which these brief notes are now written.

Mr. Scudder announced the donation of fifteen copies of the illustrated edition of Harris's "Insects injurious to Vegetation" from the State of Massachusetts. The thanks of the Society were voted for the same.

It was voted unanimously that article 3d of the constitube so altered that the last sentence shall read, "Any person who shall contribute at one time to the funds of the Society a sum not less than one hundred dollars shall be a Patron.

Messrs. A. C. Baldwin, James Freeman Allen, Jonathan Preston, William J. Preston, Lyman Nichols and Barthold Schlessinger were elected Resident Members.

March 5th.

The President in the chair.

The President read a letter from Dr. Kneeland, the Recording Secretary, stating that he had been called again to enter the medical service of the army.

Dr. J. C. White was chosen Secretary pro tempore.

Dr. White read a communication presented by Dr. Kneeland "On some Anatomical, Physiological and Zoölogical Points suggested by J. Emerson Tennant's Natural History of Ceylon."

The Corresponding Secretary presented by title a paper containing "Observations on the summit structure of Pentremites, the structure and arrangement of certain parts of Crinoids, and descriptions of new species from the carboniferous rocks at Burlington, Iowa, by Charles A. White." Referred to the Publishing Committee.

Dr. C. T. Jackson remarked upon the recent discovery of gold in Nova Scotia, and the general lithological characters of that Province. The metal is found in slate rocks and the quartz veins connected with them. The locality of its occurrence was not visited in his survey.

Mr. Marcou stated that the gold of the Atlantic coast was of another formation from that of California. The slate of Nova Scotia was metamorphic Taconic rock. There had been found in North Carolina beds of red sandstone containing gold washed into it during its formation, showing its existence previous to the formation of the latter. In California the quartz gold-bearing veins seldom occur in the slate itself. We appear to have in America gold of two different periods. In Australia the gold is entirely of the drift period, while that of the Atlantic coast is of anterior date.

Mr. Gaffield exhibited a peculiar form of crystallization occurring in a pot of window glass resembling a Nasturtium seed. It was probably silicate of lime.

March 19*th*.

Dr. A. A. Gould in the chair.

Prof. Henry J. Clark presented the following communication:—

LUCERNARIA THE CŒNOTYPE OF ACALEPHÆ. BY PROF. HENRY JAMES CLARK, OF HARVARD UNIVERSITY, CAMBRIDGE.

The present communication is a mere sketch of a most thorough and exhausting anatomy of Lucernaria, which I have illustrated by numerous plates, and which I propose to publish in an extended memoir, in connection with some considerations upon the general morphology and systematic relations of Acalephæ. I have been engaged during the whole of the past year upon the organical and histological anatomy of this animal, in order to determine what are its relations to Radiata in general, and to Acalephæ in particular. I have had abundant materials for study, inasmuch as this species of Lucernaria is a very common inhabitant of our shores, wherever the eel-grass, Zostera marina, grows. Almost invariably Lucernaria is to be found upon the Zostera, and very rarely upon any other plant.

It may be obtained from the last of August, when it is most frequently met with in a young state, until the last of June, at which time the young ones of the autumn season have developed to full-grown animals. In an adult state it measures nearly an inch across the disc, exclusive of the tentacles, and about the same in height. It varies in color from green, which is the most common tint, to deep olive; from light yellow to reddish brown, or from light violet to the deepest purple. In form it is octagonal, and most frequently it so comports itself that the four sides opposite the bifarious genitalia are shorter than those alternating with them, but frequently the same individual reverses the order of things, and the latter become either as short, or even shorter, than the first. From this we infer that the specific differences, based upon the approximation of the bunches of tentacles, two and two, are entirely erroneous. As these animals are very sensitive and irritable, they contract upon the least disturbance; and, as the muscular system is most highly developed in the region which lies about the four partitions of the disc, it is most natural that when the creature contracts it should draw the two halves of the genitalia and the bunches of tentacles together more closely here than at the alternate quarters; hence arises the frequently-observed quadrate outline of the disc. Again, in regard to another feature oftentimes employed to discriminate between different species or even groups, I would say that the absence of auricles does not indicate a specific difference from those individuals possessing them, but rather an accidental atrophy of these organs; and that this fact is to be classed in the same category as the occasional development of one of the tentacles into a semiauricular body. I have always noticed that individuals in such a condition have an unnatural appearance; that they are not so lively as the others, and appear to be diseased. I believe this species to be identical with the *L. auricula* of the English coast. The most characteristic figure that I know of, although unsatisfactory, is in Gosse's little book, "*The Aquarium.*"

In order to contrast the structure of Lucernaria with that of the Steganopthalmatan Medusæ, and, moreover, in order that I may not complicate matters, I will compare it, organ for organ and part for part, with one of our most common medusæ, *Aurelia flavidula*, Agassiz. The aboral side, which corresponds to the so-called dorsal region of other Acalephæ, projects at the apex into a moderately long columnar body, usually called the peduncle of Lucernaria. With the exception of the four equidistant channels and the four muscular cords which alternate with them, the peduncle is a solid gelatiniform mass, covered by the outer wall. This gelatiniform substance also constitutes the bulk of the disc, filling the entire space between the outer wall and the inner or lining wall of the digestive cavity, and is direct-

ly continuous with that in the peduncle. In Aurelia, Cyanea, and other Acalephs, this substance appears like an amorphous gelatiniform or semicartilaginous mass, with a few irregular cells scattered here and there; but in Lucernaria it has a highly organic structure. Extremely elongate, columnar, cell-like bodies extend in close proximity from the outer to the inner wall, so that, in a section of the thickness of the disc, it appears to be transversely striated. In the peduncle, as a transverse section reveals, these columnar cells are arranged about the axis in peculiar, regular groups; some columns pass from one channel to the next on either side; some diagonally across the axis from one channel to an opposite one, and others extend obliquely from the channel to the muscular cords which alternate with them. This arrangement reminds one of the methodical disposition of the great cells in the body of Pleurobrachia, as I have described them in Prof. Agassiz's third volume of his "Contributions to the Natural History of the United States." In the oral or lower side of the disc of Aurelia the gelatiniform substance has the same structure as in the aboral side, whilst in Lucernaria, although it has all the regularity in the disposition of its components that obtains in the aboral side, yet it possesses a totally different nature, as I will describe hereafter in connection with the muscular system.

From the middle of the base of each of the four flat sides of the quadrate proboscis a light streak, which has the deceptive appearance of a radiating canal, passes in a direct line nearly to the border of the disc; this is the line along which the oral and aboral floors of the disc unite, and form a solid partition, by which the digestive cavity is divided into four broad chambers, which communicate with one another at the inner or proximal ends, about the base of the proboscis, and also at the outer or distal ends through the narrow passage between the terminus of the partition and the edge of the disc. In the peduncle there are four equi-distant broad tubes, which merge into one cavity at its base, and correspond in position to the four chambers of the digestive cavity. The grouped tentacles which occupy the eight corners of the disc are hollow, as, likewise, are the auricles, and communicate openly and directly with the digestive cavity. This is all that constitutes the chymiferous circulatory system of Lucernaria. In Aurelia we have radiating canals at the points corresponding to the partitions of Lucernaria, as well as in the intermediate sections.

In Aurelia, the genitalia are four single circular organs, one of each being placed opposite the flat side of the proboscis; whereas in Lucernaria each genital is a double organ, the halves of which have a peculiar shape, and are situated respectively one on each side of

the partition, and extend along the inner face of the oral floor of the disc from the base of the proboscis to the extreme limits of the corners of the disc, where they almost touch the bases of the tentacles. Across the proximal end of each partition, triple or quadruple rows of slender digitiform bodies extend each way for a considerable distance along the border of each half of a genital, thus forming the common appendages of the two, and clearly indicating their *unity*. Each half has a peculiar form, which may be represented by an inequilateral triangle whose longest side extends nearly in a straight line from the inner end of the partition to the tentacles, and the two other sides, slightly curving outwardly and meeting at a very broad angle, form the rest of the outline. In the adult, the longest side of the triangle is to its height as two to one. This feature, alone, has a degree of speciality which raises these organs in rank above all others of their kind among Acalephæ; but when we examine their components, we find an unlooked-for structure, hitherto unknown among Acalephæ. What appear, to the naked eye, to be eggs of enormous size, are really little pouches, which contain either numerous eggs or matrices of spermatic particles, according as the individual is male or female. Each pouch, or *genital saccule*, as it may be called, projects freely into the digestive cavity, and is attached by a very short and rather narrow neck to the inner wall of the oral floor of the disc. This constitutes another step in the specialization of these organs, but does not complete the process. At the base of each genital saccule, and on that side which faces toward the proboscis, there is a small aperture, which leads to the interior, where there is a considerable cavity. This cavity is formed by the lateral inversion of the single wall of the saccule upon itself, and the constriction of the wall about the entrance to the chamber. The eggs or spermatic material are enclosed in saccular folds of the wall of this chamber, and into which they fall when mature, and pass thence outwardly through the lateral outlet at the base of the saccule. One may see at a glance that this is a type of the reproductive organs not to be found among the other Acalephæ.

In Aurelia, the generative products, whether eggs or spermatozoa, lie immediately beneath the *outer wall*, and imbedded in the muscular layer which extends throughout the length and breadth of the oral face of the disc, as I have described it in the fourth volume of Professor Agassiz's "Contributions." Between the muscular layer and the inner wall, which forms the immediate parietes of the digestive cavity, a thick layer of gelatiniform substance intervenes, and its presence naturally suggests the inquiry, how are the eggs or sperm to escape into the digestive cavity, as they are known to do? The spermatic particles I have observed frequently escaping directly

through the outer wall into the ocean, and I have seen them, with the broadest end out, projecting like bundles of hairs from the cavity of the matrix through the apertures in the outer wall. When the reproductive material is fully ripe, the inner wall, with the gelatiniform layer, and the muscular layer as far as it includes the material in question, splits off from the outer wall along two lines corresponding to the two borders of the generative organ, and hangs loosely, in ribbons, in the digestive cavity. From the newly-formed raw face of these ribbons the eggs or spermatic particles escape into the main chamber of the disc. This I take to be the universal rule, and such the type of genitalia among all Steganophthalmata; a structure totally unlike that of Lucernaria, in which the *inner wall* alone is concerned in the highly complicated reproductive organs.

Passing now to the consideration of the *muscular system*, I will call your attention to the four white, slender columns which alternate with the four dark tubes which are imbedded in the gelatiniform substance of the peduncle. Sars was the first to indicate the true nature of these columns, and he rightly called them muscular cords They extend from the base of the peduncle to the base of the proboscis, coursing along just beneath the outer wall, but still within the gelatiniform substance, until they reach the upper third of the pedun cle, and then gradually approximating the axial line, they meet the inner wall of the disc just below the base of the proboscis, and thence they pass along still beneath this wall, for a short distance, and, finally *each one enters the oral side of the disc* at the inner or axial end of the partition. At this point, each muscular column expands and forms a fan-shaped layer just beneath the outer wall, and extends laterally so as to occupy the whole space between the two halves of a genital. At the distal end, this layer diverges right and left of the partition into a broad muscular band which borders the disc, and, eventually, is distributed in ridges or cords beneath the outer wall of the tentacles and the auricles. At the inner end of the partition, the muscular layer also passes into the base of the proboscis, and forms a stratum immediately beneath the outer wall. At four equidistant points, alternating with the partitions and genitals, and opposite the four corners of the proboscis, there is a weaker muscular layer, which occupies the same relative position in regard to the outer wall as does the stronger system of muscles first mentioned. On the one hand, it passes into the marginal muscular band, and on the other it enters the corners of the proboscis, and forms a layer in common with the one extending from the partitions. By these alternating stronger and weaker divisions of the muscular layer, the disc is relieved of the sameness which prevails in the muscular system of the Steganophthalmata, and we have indubitable proofs of a higher degree of special-

lization than in the latter order, where the unvarying repetition of similar divisions all around the disc unmistakably indicates inferiority. Moreover, in addition to this, we have a peculiar specialization of the gelatiniform layer, which is embraced by the outer and inner walls of this floor, or rather between the muscular layer and the inner wall; instead of repeating the peculiarities of the gelatiniform layer of the aboral floor, as occurs in Aurelia, it has a totally different appearance and consistency, and an almost unlimited degree of expansion and contraction. In the tentacles it occupies a very deep space between the outer wall, or rather the muscular layer, and the inner wall. In this latter respect, Lucernaria is again peculiar, since in addition to the muscular layer, which alone is present in the young, it develops this gelatiniform layer, — the *musculo-gelatiniform layer*, as I propose to call it,— the like of which does not exist in the tentacles either of Steganophthalmata or Gymnophthalmata. In the auricles, we have also a specialization peculiar to Lucernaria; for in addition to the pigment eye-spot which is imbedded in the base of the oral face of these bodies, the auricles, which in the young cannot be distinguished from the tentacles, gradually thicken the outer wall as age advances, and peculiar, granuliferous, adhesive vesicles are developed between the cells. In the adult, their tentacular nature is almost, or altogether, obliterated, and the swollen outer wall, together with the enormous thickness of the musculo-gelatiniform layer, form an oval mass, thickly studded with adhesive organs, by which they cling, in a most tenacious manner, to any body which they may touch. These organs, and the base of the peduncle, are the only means of adherence which Lucernaria possesses; although it is true that the tentacles are used, as in Aurelia, for prehension, they are, comparatively, very weak, and can only serve to retain the prey, and never effect the purpose for which the auricles are constructed. In consideration of the very obvious office of an auricle, I would propose the name *anchor* for it.

Were the above-mentioned features in the organism of Lucernaria alone to be taken into account, there could be no hesitation in saying that this genus should be considered as the highest of the class of Acalephæ; because of its highly complicated and specialized gelatiniform mass; the high grade, and the peculiar and distinctive grouping of its muscular system; the definite and bilateral form of the genital organs, as well as their saccular subdivision; the two-fold nature and disposition of the prehensile organs, the tentacles and anchors; and, moreover, that it belongs to an order separate from either orders of Acalephæ, because of the typical elements of its genital saccules, which are altogether different from either the Steganophthalmic or Gymnophthalmic type of genitals; and also on account of the an-

chors, which have no parallel in all the class of Acalephæ. But there are parts of the Lucernarian organism which are of a lower grade than those of similar nature among the other Acalephæ. I refer, in the first place, to the hydra-like form of Lucernaria, and its comparatively stiff and hydroidal tentacles, evidently indicating a typical affinity to the fixed hydroid generation of the Sarsiæ, Bougainvilliæ, Steenstrupiæ, etc. The simple, almost unilocular chymiferous system is hardly less medusoidal, as regards the multiplicity of its subdivisions, than in some of the Tubularians, such as Tubularia and Corymorpha, which are described in Professor Agassiz's fourth volume of his "Contributions." In connection with the hydroid form of Lucernaria, I would also mention the total absence of a veil. This might, at first thought, appear to furnish an argument in favor of the high relations of this genus; but I think it is to be deemed as one of the signs of its inferior connections. However, let us look at the progress of velar development. In the *ephyra* state of all Steganophthalmata, the veil is at one time greatly in the preponderance, when compared with the size of the whole individual; but with growth it gradually becomes less conspicuous, and, finally, in some adult genera of this order, it remains as a mere trace of a veil, or, as in Cyanea and some Rhizostomidæ, it is altogether obscured. Now, it is noteworthy that among the lowest of this order, such as Pelagia, we have a strong resemblance to the ephyra state, and the ephyroid, tongue-like veil is quite prominent; and in Chrysaora it is hardly less so; ascending the scale, we find it yet more inconspicuous in Aurelia, and still more so in Cassiopeæ; and, finally, altogether absent in Cyanea, the highest, in my opinion, of all the Steganophthalmata. Now, one might suppose Lucernaria, in respect to the veil, to be in the same category with Cyanea, which has resorbed its veil; this, however, is not the case, for, as I know, from the study of the younger stages of Lucernaria, that it never passes through the veiled phase, it falls short in its development as regards this particular feature of Acalephan morphology. We must take into consideration, also, the eyes, which are found to be as low in point of structure as the merest pigment eye-spot of the Gymnophthalmata.

Thus, in balancing the value of the organisms of this animal, we are inevitably led to the conclusion, on the one hand, that Lucernaria does not stand *as a totality* above all other Acalephæ, nor, on the other hand, does it, by any means, belong below them; and that much less does it affiliate exclusively with the Gymnophthalmata. The only relation that it possibly can be considered under is that of *a correlation to both types of Acalephæ*, — viz., to the Gymnophthalmata, including the Siphonophoræ, and to the Steganophthalmata; but yet not as a graduated connecting link, which would seem to show that

the two orders pass the one into the other, but as an *ordinal type*, equivalent in value to either of the others, by reason of the peculiar and distinctive morphology of certain of its organs. On this account, Lucernaria is to be considered, and may be designated, as the *cœnotype* (κοινὸς, common) of the Acalephæ. In this respect, it holds such relations to the other two orders of Acalephæ as do the Crinoids to the other orders of Echinodermata; or the Annelidæ to the rest of the Articulata; or the Selachians to the true fishes and the reptiles; but, at the same time, containing organic features which separate each of them as a type from the others.

In order that no confusion may arise here, I would state most explicitly that I do not consider the Ctenophoræ as one of the orders of Acalephæ, but deem them to be a class by themselves, equal in value to either of the classes of Radiata, whether Polypi, Acalephæ, or Echinodermata, and standing next in rank to the Echinodermata. The division of the alimentary system of Ctenophoræ into two portions, as among Polypi, is sufficient to separate them from the Acalephæ, since the typical form of the corresponding system in the latter is a unity; moreover, the position and peculiar relations of the tentacles of Ctenophoræ are hardly of less importance, in these considerations, as distinctive characters. I cannot conceive that the Ctenophoræ may be included in the same classific type with the Acalephæ without doing violence to correlative ideas such as are expressed in the organism of the former; and much less can I admit that they have the most distant relation to the Polypi, excepting that, like the latter, they are Radiates. The same kind of arguments that have been used to show that Ctenophoræ and Polypi belong to one class might, with equal justice, be advanced to prove that the Acalephæ are Polypi. We must not mistake a similarity for an identity, any more than that the cry of a child would identify it with a cat, because their voices sound alike, and cannot always be distinguished the one from the other by any single faculty of our senses.

The following tabular view presents at a glance the relations of the Lucernaridæ to the other orders of Acalephæ, and at the same time indicates the position of the Ctenophoræ among the other classes of Radiata.

POLYPI.	ACALEPHÆ.	CTENOPHORÆ.	ECHINODERMATA.
	Lucernaridæ — Steganophthalmidæ. / Gymnophthalmidæ.		

April 2, 1862.

The President in the chair.

Dr. C. T. Jackson made some remarks upon the manufacture of writing inks. He thought they could be made much better, if not more cheaply, directly from the chemical principles themselves than from the crude substances now employed, which contain uncertain and variable proportions of the requisite materials. He described at some length the composition and merits of the various inks manufactured here and in other countries.

Mr. C. K. Dillaway read the following letter from Mr. I. A. Lapham, of Milwaukee, Wisconsin, on the habits of *Sphyrapicus varius*, Baird: —

Your Mr. E. A. Samuels, in the Wisconsin Farmer, — probably misled by some blundering newspaper report of the remarks (not lecture) of Dr. P. R. Hoy, of Racine, Wisconsin, on the habits, &c., of the *Sapsucker*, made before the Illinois Horticultural Society, — has done that careful, accurate, and scientific naturalist much injustice, accusing him of things of which he is not guilty. Dr. J. P. Kirtland, of Ohio, was the first naturalist who expressed his belief in the "popular opinion" on this subject, but unfortunately he did not investigate the matter. Dr. Hoy has recently ascertained that the food of the Sapsucker is the juice and inner bark of trees, and has presented the facts verbally, as indicated above. This little bird differs so much from the true woodpeckers, that Professor S. F. Baird * very properly made it the type of a new genus, — it is now known as *Sphyrapicus varius*, Baird, — and is the only bird properly entitled to the name of *Sapsucker*. The tongue cannot be protruded much beyond the extremity of the bill; at the tip or horny portion, it is broad, flat, and rounded, especially adapted to the work of scooping out the tender inner bark of trees. It differs in these particulars from the tongue of the woodpeckers proper, which may be extended two or two and a half inches beyond the beak; the tip is narrow, sharp, and beset with strong barbs, especially adapted to the work of extracting grubs and insects. The contents of the stomach, examined in numerous cases, at different seasons of the year, indicated only vegetable substances. Fresh specimens were sent to Dr. Joseph Leidy, of Philadelphia, whose dissections fully confirmed the observa-

* Pacific R. R. Report, Vol. IX., p. 101 (1858.)

tions and deductions of Dr. Hoy. The punctures made by the *Sphyrapicus* are usually arranged in several rows around the tree, and are so numerous as often to *girdle* the tree, and, especially in tender kinds, destroy its vitality. The damage done to young trees in and about Milwaukie and Racine is very considerable. The trees punctured are the maple, mountain ash, pine, spruce, pear, apple, cherry, ironwood, basswood, silver poplar, and perhaps others. While Dr. Hoy advises the destruction of this bird, he pleads as earnestly as Mr. Samuels can for the protection of the *Picus villosus*, and all other harmless creatures.

The President gave an account of the dissection of a Hottentot, who recently committed suicide in this city.

The subject was a young and healthy adult, who came to his death by suicide. The chest was well formed and prominent, the shoulders were well made but not broad, the loins very hollow, the hips narrow, the thighs full and feminine, and the calves slender. There was no beard, no hair in the axillæ or on the pubes. The ears were well formed, but the lobule was quite small. The web between the fingers was more extensive than usual, and gradually increased in breadth from the index to the little finger, where it reached as far as the joint between the first and second phalanx.

Height of the body - - - - - -	65½ inches.
Spread of arms from tip to tip of middle finger	66 "
From top of head to top of trochanter - -	29½ "
From top of trochanter to sole of foot - -	36 "
Breadth of shoulders - - - - -	13 "
Breadth of waist - - - - -	9½ "
Breadth of hips through trochanters - -	11¼ "
Length of arm from acromion - - -	30½ "
Length of thigh from trochanter - -	18 "
Length of leg from top of tibia to sole - -	18 "
Length of hand - - - - - -	7¼ "
Length of foot - - - - - -	9 "

From a comparison of the above measurements it will be seen, that while the height of the body and the spread of the arms are almost exactly equal, and thus conform to the standard of a well-proportioned man, the legs are disproportionately long. The tops of the trochanters, instead of being in the middle of the whole height, are five and a half inches above it.

The brain weighed 3 lbs. 2 oz. av., which is about the average weight of a European brain. There are no weights of the brains of Hottentots given in the tables of the comparative weight of the human brain. Dr. Morton gives the measurements of the three Hot-

tentot crania, the average capacity of which is 75 cubic inches. A cubic inch of brain is estimated to weigh 259.57 grains, and this multiplied by 75 would give, as the whole weight, about 2 lbs. 12 oz. av.

Mr. Bouvé asked Dr. Jackson if he had observed any evidence of metamorphic action in the conglomerate rocks of our coast. He had noticed, by the wayside near Hingham, a blood-red rock, resembling Saugus jasper, which he had suspected to be an altered conglomerate, and yet he had never discovered anything of a slaty or pebbly character about it. A short time since, he had found the locality from which these specimens had been taken, near the Ocean House, and had traced it running into true conglomerate.

Dr. Jackson said that he had often seen this red rock, and had frequently traced it into the slate. In Roxbury, rock pebbles of quartz and granite were to be found adhering closely together without any sign of cement. Chemistry reveals the fact that the surfaces are composed of silicate of lime formed by the action of heat. In the vicinity of certain trap-dykes in Rhode Island, the pebbles are often covered with crystals of specular and magnetic iron, produced by the decomposition of the sesquichloride under the influence of water and heat. Argillaceous minerals, also, in conglomerate are often charged with peroxide of iron. He thought this could not be explained by the simple conduction of heat from trap-dykes, but that, in accordance with D'Aubrèe's theory, superheated water must have been the active agent in the changes alluded to.

Messrs. Francis G. Sanborn and J. T. Rothrock were elected Resident Members.

April 16, 1862.

The President in the chair.

Mr. Scudder read the following communication from Mr. E. S. Morse, of Portland, Maine: —

THE HÆMAL AND NEURAL REGIONS OF BRACHIOPODA. BY EDWARD S. MORSE.

In a paper read before the Boston Society of Natural History, by N. S. Shaler, entitled, "Lateral Symmetry in Brachiopoda," it is as-

sumed that the valves of Brachiopoda occupy an anterior and posterior position in their relations to the animal. Statements are also made to the effect that "Naturalists have very generally failed to find any evidence of bilaterality in their organization," and also that a "fruitful source of trouble has been that Malacologists are acquainted with the arrangement of the valves in Lamellibranchiata before they examine the Brachiopoda, so that they come to consider the latter order with a vague impression that all bivalves must have the shells in a similar relation to the animal."

Such remarks unfortunately do injustice to the labors of our Malacologists, and should be corrected; for, since the researches of Cuvier, and still later Owen and Hancock, naturalists have never doubted the relative position of the two valves of Brachiopoda, which have been considered to bear a dorsal and ventral position to the animal; and it will be evident to all that in viewing their relations thus, the lateral symmetry is apparent and plain, though the assertion is made that the feature of bilaterality seems to be altogether wanting when the valves are thus considered. It seems strange that Mr. Shaler should have overlooked the fact that whether we consider the valves dorsal and ventral, or anterior and posterior, precisely the same imaginary line is drawn, and the same identical valves are made. The statement that the valves are before and behind, I believe to be an incorrect interpretation of the true homological relation which the test bears to the animal; and, furthermore, the manner in which he determines the longitudinal diameter, by passing a plane through the two extremities of the alimentary canal, is, I believe, a misconstruction of these relations.

For the reasons that the terms dorsal and ventral are indiscriminately used in various departments in the animal kingdom, and quite improperly express the regions in mollusca, to which they are generally applied, the dorsal region, which contains the heart, has been designated the Hæmal Region, and the ventral region, which embraces the great nerve-centres, has been called the Neural Region. I shall therefore adopt the terms hæmal and neural, as they more properly express an idea of the parts intended.

In order to appreciate clearly the true longitudinal diameter of the Brachiopoda, we must consider the various members belonging to the order of Polyzoa, to which, without doubt, they are intimately connected; and if we would find the longitudinal diameter of Polyzoa, we have only to compare them with the Ascidian Tunicata. G. J. Allman, in his Monograph of the Fresh-Water Polyzoa, published by the Ray Society, has so clearly pointed out the close homologies existing between the Polyzoa and Tunicata, and illustrated them by excellent diagrams, that it would be doing injustice to him were I to attempt a

résumé in the limited space of this paper. Suffice it to say, he shows clearly the homological relations between the two orders in the structural affinities between the branchial sac of the Tunicata and the palpi of the Polyzoa, in the relative position of the organs of nutrition, the opening and termination of the intestinal tube, and in the relative position of the nervous ganglion, and finally the corresponding structure of their outer envelopes. He figures a Clavalina-like Tunicate, and a Plumatella-like Polyzoon; in his relative comparisons he has placed figures of the two side by side in the natural position in which they are found. The longitudinal diameter in both is a line drawn from the base of attachment through the body and parallel with the sides of the animal. To homologize the Lamellibranchiates with the Tunicates, we have only to compare the common Mya with an Ascidian, and the relation between the syphonal tube of the one with the incurrent and excurrent orifices of the other will be obvious at once; and an anatomical investigation of the two animals will render these relations still more apparent. Now, in order to obtain the longitudinal diameter in the Brachiopoda, we must follow the connection between typical forms of this order with members of the order of Polyzoa; look at the simplest Polyzoon where the investing sac is a mere tube; we have no appendage to the cell-wall developed, though its bilaterality is plainly expressed in the horse-shoe shaped lophophore; but, as we advance, we find, on the hæmal side or region of the animal, as in Loricula and Eucratea, a lid developed, called the operculum, which is strictly homologous with the hæmal valve of the Brachiopoda. In the Lepralia and Flustra-like forms, this lid assumes more importance, and the homologies of the retractor muscles of this lid with corresponding muscles in Terebratula have been clearly pointed out by Huxley. If we lay one of these Loricula-like forms in a normal position, do we not find that the mouth, with the palpi, is at the free end of the body, as in Terebratula, while the other end, that is, the neural portion of the cell, is attached precisely as we find in Terebratula?

To make the case still more intelligible, let us compare the articulation of the cell and operculum of a Cheilostomatous Polyzoon or the two valves of an Avicularia with the two valves of the typical Brachiopoda. The two valves in the latter case are articulated in the same manner as obtains in the valves of a Polyzoon or in the valves of an Avicularia. The shell of Brachiopoda consists of two valves, — one large, through which the peduncle passes for attachment, the other small, — which homologize with the larger and lesser valves of Polyzoa. So, also, does the termination of the intestine turn from the smaller valve in Terebratula as in the Polyzoon cited above. Thus the brachial arms of the one are in strict homological

relation with the lophophore of a Hippocrepian Polyzoon. As we ascend to the Brachiopoda, we behold with interest the increasing prominence and enlargement of the hæmal valve, and at the same time a more limited movement of the palpi, which, in the lower forms, can be extended free of the cell; but as we approach Terebratula through Lingula, we observe less mobility of the hæmal valve, and a restricted movement of the brachial arms. Let us examine Lingula, which is quite long, flat, and broad, and we find the mouth pointing toward the open part of the valves, as in the Polyzoa, on each side of which is coiled a brachial arm identical with the lophophore of Polyzoa in junction and position. We find the intestine also running parallel with the sides of the body, at its posterior portion becoming convoluted and terminating on the right side, the straight part producing a curve arching toward the hæmal valve and surmounted by a heart as we witness in most Lamellibranchiata; showing clearly in this view alone its homological identity with the Lamellibranchiata. In Terebratula the curvature of the intestine is still greater, as the shell is made shorter and more inflated, and consequently the mouth is forced back to admit room for the coiled brachial arms, and the intestine is seen abruptly bent in an almost vertical plane, arching toward the hæmal valve, and apparently trending across the body from one valve to another.

The limits of this paper will not allow us to carry homologies from this point to the other two classes of mollusca, and in fact it would be hardly necessary to do so, as the path is rendered apparent and plain through the medium of Lamellibranchiates.

Mr. T. T. Bouvé exhibited a poisonous snake, which had been taken alive from a pile of wood brought from the west coast of Africa more than a year ago.

Mr. F. W. Putnam stated that it was a poisonous snake belonging to the genus ELAPS. It was a representative of a species that he had never seen before. It differed from the *Elaps fulvius* of the Southern States by the greater number and smaller size of the black rings on the body. There have been several species of the genus described from South America.

Mr. Putnam made a few remarks upon snakes in general, saying that he had of late been engaged in cataloguing the Reptiles in the Museum of Comparative Zoölogy; and that in the course of this work he had found it necessary to make several changes in the classification of North American snakes, as given by Messrs. Baird and Girard in their cata-

logue, and could not, from his observation, sanction the large number of species mentioned in that work. He gave for an example the genus *Eutœnia*, B. and G., to which our striped snake belongs; of this genus he had examined many hundred specimens, and had found several of the so-called species running into each other to such an extent, that it was impossible, upon any natural grounds, to consider them as distinct species. He was, therefore, inclined to the opinion that not more than one-third to one-half of the so-called species of *Eutœnia* could be retained. Of the two oldest forms, *Coluber ordinatus* Linn. and *C. sirtalis* Linn., he had examined a very large number of specimens from all parts of our country comprised in the Atlantic slope, and he had found every stage of color and markings, from the greenish, checkered specimens of the South, through the dark, yellow-striped ones of the Middle States, to the red-checked ones of the North; and he considered them all as belonging to one species, for which the specific name of *ordinatus* should be retained; and if it should prove that EUTÆNIA is a synonym of TROPIDONOTUS, the species would stand thus: —

TROPIDONOTUS ORDINATUS, Holbr.

SYNONYMS. — Vipera gracilis maculatus, *Catesb.*
Vipera viridis maculatus, *Catesb.*
Coluber ordinatus, *Linn.*
Coluber sirtalis, *Linn.*
Tropidonotus bipunctatus, *Schl.*
Tropidonotus tenia, *Dekay.*
Tropidonotus ordinatus, *Holbr.*
Tropidonotus sirtalis, *Holbr.*
Eutœnia ordinata, *B. & G.*
Eutœnia sirtalis, *B. & G.*
? Coluber parietalis, *Say.*
? Eutœnia parietalis, *B. & G.*
? Eutœnia radix, *B. & G.*
? Eutœnia dorsalis, *B. & G.*
? Eutœnia Haydenii, *Kenn.*

We have in New England another well-marked species of striped snake belonging to this genus, the COLUBER SAURITA Linn., to which I should refer as synonyms the *Eutœnia*

Faireyi, B. and G., and ? *E. proxima*, B. and G. This species is at once recognized by its more slender body and long tail, and by a white spot in front of the eye.

The Corresponding Secretary read the following letters recently received, viz.: —

From the Kaiserliche Akademie der Wissenschaften, Wien, October 4, 1861; the Dublin University Zoölogical and Botanical Association, November, 1861; the Portland Society of Natural History, February 12, 1862, acknowledging the receipt of the Society's publications; the Königliche Bayerische Akademie der Wissenschaften, December 2, 1861, acknowledging the same, and presenting various publications; Verein für Naturkunde im Herzogthum Nassau, August 1, 1861; Königliche Preussische Akademie der Wissenschaften, August 31, 1861; Royal University of Norway, October 26, 1861, presenting various publications; Pollichia zu Durckheim, May 22, 1860, and Offenbacher Verein für Naturkunde, July 1861, presenting their publications and desiring an exchange.

Milton Andros, Esq., of Boston, and Dr. H. J. Cate, of Framingham, were elected Resident Members.

DONATIONS TO THE MUSEUM.

January 1. Insects, crustaceans, fish, a snake, and a specimen of the wild potato from the island of St. Lorenzo, opposite Callao, Peru, by Dr. C. F. Winslow. Hair-ball from the stomach of a steer, by Mr. B. F. Penniman. Skin of a monkey from Africa, by Mr. Kilby Page.

January 15. A valuable collection of objects of Natural History, and specimens of the manufactures of the East Indian and Pacific people, by the Boston Marine Society; a large number of foreign mollusca, two echini, and tooth of a sperm whale, by Mrs. Charles Torrey; a skate, and strip of manati hide from the south side of Cuba, by Mr. S. E. Guild; specimens of *Heliastræa* from Silver Cay, off Turks Island, attached to articles from the wreck of a vessel supposed to be the British frigate Severn (lost here in 1798), together with the log-book of the vessel which obtained them, by Messrs. Sampson & Tappan.

February 19. Specimens of wild rice *(Zizania aquatica)* from Lake Superior, by Dr. C. T. Jackson; copper from Lake Superior, by Horatio Bigelow, Esq.

BOOKS RECEIVED DURING THE QUARTER ENDING MARCH 31, 1862.

Memoires pour servir à l'Histoire Naturelle des Petrifications. 4to. La Haye, 1742. *From Dr. Geo. Russell.*

Agriculture of Massachusetts. By C. L. Flint. Boston. 8vo. 3 vols. 1858–60. *From C. L. Flint, Secretary of the State Board of Agriculture.*

Treatise on some of the Insects Injurious to Vegetation. By T. W. Harris. 8vo. Boston, 1862. (15 copies.) *From the Legislature of Massachusetts.*

Catalogue of the Trowbridge Collection of Natural History in the University of Michigan. 8vo. Pamph.

New Species of Lower Silurian Fossils. By E. Billings, F. G. S. 8vo. Pamph. Montreal, 1862. *From the Author.*

Report on the Geology of Vermont. 2 vols. 4to. Claremont, N. H., 1861. *From C. H. Hitchcock.*

Report on the Colorado River of the West. 4to. Washington, 1861. *From Dr. J. S. Newberry.*

The Heather (Calluna vulgaris) a Native of the United States. By Edward S. Rand, Jr. 8vo. Pamph. 1862. *From the Author.*

Fourth Report of the Geological Survey of Kentucky in 1858–59. By David Dale Owen. 8vo. Frankfort, Ky. *From L. Lesquereux.*

A Revision of the Species of Baculites described by Dr. Morton. By W. M. Gabb. 8vo. Pamph. *From the Author.*

Reports of Explorations, etc., for a Rail-Road from the Mississippi River to the Pacific Ocean, 1853–56. Vol. XI. 4to. Washington.

Report of the Commissioner of Patents for 1860. Agriculture. 8vo. Washington. *From Hon. C. Sumner.*

On the Mollusca of Harpeh's Ferry, Va. 8vo. Pamph. Synopsis of Recent Species of Gastrochænidæ. By Geo. W. Tryon, Jr. 8vo. Pam. *From the Author.*

Würtembergische Naturwissenschaftliche Jahreshefte. Nos. 1, 2, 3. 1861. 8vo.

Journal of the Proceedings of the Linnean Society. Botany, Nos. 16–20; Supplement to Vol. IV., and two Supplements to Vol. V.; Zoölogy, 18–20. 8vo. London, 1860–61.

Transactions of the Linnean Society. Vol. XXIII., Part 1. 4to. London, 1860.

Accentuated List of British Lepidoptera. 8vo. London, 1856.

Physisch-Medicinische Topographie des Physikatsbezirks Eschwege. Von Dr. Carl Schreiber. 8vo. Marburg, 1849.

Physisch-Medicinische Topographie des Kreises Schmalkalden. 8vo. Marburg, 1848. Tafeln. Long 4to. Pamph. 1848.

Allgemeine Theorie der Curven doppelter Krümmung in rein geometrischer Darstellung. Von Dr. W. Schell. 8vo. Pamph. Leipsig, 1854.

Denkschriften der Kaiserlichen Akademie der Wissenschaften. 19 Band. 4to. Wien, 1861.

Sitzungsberichte. Band, 43. Jahrg. 1861, Februar. 8vo. Wien. Abtheilung, 1, 2. Heft, 1, 2.

Proceedings of the Royal Geographical Society of London. Vol. V. Nos. 3, 4. 8vo. 1861.

Zeitschrift für die Gesammten Naturwissenschaften. 2 vols. 1859. 2 vols., 1860. 8vo. Berlin.

Archiv für Naturgeschichte. No. 5., 1860, and Nos. 1, 2, 3, 1861.

Memoires de la Société Royale des Sciences de Liège. Tome XVI. 8vo. 1861.

Actes de l'Académie Impériale des Sciences, Belles Lettres et Arts de Bordeaux. 3e Série, 22e année. 1860. 3e Trimestre. 8vo. Paris.

Mémoires de l'Académie Impériale des Sciences, Arts et Belles-Lettres de Dijon. 2e Série, Tome VIII. Année, 1860. 8vo.

Verzeichniss der Mitglieder der K. K. Akademie der Wissenschaften. München, 1860. 4to.

Rede in der offentlichen Sitzung der K. Akademie der Wissenschaften zur Feier des Allerhöchsten Geburtsfestes Sr. Majestat des Königs Maximilian II., von Liebig. München, 1861. 4to.

Gedachtnissrede auf Friedrich Tiedemann, von Dr. Theod. L. W. Bischoff. München, 1861. 4to.

Denkrede auf Gotthilf Heinrich von Schubert, von Dr. Andreas Wagner. München, 1861. 4to.

Rede zur Vorfeier des Einhundert und Zweiten Stiftungstages der K. Akademie der Wissenschaften, von Freiherrn von Liebig. 4to. München, 1861.

Meteorologische Untersuchungen von Dr. M. A. F. Prestel, aus den Kleinen Schriften der Naturgesellschaft in Emden. VIII. 4to. Emden, 1861.

Sechsundvierzigster Jahresbericht der Naturforschenden Gesellschaft in Emden, von Dr. H. Metger. 8vo. Emden, 1861.

Monrad, M. J. Det Kongelige Norske Frederiks Universitels Stiftelse. 8vo. Pamph. Christiania, 1861.

Aus den Abhandlungen der K. Bayerischen Akademie. München.

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Canadian Journal of Industry, Science and Art. No. 37. Jan. 1862. Toronto. *By Exchange.*

Annals and Magazine of Natural History. Dec., 1861, and Jan. and Feb., 1862. 8vo. London. *From the Courtis Fund.*

New England Genealogical Register. No. 1, Vol. XVI. Jan., 1862. 8vo. Boston.

Last Political Writings of Gen. Nathaniel Lyon, with a sketch of his Life. 12mo. New York, 1861.

Lives of Donne, Walton, Hooker, Herbert, and Sanderson. By Izaak Walton. 8vo. Boston, 1860.

Sketches of the Natural History of Ceylon. By Sir J. Emerson Tennent, LL. D. 8vo. London, 1861.

Memorials of the Dead in Boston; containing exact Transcripts of Inscriptions on the Sepulchral Monuments in the King's Chapel Burial Ground, in the City of Boston. 12mo. Boston, 1853.

Memoir, Letters, and Remains of Alexis de Tocqueville. 2 vols. 12mo. Boston, 1862.

Twenty Years around the World. By John Guy Vassar. 8vo. New York, 1861.

The Constitutional History of England. 1760 to 1860. By Thomas Erskine May, C. B. Vol. I. 8vo. Boston, 1862. *Deposited by the Republican Institution.*

May 7, 1862.

ANNUAL MEETING.

The President in the chair.

The Treasurer presented a Report, in full, of the financial condition of the Society; also, the Annual Report of the Trustees of the Courtis Fund.

The Auditing Committee stated that they had examined the accounts, and had found them correctly cast and properly vouched.

The Librarian reported that three hundred and thirteen volumes and parts of volumes, and one hundred and twenty pamphlets, had been received during the past year, mainly through exchange with foreign societies. He suggested the expediency of re-printing missing signatures of the Proceedings, in order that our exchanges might be extended.

The Curator of Geology and Palæontology stated that the most valuable additions to his department consisted of specimens of tracks of animals upon the Connecticut River sandstone, purchased from Mr. Field, of Greenfield.

The Curator of Comparative Anatomy announced that the additions to the cabinet during the past year have been numerous and highly valuable, consisting in all of one hundred and thirty-eight specimens, among which may be particularly mentioned, —

1. The osteological collection of the late Dr. Lane, of this city.

2. A series of crania from Dr. Bryant.

3. A miscellaneous collection of bones from the Boston Marine Society.

4. A skull and nearly perfect skeleton of the Gorilla, from the Canna River, presented by Dr. Otis, of the navy.

5. An exceedingly valuable collection of bodies of animals, numbering twenty-six, chiefly the large cats, suffocated at the burning of the menagerie in Portland Street.

The Curator of Entomology reported the almost completed re-arrangement of the Coleoptera and Orthoptera of the Harris collection, and stated that the Hemiptera had been placed in the hands of Mr. Uhler, of Baltimore, for determination preliminary to re-arrangement; and portions of the Hymenoptera and Lepidoptera were being investigated by Mr. Norton, of Farmington, Connecticut, and Mr. Packard, of Brunswick, Maine.

The Curator of Ethnology announced that the collections, in reference to which the curatorship had been recently founded, included specimens of the arts and manufactures of North-west America, not only of the coast tribes near Puget Sound, but of those living far north; also, of the people of the Kingsmill Islands, of other islands in the Pacific, and of the East Indies proper; being monumental evidence of the conditions of these various people, when first visited by ships from the North Atlantic. These were all presented by the Boston Marine Society.

The Curators of Mineralogy, Botany, Ichthyology, and Herpetology, reported the safe transportation of their respective collections to the building now temporarily occupied, and their present satisfactory condition.

The Corresponding Secretary read letters from

The Société Royale de Zoölogie à Amsterdam, and the Leeds Literary and Philosophical Society, acknowledging the receipt of the Society's publications; from the Königliche Gesellschaft der Wissenschaften zu Göttingen, February 12, 1862, acknowledging the same and presenting its own publications; and from the Société Royale de Zoölogie à Amsterdam, presenting its Memoires.

The Nominating Committee reported a list of officers for the ensuing year.

The following gentlemen were then elected: —

PRESIDENT,
JEFFRIES WYMAN, M.D.

VICE-PRESIDENTS,
C. T. JACKSON, M.D. A. A. GOULD, M.D.

CORRESPONDING SECRETARY,
SAMUEL L. ABBOT, M.D.

RECORDING SECRETARY,
SAMUEL H. SCUDDER.

TREASURER,
THOMAS T. BOUVÉ.

LIBRARIAN,
CHARLES K. DILLAWAY.

CURATORS,

THOMAS T. BOUVÉ,	Of Geology and Mineralogy.
JOHN BACON, M.D.,	Mineralogy.
CHARLES J. SPRAGUE,	Botany.
THOMAS M. BREWER, M.D.,	Oölogy.
HENRY BRYANT, M.D.,	Ornithology.
F. W. PUTNAM,	Ichthyology.
THEODORE LYMAN,	Radiata.
J. C. WHITE, M.D.,	Comparative Anatomy.
SAMUEL H. SCUDDER,	Entomology.
NATHAN FARRAND,	Conchology.
B. J. JEFFRIES, M.D.,	Microscopy.
F. H. BROWN, M.D.,	Herpetology.
CHARLES PICKERING, M.D.,	Ethnology.

CABINET-KEEPER,
CHARLES STODDER.

Prof. Agassiz, referring to the papers of Mr. Shaler and of Mr. Morse, recently published in the Proceedings, made a few remarks upon the homologies of Brachiopoda. He maintained that the two valves of these Molluscs are anterior and posterior, but at the same time that they are not homologous with the valves of Lamellibranchiates, and that the hinge of the Brachiopods is homologous to the stem of a Bryozoön. This he showed by comparing Lingula and a Bryozoön. In order to place them in a proper position for comparison, Lingula must be placed with the stem downwards, so that the hinge of the Brachiopoda comes on the opposite side, and at right angles to the position of the hinge

in Lamellibranchiates when they are placed in their normal position for comparison. He then showed that this is not objectionable when we take into account such forms as Clavagella and similar Lamellibranchiates, and that we have the same symmetry between the two halves of the anterior and posterior valves which we find between the right and left valves of the Lamellibranchiates. From this it would follow that the foot of the Lamellibranchiates is homologous to the stem of a Bryozoön.

Mr. Scudder made some remarks upon the division of the class of Insects into orders, and its relations to other members of the branch of Articulates, on considerations drawn from the external integument of the animal. He showed that the different modes in which the plan of articulation is carried out are exhibited in Insects by a grouping together of the segments of which the body is composed into three distinct regions; in Crustacea, by a similar grouping, into two regions; while the worms show no regional distinction whatever. If a "region" be defined (among Articulates) as such a definite association of segments, in a more intimate relationship to one another than they exhibit towards other segments or association of segments, as is indicated more or less in the general contour of the body, and when accompanied by appendages, these applied to some special purpose, — then the so-called cephalothorax of Arachnids is, in reality, composed of two distinct regions, with the dorsal portions of the segments composing them, so closely united into a pseudo-cephalothoracic shield as to have caused them to have been generally considered as forming but a single region; while in the segments of the Myriapod, which bear no genuine legs, we have a more true cephalothorax than in the soldered front-body of the Arachnid, while, at the same time, there is in the Myriapod a front portion clearly separated from and freely movable upon the hind portion, the one homologous with the head of the Hexapod, and the cephalic portion of the pseudo-cephalothorax of the Arachnid; the other with the thorax of the Hexapod, and the thoracic portion of the pseudo-cephalothorax of the Arachnid. In the varied intimacy of the relationship existing between these three regions of the body, and the development of the segments composing them, we have three different degrees of complication of the Insect-structure, forming thus three natural orders: Hexapoda, Arachnida, and Myriapoda.

Mr. Putnam referred to the statements made by him at a previous meeting, in regard to the striped and spotted snakes, *Coluber ordinatus* and *sirtalis* of Linnæus, and said that he had this day received a let-

ter from Mr. E. D. Cope, one of the first Herpetologists in the country, in which he stated that he considered the two so-called species as one, and that he had given the name of *Thamnophis ordinatus* to it. Mr. Putnam was still of the opinion that the species under consideration is generally identical with the European *Coluber natrix*, Linn.

Professor Agassiz said that in Europe, as in America, there is a spotted snake, which becomes striped, and is closely allied to our own. In the former country the striped variety is southern, the spotted northern; with us, the reverse is true. The European striped snake was first described by naturalists, and the generic name applied to that long ago must govern that of its representative *ordinatus* in this country. The nomenclature of American serpents, as given by Holbrook, had been much changed by some recent writers, but he thought we should yet return to the old system.

Mr. Gaffield exhibited beautiful specimens of crystallization occurring in masses of glass cooling slowly from a state of intense heat. The materials used in its manufacture were the Berkshire sand, soda ash, and lime. He had recently visited Germantown, where a bottle-glass factory was burned about a century since, and picked up upon its site a piece of an old crucible, which was found to contain these acicular crystals.

Dr. C. T. Jackson stated that he had analyzed the crystals, and had found them to be true crystallized glass.

Dr. J. H. Slack, of Philadelphia, and Mr. E. A. Boardman, of Milltown, Maine, were elected Corresponding Members of the Society.

Messrs. Henry Sayles, Henry U. Jeffries, R. S. Fay, Jr., and Dr. David Roberts, of Boston; Franklin Nickerson, and A. P. Cragin, of Cambridge, were elected Resident Members.

May 21, 1862.

The President in the chair.

Mr. C. A. Shurtleff was chosen Secretary *pro tempore.*

Dr. C. T. Jackson read the following notice of the death of Mr. Thoreau: —

Henry D. Thoreau, of Concord, Mass., died, at the age of 44 years, of pulmonary consumption.

His grandfather was a French emigrant from the island of Guernsey, and settled in Concord. His father was well known as a manufacturer of black-lead pencils, an art which young Thoreau learned, but never practised as a business, his tastes leading him wholly into the field of science, while he abhorred trade.

Henry D. Thoreau was distinguished for the great accuracy of his observations, and for the thoroughness with which he executed every research upon which he entered. He was esteemed as an accurate land surveyor, the only business upon which he ever entered for pay. As a botanist he was highly esteemed by those who are the best judges of the subject.

As an observer of the habits of animals he was unrivalled. He would wait all day, if it was necessary, for a bird to approach him. He said their curiosity would bring them to examine him if he would remain quiet long enough; and he generally managed to make familiar acquaintance with all living creatures he met with in his rambles through the forest. Thoreau had a genuine love of nature, and pursued natural history for his own gratification, and not with any ambitious views. He was greatly troubled to find that anything had escaped the observation of eminent naturalists, and seemed to be surprised that anything should have been left by them for him to discover.

Thoreau was a man of original genius, and very peculiar in his views of society and the ways of life. He was conscientiously scrupulous, and was opposed to aiding or abetting, even by a poll-tax, measures which he did not approve of, and therefore got into trouble occasionally with the constituted authorities of the town, who could not indulge him in his opposition to a tax because any part of it might go to support the militia; so they twice shut him up in the jail, from whence his friends took him by paying his tax against his protest.

His published works are full of knowledge of the secrets of nature, and are enlivened by much quaint humor, and warmed with kindness towards all living beings. Those who knew Thoreau best loved and appreciated him most.

Dr. Jackson proposed the following resolutions, which were adopted: —

Resolved, That the Boston Society of Natural History has learned with profound regret the premature decease of their corresponding member, Henry D. Thoreau, of Concord, who was a most faithful and devoted student of nature, a keen and appreciating observer, whose researches, had longer life been granted him, promised important acquisitions to science.

Resolved, That a copy of this resolution be transmitted to the mother and sister of this eminent naturalist, with expressions of the warm sympathy of this Society in their great loss.

Dr. Jackson announced the donation of Mr. Thoreau's collections to the Society. These consisted of

1. His collection of New England pressed plants, numbering more than one thousand species, arranged by himself, together with those western plants collected in his journey of 1861.
2. His collection of birds' eggs and nests, carefully identified by himself, composed of New England species.
3. The collection of Indian antiquities, consisting of stone implements and weapons (chiefly) found by himself in Concord.

Dr. Charles T. Jackson read the following

REPORT OF THE COMMITTEE APPOINTED TO EXAMINE THE FROZEN WELL OF BRANDON, VERMONT.

The attention of the Boston Society of Natural History having been called to a communication published in the newspapers of this city, by John H. Blake, Esq., and to a statement communicated to this Society by that gentleman, a committee was appointed to investigate the phenomena in question.

This committee consists of John H. Blake, Esq., Prof. William B. Rogers, and Dr. Charles T. Jackson.

On the 23d of May, 1859, Uriah A. Boyden, Esq., of this city, liberally placed in the hands of the chairman of this committee the sum of three hundred dollars, to defray the expenses of their investigations.

On the 10th of June, 1859, Prof. Rogers being otherwise engaged, Messrs. Blake and Jackson proceeded to Brandon, taking with them the instruments required for their examination of the well, and of the geology and topography of the country around it.

In Brandon we received much valuable assistance from Mr. J. E. Higgins, and to him the care of the explorations made during our absence was intrusted, Mr. Blake occasionally visiting the place, and giving the requisite instructions.

The frozen well of Brandon is situated about half a mile west of Brandon Hotel, on the estate of Mr. Abraham Twombley. It was dug in the month of November, 1858, and stoned up with boulders of limestone rock soon after.

In excavating this well, the first strata were found to be sandy loam, then came coarse gravel, and a bed of rounded boulders, of sizes varying from that of a walnut to a foot or more in diameter, the spaces between the boulders being filled with fine clayey sand.

Twenty feet from the surface, the boulder bed and soil were found

to be frozen, and lumps of frozen earth, with pieces of ice, were raised, some of the lumps of ice being of the size of a hen's egg. Frozen masses of the earth and lumps of the ice were taken away and exhibited in the village of Brandon.

All the lower portion of the boulder bed was frozen; but on passing through it to the sand below, liquid water was found, which flowed up into the bottom of the well. The whole thickness of the frozen bed was estimated at from twelve to fifteen feet.

Before making an examination of the well, which will be detailed presently, we explored the geology of the immediate environs, and measured the slopes of the hills, the thickness of the drift strata, and the nature of the loose rocks as well as of that of the rocky strata in place. We traced the gravel bed to its outcrop, four hundred and fifty feet north-west of the well, where it is fully exposed by excavations on the roadside, gravel being there dug for the mending of the roads of the town.

A sectional profile was made of the strata, and the distances were measured, and also the thickness of the deposits.

The rocky basis on which the drift reposes is a blue limestone, the surface being much worn and striated by drift action, and an abundance of erratic boulders of granite and quartz are scattered over its surface; these erratic rocks being all strangers in the region, and having been brought from a more northern part of the country.

A section of the cliff on the roadside shows at its base what is called "the gravel bed," made up of erratic boulders. This stratum is six feet in thickness.

Over this is a bed of gravel proper, one foot thick; then we come to a stratum of sand two feet in thickness, over which is a layer of the ordinary sandy soil, mixed with mould.

The top of this cliff, which is called "The Hog Back," is forty-five feet above the top of the well, and slopes towards it at an angle of six degrees, and is four hundred and fifty feet from it.

From the dip of the strata it is evident that the gravel bed passes through the bottom of the well, and from the other wells on both sides we learn that this gravel bed does not go through or under them, and that it is quite a narrow belt.

After making a rapid survey of the country around, we returned to the frozen well, and made more particular explorations. On measuring its depth, it was found to be thirty-four feet four-tenths, and there was two feet four inches of water in the well, while around the bottom of the stone walling of the well was a thick rim of solid ice, a hole large enough for a bucket only remaining open, as it had been cut during the past winter.

The well is three feet in diameter, and over it is placed a slab of

marble, with a circular opening in it eighteen inches in diameter, with a curb windlass and a cover to the latter, to preserve the rope from rain.

A boy, son of Mr. Twombley, who had been in the habit of descending into the well daily to cut open the ice in the winter months, was sent down the well, by means of the bucket and rope, a candle being lowered down also to light the well, and to show where the ice rim existed.

It was found to be a few inches above the surface of the water, and to extend up the sides of the well about five feet, while a well-marked rim of ice projected out over the water, and was about eight inches thick. On this the boy stood, and with a hatchet cut away masses of the ice, and sent them up in the bucket for our examination.

The temperature of the water in the well was 0.5° centigrade, or $32\frac{9}{10}$° Fah.* The temperature of the air in the well near its bottom was 2° centigrade, or $35\frac{6}{10}$° Fah. That of the air on the surface was $9\frac{1}{2}$° centigrade, or $49\frac{1}{10}$° Fah.

On measuring the temperature of a spring just outside of the gravel bed, we found it to be 11° centigrade, or $51\frac{8}{10}$° Fah.

A well belonging to Mr. Strong, a few hundred yards east of Twombley's, was found to be fifteen feet deep, and the temperature of the water was 8° centigrade, or $46\frac{4}{10}$° Fah.

JUNE 11TH. — This morning we renewed our labors, re-examining the wells in the neighborhood on all sides of the frozen well.

Twombley's well had this morning precisely the same temperature it had yesterday, viz., 0.5° centigrade, while that of the air was at 10° centigrade, or 50° Fah.

Mr. Clarke's well, in a field north-west of the boulder bed, and not far from it, had a temperature of 6° centigrade, or $42\frac{8}{10}$° Fah.

A spring south-west of the frozen well, and not far distant, had a temperature of 9° centigrade, or $48\frac{2}{10}$° Fah.

None of the other wells in the town freeze in the winter, or are remarkably cold. It is evident, therefore, that the geological formation around the frozen well determines its freezing character, and that the gravel bed, in some way, causes the water in that well to freeze, and to continue frozen through the summer months.

It was therefore decided that a shaft or pit should be sunk on the gravel or boulder bed, and a point half way between the frozen well and the top of "Hogback" was selected as the location; but Mr. Twombley

*All the measurements of temperature were made with centigrade thermometers, which had recently been carefully verified as to their zero points. We give the temperature also reduced to Fah. scale.

was unwilling to have a pit sunk there, as he cultivated the field, and had a crop of potatoes growing on it at the time.

We left Mr. Higgins to make the proper arrangements for the explorations called for, and to obtain from the Brandon Iron Company some miners, to whom the excavation could be safely intrusted.

Mr. Blake visited the works from time to time, as his advice was needed.

The first pit was sunk in the garden, seventy feet south-east of the frozen well, to the depth of twenty-nine feet. The strata were found to be clay and sand near the surface, and the lower part consisted of gravel and boulders. No frozen strata were found. After examining the results of this digging, we decided to make an opening west of the well, and Messrs. Blake and Higgins obtained permission of the selectmen of Brandon to sink a pit on the roadside. This was found to be very difficult ground to excavate, requiring much skill on the part of the miners to prevent accidents from falling in of the walls of the pit; double timbering and planking being needed to support the walls.

This excavation gave more satisfactory results; for the moment the gravel and boulder bed were struck, they were found to be very cold, and near the bottom of the bed frozen earth was found. This was in the month of October, when the summer heat had penetrated as far as possible into the earth. We chose that time expressly for the purpose of ascertaining whether the surface heat ever reached the bottom of this frozen bed.

JULY 2D, 1861. — Messrs. Blake and Jackson revisited Brandon and re-examined the frozen well and the pit which had been dug by the roadside.

The temperature of the water in the well was found to be 33° Fah., and that of the air around 62° Fah. A rim of ice, three feet above the liquid water in the well, and one foot in thickness, then existed, attached firmly to its walls. The bottom of the well feels, by the sounding-lead, as if it was covered with solid ice; but we could not obtain any from the bottom, owing to the want of suitable tools for breaking it up, but gave directions to have the fact ascertained under Mr. Higgins's superintendence.

We sent the miners down into the pit which they had sunk and covered up carefully with shavings, to prevent alteration of temperature, and had the pit re-opened, and the bottom dug into. A thermometer, in its tin case filled with water, was buried in the cold earth at the bottom of the pit, and allowed to remain some hours, after which it was taken out, and the temperature was found to be $42\frac{8}{10}°$ Fah. This stratum when first dug into was frozen; hence the summer heat had penetrated to some extent since the shaft was sunk, in spite of all the precautions which had been taken to prevent it.

Enough was proved, however, to satisfy us that our conjecture respecting the influence of the boulder bed, in causing the freezing of the well, was sustained.

Extract from Mr. Blake's notes, Oct. 25, 1859:—

"During the past summer there remained in the cold well at Brandon, until about the 10th of August, a ring of ice upon the curb-stones, formed by the surface water trickling down and freezing, indicating thereby a temperature below 32° Fah. This ring of ice was near the surface of the water in the well, and was several inches in thickness. Ice also formed above it, upon the stones, of lesser thickness, to the height of about four and a half feet.

At this time a party visited the well, one of whom descended and broke off all the ice, and for about a fortnight after, or until about the 23d of August, lumps of ice were occasionally drawn up in the bucket with the water. Since that time there has been no ice seen. The temperature of the water gradually increased to 40° Fah. At this time, Oct. 22d, it is 38° Fah.

During the summer the well received numerous visitors. One of the committee was there many times during June, July, and August. One of the warmest days of the past summer he drew ice from the well; the temperature of the air at the time in the shade was 93° Fah.

On the 30th of August was commenced a shaft, seventy feet distant from the well, in a south-easterly direction. The first two feet was through very tough and compact clay; the next three feet was through very fine silicious sand; then loose gravel and cobble stones from the size of an egg to a half barrel, for the distance of four feet; through this the stones were encrusted, for the most part on the under side, with carbonate of lime.

On the 4th of September, at 7½ o'clock, A. M., the shaft had been sunk twelve feet. The temperature of the earth in the bottom was 50° Fah.; that of the air at the surface at the same time was 60° Fah. On the 7th of September a depth of fifteen feet was attained, and at 7 o'clock, A. M., the temperature of the earth at the bottom was found to be 46° Fah.; that of the air at the surface 52° Fah. On the 13th, a depth of twenty feet having been reached, the temperature of the earth in the bottom was found to be 48°; that of the air at the surface at the time 54° Fah. On the 17th, at the depth of twenty-six feet, the earth in the bottom of the shaft indicated the same temperature as on the 13th. On the 20th, at the depth of twenty-nine feet, found water, and discontinued further sinking. The temperature of the water was 46° Fah.; the air at the surface at the time was 52° Fah. The temperature in the cold well was taken at the same time, and found to be 40° Fah. The character of the gravel in this shaft remained the same till the last foot was reached, in which there was

a mixture of clay. The shaft was now filled with the material which was thrown out.

On the 28th of September a new shaft was commenced, about seventy feet from the cold well, in a north-westerly direction. Found gravel and cobble stones at the surface, which continued mixed with water-worn boulders to the depth of thirty-four feet, when the work was discontinued. This gravel was a little finer than that in the shaft previously sunk, and more like that passed through in digging the cold well. The stones were encrusted through a part of the distance with carbonate of lime as before mentioned, but much less than in the other shaft.

During the time occupied in sinking this shaft to the depth of twenty-six feet, the temperature of the air was less and less, — "the weather growing colder." The average temperature of the atmosphere was 47.011° Fah. The temperature in the bottom of the shaft was uniformly 46° Fah., and on the 19th of October, at the depth before named (twenty-six feet), no ice had been found.

On the 20th the workmen reached a depth of twenty-nine feet, and found a stratum of frozen earth (gravel) about two inches thick. No more frost was seen this day. On the 21st they sunk to the depth of thirty-one feet, and found a stratum of frozen ground about eight inches thick, below which no frost was found that day. The day following (22d) reached a depth of thirty-three feet, and found the ground frozen solid and hard to break with the pick.

The workmen supposed this to be only a crust or thin stratum of frozen ground, such as they had before encountered; but it continued solid all day, during which they sunk only one foot.

In the afternoon Mr. Higgins, who kindly volunteered his services of supervising the work of sinking both of the shafts referred to, visited the shaft in company of E. N. Briggs, Esq., and drew up from the bottom, after removing some loose gravel which had caved down from above, a bucketful of frozen ground, in which appeared clear ice in streaks, and in the interstices of the gravelly mass, clearly perceptible. Some of this frozen earth and ice was taken to the village, and exhibited to many persons before it had time to melt. The temperature of the air this day, October 24th, was in the morning 47° Fah., at 3 P. M. 52° Fah., at 5 P. M. 48° Fah. During the night previous, water froze slightly on the surface; but in some post-holes, eighteen inches deep, recently dug in the same neighborhood and containing water, no ice formed.

The lowest depth reached in this shaft was thirty-four feet. The men before leaving tried to drive an iron bar thorough the frozen ground in the bottom without success, it being frozen too deep and too solid.

The shaft was then covered over with plank, and upon the plank shavings were placed, to intercept communication as much as possible between the shaft and the external atmosphere.

A few rods north-easterly from the gravel ridge in which the cold well and the two shafts were sunk, two wells have been sunk during the summer, both through compact clay with narrow seams of fine sand. One of them, about fifteen feet deep, contains water; the other, about forty feet deep, is dry."

Although we do not feel that we have been able to remove all doubts as to the true theory of the phenomena of the frozen well, still we incline to believe that the freezing is due to the nature of the conducting medium in which the well exists, and that the wave of heat in the summer months is not adequate to overcome the cold of the longer cold months, while the uncommonly severe winters of 1856 and 1857 may have lowered the temperature of the rocky masses of boulders, so that the wave of summer heat has not yet been able to reach the frozen mass, which, once congealed, would resist thawing on account of the slow conduction of ice. It should also be remembered that water does not conduct heat downward readily, though it does upward by convection.*

The existence of beds of boulders in other cold and frozen wells, as in the one of Tioga, N. Y., seems to point to the same solution.

The ice in the Brandon well forms some time in November, and it remains until September, thus showing only a brief period when the temperature of the bottom of the well is above the freezing temperature, while the great mass of boulders remains much below it; the well, being more exposed, receives the first warmth by conduction of its walls exposed to the air.

Among the hypotheses which have been offered to account for the phenomena of the frozen wells, are the following: —

1st. — The penetration of cold currents of air through the boulder stratum. This hypothesis is without any foundation, because there are no open spaces, and the boulders are closely cemented together by being imbedded in clay and sand; and also because the fact is ascertained, that there are no currents of air moving in the mass, or

* The familiar experiment of boiling water upon the surface of a cake of ice without melting it, and that of boiling water at its surface, by means of a plate of hot iron placed over it, while the water below is not heated, illustrates this statement.

It is true that the maximum density of water is at 39° Fah., and that it sinks when at this temperature in water that is either warmer or colder, but this movement is limited to a few degrees of temperature. Ice, having its particles fixed, does not allow of the varying of heat by convection, as it is called, and is a very bad conductor of heat, as is obvious to all who observe a cake of it exposed to a warm atmosphere.

in the well, the flame of a candle placed near the stony walls not being in the least deflected.

2D. — The descent of cold air into the well, in mid-winter, communicating the degree of cold to the walls of the well.

This conjecture is insufficient, since the ice existed before the well was sunk, and when there was no opening for the air to descend into. This fact was not only ascertained at the time the well was sunk, as witnessed by credible persons residing in the vicinity, but has also been fully verified by sinking a shaft into the boulder bed by this committee, and by the discovery of an extensive frozen stratum in October.

3D. — Radiation from the bottom of the well.

If this conjecture was well founded, other wells in the vicinity, many of which are more favorably situated for such radiation, should also be frozen; and yet such is not the case, and they never do freeze in the coldest winters.

4TH. — It has also been imagined that some natural freezing mixture exists in the frozen strata, or in the water of the well.

This is not the case; the water being exactly like that of other wells in the neighborhood, and the boulder bed containing nothing but rocks, clay, and sand.

5TH. — That this boulder bed is the moraine of an ancient glacier, the ice and cold of which still remains. We doubt not that the boulders were rounded and accumulated by the action of moving ice; but it would appear improbable that ice should remain for many thousands of years, when liquid water exists both above and below this mass of drift, and percolation of warmer water is constantly taking place from the surface, and it is also introduced from below quite freely.

6TH. — The well having been stoned up in the latter part of November, it has been supposed that the stones were very cold when placed in the well, and that they have retained their low temperature ever since, and thus, by conducting the heat away from the water in the well, they have caused it to freeze.

On this hypothesis one observer predicted that "our curiosity would soon disappear," as the equilibrium of temperature would soon be restored between the water and the walls of the well. This hypothesis has required the committee to leave the question to be solved by time, and three years have passed, with the regular recurrence of the icy belt, and its equally regular disappearance in the autumn. Now, if it was the original coldness of the stones in the well that caused the ice to form, when those stones were once warmed above the freezing point, they ought never again to fall below it and cause the congelation of the water. The doubts which this observer entertained

of the correctness of the history given by the citizens of Brandon as to the existence of ice when the well was first dug are now dissipated by the direct researches of this committee, and by the actual discovery of the frozen stratum, and of bands of clear ice seventy-two feet west of the well, in the strata of boulders and clay. This fact, witnessed by one of the committee, and by numerous respectable gentlemen of Brandon, is now placed beyond a doubt.

Since it appears that the nature and situation of the strata of earth, gravel, and boulders around this well, causes the low temperature of the winter months to be preserved in the well through the summer, it is probable that, by imitating this condition of things in the construction of a well in a similar region, we could make a well that would freeze in the winter, and retain its frozen condition through the summer. The experiment might require two or three years for its fair trial, in order to afford time for the translation of the waves of heat.

By correspondence with Mr. George Sidney Camp, of Tioga, we have learned all that can be now known concerning the frozen well of that place, and also that, its walls having caved in, it would be useless for the committee to visit the place, since no additional information can be now obtained without a reconstruction of the well, which would be quite expensive, its depth being more than seventy feet, and it having been excavated in a stratum of boulders like those of the Brandon frozen well.

We think that the causes assigned as those which effected the freezing of the well in Brandon are equally applicable to that at Tioga.

The same theory will apply to the cold wells in Connecticut, which are at a temperature below the mean of the climate of that State, and yet do not freeze.

It is hardly necessary to add, that the occurrence of ice in iron mines and caves where snow drifts abundantly into them, is not similar to the case of the Brandon well; and the occurrence of masses of ice under the shadow of crags of rocks, as at Granville, Nova Scotia, and of sheets of ice below the turf in Isle Royale, Lake Superior, are also of a different class, and require a different explanation from those applicable to frozen wells. Hence we do not feel called upon to enter upon the explanation of these phenomena at this time.

The committee are under obligations to David Buckland, Esq., for elaborate tabular statements of the monthly mean temperature of Brandon, from 1853 to 1861, inclusive. They regret to state that, owing to the burning of his house, all the tables he kept for the past year are lost, with the exception of that for the month of November, 1861. These tables are appended to this report.

The committee have also the pleasure of adding letters from George Sidney Camp, Esq., of Tioga, N. Y., and of Prof. Brocklesby, of Hartford, Conn., containing information concerning the frozen and cold wells in their vicinity.

CHARLES T. JACKSON,
JOHN H. BLAKE,
WILLIAM B. ROGERS,
} *Committee.*

TABLE OF TEMPERATURES, FAHRENHEIT,

FROM OBSERVATIONS BY DAVID BUCKLAND, ESQ., OF BRANDON, VERMONT.

Years.	1853.	1854.	1855.	1856.	1857.	1858.	1859.
January	20.62	20.77	25.62	11.72	8.69	24.80	21.08
February	21.21	16.72	17.53	16.08	27.06	15.51	23.64
March	31.56	29.12	28.45	22.75	27.26	26.85	34.31
April	42.30	39.01	42.71	44.82	38.69	41.99	39.36
May	54.72	57.64	55.68	51.70	52.92	51.61	58.72
June	67.50	63.78	62.63	66.22	60.48	67.58	
July	66.77	72.89	70.67	70.90	69.42	67.37	
August	67.28	67.68	65.40	63.40	65.35	65.67	
September	57.77	59.49	59.20	58.07	57.13	59.52	
October	44.63	50.68	47.40	46.65	44.95	47.54	
November	35.88	31.01	36.17	34.05	36.85	30.37	
December	22.89	17.39	26.49	17.49	27.70	21.02	

	1853.	1854.	1855.	1856.	1857.	1858.
Winter	21.57	18.29	23.21	15.08	21.15	20.27
Spring	42.86	41.92	42.26	39.75	39.62	40.15
Summer	67.18	68.10	66.23	66.84	65.06	66.87
Autumn	46.09	47.06	47.59	46.25	46.31	45.81

DAILY AND MONTHLY MEAN TEMPERATURE,

With the Mean for every Ten Days added below,

AS KEPT FOR THE SMITHSONIAN INSTITUTION, BY DAVID BUCKLAND, BRANDON, VERMONT.

1859.

	July.	August.	September.	October.	November.	December.
1	64.33	70.50	59.00	55.16	34.00	46.50
2	73.00	76.50	57.66	56.83	37.66	30.34
3	57.67	79.00	59.50	53.00	29.66	7.66
4	52.16	73.66	58.16	66.16	45.50	17.17
5	58.34	73.66	57.00	66.16	58.00	35.33
6	63.50	65.16	52.16	47.50	35.50	37.00
7	68.16	67.17	52.67	48.33		39.66
8	72.50	64.33	54.33	38.50	44.16	11.16
9	67.00	68.34	59.00	39.50	51.33	13.16
10	72.00	71.50	59.34	38.33	40.33	13.33
	64.86	71.03	56.98	50.95	41.96	25.18
11	76.33	72.66	65.83	46.00	31.33	17.33
12	81.33	71.66	64.67	42.00	33.16	14.50
13	73.33	73.33	60.00	58.33	43.16	7.66
14	68.00	70.00	44.34	51.16	29.50	16.16
15	67.33	69.33	39.66	39.33	32.00	14.00
16	67.66	68.66	50.50		35.50	13.50
17	74.66	69.66	50.33	46.33	45.16	20.66
18	70.34	70.34	53.50	51.16	51.00	30.16
19	75.33	60.16	61.16	35.16	58.66	34.16
20	67.66	60.33	55.33	31.33	33.00	32.33
	72 35	68.73	54.68	44.18	39.25	20.10
21	62.66	64.66	50.00	29.50	28.33	28.00
22	69.16	68.00	54.33	36.00	33.16	22.66
23	58.00	68.50	57.33	34.00	31.66	20.33
24	63.00	66.50	57.33	38.33	25.34	1.33
25		66.50	61.18	32.50	26.66	15.33
26	67.66	70.66	62.16	24.33	39.33	27.33
27	61.66	64.16	65.50	30.33	36.33	3.66
28	62.50	55.66	57.17	36.00	32.33	—10.33
29	64.50	54.66	53.16	34.16	25.50	—11.66
30	68.66	57.00	57.66	36.50	41.43	17.00
31	72.16	59.16		35.00		10.66
	64.69	63.52	57.63	33.48	32.05	11.77
Monthly Mean.	67.30	67.76	56.43	42.87	37.75	19.02

1860.

	January.	February.	March.	April.	May.	June.
1	1.50	—7.50	45.83	42.50	51.50	60.00
2	—7.00	2.00	44.00	18.00	58.66	60.00
3	—3.66	9.50	39.50	30.50	60.33	65.50
4	19.00	20.50	35.16	48.66	59.83	69.33
5	3.66	25.66	26.33	44.34	60.33	66.00
6	17.33	38.50	25.33	34.33	62.00	67.00
7	27.34	35.67	33.00	40.33	67.00	70.00
8	39.50	29.33	37.33	42.16	59.16	59.00
9	34.00	34.16	32.33	42.33	55.00	59.66
10	37.33	7.34	23.66	39.50	57.66	52.00
	16.95	19.51	34.35	38.26	59.15	62.85
11	31.50	3.66	29.33	39.00	65.50	57.33
12	18.33	10.00	29.33	44.33	67.50	62.00
13	2.33	27.00	25.33	40.50	70.00	67.33
14	23.00	13.67	26.66	30.50	60.00	74.00
15	32.33	14.16	34.00	26.00	53.33	68.66
16	39.33	23.66	40.50	40.33	54.33	69.66
17	22.00	3.50	41.16	50.00	60.00	64.50
18	19.16	2.66	45.16	29.50	56.16	72.00
19	22.33	11.66	47.50	41.50	60.16	70.00
20	32.33	15.33	39.50	54.33	44.16	61.66
	24.41	12.53	35.35	39.70	59.16	66.76
21	41.67	33.33	25.00	55.16	43.66	60.50
22	40.00	42.33	16.34	44.00	56.66	63.16
23	27.00	43.66	27.00	45.34	55.00	65.33
24	34.17	27.33	29.66	36.50	55.67	68.50
25	37.66	21.66	28.00	37.00	64.16	70.33
26	21.33	22.66	32.16	37.66	64.00	70.16
27	18.33	41.16	33.34	42.00	55.00	63.00
28	16.00	32.16	36.34	47.33	58.33	70.66
29	15.34	41.00		54.16	64.66	51.00
30	32.66		47.50	56.16	61.00	73.00
31	15.66		56.16			
	28.03	34.05	38.15	45.58	57.81	65.71
Monthly Mean.	23.13	22.08	34.45	41.18	58.70	65.10

1860.

	July.	August.	September.	October.	November.	December.
1	62.00	59.00	60.16	38.34	65.33	30.83
2	64.00	63.33	56.33	49.00	61.50	25.66
3	71.34	72.33	57.66	50.17	56.00	31.00
4	68.00	72.33	65.00	50.66	49.34	29.16
5	54.16	68.33	67.16	51.33	43.33	24.66
6	61.17	70.00	69.33	38.66	38.33	24.66
7	68.00	73.00	69.33	42.66		25.66
8	62.00	80.16	53.33	43.00	37.66	21.33
9	69.50	76.00	49.66	41.00	40.00	23.66
10	69.33	72.66	53.50	43.50	39.50	29.33
	64.95	71.21	60.25	45.33	47.43	26.70
11	61.16	53.00	57.33	51.33	40.66	18.66
12		66.34	47.16	42.00	41.50	18.67
13	65.33	68.16	49.17	40.66	42.66	17.17
14	70.16	56.00	53.16	38.16	39.50	—2.33
15	73.33	58.00	64.33	36.16	38.50	2.33
16	74.00	61.67	66.16	44.00	34.50	14.33
17	64.33	69.66	63.33	40.00	33.16	18.00
18	70.00	69.34	58.50	45.33	41.67	—6.33
19	74.34	68.67	61.66	46.00	40.00	20.66
20	70.33	67.66	69.66	47.50	36.67	35.00
	69.16	64.35	59.60	43.01	38.38	14.98
21	67.33	68.66	54.33	47.00	30.00	33.00
22	61.00	73.66	56.67	53.16	29.00	31.33
23	63.16	73.33	50.50	53.50	37.33	10.33
24	62.66	72.00	64.34	51.34	32.50	14.00
25	66.66	68.00	58.16	52.00	20.33	18.00
26	71.66	73.33	48.00	47.00	25.66	25.00
27	58.33	65.16	45.33	37.66	33.67	21.66
28	62.00	63.16	43.66	43.00	28.33	20.66
29	59.00	58.66	34.33	51.33	28.34	23.66
30	69.33	64.16		63.00	33.00	29.33
31	70.33	64.33		61.33		21.00
	64.68	67.42	49.92	51.06	30.41	22.53
Monthly Mean.	66.26	67.66	56.59	46.65	33.92	21.40

1861.

	Jan.	Feb.	March.	April.	May.	June.	July.	Nov.
1	23.33	22.16	33.16	28.00	39.50	68.66	64.50	37.50
2	30.66	37.33	43.34	30.16	32.16	69.16	57.33	42.00
3	12.00	14.33	52.16	31.33	36.17	66.17	59.33	52.33
4	10.50	11.33	39.34	33.16	43.00	54.00	71.16	44.50
5	22.33	27.00	25.00	37.00	49.67	59.66	75.50	46.33
6	20.66	31.66	23.00	38.66	48.00	53.33	75.00	46.33
7	18.34	-1.66	4.34	38.66	52.00	61.34	78.66	43.16
8	9.16	-22.33	21.33	39.33	55.16	67.66	80.67	35.33
9	14.33	-1.33	42.17	43.00	49.33	70.50	77.33	41.00
10	22.66	34.00	30.66	44.66	53.33	75.17	73.34	32.00
	18.45	15.35	32.05	36.45	45.33	65.70	71.23	42.15
11	-7.33	44.33	16.67	45.33	52.16	75.33	69.00	41.66
12	-10.33	44.00	25.00	51.33	54.33	70.34	61.50	36.34
13	-15.00	33.00	27.66	54.50	53.66	57.17	62.33	33.00
14	10.00	26.17	19.00	43.33	53.33	58.00	59.33	31.67
15	23.66	31.50	24.67	41.33	56.33	68.66	63.16	27.33
16	27.00	36.50	25.66	36.00	52.16	61.33	65.33	30.16
17	19.66	34.33	17.33	30.16	46.33	55.33	65.66	33.66
18	19.50	31.66	1.33	35.00	47.33	62.00	69.50	30.00
19	33.50	27.33	5.66	35.33	50.50	70.00	71.33	25.33
20	14.00	32.16	16.33	35.33	53.33	61.33	64.00	26.00
	11.41	34.15	17.98	41.41	52.05	64.00	65.21	31.61
21	14.33	28.33	28.00	44.33	54.33	61.00	64.00	29.00
22	10.66	12.66	26.33	51.00	55.00	67.00	65.00	26.33
23	0.16	20.66	31.33	61.66	58.33	61.33	60.00	32.50
24	21.33	23.33	31.33	59.33	64.33	57.16	61.66	32.66
25	23.33	19.33	30.33	49.00	57.66	66.33	64.50	31.66
26	23.00	35.33	39.00	45.33	62.00	73.33	70.66	30.33
27	20.66	40.00	47.00	59.66	55.66	66.66	74.00	32.00
28	24.66	41.66	34.50	50.16	48.17	63.50	74.50	33.00
29	27.16		42.00	48.50	49.66	65.16	75.00	34.50
30	23.16		45.33	50.00	56.67	68.66	76.00	31.50
31	13.66		26.00		65.16		71.50	
	18.60	30.01	34.36	51.90	57.17	65.01	68.32	31.35
Monthly Mean.	16.15	26.50	28.13	43.25	51.70	64.54	68.25	35.03

OWEGO, TIOGA CO., N. Y., May 31st, 1859.

DEAR SIR: — I write now simply to acknowledge the receipt of your letter of the 23d inst., as some time may yet elapse before I can make as full an investigation of the facts referred to in your letter as I wish to make in order fully to meet the scope of your inquiries.

The well in question is about four miles and a quarter west of this village, and is familiarly known to the people here and in this vicinity as "The Deep Well." It does not, however, lie in this town, but just beyond our limits, in the town of Tioga.

It has not been in use within the past four or five years, in consequence of the earth having caved in so as partially to fill it; and the phenomenon to which you refer will soon be only a matter of tradition, as the well will not probably be reopened.

I can now only state, in general, that every winter this well, being of the depth you state, was regularly frozen over about the time the running streams in its vicinity were closed by ice, and as regularly thawed out about the month of June, though ice would be occasionally drawn from it as late as the month of July.

When it was once closed by the ice, no force at the command of those in its vicinity could re-open it. A blacksmith in its vicinity used to try to break the crust of the ice by raising a large blacksmith's anvil twelve or fifteen feet from its surface, and then suddenly letting the anvil drop upon it; but without effect.

I regret to acknowledge that the facts connected with this well have not before this been of such interest to me as to make it now only necessary to give you the results of past investigations; as it is, I will pursue the inquiry with such means as I can, and give you the fruits, if any, hereafter. I only write now lest you might suppose from the delay that I had either not received your letter, or was unpardonably inattentive to your request.

Very truly yours,

GEORGE SIDNEY CAMP.

HARTFORD, Conn., July 4th, 1859.

DR. C. T. JACKSON,

Boston, Mass.

Dear Sir: — Yours of the 16th ult. found me at the beginning of a college annual examination, followed by a college commencement, with all the distractions thereunto belonging; and up to this time I have hardly had leisure to answer correspondents. Under these circumstances, I beg you will pardon my seeming neglect.

In answer to your inquiry if I know of any localities in Owego where you can obtain information, I can only reply that, in addition to the correspondents mentioned in my paper on the frozen well of Owego, Mr. John C. Dickinson, who resides at Owego, is interested in this matter. Besides the famous freezing well, there are several others in Owego remarkable for their coldness. One, twenty-five feet deep, was in the following condition March 28th, 1856: — temperature of air, 22° Fah.; ice two feet thick above the water, then about a foot depth of water, and on the bottom of the well the ice about six inches thick. Another, thirty feet deep, freezes when the thermometer in the air

above is several degrees below zero. Several other wells in the village and vicinity of Owego are known to freeze, but their depth I do not know.

In October, 1855, I received a letter from Mr. Wm. B. Shedd, of Malden, Middlesex Co., Mass., who for four years had been making observations upon the temperature of caves, wells, springs, &c. He professed to have discovered the causes of frozen wells and ice caves, and attributed the various phenomena to one of four "combinations of circumstances," none of which he would reveal. He said that he intended to construct a cave which would freeze, in order to test his theory. He stated that he had formed an opinion respecting the Owego wells, which he would communicate to me the following spring, when he had made his experiment. I have not however heard from him.

Mr. Shedd communicated to me the fact of the existence of a very cold spring in Otis, Berkshire Co., Mass. It is situated near the Farmington river, on the eastern side. Observations were made in August, 1853, and the results were as follows: — thermometer in shade 94° Fah.; near the spring 70°; water of the spring 36°; in the river, close by the spring, 61°.

The well near Hartford, to which you allude, is not a freezing well; it is simply a cold well, and does not deserve investigation as much as others which have been mentioned.

I received a letter from the owner of the Brandon well last winter.

I confess myself to be entirely at a loss respecting the cause of this phenomenon. In Owego the wells are sunk in coarse gravel, and the waters are impregnated with lime. In these two points they resemble the Brandon well. The bed of the Otis spring is gravel. We find, I think, also hills in the vicinity of these freezing wells.

I understand that it has been suggested that possibly natural freezing mixtures may give rise to these phenomena. May we not also inquire if high ridges and hills, presenting so much surface to action of the cold, do not become colder at a given depth than a portion of the general crust of the earth, and to so great an extent that, when they are composed of materials that promote a rapid evaporation, such a reduction of temperature may result as we sometimes observe?

In the preceding part of this letter I have given you some abstracts, as it would take too much time to transcribe all the matter bearing upon this subject.

Perhaps I may have the pleasure of seeing you at Springfield next month, when the A. A. S. A. S. meets, when we can compare notes.

I remain,

Very truly yours,

JOHN BROCKLESBY.

Professor Wyman gave an account of some experiments recently made on the formation of minute living organisms in solutions of organic matter which had been boiled and exposed, in hermetically-sealed vessels, to air which had passed through iron tubes heated to redness. Thirty-seven experiments were tried, and of these thirty-three were made at the ordinary pressure of the atmosphere, and all but five supplied with air through heated tubes. The solutions were boiled from fifteen minutes to two hours before being sealed, and Infusoria appeared in all but four. The first indication of them was

a film, which formed on the surface of the solution, sometimes on the second day, generally during the first week, and occasionally not until the nineteenth day from the commencement of the experiment. The solutions consisted of mixtures of sugar and starch, with some albuminous matter, of the juice of beef sometimes filtered, and in other instances containing muscular fibre and vegetable substances. Five experiments were tried in flasks hermetically sealed at the beginning, and then immersed in boiling water, in all of which Infusoria were formed.

Four experiments were made with sealed flasks in a Papin's digester, two of them under a pressure of two, and two under five atmospheres. Infusoria were found in one of each.

The organisms consisted of Vibrio, Bacterium, Torula, minute Algæ, also of small, round or oval bodies, moving with vibrating cilia.

Dr. B. J. Jeffries presented his Annual Report as Curator of the department of Microscopy, which was accepted.

June 4, 1862.

The President in the chair.

The following communication was presented:—

ON THE MODE OF DEVELOPMENT OF THE MARGINAL TENTACLES OF THE FREE MEDUSÆ OF SOME HYDROIDS. BY A. AGASSIZ.

The uniformity of the order of appearance of the partitions of Polyps, which was first pointed out by Milne-Edwards and Haime,* led me to suppose that something similar would be the case for the order of succession of the marginal tentacles of Hydroid Medusæ. As we have not in Acalephs new chambers, formed by additional tentacles, as is the case in Polyps, I have not used the term cycle of Milne-Edwards and Haime, but have employed instead of it the words *set of tentacles*, to denote those tentacles which are formed at the same time. For instance, a young Medusa just escaped from the reproductive calycle has four tentacles,— they are the tentacles of the first set; the tentacles which next make their appearance,— also four in number,— in the intermediate spaces, are those of the second set;

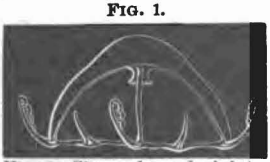
* Recherches sur la structure et la classification des Polypiers récents et fossiles, par MM. H. Milne-Edwards et Jules Haime, extrait des Annales des Sciences Naturelles, Paris, 1848-49.

the tentacles which then may make their appearance, at whatever point of the circumference it may be, and however irregularly they may divide the existing spaces between the tentacles, would be the tentacles of the third set, and so on for the other tentacles. Although in some of the families, as the *Laodiceæ* AG., the *Eucopidæ* GEGENB., the *Nucleiferæ* LESS., the *Melicertidæ* AG., I have found that the order of appearance of the different tentacles coincided with the order of appearance of the chambers of Polyps; yet the exceptions to this law were numerous, as in the *Tubularidæ* AG., the *Bougainvillidæ* LÜTK, the *Nemopsidæ* AG., the *Berenicidæ* ESCH. In one and the same family we find genera in which the law holds good, while in closely-allied forms the order of development is materially modified, as is the case in *Clytia* and in *Tiaropsis*.

Another great difference between the Polyps and Acalephs is the great variety of numbers which are found in the tentacles of the first set in Acalephs, while in Polyps six is almost uniformly the number of chambers of the first cycle. In Acalephs, on the contrary, we find in some *Eucopidæ* sixteen, *Obelia* (fig. 5), in others, *Eucope* (fig. 7), twenty-four, and forty-eight (fig. 6), as the number of tentacles of the first set; in the *Oceanidæ* ESCH., as limited by Agassiz, there are four in *Clytia* (fig. 14), *Eucheilota* (fig. 16), and *Tiaropsis* (fig. 10); in the *Laodiceæ*, there are four in *Staurophora* (fig. 1), and two in *Laphœa* (fig. 4). Among the *Berenicidæ* there are four (see *Willia*); the *Nemopsidæ* have sixteen (fig. 26), while the *Bougainvillidæ* have eight, as in *Bougainvillia* (fig. 24), or four as in *Lizzia* (fig. 28). In some of the Tubularians, as in *Corymorpha* (fig. 31), and *Hybocodon* (fig. 30), the first set has but one tentacle. This shows, among the few Medusæ which I have examined, a greater variety of modes of development than we find in the whole class of Polyps, as far as they are known.

In *Staurophora laciniata* AG., I have followed this succession of the sets of tentacles as far as the seventeenth set. The first set consists of four tentacles, and perhaps only of two if we may form conjectures from the young Medusa of *Laphœa* mentioned below. In fig. 1 we have a young *Staurophora*, measuring about $\frac{1}{20}$ of an inch across the circular tube, in which the second set of tentacles is developed. The digestive cavity hangs down as a short proboscis; there are no ovaries developed. The formula of the tentacles for a quarter segment, at the stage of growth of fig. 1, could be represented by T_1, t_2, T_1; — T_1, T_1, being the tentacles of the first set, placed in the prolongation of the chymiferous tubes,

FIG. 1.

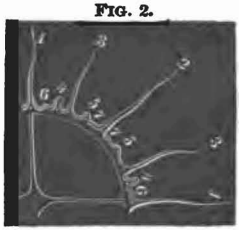


Young *Staurophora laciniata*, magnified 10 diam.

t_2, the tentacles of the second set, half-way between those of the first set. Fig. 2 is a more advanced stage of *Staurophora*, in which the tentacles of the third set are almost as large as those of the first and second sets, and the fourth, fifth, and sixth sets of tentacles can readily be distinguished. Using the same notation as above, the formula for the tentacles would be:

$T_1, t_6, t_4, t_8, t_5, t_7, t_2, t_7, t_5, t_8, t_4, t_6, T_1$.

FIG. 2.



Young *Staurophora*, slightly older than fig. 1.

In fig. 3, the young *Staurophora* has a still greater number of sets of tentacles, the fourth and fifth sets having grown sufficiently large to be easily distinguished from one another by their difference in size; the eighth and ninth sets have made their appearance. The formula for this stage of growth is: $T_1, t_6, t_4, t_8, t_8, t_9, t_5, t_7, t_2, t_7, t_5, t_9, t_8, t_8, t_4, t_6, T_1$. The number of tentacles of the first set are four ($4\,T_1$); there are in the second set also four ($4t_2$), using the same notation; there are in the third set $8\,t_8$; in the fourth set $8\,t_4$; in the fifth set $8\,t_5$; in the next set $8\,t_7$; then $8\,t_8$, and $8\,t_9$ in the ninth set. The number of tentacles which *Staurophora* may have at any particular time can easily be found, and the formulæ for the number of tentacles in figs. 1, 2, 3, would be:

FIG. 3.

Young *Staurophora*, still older than fig. 2.

$$\Sigma t = 4\,T_1 + 4\,t_2;$$ or 8 tentacles for fig. 1,

Σt denoting the sum of the different sets of tentacles round the circumference;

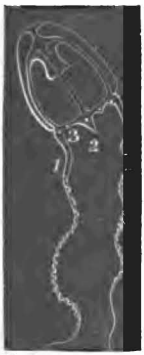
$$\Sigma t = 4\,T_1 + 4\,t_2 + 8\,t_8 + 8\,t_4 + 8\,t_5 + 8\,t_6 + 8\,t_7$$ for fig. 2, or forty-eight tentacles; and, finally,

$$\Sigma t = 4\,T_1 + 4\,t_2 + 8\,t_8 + 8\,t_4 + 8\,t_5 + 8\,t_6 + 8\,t_7 + 8\,t_8 + 8\,t_9,$$

or sixty-four tentacles in fig. 3; and so on as far as the seventeenth set. It becomes almost impossible to follow the development of the tentacles further, as they are then rather irregular in their growth, and often much more numerous in one quarter segment than in the adjoining one. In fig. 3, we have the first sign of the development of the ovaries, the corners of the digestive cavity extend, little by little, along the chymiferous tubes, and when the young Medusa has attained the size of an inch in diameter, the ovaries already reach half-way towards the circular tube. For

a figure of the adult Medusa, see Agassiz (L.) in Mem. American Academy, Vol. IV. Plate 7. The only species of the *Laodiceæ* AG. which I have found young enough to show positively what the number of tentacles of the first set was, is the Medusa of *Laphœa cornuta* LAMX., fig. 4, in which the formula for the tentacles for half the circumference is, T_1, t_3, T_2, t_3, T_1; the presence of eight tentacles at that time is expressed by the formula $\Sigma t = 2T_1 + 2T_2 + 4t_3 = 8t$. This species is closely allied to *Atractylis repens* WRIGHT, and I am inclined to believe that both may prove to be the young of *Laodicea-like* Medusæ. It will be very interesting to see how this order of succession of the sets of tentacles is modified in *Laodicea calcarata* A. AG., in which we have cirri, and club-shaped bodies between the tentacles, as in *Thaumantias mediterranea* GEGENB. Unfortunately I did not succeed in finding any Laodicea calcarata young enough to throw any light on this subject; from the youngest specimen I met with, I am convinced that the first set of tentacles does not consist of more than four, or perhaps even only of two tentacles, specimens measuring one quarter of an inch in diameter having not more than seven tentacles between every two chymiferous tubes.

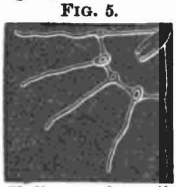
FIG. 4.



Free Medusa of *Laphœa cornuta*, magnified 15 dia.

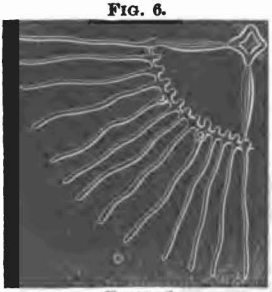
In the *Eucopidæ* GEG. we find a much greater difference in the number of tentacles of the first set. In *Obelia commissuralis* MCCR., fig. 5, there are sixteen tentacles in the first set. In *Eucope diaphana* AG. (see fig. 7), and in two other species closely allied to it, the first set consists of twenty-four tentacles; in another Hydroid belonging to this family we find a young Medusa escaping from the reproductive calycle with no less than forty-eight tentacles, as in fig. 6, which represents a quarter segment of a new species of *Eucope?* We know nothing of the adult condition of *Obelia*, fig. 5, and of the Medusa of fig. 6. But as we have no less than three species of *Eucope* on our coast, all escaping from the reproductive calycles with twenty-four tentacles, and as we now know several species of *Obelia*, all having sixteen tentacles in the first set, and still another, fig. 6, in which the first set has forty-eight tentacles, this difference in the number of tentacles of the first set would seem to be generic.

FIG. 5.



Obelia commissuralis

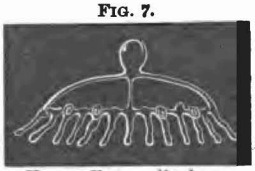
FIG. 6.



Eucope?

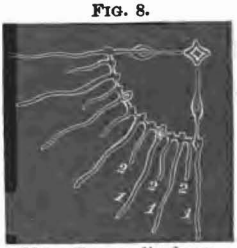
Eucope diaphana AG. is the only one of this family which I have followed from the time of its escape from the calycles to the adult state. The young Medusa is liberated with twenty-four tentacles, fig. 7; its formula would be $T_1, t_1, t_1, t_1, t_1, t_1, T_1$, or, for the number of tentacles of the first set: $\Sigma t = 4 T_1 + 20 t_1 = 24 t$. In fig. 8, we have the same Medusa at the time when the second set is developed. The formula of fig. 8 is, therefore,

FIG. 7.



Young *Eucope diaphana*.

FIG. 8.



Older *Eucope diaphana*.

$T_1, t_2, t_1, t_2, t_1, t_2, t_1, t_2, t_1, t_2, t_1, t_2, T_1,$

or, for the whole number of tentacles:

$$\Sigma t = 4 T_1 + 20 t_1 + 24 t_2 = 48 t,$$

and so on, as far as the fifth set of tentacles, fig. 9.

The formula for the third set is:

$$\Sigma t = 4 T_1 + 20 t_1 + 24 t_2 + 48 t_3 = 96 t;$$

that of the fourth set:

$$\Sigma t = 4 T_1 + 20 t_1 + 24 t_2 + 48 t_3 + 48 t_4 = 144 t;$$

that of the fifth set (fig. 9):

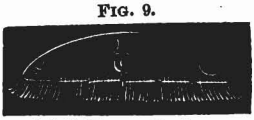
$$\Sigma t = 4 T_1 + 20 t_1 + 24 t_2 + 48 t_3 + 48 t_4 + 48 t_5 = 192 t.$$

The formula for the arrangement of the tentacles for this last set being (fig. 9),

$$T_1, t_4, t_3, t_5, t_2, t_5, t_3, t_4, t_1, t_4, t_3, t_5, t_2, t_5, t_3, t_4, t_1, t_4, t_3, t_5, t_2, t_5, t_3, t_4, t_1, \ldots\ldots\ldots\ldots T_1.$$

Fig. 9 is an adult *Eucope diaphana* AG., measuring one quarter of an inch in diameter; at the stage represented in fig. 7, it is not much larger than a pin's head.

FIG. 9.



Adult *Eucope diaphana*.

In the *Oceanidæ* ESCH., the presence of eyes between the tentacles, and the development of cirri at the base of the tentacles in some of the genera, modify the uniformity of the order of succession of the sets of tentacles.

In *Tiaropsis diademata* AG. (Mem. American Academy, Vol. IV. Plate 6), we find two compound eyes between every two chymiferous tubes, the eyes being placed at the same distance from the chymifer-

ous tubes as that at which they are placed one from the other. In the youngest *Tiaropsis* which I have found, fig. 10, there were already twenty-four tentacles, four long tentacles in the prolongation of the chymiferous tubes, four slightly shorter in the middle of the space between the eyes, and two pairs of small tentacles, one pair for each eye. So that we should have for the formula of the tentacles of fig. 10:

FIG. 10.

Young *Tiaropsis diadelmata.*

T_1, t_3, e, t_3, t_2, t_3, e, t_3, T_1; e being the compound eye. The third set, which would have fallen on the spot occupied by e, consists of a pair of tentacles, instead of a single one only, as in the former cases.

Fig. 11 is a diagram of the arrangement of the tentacles, between two chymiferous tubes, in the stage of growth of fig. 10. When we come to the next stage, represented in fig. 12, the order of succession is not interfered with by the eyes, and we have for the formula of the arrangement of the tentacles:

FIG. 11.

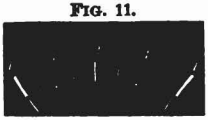
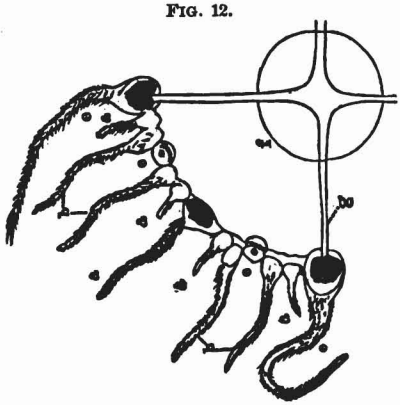


FIG. 12.

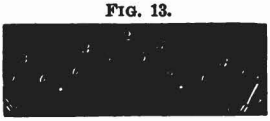


Tiaropsis, having forty tentacles.

T_1, t_4, t_3, e, t_3, t_5, t_2, t_5, t_3, e, t_3, t_4, T_1.

The fourth and fifth sets consist only of eight tentacles each, and not of sixteen, as the third set. When we come to the next set, the sixth, we find that it has sixteen tentacles, and that two pairs of tentacles are formed, one for each eye, as is shown in the diagram, fig. 13, and so on; every set which would have come in the space occupied by an eye being always formed in pairs, as was the case with the third and the sixth sets. The formula for this figure (fig. 13) would be:

FIG. 13.



T_1, t_4, t_3, t_6, e, t_6, t_3, t_5, t_2, t_5, t_3, t_6, e, t_6, t_3, t_4, T_1,

The formula for the number of tentacles of fig. 10 is:

$$\Sigma t = 4 T_1 + 4 t_2 + 16 t_3 = 24 t.$$

For fig. 12 the formula is:

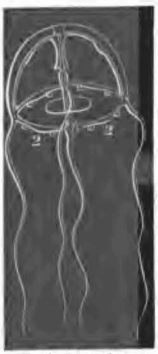
$$\Sigma t = 4 T_1 + 4 t_2 + 16 t_3 + 8 t_4 + 8 t_5 = 40 t.$$

For fig. 13 the formula becomes:

$$\Sigma t = 4 T_1 + 4 t_2 + 16 t_3 + 8 t_4 + 8 t_5 + 16 t_6 = 56 t.$$

The presence of eyes does not always modify in such a remarkable manner the order of succession of the sets of tentacles. For instance, in *Clytia bicophora* Ag. (see also Note A, p. 95), we have two eyes between every two chymiferous tubes, and yet the order of succession is as regular as if the eyes had not been present. Fig. 14 is a young *Clytia*, just escaped from the calycle, having four long tentacles and four rudimentary ones, 2 (fig. 14), and the eyes placed on each side of the middle tentacle; the formula for the arrangement of the tentacles is:

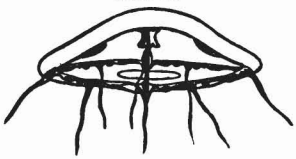
Fig. 14.



Clytia bicophora.

$$T_1, \quad e, \quad t_2, \quad e, \quad T_1.$$

Fig. 15.



Young *Clytia bicophora.*

In fig. 15, the tentacles of the third set having made their appearance, the formula becomes:

$$T_1, t_3, e, t_2, e, t_3, T_1.$$

The formulæ for the number of tentacles for figs. 14 and 15 are respectively:

$$\Sigma t = 4 T_1 + 4 t_2 = 8 t, \text{ and } \Sigma t = 4 T_1 + 4 t_2 + 8 t_3 = 16 t.$$

This Medusa has not been traced farther. I am unable, therefore, to say whether the succession of the following sets is regular or not. In the genus *Eucheilota* of McCrady, in which we have eyes and cirri, the following is the order which has been observed: the youngest *Eucheilota* (probably *Eucheilota ventricularis* McCr.; for figure of the adult see McCrady, Proc. Elliot Soc., Plate XI. fig. 3) had four long tentacles, and resembled the young of *Clytia*, fig. 14, so closely that it was at first mistaken for it. More advanced

FIG. 16.

Young *Eucheilota*.

specimens, fig. 16, showed at the base of the large tentacles slight swellings, which soon developed into short cirri as seen in fig. 17, in which the cirri of the second set of tentacles are also slightly developed. The formula for the youngest *Eucheilota* thus far seen is:

FIG. 17.

Eucheilota, more advanced than fig. 16.

$$T_1,\quad e,\quad t_2,\quad e,\quad T_1.$$

The formula of fig. 16 is:

$$\overbrace{T_8,\ T_1,\ T_8},\ e,\ t_2,\ e,\ \overbrace{T_8,\ T_1,\ T_8},$$

and that of fig. 17 is:

$$\overbrace{T_8,\ T_1,\ T_8},\ e,\ \overbrace{t_4,\ t_2,\ t_4},\ e,\ \overbrace{T_8,\ T_1,\ T_8},$$

the third and fourth sets of tentacles being the cirri of the tentacles of the first and second set; so that the cirri are developed before any additional sets of tentacles are added, the formulæ for the number of tentacles of these successive stages being:

$$\Sigma\, t = 4\,T_1 + 4\,t_2 = 8\,t.$$

$$\Sigma\, t = 4\,T_1 + 4\,t_2 + 16\,T_8 = 24\,t.$$

$$\Sigma\, t = 4\,T_1 + 4\,t_2 + 16\,T_8 + 16\,t_4 = 40\,t.$$

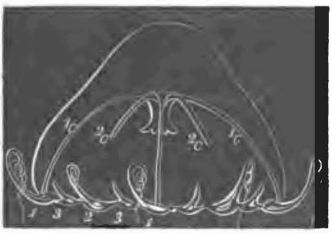
Among the *Geryonopsidæ* AG. I have found our *Tima formosa* AG., with sixteen long tentacles and sixteen shorter ones, the formula being probably:

$T_1,\ t_4,\ t_8,\ t_5,\ t_2,\ t_5,\ t_8,\ t_4,\ T_1$; as *Tima* never has many tentacles it is possible that the young *Tima* have not more than four, or perhaps two tentacles in the first set. The *Æquoridæ* will give us the best means of ascertaining the order of development of the chymiferous tubes, and of the tentacles in connection with numerous eyes between the tentacles, as these Medusæ attain quite a large size before the chymiferous tubes become numerous. From what I have seen in the *Berenicidæ* ESCH., the *Melicertidæ* AG., and the *Æquo-*

NOTE A.—The genus *Wrightia* has but two tentacles when the Medusa escapes from the calycles. I have traced the Medusa of our young *Wrightia*, mentioned by Prof. Agassiz on p. 354 of his 4th vol. of Contributions to the Natural History of the United States, through all the stages intermediate between *Wrightia* and *Oceania*, and have ascertained that our *Wrightia* is only the young of *Oceania languida* A. AG. described in p. 353 of the same volume. It has at first two long tentacles, then four, in the prolongation of the chymiferous tubes, then eight, sixteen, and finally thirty-two tentacles. The eyes are developed independently of the tentacles; one pair of eyes making its appearance for each tentacle.

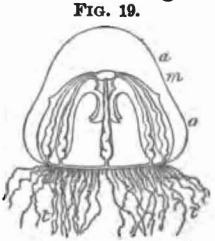
ridæ ESCH., it appears that the new chymiferous tubes are always formed from the base of the digestive cavity towards the circular tube, the tentacle which is eventually placed in the prolongation of the chymiferous tube being always first developed, before any trace of the chymiferous tubes can be found, so that the new chymiferous tube strikes the tentacle, instead of the tentacle arising from the tube. Fig. 18 is a young *Melicertum Campanula* PER. et LES., of which fig. 19 is the adult. In fig. 18 there are only four of the eight chymiferous tubes which reach the circular tube; the others, ^2c, ^2c, only extend a short distance, while the tentacles 2, which will, in later stages of growth, be found in the prolongation of these tubes, ^2c, are quite well developed. The formula for the tentacles of fig. 18 is: T_1, t_3, t_2, t_3, T_1, which soon becomes T_1, t_4, t_3, T_2, t_3, t_4, T_1; the chymiferous tubes ^2c, ^2c, having reached the circular tube at the point 2, fig. 18. The mathematical accuracy of the meeting of the tentacle and its chymiferous tube is still more striking in Willia. In a young *Willia ornata* MCCR. there are four straight chymiferous tubes which do not branch, four long tentacles in the prolongation of these chymiferous tubes, and four tentacles which are not placed in the middle of the space between two adjoining chymiferous tubes, but always in such a position that, either to the right or the left, the distance to the nearest chymiferous tube is one-third of the space between two adjoining chymiferous tubes. In fig. 20 the simple tube is sending off a small branch, ^2c, which will, in the end, strike the circular tube at the point where the tentacle 2 is placed. The formula for the tentacles in fig. 20 being: T_1, t_2 T_1, and after the branch of the chymiferous tube has reached the margin it will become: $\overset{\frown}{T_2}\ T_1$, $T_1\ \overset{\frown}{T_2}$ for half the circumference; T_1 indicating the tentacle in the prolongation of the main tube; T_2 the tentacle of the first branch; the $\frown$ joining the two letters T_1 T_2 shows that the branch T_2 is a part of the same chymiferous tube

FIG. 18.



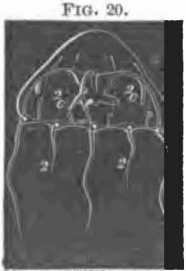
Young *Melicertum Campanula.*

FIG. 19.



Melicertum Campanula.

FIG. 20.



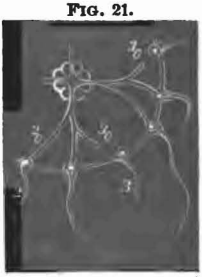
Young *Willia ornata.*

with T_1; the same applies to T_2. Soon after the tentacles of the third set make their appearance, and in fig. 21 the formula is:

$$t_3,\ \overbrace{T_1,\ T_2},\ t_3,\ \overbrace{T_1,\ T_2},\ \text{or, } \Sigma t = 4T_1 + 4T_2 + 4t_3 = 12t;$$

a branch ^3c is then set off in the opposite direction to ^2c, which soon reaches the circular tube at the point where the third set of tentacles has already been formed. The last formula becoming for this stage:

FIG. 21.



Willia, more advanced than fig. 20.

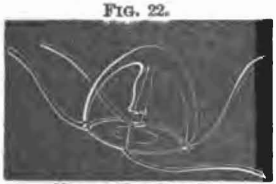
$$\overbrace{T_2,\ T_1,\ T_2},\ \overbrace{T_2,\ T_1,\ T_2},$$

$$\text{or, } \Sigma t = 4T_1 + 4T_2 + 4T_3 = 12t.$$

We have thus in *Willia* a very peculiar order of development in the first three sets, modified by the manner of branching of the chymiferous tubes.

In other genera of the Tubularians, as *Turritopsis* McCr., and *Turris* Less,* we find again the same regularity as in *Staurophora* and *Eucope;* the sets of tentacles making their appearance in the same order. In fig. 22, we have a young *Turritopsis nutricula* McCr., having only four tentacles. For a figure of the adult, see McCrady, Proc. Elliot Soc., Plates 4 and 5. Fig. 23 is the same species with sixteen tentacles. The formula of fig. 23 is:

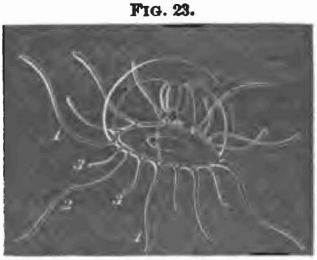
FIG. 22.



Young *Turritopsis*.

$T_1,\ t_2\ t_2,\ t_3,\ T_1$. In the *Nemopsidæ* Ag. and *Bougainvillidæ* Lütk., in which the tentacles are found arranged in clusters, we have an entirely different mode of development. In *Bougainvillia superciliaris* Ag. (for a figure of the adult see Agassiz (L.) in Mem. Am. Acad., Vol. IV. Plate 1) the young Medusa, at the time when it separates from the Hydra, has two tentacles in the prolongation of each chymiferous tube, as in fig. 24; the next sets are

FIG. 23.



Young *Turritopsis nutricula*.

* The *Turris* which occurs at Nahant is probably the *Medusa digitalis* Fab. As the name *Turris digitalis* is pre-occupied for an English species, I would propose the name of *Turris vesicaria* for the species found on our coast.

developed in pairs, one tentacle on each side of those of the first set, as in fig. 25, which is one cluster of tentacles at the time when the fourth set of tentacles is developed. The formula of fig. 24 is:

FIG. 24.

Young *Bougainvillia superciliaris*.

FIG. 25.

$$\overbrace{2\,T_1}, \quad \overbrace{2\,T_1},$$

$$\text{or, } \Sigma\, t = 8\,T_1 = 8\,t.$$

That of fig. 25 is:

$$\overbrace{T_4\ T_3\ T_2\ T_1\ T_1\ T_2\ T_3\ T_4}$$

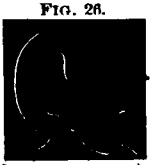
for each chymiferous tube,

$$\text{or, } \left\{\begin{matrix} 2\,T_1 & 2\,T_1 \\ 2\,T_2 & 2\,T_2 \\ 2\,T_3 & 2\,T_3 \\ 2\,T_4 & 2\,T_4 \end{matrix}\right\}$$

$$\text{or, } \Sigma\, t = 8\,T_1 + 8\,T_2 + 8\,T_3 + 8\,T_4 = 32\,t.$$

In *Nemopsis Bachei* AG. the tentacles are developed in pairs, on each side of the chymiferous tube, as in *Bougainvillia;* the only difference being that, in *Nemopsis*, the first set of tentacles consists of four, instead of two tentacles, as in the former genus. In fig. 26 we have a young *Nemopsis* with the tentacles of the first set; its formula is: $4\,T_1$, $4\,T_1$. In fig. 27 there are two additional sets formed, and the formula is:

FIG. 26.



Young *Nemopsis Bachei*.

$$\overbrace{T_3\ T_2\ T_1\ T_1\ T_1\ T_1\ T_2\ T_3}, \text{ for each chymiferous tube;}$$

$$\text{or, } \left\{\begin{matrix} 4\,T_1 & 4\,T_1 \\ 2\,T_2 & 2\,T_2 \\ 2\,T_3 & 2\,T_3 \end{matrix}\right\} \text{ or, } \Sigma\, t = 16\,T_1 + 8\,T_2 + 8\,T_3 = 32\,t;$$

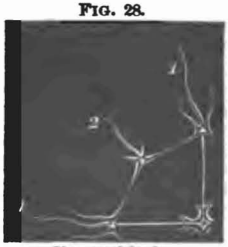
FIG. 27.

Young *Nemopsis Bachei*.

all the sets except the first having the same number of tentacles. For figures of the adult, see Agassiz (L.), Mem. American Academy, Vol. IV. p. 289; and McCrady, Proc. Elliot Soc., Plate 10, under the name of *Nemopsis Gibbesii*. In *Lizzia*, where there are secondary clusters of tentacles between the chymiferous tubes, the development is not isochronous in the tentacles in the prolongation of the chymiferous tubes and those between them. It is particularly easy to trace the order of succession of the different sets of tentacles in *Lizzia*, as the Medusæ buds are formed on the proboscis, and develop with great rapidity; from these young Medusæ, in their turn, buds are formed which become free Medusæ in three or four days; so that in the course of a week there may be as many as three successive generations swimming in a jar, which, a short time before, contained but a single Medusa. I at first supposed that the young specimens of *Lizzia*, which I found subsequently in my jars, had escaped my attention; but I became satisfied that this was not the case by isolating several specimens of our *Lizzia* with buds on the proboscis, for on examining them, at frequent intervals, I saw the buds upon their proboscis rapidly enlarge, and a few days afterwards I invariably found five or six free *Lizziæ* nearly as large as the one which had been isolated at first. The same experiment was repeated with the Medusæ which had thus been developed; they were isolated with the same result.

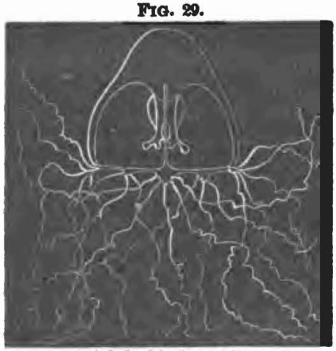
In the young buds of our Lizzia, *Lizzia grata* A. AG., there are at first four large patches of pigment cells in the prolongation of the chymiferous tubes; the intermediate clusters then make their appearance. The tentacles in the prolongation of the chymiferous tubes are first developed. We have one long tentacle for each tube. Soon afterwards the intermediate tentacles are formed, one tentacle between every two chymiferous tubes; next a pair of tentacles makes its appearance, one on each side of the long tentacle in the prolongation of the tubes; the next set consists of a similar pair for the intermediate tentacle; when the tentacles of the young *Lizzia* assume the appearance of fig. 28. In this state they remain apparently until all the tentacles have become equally developed. This is the appearance of most

FIG. 28.



Young *Lizzia*.

FIG. 29.



Adult *Lizzia grata*.

of the specimens found. It is not till then that we find a second pair of tentacles added on each side of the cluster of tentacles in the prolongation of the chymiferous tubes, as is seen in fig. 29, which represents an adult male *Lizzia grata;* the size of this Medusa is one quarter of an inch in height. The following formulæ would represent these different stages of growth:

$$T_1,\ T_1,\ \text{or,}\ \Sigma t = 4\,T_1 = 4\,t;$$

$$\text{then,}\ T_1,\ t_2,\ T_1,\ \text{or,}\ \Sigma t = 4\,T_1 + 4\,t_2 = 8\,t;$$

$$\text{next,}\ \left.\begin{matrix} T_1 \\ 2\,T_3 \end{matrix}\right\}\ \left.\begin{matrix} t_2, \\ \end{matrix}\right.\ \left.\begin{matrix} T_1 \\ 2\,T_3 \end{matrix}\right\}\ \text{or,}\ \Sigma t = 4\,T_1 + 4\,t_2 + 8\,T_3 = 16\,t,$$

$$\left.\begin{matrix} T_1 \\ 2\,T_3 \end{matrix}\right\}\ \left.\begin{matrix} t_2 \\ 2\,t_4 \end{matrix}\right\}\ \left.\begin{matrix} T_1 \\ 2\,T_3 \end{matrix}\right\}\ \text{or,}\ \Sigma t = 4\,T_1 + 4\,t_2 + 8\,T_3 + 8\,t_4 = 24\,t, \quad \text{(fig. 28.)}$$

$$\left.\begin{matrix} T_1 \\ 2\,T_3 \\ 2\,T_5 \end{matrix}\right\}\ \left.\begin{matrix} t_2 \\ 2\,t_4 \end{matrix}\right\}\ \left.\begin{matrix} T_1 \\ 2\,T_3 \\ 2\,T_5 \end{matrix}\right\}\ \text{or,}\ \Sigma t = 4\,T_1 + 4\,t_2 + 8\,T_3 + 8\,t_4 + 8\,T_5 = 32\,t, \quad \text{(fig. 29.)}$$

which, to show the arrangement, might be written thus:

$$\overbrace{T_5\ T_3\ T_1\ T_3\ T_5},\quad \overbrace{t_4\ t_2\ t_4},\quad \overbrace{T_5\ T_3\ T_1\ T_3\ T_5}.$$

In those Tubularians in which the Medusæ are not symmetrical, as in *Hybocodon* AG. and in *Corymorpha* SARS (*Euphysa* FORBES ?), the order of development is still different from what we have found in any of the preceding species. In a young *Hybocodon prolifer* AG., fig. 30, the first set consists of one tentacle only. In *Corymorpha pendula* AG., fig. 31, the first set consists of one tentacle also, the second set of two, which are formed in the prolongation of the two chymiferous tubes on each side of the first tentacle, and the third set consists again of only one tentacle, developed in the prolongation of the chymiferous tube opposite the first tentacle. In fig. 31, the tentacles of the different sets are numbered according to their order of development. The formulæ for the above stages of *Corymorpha* are for the whole cir-

FIG. 30.

Hybocodon prolifer, magnified.

FIG. 31.

Corymorpha pendula Ag., magn'd.

cumference, if O denotes that no tentacle has been developed in the prolongation of the chymiferous tube:

$\Sigma t = T_1 = 1t$; or $O + O + T_1 + O$, for the first set.

$\Sigma t = T_1 + 2T_2 = 3t$; or $O + T_2 + T_1 + T_2$ for the second set.

$\Sigma t = T_1 + 2T_2 + T_3 = 4t$; or $T_3 + T_2 + T_1 + T_2$ (fig. 31),* for the third set.

Figures 12, 15, 19, 24, 30, have been lent to me by my father, from the wood-cuts of the fourth vol. of his Contributions to the Natural History of the United States. Fig. 31 has been copied from a drawing lent to me by Prof. H. J. Clark. The other figures are copied from drawings made by me during the last two years at Nahant, Beverly, and Naushon. It was not till the appearance of the fourth volume of the Contributions of Prof. Agassiz that it became possible to trace the intermediate stages of growth of the many Hydroids of our coast, the relations of which to our free Medusæ had been traced during the investigations necessary for its publication.

On the subject of the present paper, the above-mentioned work contains only a few facts relating to *Tiaropsis*, and a general inference, derived from isolated facts, that the distinction of species, based upon the number and arrangement of the tentacles, can no longer be considered valid. See, for instance, the modifications which have been proposed in the tabular view of the Hydroids, in Vol. IV. of the Contributions to the Natural History of the United States, with reference to the numerous species of Forbes and of Gegenbaur.

Professor Agassiz mentioned that the Museum at Cambridge had recently received a cast of the great Megatherium of the British Museum. This cast had been sent by Joshua Bates, Esq., of London, to whose munificence the Museum was indebted for this valuable addition to their collections. He had taken this opportunity of comparing the bones of the South American species with some fragments of Megatherium bones which he found several years ago near Savannah,

* Owing to the great difficulty of distinguishing the free Medusæ of *Corymorpha* (which has only been discovered this spring) and that of *Hybocodon*, I have marked the Medusa of the former as doubtful.

Georgia, and with additional pieces sent to him by Dr. Habersham. As the North American Megatherium had, upon theoretical grounds, been described from a few fragments as a distinct species from the South American one, by Dr. Leidy, it was an interesting question to ascertain how far this theoretical distinction was well founded. Fortunately, the fragments, which had been found by Professor Agassiz and Dr. Habersham, were exceedingly characteristic, and included portions of bones which enabled Professor Agassiz to satisfy himself of the specific difference of the Patagonian and of the North American Megatherium. He then exhibited to the Society a portion of the ulna and radius with the perfect articulating surface of the elbow. The ulna of the two species is about the same size, the North American being somewhat shorter and blunter, while the olecranon is very prominent in the South American species. The articulating surfaces of the radius were very different, showing a much greater power of rotation in the northern species, while the great development of the articulating surface must have restricted the rotation in the southern species to much narrower bounds; and other minor differences between the heel-joints and the spinous processes, which all tend to prove that the North American Megatherium must have been more flexible than the southern species. The question then arises how far it is possible for these two animals to have been generically distinct, as the differences which have thus far been pointed out are structural differences. Professor Agassiz was inclined to believe that the differences which he had pointed out were not simply specific, but that they were generic. This view he supported by making a short revision of the Edentata, and showing that the three groups into which Owen had subdivided them were of such a character that he considered them as suborders. The Megatheroids would be divided into two families, as the presence of a trunk indicated by the structure of the anterior portion of the skull in Megatherium would warrant its separation, as a separate family, from Megalonyx, in which we have a short snout. This subdivision into families would simply be applying to the Edentata the same principles of classification which are adopted in the Pachyderms.

In reply to a question of Dr. C. Pickering, Prof. Agassiz stated that he had no satisfactory conclusive evidence in regard to the exact geological age of the deposits in which the North American Megatherium is found,

Dr. Pickering said that he had seen the deposits of the Rio Negro, where the South American Megatherium was discovered, and was inclined to consider them as belonging to the age immediately preceding our own.

Mr. Scudder presented the following paper: —

On the genus Colias in North America. By Samuel H. Scudder.

The determination of the different species of the genus *Colias*, their limits and relations to one another, is one of the most difficult undertakings in the study of the diurnal Lepidoptera, and is rendered by no means less so by the confusion into which they have been thrown by those who have written upon them. Ménétriés, it seems to me, is almost the only one who has brought to their investigation any considerable degree of acumen or of perseverance. Among the North American species there is as great a degree of confusion as there is anywhere; so that it is necessary for one attempting a fair and impartial investigation into the species on this continent, to entirely separate himself, at the start, from a knowledge of opinions previously expressed in regard to them, if he would not become hopelessly entangled in an intricate web of misconceptions and disagreements. I have had the opportunity of examining a very large number of specimens from the Eastern States and from the Pacific Coast, a considerable number from Labrador and from the central boreal regions, and a few from the States bordering the Mississippi River. The collections which I have used have been those of the Museum of Comparative Zoölogy, Cambridge; the very beautiful series of Mr. W. H. Edwards, at Newburgh, N. Y.; the collection of butterflies of the Lyceum of Natural History, Williams College, Mass., and my own specimens, which are mainly from New England.

In treating of the genus *Colias* in North America, we should first of all separate from them *C. Cæsonia* Stoll and *C. Wosnesenski* Mén.; of which latter, according to Edwards, in Morris's Synopsis, C. *Eurydice* Boisd. is a synonyme, — these must be placed in the genus *Zerene* Hübner.

Of the number of species found south of the northern boundary of the United States, I cannot form any settled opinion, nor can I of their range; for, though I have seen a very large number of specimens, these have been limited mostly to the extreme eastern and western borders of our country; yet I have very strong doubts whether there are anywhere more than two species, *C. Philodice* Godt. and *C. Eurytheme* Boisd., — the former an Eastern species, but found so far west as Missouri; the latter a Western, but found so far east as the Mississippi, and perhaps even to the Atlantic border, south of New York. The former is the only sulphur-yellow *Colias* I am acquainted with in the United States, the latter the only orange-tinted species I know of within its borders. To *C. Philodice*

belong, I think, specimens in the Museum of Comparative Zoölogy, from Osage River, Missouri, which are very large, — males and females alike measuring two and one-half inches in expanse of wings, and having the under surface of secondaries pure yellow, without any dusky scales. Here, also, belongs a pair of specimens, taken *in coitû*, in Illinois, in Mr. Edwards's collection, — the male of which has the wings yellow, but plainly tinged with orange on the disc; the only specimen of *C. Philodice* which I have seen with any orange tint upon it.

To this species, also, must be referred all the species indicated by Fitch in the 13th vol. of the Transactions New York State Agricultural Society, as *Chrysotheme* var. A, *Phicomone*, *Nastes* and *Santes*, — the three former of which are not the species so named by European authors, and the last of which is named only from a dwarfed specimen of *C. Philodice*, equally small individuals of which I have seen in Mr. Edwards's collection. It should also be added here that Dr. Fitch leads us into an error when he states that they may all doubtless be considered as but "varieties of two species, the *Philodice* and *Phicomone* of Godart, — *the latter having a row of yellow spots in the black border of the upper wings in both sexes*, whilst the former has these spots in the females only;" for we have no species here having a row of yellow spots in the marginal border of the males, and so at all referable to *Phicomone*.

It would seem as if the genus *Colias* might properly be divided into three sections: —

1°. Those having a glandular space at the base of the secondaries in the males.

2°. Those wanting this space, and having the two sexes of the same color.

3°. Those wanting this space, with the sexes of different colors.

Of the first section, none have been found in North America. To the third seem to belong all and only the boreal species.

There are two kinds of females of *C. Philodice*. One, by far the most common, is of the same yellow color as the male, or very nearly the same; the other is whitish, about the tint of *C. Hyale*, or even much paler. I have seen some considerable variation in the depth of tint in both, but never any specimens through which a gradation could be shown from one to the other, — they are either of one tint or the other, — nor have I seen this albinism ever exhibited in the males. This does not leave us in doubt that *C. Philodice* should be placed in the second section, for the white females are of great rarity.

I have examined a large number of specimens from California and Washington Territory, obtained by Mr. Agassiz, which

answer exactly to the description given by Boisduval of *C. Eurytheme* and *C. Amphidusa*, and I consider them to be the same species, for which the name of *Eurytheme* must be retained; the only difference between the two which acquires any degree of constancy is the depth and breadth of the orange tint upon the upper surface, which, in the specimens that correspond to his *Amphidusa*, covers the whole wing not occupied by the black border; while, in those corresponding to his *Eurytheme*, it covers only a central portion, and is not so deep, being mixed more with yellow; but this depth and extent of the tint appears also to be a variable character, and not to separate into two well-marked groups these Western individuals. I have seen specimens from Minnesota, Lake Superior and Texas, which seem to correspond entirely to those of the Pacific Coast. Mr. Edwards first brought to my attention the fact that the upper surface of this species has a purplish lustre when seen by oblique light, especially in those from California and Texas. This is undoubtedly the species referred to by various authors in stating that *C. Edusa* and *C. Chrysotheme* were found in California, and I suspect its prevalence even to the Atlantic border, south of New York, because it has also been asserted by authors that the two species just mentioned had been found there. I have not seen any specimens from the Middle States which could have been mistaken for them, and so cannot speak with any certainty.

Boisduval mentions, in his description of *C. Amphidusa*, that the only female he had seen was pale. There are no albinic specimens among the females I have seen; but if they occur, it only agrees, in this respect, with other allied species. Morris, in his Synopsis, gives Boisduval's authority for the localization of *C. Hyale* in California. I do not know where Boisduval asserts this, unless it be in the 3d Series of the Annales de la Société Entomologique de France, which I have not seen, but if he does, it may have been a mistaken reference of this albinic female of *C. Eurytheme* to that species.

There are three species of *Colias* in boreal America, — *C. labradorensis*, *C. interior* and *C. occidentalis*, — described below. The first inhabits Labrador, the second the interior of the continent, and the third the western portion, including the Rocky Mountain region. They are all closely allied to one another and to *C. Pelidne*, Boisd. and Lec. They do not, any one of them, agree with the figures and descriptions given of *C. Pelidne*, — under which name, I suspect, more than one species is confounded. Boisduval, in his first description of *C. Pelidne*, in Boisduval and Leconte's Histoire générale des Lépidoptères de l'Amerique Septen-

trionale, states it to be found in Greenland, Iceland and Labrador, and I presume his figure to have been taken from, and his species referable to, the species found in the former localities. The male of *C. Pelidne*, as figured by Boisduval in his Icones historique des Lépidoptères, is much like the male of *C. interior;* while the figures given by Herrich Schæffer (which I cannot think, with Ménétriés, were copied from Godart) closely resemble *C. labradorensis*, if they are not of the same species, though the species described as *Pelidne* by Ménétriés, on page 84 of his St. Petersburg Catalogue, does not seem to be the same as *C. labradorensis*. "Lederer," says Ménétriés, "pretends that he knows *Pelidne* only from Labrador." I think it must be that the true *C. Pelidne* is not found in Labrador, and that my *C. labradorensis*, which cannot be referred to it, is the species seen by Lederer, and hitherto undescribed. Other species, known in boreal Europe, have also been stated to have been found in boreal America, but I suspect that, in all these cases, a close resemblance has been mistaken for an identity. Of the two Arctic species, I know nothing, but none of the species I here describe are the *C. Boothii* or the *C. Chione* of Curtis, described in the Appendix to Ross's Second Voyage.

There seem to be three distinct faunæ in boreal America, in each of which the genus Colias is represented by a distinct species; so far as is simply indicated by an examination of the species of diurnal Lepidoptera which I have seen from there, the easternmost is confined to a narrow limit, comprising only the eastern portion of Labrador; the central appears to include in general all the country watered by streams flowing into Hudson's Bay, whether upon its eastern, western or southern coast; and the westernmost includes the Rocky Mountain region, and the country west of it. These faunæ are very closely related to one another, being connected most intimately by true representative species; they are connected together more intimately than any of them are to the faunæ lying immediately south, — in the north temperate region the relationship between these two sets of faunæ being shown rather by what may be termed *equivalent* species, as, for instance, *C. Philodice*, in comparison with *C. labradorensis* or *C. interior;* for there may be said to be three sorts of species, which may be designated thus: —

1°. *Representative species*, or those forms occupying different geographical areas, which exhibit an intimate homology in their specific peculiarities, such as the three species of Colias here described in comparison with one another.

2°. *Equivalent species*, or those forms occupying different geographical areas, which do not exhibit such an intimate homology in their specific peculiarities, but simply represent the genus in the faunæ

in which they are located, without any such peculiar reference to the species of the same genus in other faunæ, and so may also be well termed *species of replacement.* It will thus be seen that any given species may be a representative species when compared with one, and an equivalent species when compared with another specific form.

3°. *Complemental species*, or those generically allied forms which occupy the same geographical area, where, if I may so express it, the *specific material* belonging to any one zoölogical fauna has been given expression through more than one specific form. Examples have been given sufficient to illustrate my meaning in regard to the first two classes; of the third, good examples will be found in *Pieris Rapæ* and *Napæ* of Europe, which, in reference to one another, are complemental species, while both together are representatives of our *Pieris oleracea.*

I place here three cuts exhibiting the marginal bands of the three boreal American species of Colias, after the example of Ménétriés in his catalogue, with descriptions appended.

C. occidentalis.

C. interior.

C. labradorensis.

COLIAS LABRADORENSIS (nov. sp.)

♂. Above, *primaries* lemon-yellow with a slight greenish tinge, brighter than in *C. Hyale*, much as in *C. Palæno;* marginal band broad, black, dusted with yellowish scales; the inner border irregularly crenulated, parallel with the outer border, except near the costal border, where with a full curve it is turned inward a little; there is also a slight turning in of the border just below the sub-median nervure; the fringe is of moderate width; there are crowded black scales occupying a small space at the lower portion of the base of the wing; — *secondaries* much the same color as the primaries, but having a very slightly more greenish tinge; the outer black band extends from midway between the termination of the costal and upper branch of the subcostal nervures to midway between the termination of the sub-median and lower branch of the median nervures, sometimes reaching the former; the band is of moderate breadth, with the inner border quite regularly curved, sometimes slightly scalloped; the base has many black scales, giving a grimy appearance, not extending over a wide space, but chiefly attaching to the median nervure.

Below, *primaries* of the same yellow as the superior surface, but somewhat griseous, through the presence of scattered black scales over the apical half, abundant along the costal edge; the inner border is free of them, and of a paler yellow; the costa is of the same pink as the fringe, and the spot at the extremity of the cell is transverse, black, with a pink or yellow conspicuous centre; — *secondaries*, greenish-yellow, griseous, with black scales, which are less numerous, in a faint, broad band along the outer margin, which is thus of a slightly lighter tint; the fringe of pink extends around the costal border as a narrow edging; there is generally a slight cluster of reddish-brown scales just beneath the extremity of the costal nervure; the spot at the tip of the cell is small, circular, of pink scales, deepening in tint from the centre, — where there are mixed a few white scales, — so that the edge is sometimes brownish; it is almost invariably single, but occasionally with a secondary one towards the outer angle of the wing; there is a small spot of pink scales at the base of the wings.

♀. Above, *primaries* very pale dirty white, with a slight greenish-yellow tinge; costal border somewhat griseous, with dark scales; the apex is occupied by a dark brownish spot, having the inner border ill-defined, sometimes so large as to extend half way to the termination of the cell, and reaching the internal angle as a narrow band; when it is large there are several streaks of the color of the disc towards its inner border, placed between the nervures, generally broadest toward the base, and acuminate toward the inner border; the spot at the extremity of the cell is faint or absent, a little transverse, brownish, with a pale centre; the costal edge is pink, as is also the rather narrow fringe; — *secondaries*, of the color of the disc of primaries, but with more of a greenish tinge, with a very faint broad border wanting it; a few blackish scales cluster around the tips of the nervures at the outer angle, where the pink fringe is interrupted paler by bands.

Below, *primaries* as in the male, except in having the yellow replaced by a very pale greenish-white, save at the tip, where there is a spot of yellow; — *secondaries* as in the male; head, antennæ, and palpi above, pink; palpi below, yellow; lower side of club of antennæ, yellowish; legs pink; expanse of wings, two inches. 8 ♂, 5 ♀. Caribou Island, Straits of Belle Isle, Labrador. (A. S. Packard, Jr.)

COLIAS INTERIOR (nov. sp.)

♂. Above, *primaries* lemon-yellow, as in *C. labradorensis*, but lacking the greenish tinge, and so of a brighter tint, much as in the male of *C. philodice;* costal edge dark pink; marginal band black, narrow, except at tip; the inner border of band with a deep curve, extending along costal border to the tip of the costal nervure, not extending far inward along the inner border, the deepest portion

of the curve and the narrowest of the band being where the third branch of the median nervure strikes it, and so placed much farther down than in *C. labradorensis* or *C. Philodice* or *C. occidentalis;* the spot at the extremity of the cell is generally wanting, but when present is an indistinct transverse spot of grayish scales, with a yellowish centre; there are a very few grayish scales clustered at the base of the wings; the fringe is pink; — *secondaries* of the color of the primaries, with the marginal band narrow, not crenulated interiorly, extending from the second (or between the first and second) branch of the median to just beyond the first branch of the subcostal nervure; discal spot small, circular, pale orange, with a faint dusky border; fringe pink, pale towards the outer angle.

Beneath, of a more sulphur-yellow, with scattered grayish scales; the costal border of both wings narrowly edged with pink; the discal spot of primaries as above, but distinct; discal spot of secondaries not small, circular, the centre composed of silvery and pale pink scales mingled, with the border composed of reddish-brown scales; fringe pink.

♀. Above, white, with a very pale yellowish tinge; costal border with a few griseous scales joining a dusky spot at tip, which has the inner border illy defined, but extends with a curve around the outer border rather more than half way down to the inner angle, as in some specimens of *C. labradorensis;* the discal spot is as in the male, and indistinct; the secondaries are immaculate, save the faint discal spot as in the male.

Beneath. The only specimen I have is somewhat rubbed, but appears not to differ from the male, except in being pale instead of yellow.

Head, etc., as in *C. labradorensis*, except the under surface of the club of the antennæ, which is yellowish-brown.

Expanse of wings, ♂ 2.1 in.; ♀ 2 in. 5 ♂, 1 ♀. Northern shore of Lake Superior (Prof. Agassiz); mouth of the Saskatchewan River, British America. (S. H. Scudder.)

COLIAS OCCIDENTALIS (nov. sp.)

♂. Above, *primaries* color of *C. philodice;* the marginal band quite broad; the inner border curved much as in *C. labradorensis*, commencing at a point a little inside the termination of the costal nervure, and extending inwards along the internal border rather more than in *C. labradorensis*, parallel to the border from the upper median nervule to the sub-median nervure; a few distant grayish scales are scattered along the costal border, scarcely affecting the general tint; they are clustered profusely at the base, but extend over only a narrow space; the discal spot is small, oval,

transverse, sometimes quite faint; fringe pink;—*secondaries* same color as primaries, with grayish scales scattered over nearly the whole wing, more profuse at the base; the marginal border is very nearly as broad as that of the primaries; the inner border only slightly curved, extending from the tip of the costal nervure to the second median nervule, with a spot between the first and second median nervules; discal spot as in the males of *C. interior;* fringe pink, paler toward outer angle.

Beneath, *primaries* same color as above, with the costal border somewhat griseous with grayish scales, and the apex of a slightly deeper sulphur-yellow;—*secondaries* sulphur-yellow, with black or grayish scales scattered rather profusely over the whole wing, least abundant toward the outer border; there is a small spot of pink scales at the base, and a small, faint spot of ferruginous scales just below the tip of the costal nervure; there are three faint dots of brownish scales, scarcely perceptible, on each, near the middle of the space between the sub-median and the first branch of the median, the first and second and second and third branches of the median nervures; the discal spot is much as in *C. interior.*

♀. Above, *primaries* white, with a very pale greenish tinge; costal border broadly margined with closely-clustered grayish scales; a very broad, dusky margin to the external border, which has along its middle line a series of large, ill-defined, whitish spots, as in the females of *C. Eurytheme* Boisd.; the base has a broad spot of much scattered grayish scales, more closely associated toward the internal border; the discal spot is large, rounded, of grayish scales, with a small whitish centre;—*secondaries* like the primaries, with a slightly deeper greenish tint; the outer marginal band broad, extending with equal breadth nearly to the internal border, but nearly obliterated by the row of large white spots occupying so much of its space; grayish scales scattered over the whole disc, closely clustered between the median and sub-median nervures, especially toward the base; the discal spot is large, circular, pale orange; the fringe of both wings is pale pink.

Beneath, *primaries* of the same general tint as the upper surface, with scattered gray scales along the costal border, and across the wing along a line corresponding with the inner border of the band on the upper surface, clustered between the nervures into more or less distinct and larger or smaller spots; the apical portion is pale yellowish;—*secondaries* very pale sulphur-yellow, with indistinct grayish scales, rather distant, but more abundant toward the basal half of the disc; discal spot as in the female of *C. interior;* there is a faint spot by the tip of the costal nervure, as in the male, and a row of indistinct brownish dots parallel to, and distant from, the hind

border, between the nervules, as in the males, but rather larger, more distinct, and numerous.

The primaries of the females are noticeably more pointed, and their outer border straighter than those of the males.

Antennæ dark brown above, reddish brown below; legs and collar pale pink; expanse of wings, ♂ 2.1 in.; ♀ 2.4 in. 2 ♂, 3 ♀. Gulf of Georgia (A. Agassiz); Fort Simpson, British America. (W. H. Edwards.)

The President announced the completion of the subscription, in aid of the Society, to the required amount of $20,000, and stated that the $20,000 promised on this condition, by a gentleman in this vicinity, had been placed in the hands of the Treasurer.

Prof. Wm. B. Rogers congratulated the Society upon this large accession to its means of usefulness, and offered the following resolutions: —

Resolved, That the donation of $20,000, this day presented to the Society, through the President, by Dr. Wm. J. Walker, be hereby accepted, to be appropriated in such manner as may conform to the wishes and suggestions of the donor.

Resolved, That the Society hereby tender to Dr. Walker their most grateful acknowledgments for this renewed and munificent proof of his interest in their prosperity, and for the occasion and the incentive which it has afforded to other friends of the Society to contribute an equal aggregate amount.

Resolved, That, in view of this and the previous benefactions by which Dr. Walker has marked his appreciation of our scientific labors and aspirations, we feel that to his liberality, chiefly, we are indebted for the enlarged opportunities of usefulness now so brightly opening before us, and that, in offering him the homage of our grateful hearts, we have no need to assure him of the enduring honor which will associate his name with the future successes and the whole history of the Society.

The resolutions were seconded by Rev. Mr. Waterston, and adopted unanimously.

Prof. Rogers proposed in addition the following resolutions, which were passed: —

Resolved, That the Society is deeply grateful to the kind patrons who, amid the urgent public claims on their liberality, have contributed towards the erection of our new building an aggregate sum

of $20,000, and have thereby enabled the Society to secure the further munificent donation of equal amount, which was promised on condition of our obtaining this subscription.

Resolved, further, That, as a permanent memorial of this generous and timely liberality, the names of the donors be placed on the records of the Society, in connection with the proceedings of the present meeting.

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SAMUEL L. ABBOT, M.D.

J. P. Gardner and Dr. E. T. Wilson, of this city, and Geo. G. Kennedy, of Roxbury, were elected Resident Members.

June 18, 1862.

The President in the chair.

Mr. B. G. Wilder stated that he had recently examined a live Chimpanzee (Troglodytes niger) just imported from the west coast of Senegambia.

It is a female, and quite young, as shown by her possessing a complete set of milk teeth, and by her height, which is just two feet. She was brought in by the Fullah negroes to a small town named Buffa, near the mouth of the Rio Pongo, a short distance south of the Rio Nunez; this is in ten degrees north latitude; and the animal is found in greater or less abundance as many degrees south, while the Gorilla, and the two other species of Chimpanzee (T. calvus and the Kooloo-Kamba of Du Chaillu) appear to be much more limited in their geographical range. This individual is very gentle and affectionate, but a snappish impatience on being denied any gratification already indicates a disposition which, as age advances, is likely to become decidedly ill-tempered. She is now on exhibition in this city, by Captain John Sears, for whom she was purchased in Africa, by

Captain Skinner. The latter says that at the same town a pair of nearly full-grown ones were domesticated, one of whom, on his approach, gravely advanced and offered his hand. He also brought two large constrictor snakes, which are either Boas or Pythons; the latter, if they have teeth in the intermaxillary bone, a question which I could not safely decide.

I have nothing new to offer upon the general habits and manners of the Chimpanzee, concerning which, and those of the Gorilla, see Martin's Man and Monkeys; Dr. Savage and Prof. Wyman on the Natural History and Anatomy of Gorilla, Boston Journal of Natural History, Vol. v. No. 4, 1847; Prof. Owen on the Gorilla, in the Classification and Geographical Distribution of Mammalia, and Du Chaillu's Equatorial Africa. But I will say a few words on some points in its anatomy connected with its habits.

First, as to the power of straightening the limbs, which differs in the arms and legs; the former may be made nearly or quite as straight as the human, as is natural, since, in their natural mode of progression, the body is supported by the arms; but the flexors predominate over the extensors. The legs cannot be straightened to the same extent, for the animal seldom hangs by them, and in progression upon the earth the legs are always semi-flexed; the weakness of the extensor muscles of the trunk and legs is another evidence of the ape's inability to assume and maintain the erect position. The knee joint admits of considerable rotation, in adaptation to the prehensile function of the foot, the hand-like appearance of which is due not only to the separation of the great toe from the others as an opposable thumb, but also to the elongation of the third or middle digit as in the human hand. But I wish, in particular, to correct an erroneous inference given in my paper on the muscles of the Chimpanzee (Contributions to the Comparative Myology of the Chimpanzee; Boston Journal of Natural History, Vol. VII., April 17, 1861). The specimen which I dissected was of the same size as this, but had been preserved in alcohol for several years. I observed that the hand and fingers could not be straightened together; but if the hand was extended in the same line with the fore-arm, the fingers curled up tightly about mine; so that, in addition to the great strength of the flexor muscles of the fingers, here was also a *mechanical* assistance in climbing, resulting from the shortness of the tendons; this seemed a very nice thing, and was borne out by the fact that the digits of the anthropoids are usually flexed, and that the *knuckles* of the anterior limb are applied to the earth, instead of the palmar surface. But a moment's examination of this live individual showed that the inference had not the slightest foundation in nature; for her hands and fingers may be bent back together quite as far as those of man. The error in the case of

the dead specimen undoubtedly arose from the unnatural contraction of the flexor muscles, which, as we have seen, are very thick and fleshy, by the spirit in which it had been preserved. My inference was *natural*, but the facts were *unnatural*.

And it will be seen that while this structure, as it existed unnaturally in the dead specimen, would be highly useful in climbing, it would almost entirely prevent the use of the hand for any other purpose.

This correction will be added to my paper before it is bound up.

YOUNG CHIMPANZEE — TROGLODYTES NIGER.

MEASUREMENTS (WITH TAPE).

	Feet.	Inches.	Tenths.
Level of top of head to nape of neck		4	
" " ischiatic tuberosity to nape of neck		11	
" " " " " bottom of heel		9	
Height of whole body (standing erect as possible)	2		
Greatest spread of upper extremities	2	10	5
Length of arm (from elbow to distal end of clavicle)		5	
" " forearm " " wrist		5	
" " hand to tip of middle finger		4	5
" " each upper extremity	1	2	5
Breadth of shoulders between tips of clavicles		5	5
Circumference of head (base of superciliary ridges and occiput)		13	
From nape of neck to the crest of " "		7	5
" tip of chin " " " " "		4	
Width of face across orbits		3	5
" " inter-orbital space			6
" " mouth		3	
" " ear		1	7
Length of ear		2	5
Circumference of trunk at arm-pits	1	5	
Lateral diameter " " " "		6	5
Antero-posterior " " " "		5	2
" " " " " fullest part		6	
Lateral diameter " " " " "		7	
Circumference " " " " "	1	6	
" " " " hips	1	1	
Lateral diameter " " " "		5	
Length of first metacarpal (of thumb)		1	2
" " " digit (thumb)		1	3
" " third " (middle finger)		2	5
Width " "		1	7
Sole of foot from heel to tip of third digit		5	
" " width, including first digit standing at right angle with it		3	7
Length of first metatarsal (of great toe)		1	
" " " digit		1	5
" " leg, from trochanter to tip of middle toe	1	2	
" " thigh		5	5
" " leg (tibia)		5	

Mr. S. H. Scudder presented a paper entitled "Materials for a Monograph of the Orthoptera of North America, with a list of the known New England Species."

The following papers were presented:—

CATALOGUE OF AMERICAN SPECIES OF TENTHREDO, AS ARRANGED BY HARTIG. BY EDWARD NORTON.

In a paper on the "Genus Allantus," in the Journal of the Boston Society of Natural History, December, 1860, I adopted the divisions indicated by Leach and followed by Stevens in his British Entomology, viz.:

Allantus, third joint of antennæ longer than fourth; clypeus generally notched, &c.

Tenthredo, third joint of antennæ scarcely longer than fourth; clypeus generally rounded, &c.

This division is not so satisfactory as that advocated more or less by Klug, St. Fargeau, Curtis, Dahlbom, and more fully presented by Dr. Hartig, which is here briefly sketched, and all the described species known to me assigned to their respective places, together with several species, supposed to be new, in the three last-named sub-genera. I have given the references in full to the species not noticed in the above-mentioned article.

Genus TENTHREDO, Klug.

Antennæ nine or ten jointed; wings with two radial and four cubital cells, the two recurrent nervures entering the second and third cubital cells.

Body short, oval, small.	Antennæ nine jointed,	1. Selandria.
	" ten or eleven jointed,	2. Athalia.
Body lengthened, large, antennæ nine jointed.	Coxæ lengthened,	4. Macrophya.
	Antennæ short, toward the end thickened,	3. Allantus.
	Antennæ lengthened, bristle-shaped,	5. Tenthredo.

SELANDRIA, Leach. See Proceedings of the Boston Society of Natural History, Vol. VIII., 219.

ATHALIA, Leach. Antennæ ten or eleven jointed, somewhat thickened toward end, third joint long; lanceolate cell with oblique cross line.

ALLANTUS, Jurine. Antennæ hardly longer than thorax, mostly thickened toward the end; body cylindrical; coxæ reaching as far as the edge of the third * abdominal segment; lanceolate cell, without exception, with straight cross line.

MACROPHYA, Dahlbom. Coxæ large, reaching the edge of the fourth * segment.

Section 1. *Macrophya.* Antennæ hardly longer than base of thorax, somewhat thickened in the middle.

Tribe 1. Lanceolate cell with oblique cross line; under-wings two middle cells.

Tribe 2. Lanceolate cell with straight cross line; under-wings two middle cells.

Tribe 3. Lanceolate cell closed in middle; under-wings two middle cells.

Section 2. *Pachyprotasis.* Antennæ longer than base of thorax, bristle-shaped.

Tribe 1. Lanceolate cell with straight cross line; under-wings two middle cells.

Tribe 2. Lanceolate cell closed in middle; under-wings two middle cells.

TENTHREDO, Klug. Coxæ as usual; antennæ bristle-shaped, longer than basal segments of abdomen; body generally flattened, sometimes lengthened, rounded; tibiæ, especially the hinder pair, with obtuse skin-covered spurs.

Section 1. *Taxonus*, Mühl.

Tribe 1. Lanceolate cell with oblique cross line; under-wings no middle cells.

Tribe 2. Lanceolate cell with oblique cross line; under-wings two middle cells.

Section 2. *Strongylogaster*, Dahlb.

Tribe 1. Lanceolate cell with oblique cross line; under-wings two middle cells.

Tribe 2. Lanceolate cell without cross line; under-wings two middle cells.

Section 3. *Pœcilostoma*, Dahlb. Lanceolate cell with oblique cross line; under-wings one middle cell.

Section 4. *Perineura*, Hartig. Lanceolate cell closed in middle; under-wings no middle cells.

Section 5. *Tenthredo.* Lanceolate cell with straight cross line; under-wings two middle cells.

Section 6. *Synairema*, Hartig. Lanceolate cell closed in middle; under-wings two middle cells.

ATHALIA, Leach.

Synonymy, Tenthredo (Allantus). Family I. Klug.

Proxima, Klug, Berlin Mag. VII. 1813, p. 130.

* Many writers call these the second and third segments, because the first is often concealed by the basal plates of metathorax. See Westwood's Mod. Classifi. Vol. II. 92.

ALLANTUS, Jurine.

Synonymy, Tenthredo.

Basilaris, Say. Coronatus, H. Cat.
Dubius, Harris's Cat.
Excavatus, Norton. Proc. Ent. Soc. Phil. I. 143.

MACROPHYA, Dahlbom.

Synonymy, Tenth. (Allantus). Family III.–IV. Klug.

Section 1. *Macrophya.*

Tribe 2.

Epinotus, Say. Sambuci. H. Cat.
Intermedius, Norton.
Cestus, Say.
Bifasciatus, Say.
Medius, Harris's Cat.
Formosa, Klug. Berlin Mag. VIII. 1814, p. 115. Geo. Bicinctus, Norton.
Pulchella, Klug. Berlin Mag. VIII. 1814, p. 121. Geo. Flavolineatus, Norton.
Trossulus, Say.
Dejectus, Norton.
[2] Pluricinctus (n. sp.)

Section 1. Tribe 3.

Goniphorus, Say.
Varius, Norton.
Trisyllabus, Say.
Niger, Norton.
Albomaculatus, Norton.
Incertus, Norton.
Flavicoxæ, Norton.
[1] Pannosus, Say.

[1] Not seen, but supposed to belong in this section.

[2] *Macrophya pluricinctus* (n. sp.) ♀ ♂. (Length 0.28, Ex. 0.60 in.)

♀. Black, with white bands; antennæ stout as in Allantus, third joint long; face black; clypeus hardly emarginate; palpi partly white; wing scale, edge of collar, spot on the front of scutellun, edge of basal membrane, and a band at tip of each segment of abdomen, white; tips of all the femora, the four anterior tibiæ and tarsi beneath, tips of coxæ and the upper side of posterior legs, white; tarsi partly black; the middle of four posterior tibiæ encircled with white, extreme tips black; wings hyaline, stigma white at base.

♂. The male differs only in having the bands interrupted on the middle of tergum, and the posterior femora with a white line above and beneath.

Two specimens. San Mat. California. Cambridge Museum.

The bodies are short and stout as in Selandria.

TENTHREDO.

Synonymy, Tenth. (Allant.) Family VI. Klug.

Section 1. *Taxonus.*

Tribe 1.

[3] Nigrisoma (n. sp.)
[4] Unicinctus (n. sp.)

[5] Tribe 2.

[6] Dubitatus (n. sp.)

[3] *Taxonus nigrisoma* (n. sp.) ♀. (Length 0.30, Ex. 0.60 in.)

♀. Color, blue-black, legs yellow-red; antennæ slender, basal joint enlarged, third longer than fourth, apical joint as long as preceding; clypeus emarginate angulate; labrum and middle of mandibles pale-reddish; legs red or honey-yellow; base of coxæ and tarsi black; wings hyaline; stigma and costa black, costal space hardly visible.

Two specimens. Massachusetts. Harris's Coll. and F. G. Sanborn.

[4] *Taxonus unicinctus* (n. sp.) · ♀ ♂. (Length 0.30, Ex. 0.60 in.)

♀. Black, a rufous band on fourth and fifth segments of abdomen; third joint of antennæ longer than fourth, flagellum rufous beneath; a blunt spine between antennæ; labrum, mandibles, and palpi pale luteous; tegulæ, coxæ, and base of femora white; a spot at the tip of second and third segment of abdomen above, the fourth and fifth, and also all of the third beneath, and the legs, honey-yellow; base of coxæ, the anterior coxæ above, and the posterior tarsi, black; wings hyaline; marginal cross nervure straight, and received near third sub-marginal nervure; stigma and costa black.

♂. Flagellum beneath rufous toward tip; spine between antennæ not prominent; clypeus deeply emarginate, enclosing labrum, both white; the four basal segments of abdomen honey-yellow; the four anterior tarsi paler than those of female; tips of posterior tarsi black; dividing marginal nervure curved; stigma at base and costa pale.

Hab. Farmington, Conn.

Four specimens. One of the males has red shoulders. I cannot be positive that this is the male of *T. unicinctus.*

[5] This tribe has been added to that proposed by Hartig, because the species described below seemed to render it necessary.

[6] *Taxonus dubitatus* (n. sp.) ♀ ♂. (Length 0.24–26 in., Ex. 0.48–52 in.)

♀. Honey-yellow, head and metathorax black; antennæ slender, black, third and fourth joints of equal length; a basin beneath base of each of antennæ, and above these, side by side, three others, springing from each of ocelli; clypeus slightly emarginate, labrum retracted, both white; mandibles and palpi yellowish; scutel, metathorax, and basal plates blackish; posterior tibiæ, except at base and tips of all the tarsi above, blackish; wings hyaline, edges of stigma and the costa black.

♂. The male has the apex of flagellum pale beneath; upper half of pleura, apical half of abdomen, and the sides of the basal half above, black; coxæ and trochanters almost white; posterior tibiæ like the others, with only the apical joints of tarsi and the nails black.

Eleven specimens. Conn., Mass., F. G. Sanborn. Hoboken, N. J., C. F. Jung.

The thorax is narrow and body long and slender like *Taxonus rufipes* of Europe.

STRONGYLOGASTER, Dahlb.

Section 1. Tribe 1.

Terminalis, Say. All. melisoma, H. Cat.
Mellosus, Norton.
[1] Apicalis, Say.
[7] Abdominalis, Norton.
[7] Epicera, Say.
[8] Rufocinctus, Norton.
[7] Pinguis, Norton.
Pallipes, Say.
[9] Multicolor (n. sp.)

Tribe 2.

Tacitus, Say.
[12] Rufescens, Norton.
[10] Unicus (n. sp.)
Multicinctus, Norton, Proc. Ent. Soc. Phil. I. 143.

Section 5. *Tenthredo.*

[11] Tardus, Say.
Atroviolaceus, Harris.
Piceocinctus, Norton.

[7] The males seldom have any middle under-wing cells.

[8] Some of the males have one cell, and some no under-wing cells. A female has two cells in one under-wing, and one in the other. Some females have no middle under-wing cells.

[9] *Strongylogaster multicolor* (n. sp.) ♂. (Length 0.24, Ex. 0.48 in.)

♂. Piceous, rufous, yellow and black; antennæ flattened, especially the third and fourth joints, third hardly longer than fourth, color piceous, two basal joints black; head yellow, with a large black vertical spot; clypeus angulate emarginate; thorax black; tegulæ, collar, a stripe on pleura, coxæ and base of femora yellow; abdomen and legs rufous or honey-yellow, a few black spots on basal segments of tergum; tarsi above blackish; wings hyaline, basal half of stigma bright yellow.

One specimen from Maryland; taken May 28. Mr. Uhler.

This resembles *Tenthredo semiluteus*, but can readily be distinguished by its short antennæ. It has no middle under-wing cells.

[10] *Strongylogaster unicus* (n. sp.) ♀. (Length, 0.28, Ex. 0.56 in.)

♀. Color luteous, head and legs black; antennæ black, shorter than those of *tacitus*, third and fourth joints equal; clypeus rough with deep pits, not emarginate; mandibles rufous; tegulæ, edge of collar, basal plates, ovipositor sheath and legs black; anterior femora and tibiæ rufous before; wings blue-black, semi-transparent.

One specimen. New York. J. Akhurst.

In this and in *tacitus* the third submarginal wing cell is longer than in Tribe 1. The color of the body is paler than that of *tacitus*.

[11] I see no difference in *T. tardus* and *T. atroviolaceus*, except in the color of the abdomen; the first being red, and the second black. I have a specimen with the basal segments only rufous, and have examined another with a rufous band on the third and fourth segments of abdomen, and the remainder black. Both sexes in both species have very long hinder tibiæ.

[12] Not seen since first described; supposed to belong in this tribe.

Grandis, Norton.
[13] Ventralis, Say.
Flavomarginis, Norton.
[1] Externus, Say.
Lobatus, Norton.
Dissimilis, Norton.
Angulifer, Norton.
Signatus, Norton.
Verticalis, Say.
Mellinus, Harris.
Tricolor, Harris.
[1] Leucostoma, Kirby.
Rufipes, Say.
Rufopectus, Norton.
Californicus, Norton. Proc. Ent. Soc. Phil., 2, May and June.
[14] Punctatus, Norton. Proc. Ent. Soc. Phil. 1, 143.
[14] Semiluteus (n. sp.)
[15] Subcerulea, Eschscholtz Entomog. 1842. Unalaschka (Russ. Am.)
[15] Nigrofasciata, Eschscholtz Entomog. 1842. Unalaschka (Russ. Am.)

LIST OF SEVERAL SPECIES MISNAMED TENTHREDO.

Hylotoma clavicornis - - - -	Tenthredo clavicornis, Fab.
" cordigera - - - -	Tenthredo cordigera, Beauv.
" rubiginosa - - - -	Tenthredo rubiginosa, Beauv.
" thoracina - - - -	Tenthredo thoracina, Beauv.
Dineura obesus - - - - - -	Allantus obesus, Say.
" litura - - - - - -	Tenthredo (All.) litura, Klug.

[13] I have received a specimen of *ventralis* from Illinois, a male, which corresponds with Say's description.

[14] *Tenthredo semiluteus* (n. sp.). ♀♂. (Length 0.24–30 in., Ex. 0.50–65 in.)

♀. Black, yellowish-white and rufous; antennæ two-thirds the length of body, slender, luteous, the two basal joints, and a narrow line above, black; head greenish white; a large black spot on vertex, extending down between antennæ; clypeus not emarginate, its color, with labrum and mandibles, white; apical joints of palpi black; tegulæ, edges of collar, scutellum, pleura, and pectus pale-yellow or whitish; a large irregular black spot on pleura; abdomen and legs honey-yellow; a black spot in disc of basal membrane; coxæ and base of femora white; posterior femora nearly black above; wings hyaline, apical half of stigma and the costa luteous; marginal dividing nervure curved and received in middle of third submarginal cell.

♂. The male has its antennæ reddish-yellow; a black spot on upper side of two basal joints; apical segments of abdomen darkest; legs without spots.

Three specimens. Conn. and Pa. Dr. Clemens.

The antennæ and wings are very long, the body cylindrical, but shorter than usual. One specimen has but one middle under-wing cell, and the others none. Were the coxæ longer I should place it in *Pachyprotasis*.

[15] I have not seen the description of these species.

Dosytheus bicolor - - - - - -	Tenthredo bicolor, Beauv.
Dolerus unicolor - - - - - -	Tenthredo unicolor, Beauv.
Emphytus articulata - - - -	Tenth. (Emph.) articulata, Klug.
Selandria bardus - - - - - -	Allantus bardus, Say.
" pygmæa - - - - -	Tenthredo pygmæa, Say.
" labiata - - - - -	Tenthredo (All.) labiata, Klug.
" obtusa - - - - -	Tenthredo (All.) obtusa, Klug.

Catalogue of the Birds found in the vicinity of Calais, Maine, and about the Islands at the mouth of the Bay of Fundy. By George A. Boardman.

The following list of birds was originally sent to me by Mr. Boardman, for my own use, and not intended for publication; but, finding that it was very complete and valuable for determining the geographical distribution of species, I requested him to publish it. This he could not attend to himself, and I have, with his consent, re-written it in a systematic form, adding, in some cases, observations made by myself at Grand Menan, in 1859, and now offer it for publication.

I have followed the classification adopted by Professor S. F. Baird, in the General Report on Birds (Vol. IX., P. R. R. Exp. and Surveys), except in a few instances where necessary changes have been made by others. In the *Tringeæ* I have adopted some judicious changes introduced by Mr. Elliott Coues, in his excellent monograph of that group (Proceedings of Phil. Academy, 1861, page 170), but have also given as synonyms the names used in the General Report.

A. E. Verrill.

Cathartes aura, Illig. Turkey Buzzard. Accidental. Only one instance.

Falco anatum, Bon. Duck Hawk. Resident. Breeds on cliffs at Grand Menan.

Falco columbarius, Linn. Pigeon Hawk. Resident. Not common. Breeds in hollow trees.

Falco candicans, Gm. ? Gyr Falcon. Only in winter. Very rare.

Falco sparverius, Linn. Sparrow Hawk. Summer visitant. Common. Breeds.

Astur atricapillus, Bon. Goshawk. Resident. Common. Breeds.

Accipiter Cooperii, Bon. Cooper's Hawk. Summer visitant. Rare.

Accipiter fuscus, Bon. Sharp-shinned Hawk. Summer visitant. Common. Breeds. Generally called "Pigeon Hawk."

Buteo borealis, Vieill. Red-tailed Hawk. Summer visitant. Common. Breeds.

Buteo pennsylvanicus, Bon. Broad-winged Hawk. Summer visitant. Common. Breeds.

Buteo lineatus, Jard. Red-shouldered Hawk. Probably resident. Common. Breeds.

Archibuteo sancti-johannis, Gray. Black Hawk. One last spring. Rare.

Archibuteo lagopus, Gray. Rough-legged Hawk. Not common.

Circus hudsonius, Vieill. Marsh Hawk. Summer visitant. Very common. Breeds.

Aquila canadensis, Cassin. Golden Eagle. Probably resident. Rare.

Haliætus leucocephalus, Savig. Bald Eagle. Resident. Abundant. Breeds.

Pandion carolinensis, Bon. Fish Hawk. Summer visitant. Common. Breeds. Arrives April 10th; leaves September 15th.

Bubo virginianus, Bon. Great-horned Owl. Resident. Common. Breeds.

Scops asio, Bon. Mottled Owl. Resident. Not very common. Breeds.

Otus wilsonianus, Lesson. Long-eared Owl. Not very common. Breeds.

Brachyotus Cassinii, Brewer. Short-eared Owl. Not very common. Breeds.*

Syrnium cinereum, Aud. Great Gray Owl. Winter. Very rare.

Syrnium nebulosum, Gray. Barred Owl. Resident. Common. Breeds.

Nyctale Richardsoni, Bon. Sparrow Owl. Probably resident. Not common. This is "Tengmalm's Owl" of Audubon.

Nyctale acadica, Bon. Saw-whet Owl. Resident. Common. Breeds.

Nyctea nivea, Gray. Snowy Owl. Winter. Not common. A pair seen this spring, the last of May, probably had a nest.

Surnia ulula, Bon. Hawk Owl. Resident. Not very plenty. Breeds.

Coccygus americanus, Bon. Yellow-billed Cuckoo. Summer visitant. Common. Breeds.

Coccygus erythrophthalmus, Bon. Black-billed Cuckoo. Summer visitant. Common. Breeds.

Picus villosus, Linn. Hairy Woodpecker. Resident. Very common. Breeds.

Picus pubescens, Linn. Downy Woodpecker. Resident. Very common. Breeds.

Picoides arcticus, Gray. Three-toed Woodpecker. Resident. Not very common. Probably breeds.

Sphyrapicus varius, Baird. Yellow-bellied Woodpecker. Summer visitant. Common. Breeds.

Hylatomus pileatus, Baird. Black Woodcock. Resident. Common. Breeds.

* A nest of this bird was found at Grand Menan by Mr .Cabot. (See Proc. Bos. Soc., Vol. VI., p. 115.)

Melanerpes erythrocephalus, Sw. Red-headed Woodpecker. Summer visitant. Rare.

Colaptes auratus, Sw. Golden-winged Woodpecker. Summer visitant. Common. Breeds. Leaves the last of October. Generally called "Yellow Hammer."

Trochilus colubris, Linn. Humming Bird. Summer visitant. Common. Breeds. Seen from the last of April to last of Sept.

Chætura pelasgia, Steph. Chimney Swallow. Summer visitant. Common. Breeds. Arrives the first of May.

Antrostomus vociferus, Bon. Whip-poor-will. Summer visitant. Not very common.

Chordeiles popetue, Baird. Night Hawk. Summer visitant. Common. Breeds. Arrives the last of May.

Ceryle alcyon, Boie. Belted Kingfisher. Summer visitant. Abundant. Breeds. Seen from first of May to the middle of Sept.

Tyrannus carolinensis, Baird. King-Bird. Summer visitant. Abundant. Breeds.

Myiarchus crinitus, Cab. Great-crested Flycatcher. Summer visitant. Breeds.

Sayornis fuscus, Baird. Pewee. Summer visitant. Rare.

Contopus virens, Cab. Wood Pewee. Summer visitant. Not common.

Turdus Pallasii. Hermit Thrush. Summer visitant. Common. Breeds. Arrives 15th of April. Nests on the ground; eggs blue.

Turdus Swainsonii, Cab. Olive-backed Thrush. Summer visitant. Common. Breeds. Nests on low trees; eggs with blue ground color, and spotted.

Turdus migratorius, Linn. Robin. Summer visitant. Very common. Breeds. Arrives the first of April; sometimes seen in winter.

Sialia sialis, Baird. Blue Bird. Summer visitant. Very rare. Breeds.

Regulus calendula, Licht. Ruby-crowned Wren. Summer visitant. Rare.

Regulus satrapa, Licht. Golden-crested Wren. Summer visitant. Common. Breeds.

Anthus ludovicianus, Licht. Tit-Lark. Flocks seen occasionally in September.

Mniotilta varia, Vieill. Black and White Creeper. Summer visitant. Common. Breeds. Arrives the first of May; abundant about the 10th of May.

Geothlypis trichas, Cab. Maryland Yellow Throat. Summer visitant. Abundant. Breeds.

Helminthophaga ruficapilla, Baird. Nashville Warbler. Very rare.

Seiurus aurocapillus, Sw. Golden-crowned Thrush. Summer visitant. Common. Breeds. Arrives the first of May.

Seiurus noveboracensis, Nutt. Water Thrush. Summer visitant. Not very common. Breeds.

Dendroica virens, Baird. Black-throated Green Warbler. Summer visitant. Not very common. Breeds.

Dendroica canadensis, Baird. Black-throated Blue Warbler. Middle of May. Rare.

Dendroica coronata, Gray. Yellow-rumped Warbler. First of May. Common. Breeds. Arrives 25th of April.

Dendroica blackburniæ, Baird. Blackburnian Warbler. Summer visitant. Not very common. Breeds. Arrives the middle of May.

Dendroica castanea, Baird. Bay-breasted Warbler. Summer visitant. Rather rare. Arrives the middle of May.

Dendroica pennsylvanica, Baird. Chestnut-sided Warbler. Summer visitant. Common. Breeds. Arrives the middle of May.

Dendroica striata, Baird. Black-poll Warbler. Summer visitant. Common. Breeds.

Dendroica æstiva, Baird. Yellow Warbler. Summer visitant. Very common. Breeds. Arrives the second week in May.

Dendroica tigrina, Baird. Cape May Warbler. Summer visitant. Common. Breeds. Arrives the second week in May.

Dendroica palmarum, Baird. Yellow Red-poll Warbler. Summer visitant. Common. Breeds. Arrives from 20th to 25th April.

Myiodioctes pusillus, Bon. Wilson's Black Cap. Summer visitant. Not common. Arrives about the 10th of May.

Myiodioctes canadensis, Aud. Canada Flycatcher. Summer visitant. Common. Breeds. Arrives the middle of May.

Setophaga ruticilla, Sw. Redstart. Summer visitant. Abundant. Breeds. Arrives the middle of May.

Pyranga rubra, Vieill. Scarlet Tanager. Uncertain. Common in the spring of 1861.

Hirundo horreorum, Barton. Barn Swallow. Summer visitant. Common. Breeds. Arrives the first of May.

Hirundo lunifrons, Say. Cliff Swallow. Summer visitant. Common. Breeds. Arrives the first of May.

Hirundo bicolor, Vieill. White-bellied Swallow. Summer visitant. Common. Breeds. Arrives the middle of April.

Cotyle riparia, Boie. Bank Swallow. Summer visitant. Common. Breeds. Arrives the first of May.

Progne purpurea, Boie. Purple Martin. Summer visitant. Common. Breeds. Arrives the first of May; leaves the last of August.

Ampelis garrulus, Linn. Wax Wing. Accidental in winter.

Ampelis cedrorum, Baird. Cedar Bird. Summer visitant. Abundant from the first of June to the first of September.

Collyrio borealis, Baird. Shrike, Butcher Bird. Common in winter.

Vireo olivaceus, Vieill. Red-eyed Flycatcher. Summer visitant. Abundant. Breeds. Arrives the middle of May.

Vireo solitarius, Vieill. Solitary Flycatcher. Summer visitant. Not common.

Mimus carolinensis, Gray. Cat Bird. Summer visitant. Not very common. Breeds.

Troglodytes hyemalis, Vieill. Winter Wren. Resident. Breeds.

Certhia americana, Bon. American Brown Creeper. Summer visitant. Breeds. Arrives the first of May.

Sitta carolinensis, Gm. White-bellied Nuthatch. Resident. Breeds.

Sitta canadensis, Linn. Red-bellied Nuthatch. Resident. Common. Breeds.

Parus atricapillus, Linn. Chickadee. Resident. Abundant. Breeds.

Parus hudsonicus, Fors. Hudson Bay Titmouse. Resident. Not common. Breeds.

Eremophila cornuta, Boie. Shore Lark. Winter. Rare.

Pinicola canadensis, Cab. Pine Grosbeak. Winter. Common.

Carpodacus purpureus, Gray. Purple Finch. Summer visitant. Common. Breeds. Arrives the first of April.

Chrysomitris tristis, Bon. Yellow-Bird. Summer visitant. Common. Breeds.

Chrysomitris pinus, Bon. Pine Pinch. Resident. Breeds. Not very common in summer.

Curvirostra americana, Wils. Red Crossbill. Resident. Said to breed in winter.

Curvirostra leucoptera, Wils. White-winged Crossbill. Resident. Breeds in the winter.

Aegiothus linaria, Cab. Red-poll Linnet. Common first of the winter.

Plectrophanes nivalis, Mey. Snow Bunting. Seen at times in September.

Plectrophanes lapponicus, Selby. Lapland Longspur. Winter. Not common.

Passerculus savanna, Bon. Savannah Sparrow. Summer visitant. Common. Breeds. Arrives the first of April.

Poœcetes gramineus, Baird. Grass Sparrow. Summer visitant. Common. Breeds.

Coturniculus passerinus, Bon. Yellow-winged Sparrow. Summer visitant. Rare. Arrives the first of April.

Zonotrichia leucophrys, Sw. White-crowned Sparrow. Not common.

Zonotrichia albicollis, Bon. White-throated Sparrow. Summer visitant. Common. Breeds.

Junco hyemalis, Sclat. Blue Snow-Bird. Summer visitant. Very common. Breeds. Generally called "Chip Bird."

Spizella monticola, Baird. Tree Sparrow. Summer visitant. Common. Arrives from middle to last of March. Breeds very early.

Spizella socialis, Bon. Chipping Sparrow. Summer visitant. Common. Breeds. Arrives from middle to last of March.

Melospiza melodia, Baird. Song Sparrow. Summer visitant. Common. Breeds. Arrives early in March.

Melospiza palustris, Baird. Swamp Sparrow. Summer visitant. Breeds. Arrives last of March. Common first of May.

Passerella iliaca, Sw. Fox-colored Sparrow. Spring and fall. Common. Have not found it breeding.

Guiraca ludoviciana, Sw. Rose-breasted Grosbeak. Summer visitant. Rare.

Guiraca cœrulea, Sw. Blue Grosbeak. Very uncertain, but common in the spring of 1861.

Cyanospiza cyanea, Baird. Indigo Bird. Summer visitant. Rare.

Dolichonyx oryzivorus, Sw. Bobolink. Summer visitant. Common. Breeds. Arrives first of June; leaves first of September.

Molothrus pecoris, Sw. Cow Blackbird. Summer visitant. Not common. Breeds.

Agelæus phœniceus, Vieill. Red-wing Blackbird. Summer visitant. Common. Breeds.

Sturnella magna, Sw. Meadow Lark. Summer visitant. Very rare. Only one specimen seen.

Icterus spurius, Bon. Orchard Oriole. Summer visitant. Rare.

Icterus baltimore, Daud. Baltimore Oriole. Summer visitant. Very rare.

Scolecophagus ferrugineus, Sw. Rusty Blackbird. Common. Arrives in March.

Quiscalus versicolor, Vieill. Crow Blackbird. Summer visitant. Common. Breeds. Arrives first of April.

Corvus carnivorus, Bart. Raven. Resident. Not uncommon. Breeds on cliffs at Grand Menan, etc.

Corvus americanus, Aud. Crow. Resident. Abundant. Breeds.

Cyanura cristata, Sw. Blue Jay. Resident. Common. Breeds.

Perisoreus canadensis, Bon. Canada Jay. Resident. Common. Said to breed in March.

Ectopistes migratoria, Sw. Wild Pigeon. Summer visitant. Very uncertain.

Zenœdura carolinensis, Bon. Carolina Dove. Summer visitant. Rare.

Tetrao canadensis, Linn. Spruce Partridge. Resident. Common. Breeds.

Bonasa umbellus, Steph. Partridge or Ruffed Grouse. Resident. Common. Breeds.

Ardea herodias, Linn. Great Blue Heron. Summer visitant. Common. Breeds.

Botaurus lentiginosus, Steph. Stake Driver or Bittern. Summer visitant. Common. Breeds.

Butorides virescens, Bon. Green Heron. Summer visitant. Common. Breeds.

Nyctiardea Gardeni, Baird. Night Heron. Summer visitant. Not common.

Charadrius virginicus, Borck. Golden Plover. Autumn.

Aegialitis vociferus, Cas. Killdeer. Autumn.

Aegialitis melodus, Cab. Piping Plover. Summer visitant. Abundant. Breeds on islands the middle of June.

Aegialitis semipalmalus, Cab. Ring Plover. August and September. Plenty.

Squatarola helvetica, Cuv. Black-bellied Plover. Autumn. Not common.

Strepsilas interpres, Illig. Turnstone. Autumn. Rare.

Recurvirostra americana, Gm. Avoset. Spring of 1862, one specimen.

Himantopus nigricollis, Vieill. Black-necked Stilt. Spring of 1862, one specimen.

Phalaropus. A Phalarope is abundant in the Bay of Fundy, but the species is not determined.

Philohela minor, Gray. American Woodcock. Summer visitant. Common. Breeds. Arrives first of April; lays first of May.

Gallinago Wilsonii, Bon. Wilson's Snipe. Summer visitant. Common. Breeds.

Macrorhamphus griseus, Leach. Red-breasted Snipe. Summer visitant. Arrives first of April.

Tringa canutus, Linn. Ash-colored Sandpiper. August and September. Common.

Arquatella maritima, Baird. Purple Sandpiper. Winter. Abundant.

Ancylocheilus subarquata, Kaup. (Tringa subarquata, Temm.) Curlew Sandpiper. Not very plenty.

Pelidna americana, Coues. (Tringa alpina, Cassin.) Red-backed Sandpiper. August and September. Plenty.

Actodromas maculata, Cass. Jack Snipe or Pectoral Sandpiper. Autumn. Not common.

Actodromas minutilla, Coues. (Tringa Wilsonii, Nutt.) Least Sandpiper. Plenty. August and September.

Actodromas Bonapartii, Cass. Bonaparte's Sandpiper. Not very common.

Calidris arenaria, Ill. Sanderling. Summer visitant. Common.

Ereunetes pusilla, Cass. (E. petrificatus, Illig.) Semi-palmated Sandpiper. August and September. Plenty.

Symphemia semipalmata, Hart. Willet. Summer visitant. Not very plenty. Breeds.

Gambetta melanoleuca, Bon. Tell-tale. Fall and spring. Common.

Gambetta flavipes, Bon. Yellow Legs. Fall and spring.

Rhyacophilus solitarius, Bon. Solitary Sandpiper. Summer visitant. Not very plenty. Breeds.

Tringoides macularius, Gray. Spotted Sandpiper. Summer visitant. Abundant. Breeds.

Philomachus pugnax, Gray. Ruff. Rare. One or two instances.

Actiturus bartramius, Bon. Bartram's Sandpiper. Field Plover. Summer visitant. Not common.

Limosa hudsonica, Sw. Hudsonian Godwit. Fall and spring.

Numenius longirostris, Wilson. Long-billed Curlew. Fall and spring.

Numenius hudsonicus, Lath. Hudsonian Curlew. Spring. Rare.

Numenius borealis, Lath. Esquimaux Curlew. Fall and spring. Rare.

Porzana carolina, Vieill. Carolina or Sora Rail. Summer visitant. Common. Breeds.

Anser hyperboreus, Pall. Snow Goose. Spring. Rare.

Bernicla canadensis, Boie. Wild Goose. Fall and spring. Common.

Bernicla brenta, Steph. Brant. Fall and spring.

Anas boschas, Linn. Mallard. Rare.

Anas obscura, Gm. Dusky Duck. Resident. Breeds.

Dafila acuta, Jenyns. Pin-tail. Winter. Rare.

Nettion carolinensis, Baird. Green-winged Teal. Fall and spring.

Querquedula discors, Steph. Blue-winged Teal. Fall and spring.

Spatula clypeata, Boie. Shoveller. Rare.

Chaulelasmus streperus, Gray. Gadwall or Gray Duck. Rare.

Mareca americana, Steph. Widgeon. Rare.

Aix sponsa, Boie. Wood Duck. Summer visitant. Common. Breeds.

Fulix americana, Gm. Coot. Autumn.

Fulix marila, Baird. Black-headed Duck. Rare.

Fulix affinis, Baird. Little Black-head. Not common. Does not breed.

Fulix collaris, Baird. Ring-necked Duck. Rare. Does not breed.

Bucephala americana, Baird. Whistler or Golden Eye. Resident. Common. Breeds usually in trees.

Bucephala islandica, Baird. Barrow's Golden Eye. Winter. Very rare.

Bucephala albeola, Baird. Butter Ball or Buffle-Head. Fall and winter. Common.

Histrionicus torquatus, Bon. Harlequin Duck. Winter. Common. A few apparently somewhat disabled individuals breed on the islands.

Harelda glacialis, Leach. Old Squaw. Fall and winter. Common.

Camptolæmus labradorius, Gray. Labrador Duck. Winter. Rare.

Melanetta velvetina, Baird. White-winged Coot. Fall and winter. Common.

Pelionetta perspicillata, Kaup. Surf Duck. Fall and winter. Common.

Oidemia americana, Swains. Scoter. Fall and winter. Not very common.

Somateria mollissima, Leach. Eider Duck. "Sea Duck." Resident. Common. Breeds.

Somateria spectabilis, Leach. King Eider. Winter. Found occasionally.

Erismatura rubida, Bon. Ruddy Duck. Winter. Rare.

Mergus americanus, Cass. Sheldrake. Resident. Common. Breeds in high trees.

Mergus serrator, Linn. Red-breasted Sheldrake. Fall and winter. Does not breed.

Lophodytes cucullatus, Reich. Hooded Merganser. Very rare. Said to breed in trees.

Pelecanus erythrorhynchus, Gm. Pelican. Accidental. One or two instances.

Sula bassana, Briss. Gannet. Resident. Common on fishing ground. A few breed at Gannet Rock (near Grand Menan).

Graculus carbo, Gray. Cormorant. "Shag." Winter. Common.

Graculus dilophus, Gray. Double-crested Cormorant or Shag. Winter.

Thalassidroma Leachii, Temm. Leach's Petrel. "Mother Cary's Chicken." Common on fishing grounds. Breeds on the islands in abundance.

Thalassidroma Wilsoni, Bon. Wilson's Petrel. Common on fishing grounds.

Puffinus major, Bon. Greater Shearwater. "Hagdon" or "Haglin." Common on mackerel grounds. Arrives early from the north.

Puffinus anglorum, Temm. Mank's Shearwater. "Black Hagdon." Summer. Common on mackerel grounds.

Puffinus fuliginosus, Strick. Sooty Shearwater. Last of summer and autumn on mackerel grounds. Common. Called, like the last, "Black Hagdon."

Stercorarius pomarinus, Temm. Pomarine Jager. Fall and winter Rather common.

Stercorarius parasiticus, Temm. Arctic Jager. Winter or late in fall. Rather common.

Stercorarius cepphus, Lawr. Buffon's Skua. "Marlingspike Bird." Fall and winter. Common in the Bay of Fundy in August.

Larus marinus, Linn. Black-backed Gull. Resident. Not plenty. A few breed about the islands.

Larus argentatus, Brunn. Herring Gull. Resident. Abundant. Breeds upon the islands in large numbers; occasionally in trees.

Larus Delawarensis, Ord. Ring-billed Gull. Summer and fall. Not very common.

Chræcocephalus atricilla, Lawr. Laughing Gull. Resident. Not plenty. A few breed about the islands.

Chræcocephalus Philadelphia, Lawr. Bonaparte's Gull. Fall and winter. Common.

Rissa tridactyla, Bon. Kittiwake Gull. Fall and winter. Abundant.

Sterna Wilsoni, Bon. Wilson's Tern. Summer visitant. Breeds on the islands; in some places abundantly.

Sterna macroura, Naum. Arctic Tern. Summer. Common. Breeds on the islands; in some places abundantly.

Colymbus torquatus, Brunn. Loon. Northern Diver. Abundant. Breeds about fresh water; does not lay until June.

Colymbus septentrionalis, Linn. Red-throated Loon. Winter. Seldom seen with red on the throat.

Podiceps griseigena, Gray. Red-necked Grebe. Winter. Not uncommon; immature, plenty.

Podiceps cristatus, Lath. Crested Grebe. Summer. Breeds about fresh water late in the season. Not common.

Podylimbus podiceps, Lawr. Pied-billed Grebe. Summer. Common. Breeds about most streams in August.

Utamania torda, Leach (Alca torda, Linn.) Razor-billed Auk. Resident. Common. Few breed.

Mormon arctica, Ill. Puffin. "Sea Parrot." Resident. Common. A few breed about the islands.

Uria grylle, Lath. Sea Pigeon. Resident. Very common. Breeds on nearly all the rocky islands abundantly.

Uria (Cataractes) troile, Linn. Murre. (Uria lomvia, Brunn.) Resident. Not plenty in summer. Breeds on the Murre Ledges but not very abundantly.

Uria (Cataractes) ringvia, Brunn. Murre. Fall and winter. N uncommon. Possibly breeds with the last.

Mergulus alle, Vieill. Little Auk. In winter only.

The following birds have been mentioned as occurring in the same region by other persons, but are not included in the preceding list.

V.

Empidonax flaviventris, Baird. Yellow-bellied Flycatcher. This species was found breeding at Grand Menan by Dr. Henry Bryant (Proc. Boston Soc. N. H., Vol. VI., p. 115), and also by Dr. T. M. Brewer and myself. It appeared to be rather common.

Larus leucopterus, Fabr. White-winged Gull. This species is said to breed occasionally on an island near Grand Menan, by Dr. Brewer (see Bost. Jour. Nat. Hist., Vol. VI., p. 304), but there has been some doubt expressed by others as to the identity of the species.

Mormon cirrhata, Pal. Tufted Puffin. According to Mr. Boardman, the fishermen state that a Tufted Puffin, or "Sea Parrot," is occasionally seen about the islands in winter. This species is also said by Audubon to be sometimes found on the coast of Maine. A specimen in the Museum of Comparative Zoölogy was probably obtained at Grand Menan.

Mormon glacialis, Leach. Large-billed Puffin. Specimens supposed to be of this species were seen near Grand Menan by Audubon.

Notes on the Natural History of Anticosti. By A. E. Verrill.

During the summer of 1861, a party, consisting of Messrs. A. Hyatt, N. S. Shaler and myself, went from the Museum of Comparative Zoölogy for the purpose of studying the geology of Anticosti and making collections of fossils and other objects of natural history.

At Eastport, Me., we chartered the schooner Inlet. We there obtained the valuable services of Captain Mariner Small, and were joined by Mr. U. S. Treat, Jr. To both of these gentlemen we were greatly indebted for assistance in collecting specimens and in the prosecution of all our labors.

It is with pleasure that we are able to state that at every place in Canada which we visited we were received hospitably, and were at all times aided in carrying out the purposes of our expedition by every one whom we met during our excursion.

We sailed from Eastport on the 14th of June, and reached the Magdalen Islands on the 22d. We remained there two days, studying the interesting geology of Entry Island, which presents some very remarkable cliffs.

We then visited the Bird Rocks, which are noted for the vast number and great variety of the sea birds breeding there. But Dr. Henry Bryant, who visited the place a year before, has given a

very full and accurate account of this locality (Proc. Bos. Soc. N. H., Vol. VIII., page 65).

We reached Heath Point Light, at the eastern end of Anticosti, on the 25th of June. Mr. Julyan, the keeper of the light at this place, gave us quite a number of birds' eggs and skins that he had collected, and directed us to various localities in the vicinity. We afterwards proceeded along the northern shore of the island, touching at all places of interest, and making large collections in all departments. On the 4th of July we visited the Mingan Islands, and spent about a week among them, collecting birds, plants and marine animals.

After our return to Anticosti, we spent most of July and August geologizing about the western end of the island and along the southern shore. We here received considerable aid from Mr. Pope, the keeper of the light at South-West Point.

During the summer we made two excursions to Gaspé, and while there received much assistance from Rev. Isaac Tallman in making collections of specimens.

The only account of Anticosti, of any importance, that I have seen, is that of Mr. J. Richardson, in the Canadian Geological Survey (Report for 1856). It may therefore be useful to give a short description of the general features of this island, which is at present so little known.

It is situated between 49° and 50° north latitude, and between 61° 40′ and 64° 40′ west longitude. Its length is about 120 nautical miles, and its average breadth about 25. Its trend is north-west and south-east, and its western end is but 18 miles south of the coast of Labrador, and still less from some of the Mingan Islands. From South-West Point across to Cape Gaspé, on the Canadian shore, it is about 40 miles. There are three lighthouses, — one at West Point, one at South-West Point, and another at Heath Point, near the eastern end. There are in all seven or eight families on the island.

Anticosti is composed almost entirely of limestone strata, usually inclining slightly to the south-west, but in many parts nearly horizontal. The length of the island is therefore in the direction of the strike of the strata. In consequence of this structure, the surface is but little diversified. Along the northern and eastern side, the elevation is in general from 200 to 300 feet, but in some places attains a height of 500 feet. On the southern side, the land is generally low and flat, particularly between South-West Point and the eastern end. There are several ranges of hills extending lengthwise of the island, apparently formed by denudation along the direction of the strata. These hills are generally not very elevated, and are densely covered by a growth of spruce and white birch, with other species occasionally intermingled. In the valleys between these hills

there are numerous lakes, usually of moderate size, and extensive peat bogs, covered with moss and low shrubs. On the south side, between South-West Point and Heath Point, these peat bogs border the shore of the island in most places, and are often several miles wide.

The streams and springs flowing from the interior are very numerous, and the water is generally good, although it contains considerable lime. Jupiter River is the largest stream on the island, but at the time of our visit it would not admit the Inlet, drawing only six feet of water.

The eastern and northern shore of the island, and a large part of the coast between West Point and South-West Point, is precipitous, and consists of a series of high limestone cliffs, generally from 60 to 200 feet in height, but in some places having an elevation of about 400 feet. Owing to the horizontal position of the beds, and the unequal hardness of the strata, these cliffs are worn away rapidly near the base by the action of the sea, while the upper part usually remains projecting far beyond the base, thus producing a very imposing effect where the cliffs are high. The streams flowing from the interior frequently fall over these cliffs into the sea at one leap, adding greatly to the interest and variety of the scenery. Cases of this kind are numerous between East Point and Salmon River. But the horizontality of the beds of limestone has another effect which is far less agreeable, for at the foot of the cliffs there is generally very little, if any, beach, and the strata extend in the form of flat reefs, often to a distance of from half a mile to a mile from the shore. These flats are mostly bare at low water, and covered by three or four feet at high water. The outer edge of the reef is usually abrupt, with deep water just beyond. It is therefore very difficult and dangerous to land on many parts of the shore, except when it is calm, and even then it is very inconvenient. There are but two harbors at the island which are safe in all winds. One of these, Ellis Bay, is on the south side of the island, near the western end. The other, Fox Bay, is on the north-eastern side of the island, near the eastern end.

There are several other places, however, where there is safe anchorage in many winds. On the western side of South-West Point there is shelter from all except north-west and west winds. On the eastern side, there is partial shelter from north-west winds, but it is exposed to the west and south-west. At Salt Lake, a few miles to the east, there is good anchorage and shelter from north-west winds.

The soil of Anticosti, where it does not contain peat, is excellent, and the plants adapted to that climate grow very luxuriantly. The herbaceous plants and wild flowers are exceedingly abundant and

varied for so northern a climate. The island is thickly wooded, except where there is water or peat bogs, but it is probable that nearly one-third of the island is covered by lakes and bogs or heaths. As a result of this, the black flies (*Simulium ornatum*) and mosquitoes were found in immense numbers, often rendering it impossible to remain on shore, or penetrate into the interior, without the loss of a great amount of blood and patience. The black flies are by far the worst of these two pests of the north.

The marine animals found on the shores are very few, and, owing to the smooth bottom of flat limestone strata, dredging was equally unprofitable. A collection of the marine invertebrates was made, however, but is necessarily very incomplete. Among the land mollusca we found *Vitrina pellucida*, *Pupa badia* and *Helix nemoralis* very abundant near the beach, together with several other species.

The land mammalia are of very few kinds. There are no hares or squirrels on the island, and we saw no mice or moles. No reptiles are found at Anticosti, but on several of the Mingan Islands we found a peculiar species of frog, still undetermined. Fish are abundant about Anticosti, of various species. Cod can be caught at almost any time in abundance. Halibut, herring, capelin and mackerel are usually abundant. In all the larger streams salmon are found, together with "sea-trout," but, since the streams are all quite small, the amount of fish cannot be large. There are fishing stations at the mouths of all the larger streams. Brook trout were also found. Two very beautiful specimens of *Psolis* were dredged at the eastern end of the island, in about 20 fathoms, on a rocky bottom. Many other less interesting fishes were collected.

Mammals observed at Anticosti during the Summer of 1861. By A. E. Verrill.

Vulpes fulvus, Rich. Common Red Fox. Said to be common on the island by the inhabitants, but skins only were seen by the party.

Vulpes fulvus var. *argentatus*, Rich. Silver Fox. We were shown some skins of young silver foxes at Ellis Bay, and were told that a few were taken nearly every year on the island. The young, when quite small, are entirely black.

Mustela americana, Turton. American Sable. We were shown a number of skins of this species, but saw none living. They are said to be quite common.

Lutra canadensis, Sab. American Otter. A few skins were seen in possession of a hunter. We were told that they are not uncommon.

Ursus americanus, Pallas. Black Bear. Five individuals were seen during the summer. They are very common, since fresh tracks were seen almost every day on the beach, but are very shy, and seldom come out of the woods except at night, when they feed upon the fish or seals that may be found thrown upon the shores.

Phoca grœnlandica, Mull. Very common about most parts of the island, but they were always very shy and difficult to approach. They are hunted constantly by the Indians from Mingan. All of the specimens that we obtained were young.

Lepus americanus, Erxl. Common Hare. This species is not found at Anticosti. A female with young was shot at Esquimaux Island.

Balœnoptera rostrata (?). "Fin-backed Whale." A fin-backed whale was quite common about the eastern and northern parts of the island, and also at Mingan. They appeared to be usually 25 or 30 feet in length.

Megaptera (?). "Sulphur Whale." A carcass of a whale was seen on the beach at Salt Lake, but it had decomposed to such an extent that it was impossible to ascertain its characters. It was 84 feet in length and 18 feet across the tail, according to the statement of Mr. Corbet, who had found it when first stranded. He obtained 40 barrels of oil from the blubber of one side. He stated that the under parts were yellow, and for that reason it is called the "sulphur whale." The baleen was about two feet in length. They are said to be quite common.

Megaptera sp. Hump-backed Whale. We were told that a species of hump-backed whale was common about the island, but saw none ourselves. The remains of one that had been stranded two years before was on the beach near Becscie River. All the inhabitants seemed to be aware of the distinction between this and the last.

Phocœna communis. Common Porpoise. Porpoise were common about the eastern parts of the island, but were not seen in great numbers. While off the southern coast of Nova Scotia, they were seen twice in countless numbers, forming "schools" several miles in extent. These specimens were unusually large. We saw no whales in the gulf which appeared to be the same as the fin-backed whale, so common about the Bay of Fundy, and which I suppose to be the *Physalus boops*. It is to be hoped that our knowledge of the Cetacea frequenting our coast may be increased before many years by some enterprising naturalist. At present, there is scarcely a species concerning the identity of which there is not some doubt.

Catalogue of the Birds observed at Anticosti and Vicinity. By A. E. Verrill.

Accipiter fuscus, Bon. Sharp-shinned Hawk. An individual of this species was seen near Salmon River, July 3. It flew about us, uttering its peculiar scolding cry, and evidently had a nest in the vicinity.

Pandion carolinensis, Bon. Fish Hawk. A few individuals were seen at various times during the summer, but no nests were observed.

Haliætus leucocephalus, Savig. White-headed Eagle. One or two individuals were seen at Ellis Bay, Anticosti, in July.

Picus pubescens, Linn. Downy Woodpecker. Common.

Ceryle alcyon, Boie. Kingfisher. Seen at various times during the summer, but not frequently.

Turdus Pallasii, Cab. Hermit Thrush. Common, but less abundant than the next.

Turdus Swainsonii, Cab. Swainson's Thrush. Very common.

Turdus migratorius, Linn. Robin. Not common. Nearly all those that were seen were at Ellis Bay.

Geothlypis trichas, Cab. Maryland Yellow-Throat. Common all summer.

Seiurus aurocapillus, Sw. Oven Bird. Specimens of this species were obtained at Ellis Bay, July 15.

Dendroica æstiva, Baird. Yellow Warbler. A few individuals were seen at various times. While about midway on our passage from Anticosti to Gaspé, July 25, one of these little birds came on board of the Inlet, and, after flitting about the deck for some time in a very familiar manner, for the purpose of catching insects, it flew off quite unconcernedly in the direction of the island, although there was no land nearer than twenty miles. A small sparrow flew about us the same day, and when about equally distant from the land, but as it alighted only once, and then but for a moment, I could not identify it with certainty, but it was most likely the chipping sparrow.

Dendroica maculosa, Baird. Magnolia Warbler. A specimen of this species was shot at Ellis Bay, July 15. It was not met with at any other time, but is probably not uncommon.

Setophaga ruticilla, Sw. Redstart. Very common. Young ones just able to fly were seen July 18.

Hirundo lunifrons, Say. Cliff Swallow. These birds were found breeding in large numbers at Cape Eagle, at the entrance of Ellis Bay, July 15. The nests, of which there were several hundreds, were built under the high, overhanging limestone cliffs which form the outer side of the cape.

Hirundo bicolor, Vieill. White-bellied Swallow. Common. Probably breeds in hollow trees, as at Grand Menan.

Cotyle riparia, Boie. Bank Swallow. Common.

Vireo olivaceus, Vieill. Red-eyed Vireo. Common.

Troglodytes hyemalis, Vieill. Winter Wren. A small wren, apparently of this species, was seen at South-West Point, Anticosti, in July.

Sitta canadensis, Linn. Red-bellied Nuthatch. Common.

Parus atricapillus, Linn. Chickadee. Very common.

Passerculus savanna, Bon. Savannah Sparrow. Common. Breeds in almost every place where there is grass.

Zonotrichia albicollis, Bon. White-throated Sparrow. Very common. This is by far the most common singing bird, and its clear, musical notes were heard at all parts of the island and during the whole summer.

Junco hyemalis, Sclat. Blue Snow Bird. Common all summer.

Spizella monticola, Baird. Tree Sparrow. Common. Breeds.

Passerella iliaca, Sw. Fox-colored Sparrow. Common. Breeds.

Passerella obscura, V. nov. sp. Dusky Sparrow. Probably frequent. Two specimens were obtained.

Corvus americanus, Aud. Crow. Very abundant and quite unsuspicious.

Corvus carnivorus, Bart. Raven. Not very common. Only a few individuals were seen.

Perisoreus canadensis, Bon. Canada Jay. Common and very familiar and unsuspicious. Young ones that were fully grown were shot July 15.

Ectopistes migratoria, Sw. Wild Pigeon. A single individual was seen at Heath Point. We were told that they are very rare on the island.

Lagopus albus, Aud. White Ptarmigan. We were told that this species is to be found in the interior, but none were seen by our party.

Ardea herodias, Linn. Blue Heron. A large heron, which appeared to be of this species, was seen at Ellis Bay.

Botaurus lentiginosus, Steph. Bittern. Common. Several were seen at various times. A young one, just beginning to fly, was caught August 4.

Actodromas minutilla, Coues. Little Sandpiper. (*Tringa Wilsoni*, Nutt.) A large number of these birds were seen while crossing a marshy plain or heath near Ellis Bay. They flew around our heads, uttering a peculiar scolding note, and evidently had nests in the vicinity, but we did not succeed in finding them. They began to appear on the beach in small flocks about the 8th of August.

Actodromas Bonapartii, Coues. Bonaparte's Sandpiper. These birds were very abundant on the beach, in large flocks, August 14. They were then very fat and all fully grown. They probably breed in the interior of the island.

Gambetta melanoleuca, Bon. "Yellow Legs." Very common about the shores all summer, but generally singly until August 12, when they were seen in a large flock at the mouth of Becscie River.

Tringoides macularius, Gray. Spotted Sandpiper. Common. Breeds in grassy places near the beach. A nest of this species was found, June 21, at Breton Island, N. S., by our captain, Mariner Small, Esq., which contained four young, not able to fly, and also four eggs, containing small embryos. The old one was sitting on the nest when found, and when disturbed flew away, while the young hid themselves among the grass, but on going to the nest again, the young were found in the nest with the eggs, and were secured with the old one.

Bernicla canadensis, Boie. Wild Goose. This species breeds in large numbers in the interior of the island, about the shores of the lakes. They are seldom seen about the beach until the first of August, when they appear in flocks of about ten or twelve. The young are then fully grown and in good order for the table, and are excellent food.

Anas obscura, Gm. Dusky Duck. Black Duck. Very abundant. Young were seen about the shores as early as July 3d. They are excellent runners from the time they are hatched, and when pursued take to the water only when they cannot hide.

Chaulelasmus streperus, Gray. Gray Duck. A few specimens were seen. A young one, about half grown, was caught near the middle of July.

Bucephala americana, Baird. Whistler. Common. Young ones, about one-third grown, were caught July 19, at Ellis Bay. They swim and dive readily when very small.

Harelda glacialis, Leach. Old Squaw. Very common. Breeds abundantly. The males were seen in small flocks by themselves during the whole time that we were at the island.

Somateria mollissima, Leach. Eider Duck. Very abundant. This species was common about Anticosti, but was far more abundant on some of the Mingan Islands. On the 4th of July we visited an island off Esquimaux Point where they were breeding in immense numbers. The nests were mostly placed under the dense, low spruces near the shore, but many were found among the grass and rocks upon the open beach. At that time, many of the young were hatched, and could run,

swim, and dive with celerity, although very small; but on the same occasion many eggs were found that were nearly fresh. The males were often seen about the shores in small flocks by themselves. By the middle of August, the eider ducks, wild geese and several other species were seen in immense flocks on and about the reefs at low water, but could then be approached only with extreme care, on account of their watchfulness.

Somateria spectabilis, Leach. King Eider. A skin of this species was seen in possession of Mr. Pope, at South-West Point lighthouse, and he informed us that they were not uncommon. It is uncertain whether they breed on the island.

Mergus serrator, Linn. Red-breasted Sheldrake. Very common. Called "Becscie" by the French Canadians. A nest was found July 17, containing six eggs with embryos about half developed. It was placed under a low larch by the edge of a small pond about half a mile from the shore of the island. The nest consisted merely of a shallow excavation lined with small sticks, leaves, and a few feathers. Young were seen, however, as early as July 3. They are, from the first, very expert in diving and swimming, and are caught with difficulty. Some that were captured August 12, at Becscie River, were about one-third grown, and the wings were very small. These we endeavored to keep alive, but they continued exceedingly wild and shy, refused all kinds of food, and died in a few days.

Sula bassana, Briss. Gannet. These were quite common about the island, but none were found breeding there. They were found breeding in immense numbers at Bird Rocks, but we can add nothing to the excellent description of that locality by Dr. Henry Bryant (Proc. B. S. N. H., Vol. VIII., p. 68). They also breed in large numbers at Percé Rock, situated a few miles south of Cape Gaspé, near Percé Village and Bonaventure Island. The locality is, however, quite inaccessible. This remarkable rock is about 300 feet high, with perpendicular walls on all sides. There is a large arch through it, near the middle, through which the tide flows. Aside from its ornithological attractions, it is well worth a visit on account of its geological structure. It consists of stratified limestones, considerably altered, and containing a few fossils, apparently of Upper Silurian age, but the strata stand in a nearly perpendicular position, so that the sides of the island are formed by the surfaces of the strata, and its summit by their edges. Large numbers of cormorants also breed on this rock, together with some herring gulls and murres.

Phalacrocorax carbo, Bon. Cormorant. This species was found breeding in large numbers on the cliffs at East Point, Anticosti. Their habits have, however, been very fully described, in the paper referred to above, by Dr. Bryant. They also breed at Percé Rock. The double-crested cormorant *(P. dilophus)* may possibly breed with the former at Anticosti, but none were seen that could be identified.

Thalassidroma Leachii, Bon. Fork-tailed Petrel. Often seen about the island, but none were found breeding.

Stercorarius parasiticus, Temm. Arctic Jager. Not seen immediately about the island, though frequent in the gulf.

Larus marinus, Linn. Black-backed Gull. Common. Found breeding at the Mingan Islands, but not at Anticosti, although it appeared to have nests about the island.

Larus argentatus, Brunn. Herring Gull. Very abundant. Numerous nests were found on the debris fallen from the high cliffs at the eastern end of the island, particularly at Gull Cove and vicinity, where, also, the kittiwake gulls were breeding on the cliffs above them. At the Mingan Islands, they were found breeding in great numbers on several islands. On Fright Island, July 4, I found several nests, containing eggs and young, built on the tops of the low, dense spruces, as at Grand Menan, but the majority were on the ground, and some on the bare rocks close by the beach.

Chrœcocephalus Philadelphia, Lawr. Bonaparte's Gull. This species was very abundant at the Gut of Canso, August 21, but was not seen at any other time.

Rissa tridactyla, Bon. Kittiwake Gull. This species was found breeding in immense numbers along the eastern and northern shores of the island, particularly along the line of cliffs extending from East Point to Gull Cove.

The nests were always placed on the edges of projecting strata, towards the upper part of the cliffs, but below the overhanging portion. They were therefore entirely inaccessible from above, and, owing to the loose and yielding nature of the rocks, equally so from below, unless long ladders could be used in some places. We did not succeed in obtaining any eggs, and but few young. They also breed in great numbers at the Bird Rocks, and build their nests in similar situations. Quite a number were met with about Entry Island, one of the Magdalen group, the last of June. It is not improbable that they may breed in small numbers about the high cliffs which surround that island.

Sterna macroura, Naum. Arctic Tern. Often seen in the gulf, but not about Anticosti.

Colymbus torquatus, Brunn. Loon. Very common. Breeds about the lakes in the interior. The nests are usually placed on small grassy islands in the ponds or lakes.

Colymbus septentrionalis, Linn. Red-throated Loon. Very common. This species is still more abundant than the last, and may be shot much more readily. It breeds, like the last, on the little islands in the interior lakes. The eggs are very similar in color to those of *C. torquatus*, but are much smaller. The color is dark olive-brown, irregularly spotted with brownish black, but varying both in the shade of the ground color and in the size and number of the spots. Two specimens in the collection measure as follows: 2.90 inches in length, 1.70 in breadth; 2.98 in length, 1.68 in breadth. An egg of *C. torquatus*, from the same place, measures 3.65 inches in length, 2.22 in breadth.

Utamania torda, Leach. Razor-billed Auk. Common. Breeds at numerous localities along the eastern and northern shores of the island.

Mormon arctica, Ill. Puffin. Sea Parrot. Breeds in considerable numbers along the eastern and northern shores. The nests are found here both among the fallen debris at the foot of the cliffs and in the crevices near the top. At Gull Island, off Esquimaux Point, we found them breeding in immense numbers. The nests there were usually in holes under the flat stones that cover the island. In the excellent account given by Mr. Elliott Coues (Proc. Phil. Acad. for 1861, page 251) of the habits of this bird, it is stated that "the flesh of the puffin, though not ill-flavored, is so exceedingly tough as to be eatable only in cases of necessity." This was not found to be the case by our party, for we shot them constantly for the table whenever they were to be had, and found them, like the different species of murres, excellent food, and not at all tough if properly cooked. We always preferred them to most of the species of ducks that were to be obtained. It is possible, however, that Mr. Coues does not speak from his own observations in this case.

Uria grylle, Lath. Sea Pigeon. Very common, and found breeding in the crevices of almost every cliff, and often among the debris at their bases. This species was found breeding also at Entry Island. I have found it breeding at Mount Desert, on the coast of Maine, and abundantly at Grand Menan and the adjacent islands. I have never found more than two eggs in one nest. This species appears to be more variable in its habits and mode of nesting than most of the family. Its most

usual breeding places are in deep holes and crevices among large blocks of fallen and shattered rocks, but it will also breed in crevices high up in the faces of the cliffs. On an island near Grand Menan, I once found large numbers breeding in a mass of drift wood and small stones thrown up by the waves. This species, like the puffin, was relished by all of our party.

Cataractes troile, Mœh. Murre. Breeds in large numbers along the eastern and northern shores of Anticosti, but not so abundantly as at the Bird Rocks. The eggs were placed near the top of the high, overhanging cliffs, either on the shelves produced by projecting strata, or in crevices. Of the murres that we shot, about one-half belonged to this species, and one-half to the following.

Cataractes ringvia, Mœh. Murre. Very abundant. Breeding with the last, and in about equal numbers. We also found this species breeding at Entry Island in small numbers. We did not observe *C. lomvia* (*Uria arra*, Cas.), which was found breeding at Bird Rock by Dr. Bryant (Proc. Bos. Soc. N. H., Vol. VIII., page 75), but it is quite probable that it breeds at Anticosti with the two last, as at Bird Rocks, but in less numbers.

Description of a Species of Passerella, supposed to be new, from Anticosti. By A. E. Verrill.

In the collection, there are two specimens of *Passerella* which I have not been able to refer to any known species, yet it is with great reluctance that I have finally been led to the belief that they belong to a species hitherto undescribed, and it is with still greater hesitation that I have attempted to describe it as such. I have been induced to do this chiefly from a desire to call the attention of others to this bird, and to avoid confounding a doubtful form with any well-known species, which would surely lead to error in determining the geographical distribution of our birds.

Passerella obscura (n. sp.) Size somewhat smaller than that of *P. iliaca*. Legs and wings a little shorter in proportion. Claws less elongated. Bill somewhat shorter, thicker and less acute. Color above rufous brown, becoming bright rufous on the rump and exposed portion of the tail, but a shade darker than in *P. iliaca;* head uniform brown, with a slight tinge of ash; feathers of the back centred with a streak of darker brown. Wings nearly the same color as the back, with no white bands; outer webs of the quills rufous, inner webs dark brown; secondary coverts rufous, with dark brown centres; primary coverts uniform brown. Beneath, dull white, with the throat

and breast thickly covered with elongated triangular spots and streaks of dark reddish-brown; sides streaked with rufous brown; middle of abdomen with a few small triangular spots of dark brown; under tail coverts brownish white, with a few small spots of bright rufous; tibiæ dark brown. The auriculars are tinged with reddish-brown. Bristles at the base of the bill numerous, extending over the nostrils. Tail rather long, broad and nearly even. Third quill longest; second and fourth equal, and but slightly shorter; first intermediate between the fifth and sixth, and one-fourth of an inch shorter than the third.

COMPARATIVE MEASUREMENTS.

	P. OBSCURA.		P. ILIACA.
	No. 620.	No. 775.	No. 810.
Length	6.75	6.60	7.15
Extent of wings	10.75	10.50	11.00
Wing	3.35	3.38	3.45
Tail	3.12	3.20	3.20
Bill to end of toe	6.75	6.55	7.25
Bill to end of wing	7.50	7.20	7.65
Leg from knee	3.08	3.10	3.20
Tarsus	1.00	.97	.95
Middle toe	.90	.95	.95
Its nail alone	.21	.28	.32
Hind toe	.68	.68	.70
Its nail alone	.33	.32	.40
Outer toe	.73	.75	.75
Its nail	.23	.24	.30
Bill above	.40	.48	.53
Along gape	.51	.57	.60
Depth	.31	.32	.38
Lower jaw	.95	.95	.98

The three specimens measured are in alcohol, and were collected about the same time, and preserved together.

No. 620 was collected the first of July, near the eastern end of Anticosti; No. 775 the 8th of August, at Salt Lake.

There is but little difference in color between the two specimens of *P. obscura*, but the brown of the back, and the spots on the breast, are a shade darker in No. 620 than in the other.

This species differs greatly in color from *P. iliaca*. It is darker in all parts; the feathers of the back are rufous brown, centred with darker, instead of ash centred with brownish red; the two white bands on the wing are wanting; the breast and throat is thickly streaked with elongated spots of dark reddish-brown, while in *P. iliaca* the spots are less numerous, shorter and broader, and bright rufous, and the central part of the throat is nearly free from spots; the under tail coverts are brownish white, with rufous spots, instead

of nearly pure white. Though resembling *P. Townsendii* somewhat in its dark colors and thickly spotted breast, it differs greatly in many respects. The bill is much shorter and thicker, the wings longer and the claws shorter. It is also considerably smaller than any specimen of *P. Townsendii* that I have seen. The colors above are rufous brown, with darker spots, instead of uniform dark, olive brown. The spots on the breast are also very different, these being very broad, triangular and very dark brown, without any shade of red in *T. Townsendii*. The under tail coverts are white, with only a tinge of brown, instead of dark brown, edged with yellowish.

P. schistacea, Baird, differs from it in having the upper parts and spots on the breast uniform slate, without any streaks on the back; in having longer claws and tail, and shorter wings. The spots on the breast are also broad, triangular and well defined, instead of being elongated and more or less linear, as in *P. obscura*. It resembles the latter, however, in having a stout, thick bill.

I at first supposed that the specimens described might be the young of *P. iliaca*, or some other species, but this is hardly probable, since one of the specimens was shot the first of July, when the young of none of the small birds had been seen large enough to leave the nest. But these specimens have every appearance of being fully adult, and Audubon expressly states that the young attain the adult plumage before leaving Labrador, the 1st of September, and he does not mention any change in their colors previously. But there are other differences that could not well be accounted for by age, such as the stoutness of the bill and claws, and differences in the proportions.

I am therefore led to believe that there are two species of *Passerella* in the eastern part of North America, corresponding to the two in the west. Then *P. iliaca* would be the eastern representative of *P. Townsendii*, and *P. obscura* of *P. schistacea*. But there is yet much to learn concerning the geographical range of all these species.

Of the other species referred to this genus by Bonaparte, *P. cinerea* (*Fringilla cinerea*, Aud.), *P. rufina* and *P. unalaschensis* appear to belong to the genus *Melospiza* of Baird. The two first are considered synonymous by him. They all agree in having elongated and acute bills, and the two first, at least, have the short, rounded wings of *Melospiza*, differing much, in this respect, from the species of *Passerella*. In color, however, *P. obscura* agrees nearer with *Melospiza rufina* of Baird than with any other bird with which I am acquainted, but the upper parts, and especially the rump and tail, are much more rufous. The bill, feet and wings are entirely different.

The remaining species, *P. hyperborea*, I have never seen, but the description given by Bonaparte does not apply to *P. obscura*. All of these doubtful species are from the north-west coast.

List of the Plants collected at Anticosti and the Mingan Islands during the Summer of 1861. By A. E. Verrill.

Owing to the numerous demands upon our time during the whole summer, the collection of plants did not receive so much attention as it deserved. Indeed, it often happened that collections that had been made were left in the botanical boxes until spoiled, for want of time to press them. The grasses, sedges, mosses and ferns were almost entirely neglected. But since there are some very interesting plants in the collection, and others which have not been previously obtained in that region, I have been induced to prepare the following list, incomplete as it is.

In the identification of many of the most difficult species, I have received much assistance from Mr. J. T. Rothrock, a student with Prof. Gray, while some of the most doubtful forms have been examined by Prof. Gray himself.

The collection, like those in other departments, was made jointly by all the members of the party.

The only list of plants from Anticosti that has been published before, of which I am aware, is that of the plants collected by J. Richardson in 1860; published by B. Billings, Jr., in the Annals of the Botanical Society of Canada, Vol. I., Part I., page 58. In that list there are 37 species enumerated, nearly all of which are in our collection. *Kalmia latifolia* is given, probably by some error, instead of *K. angustifolia*, which is common there.

All of the species in the following list are common at Anticosti, unless otherwise stated. The dates refer to the time when they were first found by us in flower.

Anemone parviflora, Michx. July 23. S. W. Point.
A. pennsylvanica, L. July 18.
Thalictrum Cornuti, L. July 18.
T. dioicum, L. June 26.
T. alpinum, L. Not in flower. Rare.
Ranunculus cymbalaria, Pursh. July 5.
R. abortivus, L. June 25.
R. acris, L. July 15. Ellis Bay.
Caltha palustris, L. July 5. Mingan and Anticosti.
Coptis trifolia, Sal. July.
Actæa spicata, var. *rubra*, Mich. June 25.

A. spicata, var. *alba*, Mich. June 25.
Nupha advena, Ait. July 17. Near Ellis Bay.
Sarracenia purpurea, L.
Turritis stricta, Gra. July 9. Anticosti.
Cochlearia tridactylites, DC. July 6. Niapisca Island, Mingan. This very rare and interesting plant was only found in one locality. It was there quite abundant.
Erysimum lanceolatum, R. B. July 4. Mingan, also at Anticosti.
Draba arabisans, Mich. June 26. Abundant.
D. incana, L. June 26. Abundant at Anticosti and Entry Island.
Sysymbrium sp. Specimens too imperfect for identification from cliffs near Jupiter River.
Cakile americana, Nutt. July 23.
Viola blanda, Willd. June 25. Heath Point.
V. cucullata, Ait. July 18. Nearly past flower. Not common.
V. palustris, L. July 23. S. W. Point.
Drosera rotundifolia, L.
Parnassia parviflora, DC. July 23. Abundant at Anticosti on damp banks.
P. caroliniana, Mich. Aug. 6. Common at Anticosti.
Silene inflata, Smith. Aug. 1. In woods at Anticosti, some distance from the shore.
Honkenya peploides, Ehr. July 11.
Alsine grœnlandica, Fen. July 25.
Mœhringia lateriflora, L. June 26.
Stellaria longifolia, Muhl.
S. longipes, Gold. June 26. Abundant.
S. borealis, Big. July 18.
Cerastium vulgatum, L. Entry Island.
C. arvense, L. July 5. Mingan and Anticosti. Abundant.
Sagina nodosa, Henz. July 6. Mingan Islands.
Claytonia caroliniana, Mich. June 23. Entry Island.
Oxalis Acetosella, L.
Geranium Robertianum. July 9.
Impatiens fulva, Nutt. Aug. 1. Salt Lake.
Acer pennsylvanicum, L.
A. spicatum, Lam.
Trifolium pratense, S. July 17. Ellis Bay.
T. repens, L. Ellis Bay.
Vicia cracca, L.
Lathyrus maritimus, Big. June 26.
L. palustris, L. July 11.
Sanguisorba canadensis, L. July 18. Anticosti. Abundant.

Dryas integrifolia, Vahl. July 4. Mingan and Anticosti. Abundant. We did not meet with *D. Drummondii*, attributed to Anticosti by Pursh.

Geum strictum, Ait.

G. rivale, L. July 8.

Potentilla norvegica, L. Aug. 1.

P. anserina, L. June 25.

P. fruticosa, L. July 23.

P. tridentata, Ait. July 25. S. W. Pt., Ant.

Comarum palustris, Scop. Aug. 2. Near Salt Lake, Anticosti. Abundant.

Fragaria virginiana, Ehr. June 25; fruit Aug. 1.

F. vesca, L. June 25.

Rubus Chamæmorus, L. June 25, nearly past; fruit Aug. 2. Abundant.

R. arcticus, L. June 25; fruit Aug. 6. Common.

R. triflorus, Rich. June 25.

R. strigosus, Michx. June 25; fruit Aug. 14.

Rosa blanda, Ait. July 11. Junction Cliff, etc.

R. carolina, L. Aug. 6. Salt Lake, Ant.

Pyrus americana, DC.

Amelanchier canadensis, T. and G.

Epilobium angustifolium, L. July 10.

E. palustre, L. July 18.

E. alpinum, L. (var. *majus*, Wahl.)

Œnothera biennis, L. July 18.

Ribes hirtellum, Mich. June 25.

R. lacustre, Poir. June 25.

R. prostratum, L. Her. June 25.

R. floridum, L. June 29.

R. rubrum, L. June 25; fruit ripe Aug. 5.

Sedum Rhodiola. July 4.

Saxifraga grœnlandica, L. Very abundant at Mingan Islands. A very large number of specimens of this species, collected at Mingan, proves, according to Prof. Gray, who has examined them, that *S. grœnlandica*, *S. cæspitosa*, L., and *S. exarata*, Vill., are only forms of one species.

S. aizoides, L. (Large variety.) Aug. 5. Very abundant at Anticosti about limestone cliffs.

S. Aizoon, Jacq. July 5. Niapisca Island, Mingan.

Mitella nuda, L. June 29.

Sanicula marilandica, L. July 18.

Archangelica peregrina, Nutt. July 18.

Heracleum lanatum, Mich. July 15.
Conioselinum canadense, T. and G.
Ligusticum scoticum, L. Aug. 1.
Cicuta maculata, L.
Osmorrhiza brevistylis, DC. Aug. 1 in fruit. Anticosti. Not common.
Cornus canadensis, L. June 25.
C. stolonifera, Mich. June 26.
Linnæa borealis, Gron. July 9.
Lonicera cærulea, L. June 25.
Viburnum pauciflorum. July 4. Mingan Islands.
Galium triflorum, L.
Eupatorium purpurem, L.
Aster radula, Ait. Aug. 5.
A. carneus, Nees. Aug. 5.
A. Novi-Belgii, L. Aug. 6.
A. graminifolius, Pursh. July 23.
A. acuminatus, Mich. (Narrow-leaved variety.) Aug. 6.
A. nemoralis, Ait. Aug. 6.
Erigeron acre (*E. alpinum*, Hooker.) Narrow-leaved form. Aug. 10. Abundant on grassy banks near the mouth of Jupiter River.
Solidago Virga-aurea, L. July 23.
S. thyrsoidea, E. Mey. Aug. 1.
S. bicolor, L. (var. *concolor*.) Aug. 5.
S. arguta, Ait. (var. *juncea*.) Aug. 6.
S. altissima, L.
Achillea millefolium, L. (Purple var.) July 23.
Artemesia borealis, Pal. Aug.
Senecio aureus, L. Aug. 6.
S. pseudo-arnica. Aug. 1.
S. vulgaris, L.
Cirsium muticum, Mich. Aug. 1.
Leontodon autumnale, L.
Nabalus altissimus, Hook. July 18.
N. nanus, DC. July 25. S. W. Point.
N. racemosus, Hook. Aug. 5. S. W. Point.
Taraxacum Dens-leonis, Desf.
Lobelia Kalmii, L. Aug. 5. On limestone cliffs, Anticosti.
Campanula rotundifolia, L. July 9. Very abundant, with unusually large flowers.
Vaccinum Oxycoccus, L.
V. macrocarpon, Ait.
V. Vitis-Idea, L.

V. uliginosum, L. Anticosti and Mingan. Fruit ripe Aug. 6.
V. pennsylvanicum, Lam. July 5.
V. pennsylvanicum (var. *angustifolium.*) July 4. Mingan Islands.
V. corymbosum, L. July 6.
Chiogenes hispidula, T. and G. In fruit Aug. 15.
Arctostaphylos Uva-ursi, Spreng. July 5.
Cassandra calyculata, Don.
Andromeda polifolia, L. June 25.
Kalmia angustifolia, L. July 17.
K. glauca, Ait. June 25.
Rhodora canadensis, L. July 4.
Ledum latifolium, Ait.
Loiseleuria procumbens, Desv. Not in flower.
Pyrola rotundifolia, L. (var. *incarnata.*) July 9.
Moneses uniflora, Gray. July 11.
Monotropa uniflora, L. Aug. 1.
M. Hypopitys, L. Aug. 6.
Nemopanthes canadensis, DC.
Plantago major, S. July 10.
Primula farinosa, L. June 25. Abundant at Anticosti and Entry Island.
P. Mistassinica, Mich. June 25. Anticosti. Not abundant.
Trientalis americana, Pursh.
Glaux maritima, L. July 11.
Utricularia cornuta. Aug. 5. Anticosti.
Pinguicula vulgaris. July 5. Anticosti and Mingan Is. Abundant.
Euphrasia officinalis, L. July 9.
Rhinanthus crista-galli, L. July 23.
Mentha canadensis, L.
Mertensia maritima, Don. July 4. A form with glabrous leaves was occasionally met with.
Calystegia sepium, R. B. (var. *repens.*) Aug. 9. Salt Lake, Anticosti.
Halenia deflexa, Gris. Aug. 1. Abundant.
Gentiana detonsa, Fries. Aug. 10. Abundant on grassy banks near the mouth of Jupiter River.
G. acuta, Mich. Aug. 10. With the last, and also at S. W. Point. Abundant.
Pleurogyra rotata. Aug. 5. With the two preceding. Common.
Menyanthes trifoliata, L. Abundant.
Atriplex hastata, L. Aug. 1.
Polygonum viviparum, L. July 4. Abundant at Anticosti and Mingan.
P. amphibium. Aug. 6. Salt Lake.
Rumex domesticus (*R. longifolius*, DC.) July 8. Mingan Islands.

Shepherdia canadensis, Nutt. Common.
Comandra umbellata, Nutt. July 5.
C. livida, Rich. July 5. Mingan Islands.
Empetrum nigrum, L. Very abundant.
Urtica gracilis, Ait.
Betula papyracea, Ait. Abundant.
B. excelsa, Ait.
B. nana, L. July 6. Abundant.
Alnus viridis, DC.
Salix repens, L. (*S. arbuscula*, And.) July 4. Mingan and Anticosti.
S. reticulata, L. (var. *vestita*, And.)
S. (species undetermined.) Mingan Islands.
Populus balsamifera, L. Anticosti. Common.
Abies balsamea, Mar.
A. nigra, Poir. Abundant.
A. alba, Mich. Abundant.
Larix americana, Mich.
Juniperus communis, L.
Taxus canadensis, Willd.
A species of pine is mentioned by Richardson, but we did not meet with it.
Triglochin maritimum, L. July 9.
Gymnadenia tridentata, Lind. Aug. 6. Very abundant.
Platanthera rotundifolia, Lind. July 5. Common at the Mingan Islands.
P. bracteata, Torr.
P. dilatata, Lind. July 17.
P. hyperborea, Lind. July 19.
P. psycodes, Gray. Aug. 2. Salt Lake.
Goodyera repens, R. B.
Spiranthes cernua, Rich. Aug. 1.
Listera cordata, R. B. Aug. 6. Abundant.
Calypso borealis, Sal. July 5. Mingan Islands. Common.
Microstylis monophyllos, Lind. Aug. 5. S. W. Point.
Liparis Læselii, Rich.
Cypripedium parviflorum, Sal. July 4. Anticosti and Mingan Islands. Very common.
Iris versicolor, L. July 4. Mingan Islands and Ellis Bay.
Smilacina racemosa, Desf. July 16.
S. stellata, Desf. June 25.
S. trifolia, Desf.
S. bifolia, Ker.
Clintonia borealis, Raf. June 25.

Allium. A species with tall scape and rose-colored flowers. Specimens too imperfect for identification.
Streptopus amplexifolius, DC. July 9. Common.
S. roseus, Mich. June 25. Common.
Zygadenus glaucus, Nutt. July 23. Very common.
Tofieldia palustris, Hudson. July 17. Marsh near Ellis Bay.
T. glutinosa. Aug. 5. Grassy banks. Very common.
Carex limosa, L.
C. aurea, Nutt.
Eriophorum russeolum. July 17. Ellis Bay.
E. vaginatum, L. July 17. Ellis Bay.
E. polystachyon, L.
E. alpinum, L.
Elymus mollis, Trin. (Goose grass.) Abundant.
Hierochloa borealis, R. and S. June 25. Common.

Mr. F. H. Storer exhibited a specimen showing the pseudo-metamorphism of cast-iron into plumbago, proving that iron is not, as might be supposed, a homogeneous mass; the plumbago had first been diffused through the mass, from which the iron had been afterwards removed by immersion for a long time in dilute acid. The casting came from Mr. Homer, of the Pacific Mills, Lawrence.

The following letters were read, viz: —

From the Royal Institution, September 12th, 1861; the Liverpool Literary and Philosophical Society, October 21st, 1861; the Naturhistorischer Verein, Bonn, January 22d, 1862, and the Regents of the University of New York, Albany, May 31st, 1862, acknowledging the receipt of the Society's publications; from the K. Preussiche Akademie, Berlin, February 18th, 1862, presenting its Monthly Journal for 1861.

Mr. E. H. Eldredge was elected a Resident Member.

DONATIONS TO THE MUSEUM.

April 16. A specimen of *Pocillopora* from the isthmus of Panama, by Mr. Charles F. Watts.

May 7. A collection of plants from the Arctic regions, by Dr. I. I. Hayes.

May 21. A collection of upwards of one thousand species of the plants of New England; a collection of plants of Minnesota; a large number of the nests and eggs of the birds of New England; a collection of Indian antiquities, consisting of stone implements of art and warfare, mostly from Concord, Mass., by the bequest of Mr. H. D. Thoreau; specimens of *Crioceris asparagi* from Fall River, by Mr. Norman Easton; two *Exocœtus* and two *Echeneis* from New-

bern, N. C., by Dr. S. Kneeland ; a specimen of *Gammarus*, by Mr. T. J. Whittemore.

June 4. Copper pyrites from California, by Mr. T. J. Whittemore; a pair of the horns of *Bos caffer* from the Cape of Good Hope; a horn of the Sicilian cow; an *Elaps* from Rio Janeiro; a *Gecko* from Java; a beak of *Xiphius* and of *Pristes*, by Mrs. Kent; two specimens of an Orthopteron and an *Asilus* from Lima, Peru, by Dr. C. T. Winslow; two slabs of sandstone, from Middletown, Conn., containing fossil foot-prints, by Mr. Brainard; a *Pityophis* and a *Scincus*, from Newbern, N. C., by Dr. S. Kneeland.

June 18. *Umbrina nebulosa* from New Bedford, by Mr. William H. Taylor; *Ceratomia repentina* from Boston, by Dr. J. C. White.

BOOKS RECEIVED DURING THE QUARTER ENDING JUNE 30, 1862.

United States Coast Survey. Report for 1860. 4to. Washington. *From Prof. A. D. Bache.*

Sixth Annual Report of the Secretary of the Maine Board of Agriculture. 8vo. 1861. *From C. H. Hitchcock, Esq.*

Annual Report of the School Committee of the City of Boston. 1861. 8vo. *From J. D. Philbrick, Esq.*

Annual of Scientific Discovery for 1862. 12mo. Boston. *From D. A. Wells, A. M., Editor.*

On the Rocks lying between the Carboniferous Limestone of the Lower Peninsula of Michigan and the Limestones of the Hamilton Group. By Alexander Winchell. 8vo. Pamph. New Haven, 1862. *From the Author.*

Manual of Elementary Geology. By Sir Charles Lyell. 8vo. London, 1851. *From Dr. S. Durkee.*

Otia Conchologica. By Augustus A. Gould, M. D. 8vo. Boston, 1861. *From the Author.*

Researches on the Molecular Dissymmetry of Natural Organic Products. By W. S. W. Ruschenberger, M. D. 8vo. Pamph. 1860. *From the Author.*

Mémoire sur la Mode de formation des Cones Volcaniques et des Cratères. Par G. Poulet Scrope. 8vo. Pamph. Paris, 1860. *From the Author.*

History of the Fishes of Massachusetts. By D. Humphreys Storer. 4to. pp. 195–240. *From the Author.*

Description of Remains of a new Enallosaurian from the Coal Formation of Nova Scotia. By O. C. Marsh, B. A. 8vo. Pamph. 1862. *From the Author.*

Report on the Geological Survey of the State of Wisconsin. By James Hall and J. D. Whitney. 8vo. Vol. I. 1862.

Geological Survey of New York. Paleontology. By James Hall. 2 vols. 4to. Albany, 1859. *From Prof. James Hall.*

Check List of the Shells of North America. Unionidæ. By Isaac Lea, LL. D. 8vo. Pamph.

Papers on the Unionidæ, &c. By Isaac Lea, LL. D. Extracted from Proceedings of Academy of Natural Sciences of Philadelphia. 8vo. Pamph. 1862.

Observations on the Genus Unio. By Isaac Lea, LL. D. 4to. Pamph. Philadelphia, 1862. *From the Author.*

On the Tides of the Coast of Ireland. 8vo. Pamph.

Laws of Polarized Light. 8vo. Pamph.

Tides of Dublin Bay. 8vo. Pamph.

Healthy Urine of Man. 8vo. Pamph.

The Azimuthal Motion, &c. All by Samuel Haughton. 8vo. Pamph. *From the Author.*

Jahrbücher der K. K. Central-Anstalt fur Meteorologie und Erdmagnetismus. Von Karl Kreil. VIII. Band. Jahrgang, 1856. 4to. Wien, 1861.

Verhandlungen des Naturhistorischen Vereines der Preussischen Rheinlande und Westphalens. Achtzehnter Jahrgang. 8vo. Bonn, 1861.

Bericht über die St. Gallischen Naturwissenschaftlichen Gesellschaft. 1858–61. 8vo. Pamph. St. Gallen.

Jahrbuch der K. K. Geologischen Reichsanstalt, 1861–1862. XII. Band. Nro. 1. Jänner bis Dec. 1861. 8vo. Pamph. Wien.

Monatsbericht der Königlichen Preussischen Akademie der Wissenschaften zu Berlin. 8vo. 1861.

Schriften der Königlichen Physikalisch-ökonomischen Gesellschaft zu Königsberg. Zweiter Jahrgang. 1861. Erste Abtheilung.

Sitzungsberichte der K. Akademie der Wissenschaften. Nos. 6, 7, 8. June, July, Oct. 1861. 8vo. Wien.

Entomologische Zeitung. Zwei und Zwanzigster Jahrgang. 8vo. Stettin, 1861.

Nachrichten von der Georg-Augusts-Universitat und der K. Gesellschaft der Wissenschaften zu Göttingen. 1861. 12mo.

Archiv für Naturgeschichte. Sieben und Zwanzigster Jahrgang. Viertes Heft. Berlin, 1861.

Beiträge zur Anatomie und Entwicklungsgeschichte der Algengattung Lemanea. Von B. Wartmann. 4to. Pamph. St. Gallen. 1854.

Der Zöologische Garten. Nos. 7–18. 8vo. Pamph. Frankfurt a. M. April to Dec. 1861.

Bulletin de la Société de Geographie. 5ième Serie. Tome II. 8vo. Paris, 1861.

Bulletin de la Société des Sciences Naturelles de Neuchatel. Tome V. 8vo. 1861.

Memoirs of Geological Survey of India. Vol. III. Part I. 8vo. Calcutta, 1861.

Journal of the Geological Society of Dublin. Vol. IX. Part 1. 8vo. Pamph.

Notices of Proceedings of the Royal Institution of Great Britain. Part II. 1860–61. 8vo. Pamph. Also, List of Officers, &c. 8vo. Pamph. London, 1861.

Proceedings of the Royal Society of London. Vol. VI. No. 1. 8vo. 1862. Pamph. Vol. XI. Nos. 44, 46. 8vo. 1861.

Report of Proceedings of the Geological and Polytechnic Society of the West Riding of Yorkshire. 1860. 8vo. Pamph.

Annual Report of the Leeds Philosophical and Literary Society, for 1860–61. 8vo. Pamph.

Proceedings of the Royal Horticultural Society. Vol. I. pp. 696–724. 8vo. Pamph. London, 1861.

Canadian Naturalist and Geologist. Vol. VI. No. 2. April, 1862. Montreal.

Canadian Journal of Industry, Science, and Art. No. 38. March, 1862.

Annual Report of Montreal Horticultural Society. 8vo. Pamph. 1861.

Silliman's American Journal of Science and Arts. Vol. XXXIII. No. 99. May, 1862.

Proceedings of the American Philosophical Society. Vol. VIII. No. 66 to end of vol. 8vo. Philadelphia, 1862.

Proceedings of the Entomological Society of Philadelphia. March and April, 1862. 8vo. Pamph.

Proceedings of the Academy of Natural Sciences of Philadelphia. Nos. 1, 2, 3, 4. Jan. to April, 1862. 8vo. Pamph. *By Exchange.*

Quarterly Journal of the Geological Society. Nos. 67, 68, 69, 70, for Aug. and Nov. 1861, and Feb. and May, 1862.

Bydragen tot de Dierkunde. Long 4to. 7 Aflevering. 1848–54.

Contributions to the Natural History of the United States of America. By Louis Agassiz. Vol. IV. 4to. Boston, 1862.

Annals and Magazine of Natural History. Nos. 50, 51, 52, 53, for February, March, April, and May, 1862. *From the Courtis Fund.*

New England Historical and Genealogical Register. Vol. XVI. No. 2, for April, 1862.

Life and Letters of Washington Irving. By his nephew, P. M. Irving. Vol. I. 8vo. New York, 1862. *Deposited by the Republican Institution.*

September 3, 1862.

The President in the chair.

Dr. Jackson offered some remarks upon a new method of security against counterfeits in paper currency through the introduction of determinate species of Diatomaceæ into the material of the paper, or into some of the ingredients used in the preparation of the stamps; the method is the invention of Mr. D. J. Browne.

Mr. E. D. Cope, of Philadelphia, was elected Corresponding Member.

September 17, 1862.

The President in the chair.

Prof. J. Wyman stated that through the kindness of Prof. Agassiz, he had had an opportunity of studying the larvæ of *Dactylethra capensis* from South Africa. These larvæ are all considerably advanced in development, are from three to four inches in length, and have the hinder limbs more or less formed. The rudimentary fore limbs were protruded in all the specimens but one. In several respects they differ greatly from the larvæ of other Batrachians. The head is more flattened, the body is less rounded and longer, and the tail

longer and more pointed. The mouth has none of the characteristics of Batrachian larvæ; it is wider, the lips are fleshy, have neither papillæ nor horny appendages on the lower lip, nor is there any beak on the upper. One of the most remarkable peculiarities, and which especially attracted the attention of Prof. Agassiz, is the existence at each angle of the mouth of a slender filament resembling that of the Siluroid fishes, and which, when placed beside the body, extends as far backwards as the legs. A series of hollow and inwardly corrugated teeth exist in the upper jaw as in the adult, but none in the lower.

The skin, like that of other larvæ, is mostly very thin, and of a dark-blue color. The back is covered with a patch of integument differing from that of the rest of the surface, which is thick, of a dark-brown color, and resembling that of the adult. In the older specimens patches of similar skin are seen on the nose and on the backs of the thighs and arms. These patches are the beginnings of the metamorphosis by which the larval integument is changed for that of the adult, and gradually extends over the whole body.

A series of linear groups of follicles begins at the hinder part of the middle line of the back, extends in a curve downwards on either side, ascends over the arms, and ends in a semicircle between each eye and the middle line of the head. On the back the series is partly double, and there are other groups of them over the shoulders.

The upper caudal fold of skin begins near the middle of the upper edge of the tail, where it is quite narrow, and continues so to the end. The lower fold is very much the broadest, and instead of ending at the base of the tail, as in other Batrachians, extends as far forward as the middle of the abdomen, having its greatest breadth between the legs. The end of the tail is sharply pointed; the anus perforates the caudal fold behind the abdomen as in other Batrachian larvæ.

The cavity of the mouth is large, is quite smooth, has no papillæ or palatine folds. In common Batrachians the gill-arches are composed of two distinct portions. First, an inner, consisting of a broad plate, on the sides of which are developed parallel rows of closely-attached fringes. Second, on the outer border of the arch and nearest to the respiratory opening, a series of dendritic fringes floating free, which are highly vascular, and which form the chief part of the respiratory surface. In the larva of Dactylethra here described, these last are entirely wanting. There are two outer respiratory openings, one on each side, instead of one on the left side, as is usually the case. These openings are in the form of fissures instead of tubes.

Another remarkable feature in the development of Dactylethra is that of the position of the fore limbs; these in common Batrachians are formed in the respiratory sacs just exteriorly to the gills; the left leg protruding outwards by the respiratory orifice, and the right by a corresponding opening on the right side, formed by the absorption of the skin for the purpose of freeing the limb. In Dactylethra the fore limbs are formed in special sacs, which are situated some distance behind the organs of respiration.

The urinary bladder is already somewhat developed, is formed relatively much earlier than in ordinary Batrachians, and in this respect more closely resembles a true allantois.

While in many respects the genus Dactylethra resembles Pipa, as in the conformation of the limbs, the single Eustachian tube, the absence of a tongue, and the broad transverse process of the coccyx, it differs widely from it in its phases of development, especially in the mode of the formation of the limbs and the position of them in the embryo.

Prof. J. Wyman gave an account of some experiments recently made by him on Planariæ, showing their power of repairing injuries.

One experiment consisted in cutting longitudinally the hinder half of one side of a Planaria. The incision began on the side, extending to the middle line, and then lengthwise, backwards to near the end of the body, so that the severed portion hung by a slender neck, and trailed backwards. At the end of the first day the separated portion was restored to its natural position, and by the third day was wholly united with the rest, the only indication of the injury being a small notch on the side.

In a second experiment the body was divided lengthwise from behind forwards for about two-thirds of the length of the animal. The divided portions completely cicatrized, but did not unite with each other, so that the Planaria remained permanently bifid behind.

In a third experiment the Planaria was divided in the middle transversely. The fore part continued to move as usual, but the hinder remained stationary. In the course of a few days the fore part reproduced what it had lost, and the hinder reproduced the head and eye specks, and thus two perfect animals were formed, both moving with perfect freedom.

Professor Carlo Matteucci, of Turin, was elected an Honorary Member.

DONATIONS TO THE MUSEUM.

September 8. Copper pyrites and erubescite, from Acton Vale Mine, C. E., by Dr. C. T. Jackson ; two bottles, containing a number of fishes, reptiles, and insects, from Newbern, N. C., by Dr. S. Kneeland; two specimens of *Acrochordes* from Hoogly River, and a *Scatophagus* and *Trichiurus* from off Madagascar, by Mr. R. Simonson.

September 17. *Corydalis cornuta*, from Milton, by Mr. J. Schohfield.

BOOKS RECEIVED DURING THE QUARTER ENDING SEPT. 30, 1862.

On the Primitive Formations in Norway and Canada. By Thomas McFarlane. 8vo. Pamph. *From the Author.*

Geological Survey of Canada. New species of Lower Silurian Fossils. By E. Billings, F. G. S. 8vo. Pamph. Montreal, 1862. *From the Author.*

Cases in Surgery. Gun-shot Wounds. Plural Births. By J. Mason Warren. Pamph. Boston, 1862. *From the Author.*

Experiments and Observations upon the Circulation in the Snapping Turtle. By Mitchell S. Weir, M. D. 4to. Pamph. Philadelphia, 1862. *From the Author.*

The mode of Development of the Marginal Tentacles of the free Medusæ of some Hydroids. By A. Agassiz. 8vo. Pamph. 1862. *From the Author.*

Remarks on certain species of N. A. Helicidæ, etc. By Thomas Bland, F. G. S. 8vo. Pamph. New York, 1862. *From the Author.*

Monograph of the Species of Sphœrium of North and South America. By Temple Prime. 8vo. Pamph. Philadelphia, 1862. *From the Author.*

On the Genus Colias in North America. By Samuel H. Scudder. 8vo. Pamph. 1862. *From the Author.*

Défense des Colonies. Par J. Barrande. 2 Parts. 8vo. Pamph. 1861–2. *From the Author.*

Observations on the terms "Pénéen," "Permian," and "Dyas." By Jules Marcou. 8vo. Pamph. Boston, 1862.

Letter to M. Joachim Barrande, on the Taconic Rocks of Vermont and Canada. By Jules Marcou. 8vo. Pamph. Cambridge, 1862. *From the Author.*

Results of Meteorological Observations made by the United States Patent Office and Smithsonian Institution. 1854 to 1859. 4to. Washington.

Smithsonian Miscellaneous Collections. Vols. I.–IV. 8vo. Washington, 1862. *From the Smithsonian Institution.*

Memorias de la Real Academia de Ciencias de Madrid. Tomos 3, 4, 5. 4to. 1859–61.

Tijdschrift voor Indische Taal-, Land- en Volkenkunde. 18 Nos. 1857–60. 8vo. Pamph. Batavia.

Verhandelingen Van Het Bataviaasch Genootschaf van Kunsten en Wetenschaffen. Deel 27, 28. 4to. Batavia, 1860.

Archiv für Naturgeschichte. 1862. Acht und Zwanzigster Jahrgang. Erstes Heft.

Nachträge zu Maly's Enumeratio plantarum phanerogamicarum imperii austriaci universi. Von August Neilrich. 8vo. Pamph. Wien, 1861.

Schriften der Königlichen Physikalisch-ökonomischen Gesellschaft zu Königsberg. Zweiter Jahrgang, 1861. Zweite Abtheilung. 4to. Pamph.

Verhandlungen der Kaiserlich-Koniglichen Zoologisch-Botanischen Gesellschaft in Wien. Jahrgang, 1861. XI Band. 8vo.

Denkschriften der Kaiserlichen Akademie der Wissenschaften. Zwanzigster Band. 4to. Wien, 1862. Sitzungsberichte. Band 44. Heft 4, 5. 1861. Band 44. Heft 4, 5. 1862. 8vo. Wien.

Journal of the Royal Geographical Society. Vol. XXXI. London, 1861.

Proceedings of the Royal Geographical Society of London. Vol. V. No. 5, 1861, and Vol. VI. No. 3, 1862.

Quarterly Journal of the Geological Society. Vol. XVIII. Part III. London, Aug. 1862.

Proceedings of the Royal Horticultural Society of London. Vol. II. No. 1–3, 1862. Also, Nos. 6, 7, 8, 9 to 31 of Vol. I.

Journal of the Royal Dublin Society. Nos. 20–23. 1861.

Proceedings of the Royal Society. Vol. XI. No. 47. 8vo. Pamph. London.

Canadian Naturalist and Geologist. Vol. VII. No. 3, June. No. 4, August, 1862. Montreal.

Annals of the Botanical Society of Canada. Vol. I. Part III. 4to. April, 1861 to Feb. 1862.

Proceedings of the American Philosophical Society. Vol. IX. No. 67. 8vo. Pamph. Philadelphia, 1862.

Silliman's American Journal of Science and Arts. No. 101, for Sept. 1862.

Annals of the Lyceum of Natural History of New York. Vol. VII. Nos. 10–12. June, 1861.

Proceedings of the Academy of Natural Sciences of Philadelphia. No. 5, April and May, No. 6, June, 1862.

Proceedings of the Entomological Society of Philadelphia. May, June, and July, 1862. 8vo. Pamph. *By exchange.*

Annals and Magazine of Natural History. Vol. X. Nos. 54–57. June—Sept. 1862. London. *From Courtis Fund.*

Genealogical Dictionary of the First Settlers of New England. By James Savage. Vols. III. and IV. 8vo. Boston, 1862. *Deposited by Republican Institution.*

October 1, 1862.

Vice-President Jackson in the chair.

Mr. A. Agassiz gave an account of a new species of *Arachnactis* Sars, which is found swimming in large numbers near the surface of the sea, at night, during the last part of September. It is of a pale ochre color, and differs from the Norwegian species by its size, the length of the marginal tentacles, the arrangement of the row of tentacles round the mouth, and the manner in which it moves. On account of its great resemblance to the larva of our common star-

fishes he called it *Arachnactis brachiolata*. A full account of this Actinia will soon be published in the publications of the Society. Living specimens were brought to the Society for examination, and also larvæ of starfishes to compare with them.

Prof. William B. Rogers presented a paper by Dr. J. S. Newberry, entitled "Descriptions of the Fossil Plants collected by Mr. George Gibbs, Geologist to the United States North West Boundary Commission under Mr. Archibald Campbell, United States Commissioner. Referred to the Publishing Committee.

The Secretary read the following communication from Dr. James Lewis, of Mohawk, N. Y.:—

Since the autumn of 1853 I have devoted some attention to the mollusks of this immediate vicinity. My explorations and searchings for species and varieties have been, from the first, quite thorough, and have, I think, developed the fact that the number of aquatic species is being increased by the introduction of species from other parts of the State; while our local land species, if undergoing any change, must be diminishing, by reason of changes in the face of the country, making their former habitats untenable.

I propose to offer some remarks upon some aquatic species detected under such circumstances as to lead to the inference that they have been introduced.

Up to 1855 and 1856 the following species had not been detected, although as much and perhaps more attention had been devoted to *minute search* than since.

Paludina rufa Haldeman.	Observed	1856.
Melania virginica Gmel.	"	1858.
Melania? isogona Say.	"	1862.
Sphærium solidulum Prime *(var. distortum)*	"	1860.

PALUDINA RUFA Hald. was first detected in the Erie canal within a somewhat restricted area, where it has been found since in considerable numbers, and of such a size as indicates a growth of five or six years (1860). This would date its introduction back at least to 1854 or 1855. Two years later, specimens which might have been developed in two or three years were found, but not very plenty (1856). Since that time (perhaps as early as 1857), a very few specimens were found in the Mohawk River, small, and of a somewhat different form and color from those found in the canal. Later (1862), they have been found there larger and more abundantly. The soft parts of this species present constant characters which separate

them from the species I have regarded as *decisa* and *integra*, which are abundant here. The shell of *P. rufa* may be called *ovate conic*, while the shells of *decisa (?)* and *integra (?)* are *conic*. This results from the greater angular divergence of the apical whorls of *rufa*, and the subsequent diminution of the *angle* of the body whorl. The *angle* for *decisa (?)* and *integra (?)* is constant in each, for all the whorls. The interior of *rufa* is colored pink, which in some specimens deepens to a faint purple, and also by reflection through the epidermis imparts a faint purple tinge to the exterior of the shell. The apical whorls are pink (externally), and contrast with the olivaceous hue of the larger whorls. In *integra (?)* and *decisa (?)* the apices are not colored, and if any contrast is shown with the larger whorls, it is due to a want of coloring matter in the apical whorls.

[There is some doubt about the identification of the shells of *decisa* and *integra*, and they may not be, and probably are not, the shells described by Mr. Say, though they are unquestionably the shells alluded to by DeKay.]

MELANIA VIRGINICA Gmel. was also first observed in the same portion of the canal where *Pal. rufa* was discovered. It has since been detected in other portions of the canal in somewhat greater numbers, but it yet remains a rare shell. This and *Pal. rufa* have, no doubt, been introduced from other portions of the State, on the bottoms of boats. Both species are found at the Eastern and Western terminus of the canal.

MELANIA? ISOGONA Say, is a very recently-introduced species, the first and only specimens yet found having been taken within the last four weeks. They are probably introduced from Buffalo, at which point they have been detected by Mr. C. T. Robinson, of that city.

The few specimens I have been able to secure here enable me to correct an error in the generic nomenclature of this species. Mr. Say first noticed it as a Melania. It has since been catalogued by the Smithsonian Institute as an Anculosa (LEPTOXIS Raf.). The form of the shell suggests, however, different relations, and the soft parts confirm the suggestion that the animal belongs to the genus AMNICOLA, Hald. and Gould.

[I enclose herewith an enlarged sketch of the foot of the animal, as seen from below, through the side of a glass vessel, in which the animal was crawling. Foot white and translucent, with a recurved projecting angle on each side in front, widening a little posteriorly, and terminating in a slightly emarginate semicircle of a radius equal to one-half the width of the foot. Tentacles white, filiform, nearly straight, and of nearly equal diameter throughout; length of tenta-

cles (as seen from below) about equal to the width of the foot at its narrowest part. Foot = 1½ length of shell.]

The specimens to which these notes refer are young; no adults have yet been found.

SPHÆRIUM SOLIDULUM Pr., found only in the Mohawk River. The shells are almost precisely identical with specimens received from Michigan. Until the present season very few have been seen, and those only young specimens. The present season, however, affords adults in considerable numbers, in isolated stations. It may be well to remark that this species does not seem to associate largely with *Sph. striatinum* Lk., which is an abundant species in the river. Each species seems to prefer its own station, but I am not able to state correctly the differences in their habits. This species has probably been introduced from the West. It bears a strong resemblance to *Sph. striatinum* Lk. (*similis* Say), differing by being smaller, a little more angular, and by the absence of striæ or *sulcations* on the umbo.

Among the shells of this region to which attention has been called heretofore, are a few which seem to need further attention.

A species of Amnicola is found here, which is, in Thompson's Vermont Shells (Adams), referred to *Pal. lustrica* Say. The shell in question is pupoid in form, the apical whorls having a large angle, and the subsequent whorls a diminished angle, almost cylindrical. The soft parts near the apex, as seen through the shell, are of an orange tint, resembling in that particular some of the Melanidæ. In other respects the soft parts are those of the genus Amnicola. This shell has been very widely distributed to my correspondents as "*Amnicola lustrica* Say," but it is probably the same species as described by Mr. Say as *Pal. grana*. (See Binney's edition of Say's Works, pp. 110, 111.) I am led to infer from Mr. Say's note to the description of *Pal. grana*, that his *Pal. lustrica* is similar to, if not identical with, *Valvata pupoidea* Gould.

Among the shells observed this season, it may be well to notice *Lymnæa gracilis* Jay.* On the 18th and 19th of August, I obtained over six hundred specimens of this species from the outlet of Schuyler's Lake, in Otsego County. A few years ago, in company with

* L. gracilis Jay has been found in the following locations:—
Lake Champlain, N. Y.
Schuyler's Lake, N. Y. (Lewis.)
Little Lakes, N. Y. (dead shells only). (Lewis.)
Niagara River, N. Y., in a small bay in an island about six miles below Buffalo. (C. T. Robinson.)
Lakes near Grand Rapids, Michigan. (McNiel & Currier.)
Lakes in Grattan, Michigan. " "

Mr. T. J. Whittemore, of Boston, I obtained a smaller number of the same species at the same locality, but under somewhat different circumstances. On the 5th of August (1859 ?) this species was found on the bulrush, growing in water from three to four feet deep, in considerable numbers, associated with Ancylus and Amnicola. The present season not presenting as high a stage of water, flag occupied the space previously covered by the bulrush, and no specimens were found there.

Those taken this summer were found about thirty rods lower down the creek, on eel-grass, in water varying from twenty to eight inches in depth. Most of the specimens were found near the roots of the plants, which were pulled up by the roots, with the mud adhering. Many of the shells were found almost imbedded in the mud, their apices pointing upwards, and to the casual observer presenting the appearance of an abortive leaflet. About nine out of ten were found with the apex pointing up. I have a large number of specimens in alcohol, which will enable me to supply specimens to any persons who may desire to study the soft parts. Very few of the specimens taken were of considerable size, and among them only one adult. The adult is characterized by the separation of the labium from the columella. The animals probably attain maturity late in autumn.

In the Erie Canal are found large numbers of *Sphærium striatinum* Lk. associated with *Sph. transversum* Say. I have observed that in early spring the former is nearly as abundant as at any other time of the year, while scarcely a specimen of the latter can be found. Later in the season *Sph. transversum* becomes more abundant and larger; and at the latter part of summer and beginning of autumn its numbers exceed those of *Sph. striatinum*, as is the case at the present time. The inference is that this species *(transversum)* is very prolific and of rapid growth; and judging also from the abundance of dead shells, just at the present time, it is probably very short-lived.

[Note. — In a communication to the Boston Society of Natural History several months ago, relative to Say's *Cyclostoma lapidaria*, that species was referred to Melania. Further researches will probably determine that, if it does not belong to the genus Melania, it may require to be set apart under a separate genus intermediate between Melania and Truncatella.]

October 15*th*, 1862.

The President in the chair.

Rev. Mr. Waterston announced the recent decease of Dr. B. D. Greene, of Boston, the first President of the Society. He spoke of the high personal character and scientific attainments of the deceased, and of the deep interest he ever felt in the welfare of the Society; in consideration of which, he moved that a committee of two be appointed to consider the best plan of procedure in reference to this loss. The President, Prof. Agassiz and Dr. Pickering followed, with remarks testifying to the great esteem in which Dr. Greene was universally held, and of his connection with the scientific world. Dr. Gould and Prof. Rogers were appointed as the committee, to which were afterwards added the names of Prof. Agassiz and Mr. Waterston.

The following paper was presented: —

NOTICE OF A SPECIES OF NEOSOREX FROM MASSACHUSETTS, AND OF SOREX THOMPSONI FROM MAINE. By A. E. VERRILL.

The genus *Neosorex* was instituted by Prof. S. F. Baird in 1857, in the General Report on Mammals (Vol. VIII. Pacific R. R. Exp. and Surveys), for the reception of a peculiar species of Shrew from Washington Territory, named *N. navigator*. To the same genus *Sorex fimbripes* of Bachman was also referred, with some doubt.

The diagnosis of the genus, according to Prof. Baird, is as follows: —

NEOSOREX, Baird.

"Ears rather short, partly furred on both surfaces; valvular.

"Dental formula: anterior incisors, $\frac{3}{2}$; lateral incisors and premolars, $\frac{5}{2}$-$\frac{5}{2}$; molars, $\frac{4}{3}$-$\frac{4}{3}$ = 32; upper anterior incisor with a well defined hook at the base; lower one with two tubercles and a notch; first two upper teeth, or premolars, equal, and larger than the fourth, which exceeds the third, and equals the basal hook of the anterior one; the fifth smallest; the first and half the second lower lateral teeth placed above the base of the incisor; all the teeth colored at the tip. Lower angular process of lower jaw very long and slender. Tail as long, or longer than the body, with a terminal pencil; hairs uniform in length, except at tip. Feet well developed, with a fringe of stiff bristles.

"The genus bears a close resemblance to *Crossopus*, but differs in the more slender muzzle, in having one more molar, and two tubercles on the anterior lower incisor instead of one. With the feet similarly constituted, the tail is destitute of the median line of longer hairs. The very large and highly fringed feet distinguish it from *Sorex*."

In April of the present year, another species of this genus, which was obtained at Franconia, N. H., was described by Mr. E. D. Cope (Proc. Philadelphia Academy, 1862, p. 188), under the name of *Neosorex albibarbis*. Two individuals were seen by him swimming in a lake, about forty feet from the bank, with an undulatory motion, and were caught under stones on the shore, where they had taken refuge. For this aquatic mode of life the species of this genus are eminently adapted by their large, fringed feet, valvular ears, and close fur.

The subject of the present notice was obtained by Mr. F. W. Putnam, at Warwick, Mass., last July, and was presented by him to the Museum of Comparative Zoölogy. Nothing was learned concerning its habits. The specimen is preserved in alcohol, and, although somewhat larger than that described by Mr. Cope, agrees very closely with it in proportions and color, and must, unquestionably, be referred to the same species. But a careful comparison with the published descriptions and figures of *Sorex palustris* of Richardson has led me to consider it identical, also, with that species, notwithstanding some differences, real or apparent.

That the latter species belongs to the genus *Neosorex*, I infer from the description of Richardson (Fauna Bor. Am. I., p. 5), where the ear is said to be "shorter than the fur; its inferior margin is folded in; there is a heart-shaped lobe covering the auditory opening, and a transverse fold above it." The tail is rounded, and covered with a close coat of short hair, terminated by a small pencil of hair at the tip. "Feet clothed with rather coarse, short, appressed hairs, those on the sides of the toes being arranged somewhat in a parallel manner, but not very distinctly. The fur resembles that of the mole in softness, closeness, and lustre." The length of the tail was 2 inches and 7 lines; head 1 inch 2 lines; hind foot 9 lines, — dimensions not found in any other American genus. But, on the other hand, the dental formula is given as $\frac{3}{2} + \frac{1}{1}\frac{4}{2} + \frac{1}{1}\frac{4}{3} = 30$; and the length, from nose to tail, is 3 inches 6 lines. In my opinion, these characters, which are different from those of *N. albibarbis*, can be attributed to the imperfections of the description of Richardson, for it was, as he himself states, "drawn up from prepared skins," which, of itself, is enough to explain the greater size of the body. The principal difference is in the presence of *four* upper premolars instead of *five;* but in the specimen before me the fifth premolar is

very small, and destitute of the brown color at the tip, while it is so placed between the fourth premolar and first molar, that it could not be seen without cutting away the lip, and with a prepared skin, it is not surprising that it should have been overlooked even by so accurate an observer as the distinguished author of the Fauna Boreali-Americana.

An additional confirmation of this view of its generic affinities may be derived from the fact that Dr. J. E. Gray, having the original specimen of Richardson for examination, referred it to the genus *Amphisorex*, which he characterized as having *fringed feet.* (See Pr. Zoöl. Soc. Lond., v. 1837, p. 125.)

Admitting, then, that *Sorex palustris* of Richardson belongs to the genus *Neosorex*, its identity with *N. albibarbis*, Cope, remains to be shown.

The proportions, and even the absolute size of the former (excepting that of the body, which was, probably, overstuffed), agree very closely with those given by Mr. Cope, as the following comparison will show.

	N. albibarbis, Cope.	Sorex palustris, Rich.
	Inches. Lines.	Inches. Lines.
Length of head and body	2 . . 8½	3 . . 6
Length of head	1 . . 2⅔	1 . . 2
Length of tail	2* . . 9	2 . . 7
Length of hind foot	8¾	9
From nose to eye		7
Nose to upper incisors, scarcely		2
Height of ear		3
Length of fore foot	4½	
Nature of specimen	In alcohol.	Prepared skin.

It is very seldom that two specimens of the same species, among mammals, agree more nearly, in proportions and size, than these.

The principal difference seems to be in color; but both are remarkable for their dark tints. According to Richardson, the back is "black, with a slightly hoary appearance when turned to the light." "On the ventral aspect it is ash-colored." "The outside of the thighs and upper surface of the tail correspond in color with the back, the under surface of the tail and inside of the thighs with the belly." "The feet are paler than the back, and a little hoary." According to Cope, "The general color is black, with a tinge of brown; this tinge is more apparent on the abdomen, and most upon the

* In the original description the length of the tail is given as "1 in. 9 lines," but Mr. Cope has informed me, by letter, that this is an error, and should be 2 in. 9 lines.

posterior gular region; anterior gular region and chin nearly white, lightest anteriorly; tail unicolor."

By a comparison of the two descriptions, it will be seen that the principal difference in color is in the lighter hue of the lower surface of the body and tail in Mr. Richardson's specimen; but if his was, as his remarks imply, taken in the winter, and Mr. Cope's in summer, this difference would fall within the variation according to season known among other species of shrews. The specimen from Warwick, though ashy brown beneath, has the tips of the fur hoary, and the under surface of the tail light ash, — much lighter than the upper surface. In other respects the color agrees very well with Mr. Cope's description. It was, also, taken at about the same season.

Admitting the correctness of my identification of this species, the known representatives of the genus *Neosorex*, which is, as yet, known only in North America, will be as follows: —

NEOSOREX NAVIGATOR.

Sorex navigator, J. G. Cooper. MSS.

Neosorex navigator, S. F. Baird, General Report on Mammals, Pacific R. R. Exp. and Sur., Vol. VIII. p. 11, pl. XXVI. 1857. Fort Vancouver, Washington Territory. — Dr. J. G. Cooper.

NEOSOREX (?) FIMBRIPES.

Sorex fimbripes, Bachman, Journ. Ac. Nat. Sc. Philad., VII., p. 391, pl. XXIV., f. 8. 1837. Audubon and Bachman, N. A. Quad., Vol. III., p. 312. (Copied from preceding.) 1854.

Neosorex (?) fimbripes, S. F. Baird, General Report on Mammals, P. R. R. Exp. and Sur., VIII., p. 11. 1857.

Sorex fimbripes, S. F. Baird, l. c., page 55. 1857.

Drury's Run, Lycoming Co., Pennsylvania. — W. R. Johnson. Only one specimen is yet known.

NEOSOREX PALUSTRIS.

Sorex palustris, J. Richardson, Zoöl. Journal, III., p. 516, Jan.–April, 1828. J. Richardson, Fauna Bor. Am. Vol. I., p. 5. 1829. Audubon and Bach., N. A. Quad., Vol. III., p. 108, pl. CXXV. (Description copied from Richardson; figure from his original specimen, which is in the British Museum.) 1853. S. F. Baird, l. c., Vol. VIII., p. 55. 1857.

Amphisorex palustris, J. E. Gray, Proc. Zoöl. Soc. of Lond., Vol. V., p. 125. 1837.

Crossopus palustris, Wagner, Suppl. Schreber, Vol. V., p. 542. 1855.

Neosorex albibarbis, E. D. Cope, Proc. Philad. Acad. Nat. Sc., p. 188. 1862.

Hudson Bay region, inhabiting the borders of lakes. — J. Richardson. Franconia, N. H., swimming in a lake. — E. D. Cope. Warwick, Mass. — F. W. Putnam.

Description of a specimen of Neosorex palustris (No. 1022 M. C. Z.) *from Warwick, Mass.* This specimen is a female preserved in alcohol, and is not much, if at all, contracted. Form rather full and stout, similar in size and general appearance to the common house mouse (*Mus musculus*). Nose long and rather slender, with a small bilobed tip; nostrils lateral, and pretty well developed. Ears small, appearing pointed, shorter than the fur, and concealed by it; concha small and rounded, its edge covered by rather long fur, its outer side by shorter; a narrow transverse fold extends across its lower portion, which is likewise furred on the edges; meatus covered by a large valvular antitragus, which is rounded and hairy at its outer edge, its anterior margin folding backwards to unite with the helix. Eyes moderately developed. Feet large and stout, nearly destitute of hair, except along the sides, where there is a strong fringe of close and stiff hairs; a shorter fringe borders the sides of all the toes. At the base of the 1st, 2d and 5th toes there is a round tubercle, another between the bases of the 3d and 4th, and two, side by side, about midway between the heel and base of middle toe; the tubercles on the fore feet are arranged in a similar way, but are much more crowded. Fore foot contained one and two-thirds times in the length of hind foot. Tail equal in length to head and body, rather large, somewhat quadrangular near the base, covered by closely appressed, short, stiff hairs, with a distinct pencil at the end. Whiskers black, well developed, the longest reaching the occiput.

In this specimen the upper lip is not split to the end of the nose, as is usual in species of *Sorex*. This will probably be found to be a generic character.

Teeth strong and sharp, the tips of all, except the fifth upper premolar, deep chestnut; upper incisors with a strong basal hook, equalling in size the third upper premolar, which is somewhat smaller than the two first; fourth premolar larger than the third; fifth very small, wedged in between fourth premolar and first molar, scarcely visible from the outside; lower incisors with three rounded serrations, their bases extending back beyond the tips of the second lower premolars.

Color above nearly black; the fur, at base, is dark plumbeous, near the ends black, the extreme tips being light gray, giving a slight hoariness to the fur; under surface of the body dark lead gray, with a distinct wash of brown; throat light gray; chin nearly white; feet and tail black, the tail somewhat lighter beneath. The colors of the back and abdomen pass into one another, without any distinct line of separation. The fur is very close and full, and of moderate length.

COMPARATIVE MEASUREMENTS.

	N. palustris (1022)	N. navigator (629)
	Inches.	Inches.
Nose to tip of tail	5.60	5.17
" " root of tail	2.80	2.17
" " occiput	.95	.92
" " tip of ear	1.05	
" " eye	.45	
" " extended hind foot	3.80	
Length of tail to tip	2.80	3.00
" " tail to end of bone	2.68	2.83
" " fore leg from knee	.85	
" " fore foot	.42	.38
" " hind leg from knee	1.40	
" " hind foot	.71	.79
" " longest toe	.27	.25
" " whiskers	.75	
Between eyes	.35	
Between extended feet	3.30	

The measurements of *Neosorex navigator* are taken from those given by Prof. Baird, the first five having been made from the alcoholic specimen, and the others after skinning. From this species *N. palustris* differs in having a shorter tail, although a larger species; a *shorter* hind foot and *longer* fore foot; in its much darker colors, even the specimen described by Richardson being much darker than that of *N. navigator*, described by Baird, while the two known specimens, in summer pelage, are still darker.

From *N. (?) fimbripes* it differs still more widely; the latter being but $3\frac{7}{8}$ inches in length to tip of tail, with the body $1\frac{1}{2}$; head 1; tail $1\frac{3}{4}$; while the hind feet are only .50 in. instead of .71; so that it is not only a much smaller species, but has disproportionately shorter hind feet and tail.

Sorex Thompsoni, Baird.

Among the twelve North American species belonging to the restricted genus *Sorex*, so fully described by Prof. S. F. Baird, in the General Report on Mammals, this species is remarkable for its small size, it being, in fact, the smallest mammal known to inhabit North America. The three specimens examined by Prof. Baird came respectively from Halifax, N. S., Burlington, Vt., and Zanesville, Ohio.

In the Museum of Comparative Zoölogy there are two specimens preserved in alcohol; one of which was collected by Prof. Charles E. Hamlin, at Waterville, Me., the other by myself at Norway, Me. Since these specimens afford additional information concerning the characters and variations of this rare and interesting species, I have prepared descriptions and measurements of each.

Description of a specimen from Norway, Me., in alcohol (No. 684 M. C. Z.). This specimen seems to be a fully adult female, and is in a

good state of preservation, though it is probable that the body is somewhat contracted and measures less than when fresh. Teeth $\frac{3}{2}$—$\frac{1\cdot1}{2\cdot2}$—$\frac{1\cdot1}{3\cdot3}$ 30; premolars not imbricated, the first two about equal, considerably larger than the third and fourth, not exceeding the basal hook of the upper incisors. Form rather more thick than usual in this genus, but very small and delicate; legs very slender; feet very small; the fore feet contained about $1\frac{1}{2}$ times in the hind ones; nose short, conical, pointed, scarcely depressed, much less elongated than that of *S. Cooperi;* ears large, but projecting only a little beyond the fur; eyes larger than usual in the genus; tail slender, about $3\frac{1}{2}$ times the length of the hind foot, pretty well furred, with a distinct pencil of hair at the tip; whiskers well developed, numerous, about $\frac{1}{2}$ in. long.

Color of body, head and tail, above, dark olive brown with a slight hoariness; under surface of body light plumbeous gray; lips, chin, feet, and lower side of tail, yellowish white; tips of the teeth dark chestnut brown; the lower incisors have two strong serrations; feet with a distinct fringe of fine, close hairs, as in *S. Cooperi.*

Description of a specimen in alcohol from Waterville, Me. (No. 1164 M. C. Z.*).* This specimen was taken July 14. It is a male, and does not appear to be fully adult. The body is somewhat mutilated and evidently stretched beyond its natural length.

Form very small and slender, agreeing in all respects with the last, except that the body appears longer; teeth agreeing in number and relative size with those of the last, but shorter; premolars less pointed; incisors shorter, the lower ones without serrations; the tips of most of the teeth are light chestnut, but this is scarcely apparent on the premolars. Color, above, dark gray or plumbeous, with a distinct wash of brown along the middle of the back; the tips of the hairs on the sides tinged with the same; body beneath grayish white; the lips, chin, feet, and tail, whitish, as in the former specimen; pencil of hair at tip of tail very small. Proportions as in the preceding. Feet, as in several other species of this genus, furnished with a short but distinct fringe of fine hairs; upper surface pretty well furred.

This specimen agrees very closely with *Sorex Hoyi*, described by Prof. Baird, from Racine, Wis., and renders it probable that the latter species is only a variety of *S. Thompsoni*, depending upon age or season, as was suggested by Prof. Baird. The proportions are nearly the same, and the colors similar, being much lighter than in the preceding specimen.

COMPARATIVE MEASUREMENTS IN INCHES.

	S. Thompsoni, ♀, Norway, Me. (No. 894.)	S. Thompsoni, ♂, Waterville, Me. (No. 1164.)	S. Cooperi, ♀, Danvers, Mass. (Essex Inst.)	S. platyrhinus, ♀, Warwick, Mass. (No. 1183.)	S. personatus, ♀, Louisiana. (Essex Inst.)
Nose to tip of tail	2.90	3.20	3.75	3.80	3.15
" " occiput	.75	.75	.80	.87	.75
" " root of tail	1.53	2.00	2.00	2.25	2.00
" " extended hind foot	2.09	2 60	2.62	3.00	2.50
" " tip of ear	.66	.70	.87	.90	.85
" " eye	.30	.30	.35	.36	.33
" " posterior angle of mouth	.25	.25	.23	.31	.25
Length of tail vertebræ	1.17	1.15	1.50	1.50	1.10
" " tail to tip	1.38	1.23	1.75	1.55	1.15
" " ear	.21	.25	.25	.26	.30
" " snout	.13	.14	.15	.17	.13
" " whiskers	.50	.50	.60	.65	.55
" " leg from knee	.75	.89	.90	.96	.80
" " foot	.40	.38	.45	.50	.40
" " arm from elbow	.42	.45	.57	.56	.50
" " hand	.22	.23	.28	.26	.26
Greatest distance between extended feet	1.72	2.05	2.50	2.63	2.25

In color and general appearance, this species resembles *S. Cooperi*, but is considerably smaller.* The latter has also 32 teeth instead of 30; its nose is longer and much more attenuated; its tail is disproportionately longer and larger, and its feet and ears are much larger, though of about the same form.

In proportions, size and form, *S. personatus*, of the South, resembles it still more closely, but its color is a light chestnut brown. It also has 32 teeth; a shorter tail, though a somewhat larger species in other respects; and the ears are much longer and less rounded, and have much more hair on the inside of the concha. The specimen measured belongs to the Essex Institute.

S. platyrhinus differs greatly from it, being much larger and stouter; having a disproportionately longer tail and hind feet, the latter being about twice the length of the fore feet; possessing 32 teeth, with the five premolars imbricated; and having a much broader and depressed nose, which is not longer in proportion. The color, also, is different, being in the latter species nearer chestnut-brown, with scarcely any shade of olive-brown even on the back; while the feet, under surface of the tail, and a broad space around the mouth, including the lips and chin, are nearly pure white; the feet are nearly destitute of hair in my specimens, and have no fringe along the sides. The ears, also, are more distinctly rounded, whiter, and less hairy.

* The specimen of *S. Cooperi*, from Danvers, Mass., of which the measurements are given in the table, is the smallest one that I have ever seen, of this species. It belongs to the collection of the Essex Institute.

The specimen measured, in the table, was presented to the Museum of Comparative Zoölogy by F. W. Putnam.

S. Fosteri differs from it in nearly the same characters as does *S. platyrhinus*, these two species being very closely allied.

List of the Species of the Family Soricidæ, known to inhabit New England.

The seven species belonging to this family, that are considered as belonging to the fauna of New England, may be arranged as follows:

Neosorex, Baird.

Neosorex palustris, Verrill. (*Sorex palustris*, Rich.) Range from Hudson's Bay to Franconia, N. H., and Warwick, Mass.

Sorex, Linn.

Section A, *with five upper premolars. Teeth*, $\frac{3}{2} - \frac{5-5}{3-3} - \frac{4-4}{2-2} = 32$.

Sorex platyrhinus, Linsley. (*Otisorex platyrhinus*, Dekay.) (*Sorex Fosteri*, Thompson, Nat. Hist. Vt.)

Known range, from Norway, Me., and Burlington, Vt., to Cleveland, Ohio. In Massachusetts much more common than any other species of this genus.

Sorex Fosteri, Rich.

Range from Hudson's Bay (Rich.) to New York (Bachman), and Carlisle, Penn. (Baird). This species has been mentioned, by authors, from New England, but I have never met with a specimen myself. It is possible that the species, as described by Richardson, is not identical with that of Bachman from New York, or of Baird from Pennsylvania.

Sorex Cooperi, Bachman.

Range from Labrador to Nebraska, south to West Northfield, Ill., and Western New York. The only specimen that I have seen from New England is from Danvers, Mass., in the collection of the Essex Institute.

Section B, *with four upper premolars. Teeth*, $\frac{3}{3} - \frac{4-4}{3-3} - \frac{4-4}{2-2} = 30$.

Sorex Thompsoni, Baird. (*S. Thompsoni and (?) S. Hoyi*, Baird.) Range from Halifax, N. S., Norway, Me., Waterville, Me., and Burlington, Vt., to Zanesville, Ohio, and (*S. Hoyi*) Racine, Wis.

Blarina, Gray.

Blarina talpoides, Gray. (*Sorex talpoides*, Gapper. *Sorex Dekayi*, Bach.)

Range from Nova Scotia, Upper Canada and Northern Maine

to Lake Superior, and south to Ohio, Pennsylvania and mountains of Virginia and Georgia. This is more abundant in New England than any other species of this family, frequenting chiefly moist woods and meadows, and taking readily to the water when disturbed. *Blarina brevicauda* of Dekay, Thompson, and several other authors (not of Say), is included here as a synonym of this species.

Blarina angusticeps, Baird.

Burlington, Vt. (Baird), near Sebago Lake, Me. (Prof. Agassiz). This very rare but interesting species is as yet known from only two specimens. It is quite peculiar in the form and narrowness of the skull, but resembles, externally, the preceding species. Its color is uniform plumbeous, scarcely paler beneath.

Mr. F. W. Putnam exhibited specimens of the "Red-backed Salamander," *Plethodon erythronotus*, Baird, with the eggs and young in different degrees of development, which he had found under the moss and bark of decayed trees in the woods at Warwick, Mass., on the 26th, 27th and 29th of August last. The eggs were quite large, measuring .15 inch in diameter, and were found in little packets of from six to eleven each; some five or six of these bunches were found during the three days' search, also a number of young evidently just hatched, as they still retained their gills; those that he hatched from the eggs lost their gills in less than three days from the time of their casting the egg envelope. When just from the egg the young measured .6 inch in length, and had the marking and color of the adult, with the exception of the dorsal vermilion band being lighter, and extending to the tip of the tail. In three instances out of five in which the young were found there was an adult specimen with them, and apparently feeding them with small snails (Limax), as remains of the slimy substance of the snails were found, and, in one case, a partially decomposed or eaten snail was seen in the midst of the little family. When discovered by itself the adult animal quickly disappears in the decayed wood and moss, but in every case when found with the young, neither it nor the little ones attempted to escape until touched. The only reference that he could find in regard to the eggs of this species is in Prof. Baird's "*Revision of the Tailed Batrachians of North America*," where it is stated that they are "deposited in packets under damp stones."

Mr. Putnam called attention to the few observations that had been made upon the habits and development of our salamanders and newts.

The President stated that he had found the eggs of the same spe-

cies at two widely different seasons; early in June at Fitchburg, in this State, and in the middle of August at the White Mountains.

Prof. Agassiz referred to the difference in the time of development in *Rana temporaria*, in the Alps and Lowlands, in the latter of which the eggs are laid in March and April, and attain their development the same season, while on the mountains they are laid in June, and remain in the tadpole state during the winter.

The President alluded to a remarkable case of poisoning, which had occurred, as was alleged, by the introduction of the anther of a tiger lily (*Lilium tigrinum*) into the nostril of a child, causing inflammation, followed by vomiting, and finally by death.

Upon request, Prof. Agassiz gave an account of the conclusions at which he had arrived by the study of tertiary fossils in reference to the division of the strata in which they occur. He was satisfied that the primary divisions given by Lyell were natural, although the subdivisions are much more numerous, and the basis upon which the larger groups had been founded was erroneous; the relations of one group of beds to another being correctly based upon a percentage of species, representative of, rather than identical with, those now living. He was further satisfied that the principles upon which fossiliferous deposits of distant regions had been synchronized, namely, by the similarity of their organic forms, was entirely erroneous, since such fossils, even when unquestionably cotemporaneous, showed frequently, when compared together, greater differences than the fossils from successive horizons in the same country.

November 5, 1862.

The President in the chair.

The committee appointed at the previous meeting to take suitable action with reference to the decease of Dr. B. D. Greene, being called upon, —

Dr. A. A. Gould offered some preliminary statements with regard to Dr. Greene's connection with the early history of the Society, and then gave place to the introduction of resolutions by Professor W. B. Rogers.

Professor W. B. Rogers said that before submitting to the Society the resolutions which he held in his hand, he was desirous of making a few remarks on the important services and peculiar virtues of our

late valued friend and associate. He felt, indeed, that it was especially incumbent on him to offer in person a tribute of honor and gratitude to the memory of the deceased, as on a former occasion, when called upon to address the Society in public, his imperfect knowledge of its early history had led him to overlook the distinguished part which Dr. Greene had taken in the formation and in the early nurture and guidance of the Society.

It will be gratefully remembered by us all, that our associate, feeble as was his health at the time, united with us on that occasion in the celebration of our thirtieth anniversary. Who can doubt that a nature less noble than his would have seen, in the omission here referred to, a just cause for displeasure as well as surprise. But the large heart of our associate was too deeply interested in the *good results* of the zeal and liberality in which he had so earnestly shared to be much concerned about any apportionment of the honors so justly due to himself and the other founders and early friends of the Society. Soon after this occurrence, his usual kindly smile and cordial greeting gave touching proof that the much-regretted omission was as fully and freely forgiven as it had been unconsciously and innocently made.

Without attempting a review of the scientific attainments and services of Dr. Greene, for which only the intimate and honored associates of his labors would be qualified, Professor Rogers begged simply to bring to the minds of the Society two points in the life and character of their late friend and associate, from which, as he thought, the wealthy and the learned here and everywhere might reap instruction.

It is not often that the possessor of a liberal fortune is found giving his heart and time to the labor of scientific studies, which, however ennobling and replete with the purest of enjoyments, have, as we know, nothing in sympathy with the luxurious ease and brilliant excitements of what is called society. It is true that in the higher civilization to which the world is advancing, it may be confidently expected that the cultivation and promotion of knowledge and the nurture of all good enterprises will be recognized as the duty, and will become the noble aspiration of all whose wealth offers them at once the leisure and the facility for such tastes and labors. Indeed, we already see among the most advanced communities bright auguries of this lofty social development, and in our city and State we may proudly point to many an example of affluence ennobled by large and profound culture, as well as by unstinted liberality in support of education and whatever else conduces to the happiness and progress of our race. Yet, it must be confessed that such tastes and labors as marked the life of our late colleague are still the exception, rather than the rule, and we are therefore especially called on to honor the memory of him who has furnished so beautiful and inspiring an example of them.

But qualities still more rare than that here alluded to characterized the pursuits and conversation of our late colleague. No one could fail to remark his singular freedom from the ambitious impulses which, while they stimulate the labors of men of science, so often dim the clear beauty of their aspirations for what is true and beneficent. With him the love of knowledge, as gathered in the fields and in his precious library and herbarium, was a sufficing incentive and adequate reward. Delighting to store his mind with the beautiful truths gathered from the ample sources around him, and ever ready to help others devoting themselves to kindred branches of inquiry, and indeed to any scientific pursuits, his *singular modesty* shrunk from the least public exhibition of his various knowledge, and, in the eyes of those who knew his solid and diversified culture, gave to his social character its most peculiar and winning charm.

Such were some of the services and characteristics of our late colleague, for which we owe him the tribute of our respect and reverence; and in testimony of which Professor Rogers concluded by submitting the following resolutions: —

1. *Resolved*, That while it is the duty of the Society to hold in grateful recollection all who at any time may have participated in its labors or helped to enlarge its means of scientific usefulness, it is under especial obligations to honor the memory of the founders and early patrons of the Society, whose earnest zeal gave the first strong impulse to the pursuit of Natural History in this community, and whose liberal contributions and fostering care laid the foundation for those labors which have won for the Society an honorable place in the history of scientific investigation.

2. *Resolved*, That the Society, while deeply regretting the loss which it has sustained in the death of its late associate, Dr. Benjamin D. Greene, has a sad pleasure in placing on record an expression of its grateful and enduring reverence for his memory as one of the most zealous of its founders, as its first acting President, and as one of the most liberal of the patrons and co-workers of the Society.

3. *Resolved*, That in expressing our sense of the great value of the services of our late associate to this Society, and of his worth as a cultivator and promoter of Natural Science, we would dwell with affectionate interest on the gentle graces of character for which he was remarkable, and especially on the shrinking modesty and reserve which veiled so beautifully the knowledge and culture they were unable to conceal.

4. *Resolved*, That the Secretary be directed to transmit a copy of these resolutions to the family of the deceased.

The resolutions were unanimously adopted.

On motion of Dr. Gould, it was voted, —

That a Memorial of his Life would have an important influence on the interests of Science; and that Rev. R. C. Waterston be requested to prepare such a Memorial, with a view to its publication under the auspices of the Society, if agreeable to his family.

Professor Rogers read a letter from Joshua Bates, Esq., of London, presenting to the Society a cast of the Megatherium in the British Museum. The thanks of the Society were voted for this valuable donation.

Mr. W. G. Binney exhibited a map of North America north of the Rio Grande, illustrative of the distribution of the Land Shells, and made the following remarks thereon: —

As regards the geographical distribution of the terrestrial Mollusks of North America, judging from the very limited material at our disposal, there appear to be three distinct Provinces, which are again subdivided into Regions. These are shown in the following table: —

I. The Pacific Province, comprising a narrow strip between the Sierra Nevada and the Pacific Ocean, extending through all of our Pacific States.

II. The Central Province, extending from the Sierra Nevada to the most eastern range of the Rocky Mountains and thence to the Rio Grande.

III. The Eastern Province, comprising the remaining portions of the continent, and subdivided into, —

(*a.*) *The Northern Region*, bounded on the south by a very irregular line, apparently commencing at the Atlantic Ocean, running along Chesapeake Bay and the Potomac River to the Alleghanies, then along that chain north-easterly to Lake Champlain, thence south-westerly through the chain of great lakes, then westerly to the mountains. Its western boundaries are unknown north of 50°.

(*b.*) *The Interior Region*, stretching from the last-named to the alluvial regions of the Atlantic and Gulf, and bounded westerly by the Rocky Mountains. It includes also within its borders the distinct subregion of the Cumberland tableland.

(*c.*) *The Southern Region*, comprising the whole alluvial region to the Rio Grande, and including two very distinct subregions, the Texan and Floridan.

The number of species found in these several Provinces and Regions, the number of individuals in each, and many other interesting questions, will form the subject of a future paper.

Professor Agassiz alluded to a remarkable feature in the distribution of the fresh-water fishes of Europe: that the fishes of the head-waters of the three great rivers, the Rhine, the Rhone, and the Danube, were the same, while those the lower waters differed not only from one another, but also from those of the sources.

Mr. F. W. Putnam remarked that the fresh-water fishes of North America were generally more limited in their distribution than the mollusks mentioned by Mr. Binney, although there were several species that extended over the whole region from Texas north to the Saskatchawan, and east to the Atlantic. *Perca flavescens*, *Pomotis vulgaris*, and *Boleosoma Olmstedii*, are examples. The more limited districts or faunæ, within this region are, 1st, The waters of the Upper Mississippi and Missouri; 2d, the Arkansas and its tributaries; 3d, the Lower Mississippi and south-west to the Rio Grande; 4th, the waters of the Southern Atlantic States; 5th, the Ohio and its tributaries; 6th, the Northern Atlantic States; 7th, the Great Lakes, including, in all probability, Lake Champlain and some of the larger lakes in Maine.

Mr. Putnam was led to the supposition of there being a "Great-Lake" fauna from the study of the *Catostomi* and *Cyprini*, having carefully compared specimens of several species from Lake Richardson and Lake Champlain with those of Lake Superior, and found them identical.

Of the fishes of the Pacific slope of the Rocky Mountains he could say but little, except that so far as he knew they were specifically distinct from those of the Atlantic slope.

With the exception of a well-marked Arctic fauna, the fishes north of the States are not sufficiently known to warrant any conclusions.

Mr. S. H. Scudder, in referring to Mr. Binney's remarks, said that the study of the geographical distribution of insects in America did not prove the boreal portions to be one indivisible province, but that different species were found to inhabit the extremes and the centre of the district. He alluded further to the European character of the Lepidopteran fauna of California, where, in antagonism to the other portions of America, there were found to be a great abundance of *Lycænidæ*, and an almost total absence of *Teriades*.

Professor Agassiz observed, from the dissimilarity of results arrived at in the different groups, that too much confidence should not be placed in conclusions obtained from a study of a single group only.

Dr. O. W. Holmes exhibited a microscope-stand for which he claimed certain advantages, and which he employs in his demonstrations:—

The base is of black walnut, supporting an upright flat portion of the same wood, with two crotches in which the somewhat heavily-loaded tube rests, inclined at an angle of thirty degrees from the horizontal. The adjustment is by rotation of the large shade disc, a pin projecting from which rests against the slightly-inclined extremity of the upright support, and is according to the general plan long employed by him. The stage is of iron, eight inches long, and rests against the flat ends of a horse-shoe magnet. It turns on an edge a little to the left (or right, if preferred) of the middle, so that the up and down motion is a radial one, while the lateral motion is sliding. An achromatic condenser and diaphragm of the simplest construction are brought close to the stage. The direct light of a kerosene lamp, which is brought as near as possible to the achromatic condenser, is preferred for illumination. When daylight is used the following is the arrangement: A plano-convex lens is mounted in a deep, open frame, and may be thus used as a magnifier or a bull's-eye. When a reflector is wanted, two round pieces of plane mirror, fastened back to back, are placed in the frame, so that one of them shall lie against the plane side of the lens. This contrivance gives us a plane mirror on one side, and a combination practically equivalent to a concave mirror on the other. The instrument is so arranged as to be very easily packed and handled. Dr. Holmes claims that it is perfectly solid, simple in management, gives a brilliant and readily adjusted illumination, especially with artificial light, has no machinery which can get out of order, and can be constructed very cheaply. The idea of the magnetic stage is not original, but the arrangement of it is new, embodying the radial movement first used, he believes, by himself, in a microscopic stage. He has for some years used instruments of his contrivance resembling this in many points, with satisfaction, but presents this model as more simple than and as effective as those he has previously employed. It is specially adapted for the higher magnifying powers.

November 19, 1862.

The President in the chair.

Mr. A. E. Verrill presented a paper entitled, "Review of the Polyps of the Eastern Coast of the United States, with descriptions of new and imperfectly known species."

Dr. J. Wyman gave an account of recent observations on *Penta-*

stoma (Linguatula, Rudolphi) armillata, Wyman, which infests the lungs of the *Python Sebæ*, of Africa. This species of Entozoon was first described in the Journal of the Boston Society of Natural History, Vol. v., p. 294. To the description there given, the following particulars are added: —

The number of individuals found in the lungs of the specimen of Python here noticed was six, all but one of which were females, and the longest measuring six inches in length. The form of the females is cylindrical, somewhat flattened on the under side, and gradually diminishing from the middle backwards. The tegumentary rings are large, prominent, and fleshy, widely separated, and placed a little obliquely on the body; eighteen of them are well defined; four more are contained in the head, and scarcely to be distinguished from each other. The hooks, four in number, are arranged in a curved line which is concave upwards, the mouth being in the middle of the line; and above it, on the foremost part of the head, are two prominent papillæ, slightly separated from each other. The muscular system consists of bands of longitudinal fibres, separated by narrow intervals, except on the middle line beneath, where there is a wide space without such fibres, and through which the viscera are easily seen. The genital orifice is in front of the anal.

The *male* was much smaller, only 1.84 inch in length, of an elongated conical shape, regularly tapering to a point from the head backwards. There are only fourteen distinct fleshy rings, and four more in the head but imperfectly defined. Besides the two papillæ on the top of the head, as seen in the female, there are two others on each side, one over each of the hooks.

Van Beneden, in his description* of *P. proboscidea*, describes the testis as being *beneath* the intestine; — in *P. armillata* both ovary and testis are *above*, or on the dorsal side of, the intestine. In the female the spermatheca is of a spherical shape, instead of being cylindrical, and ending in an oval pouch as in *P. proboscidea*. Van Beneden has given the embryology of this genus, and shown its affinities with the Lerneans.

Mr. A. Agassiz exhibited drawings of a new genus of *Physophoræ*. It is closely allied to *Halistemma* Huxl. and *Agalmopsis* Sars. The swimming bells are arranged in two rows; in the largest perfect specimens found there were not more than four on each side; they resemble those of Agalmopsis. The tentacles are of three kinds — clusters of long, slender threads, which they throw about in every possible direction, having club-shaped appendages without filiform terminations; the second kind are clusters of short, corkscrew-shaped

* Mem. Acad. Roy. des Sc. Belges, T. xv. p. 188.

tentacles, covered with a pavement of lasso-cells for their whole length, as in the club of the long tentacles; and the third kind of tentacle, which is always found at the base of the Hydrocysts, as Huxley calls them, are perfectly simple, thread-like appendages, with an occasional cluster of lasso-cells like small warts. From the observations Mr. Agassiz had made about the development of this genus, he was inclined to believe that the Hydrocysts became separated, — that a float was formed at the extremity which was formerly attached. Below this float, swimming bells, deckstücke, tentacles, Hydræ, soon made their appearance, and thus young were formed, precisely in the same way as those which were developed from the eggs. Although he had never seen them separate, yet he had frequently found Hydrocysts still attached with strong constrictions at the base, in which an oil bubble had become separated into a distinct cavity by the folding of the walls. These Hydrocysts, thus attached, could in no way be distinguished from young specimens which were found floating about, and which afterwards developed in confinement to adult specimens. Hence strong probability that by the separation of these Hydrocysts we have in Physophoridæ a mode of development similar to the budding of some genera of Hydroids, in addition to the development by sexual reproduction. In jars in which adult specimens had been placed these Hydrocysts were frequently found after they had separated. On account of their small size they may however have escaped notice at first, and been introduced with the adults. This species is quite small, never growing to more than two or three inches. Specimens of that size had the reproductive organs quite well developed. This species appears to be nocturnal, as not a single specimen was ever taken during the daytime: scarcely a night passed while fishing for them without finding several. He would propose for this species the name of *Nanomia cara*. It is found at Nahant during the summer and fall. This is the first free Hydroid found north of Cape Cod, and, if we except the occasional washing ashore on the Cape of specimens of *Physalia arethusa* Til., brought by the gulf stream, the only species known to inhabit the coast of New England. A more detailed account of this interesting Hydroid, with figures and its embryology, will shortly be published.

On motion of Dr. A. A. Gould it was voted that the names of all persons who have contributed toward the erection of the new building the sum of one hundred dollars and upwards, be entered on the Records of the Society as Patrons.

Mr. Thomas MacFarlane, of Acton Vale, C. E., was elected Corresponding Member.

Mr. George H. Powers, of Boston, and Messrs. J. A. Allen and W. H. Niles, of Cambridge, were elected Resident Members.

December 3, 1862.

The President in the chair.

Dr. Pickering referred to two *Esquimaux* now on exhibition in this city. From their low stature, florid complexion, broad, flat countenance, with the profile very slightly projecting, one would be disposed to reject the idea of affinity with the general aboriginal population of this continent. But the sea-going tribes of Northwest America, of which he had seen the Chinooks, are intermediate in aspect; having very generally a lighter complexion, and less prominence of profile, than the interior or hunting tribes. He had remarked, that the strange custom among the Chinooks of flattening the skull produced "unusual breadth of face;" and he now thought that the purpose aimed at may have been the Esquimaux standard of personal beauty. In addition to his published opinion that, with one minor exception, America was originally peopled from the Northwest by the sea-going tribes following the coast, personal inspection now satisfied him that the Esquimaux are Mongolians, and that there is no distinct physical race of man in the Arctic regions.

Mr. S. H. Scudder gave an account of the structure of *Pogonia ophioglossoides* Nutt., and of the probable manner in which its fertilization is effected: —

The plant is of special interest, since it belongs to the only group of Orchids of which Darwin in his recent work has given no account. The flower is thrust out at nearly right angles to the upright stem, the column being a little raised from the horizontal; the labellum is spatulate, heavily crested and fringed, the distal half depending somewhat; the shield-shaped, stigmatic surface is situated at the upper front portion of the column, which is surmounted by a pretty deep clinandrum, with an elevated, jagged border; and to the hind part of this, the curiously shaped, auriculated anther is attached as a lid by a narrow, elastic hinge, which compels the anther-lid to remain deeply seated in the clinandrum, whose thin, jagged edges border it on every side. Upon the under surface of the anther-lid, as it thus lies, are situated the two bunches of pollen, confluent, forming a prominent oval mass; they are not pollinia, that is, they have no caudicle and disc, but are only pollen-masses, completely sessile, which a slight touch

may remove. The thin edges of the clinandrum do not border the anther-lid equally on every side, for if it were so the raising of the lid would brush the prominent pollen-masses against the front edge, causing the pollen to fall useless into the bottom of the pit, and thus render the plant self-destructive; to obviate this, the edge of the clinandrum in front is hollowed and thrust forward slightly, leaving sufficient room for the passage of the pollen-masses at the raising of the lid; the resulting space is not, however, left completely open, but, as if to prevent the accidental removal of the pollen-masses, the lower front edge of the anther-lid is furnished with a row or fringe of elongated papillæ, quite effectually closing the opening. So by this means, although the masses of pollen and the stigmatic surface are in close contiguity, they are entirely prevented by the exact structure and sculpture of the parts of the flower from ever coming in contact with one another except through foreign aid; for the pollen-masses are seen to be completely packed away in a deep pit, pressed down by a ponderous lid, whose elastic hinge will not allow its elevation without considerable force: and should by any possibility a portion of the pollen escape through the opening in front, really effectually closed by the fringe, it would drop, not upon the stigmatic surface, but upon the labellum, opposite to it.

By what means does an insect effect the fertilization of this plant? Its probable action may be readily and successfully imitated. Flying to the flower intent upon its sweets, it would alight upon the labellum, and, creeping in, would strike its head and back first against the protruding anther-lid, only pressing it down more tightly, effecting nothing, and then against the stigmatic surface. The passage into the flower is narrow, allowing no room for anything but a very small insect to turn round in, so that no sooner does the insect withdraw itself backward, than the top of the back and of the head striking, as it almost infallibly must, against the front of the anther-lid (which at its upper portion projects forward somewhat, in order the more readily to catch the passing head), raises it more and more with its continued withdrawal, rolling the outer and under surface of the lid against the upper and front portion of the head of the insect, till it has passed, when the lid snaps back to its original position, leaving the pollen-masses adhering to the upper portion of the front of the insect's head; — or if only a portion of the pollen be removed, the lid, being closed again, is ready for the services of the next visitor. The insect flies to another flower, and, striking with the top of the head plump against the viscid stigmatic surface, leaves the pollen glued to it, and thus fertilization is ensured.

There are several minor points of structure in the plant, all seeming to aid in this special mode of fertilization through the agency of

insects. The prominence of the front of the anther-lid has already been referred to; besides this, the fringe upon the under edge of the lid in front is directed slightly outward, and may assist by becoming entangled or interlocked in the hairs of the retreating insect, and more surely effect the raising of the lid; the edges of the column on either side of the stigmatic surface project outward a little, making a shallow channel for the better guidance of the insect toward it; and it does not seem too fanciful to suppose that the heavy beard upon the labellum, through which the insect must pass with difficulty, may cause it to walk through it as it were on tiptoe, in order to raise its abdomen high above the obstacle, and therefore to strike more surely the stigmatic surface on entering and the anther-lid on retiring. There is besides another curious fact: on raising the lid, it will be seen that it does not open altogether as we should expect it, but is thrust forward a little, apparently through some elasticity of the hinge, so that the pollen-masses, when the lid is partially open, are found to reach a position nearly as far forward as the projecting front of the lid did when closed, although on the removal of the pressure it will revert to its original position; this again seems to lend its aid in the same direction.

Out of nine flowers examined on the first of August at the White Mountains, N. H., seven had both pollen-masses and stigmatic surface intact; the other two had each their stigmatic surface smeared with pollen, and the pollen-masses, in one wholly, in the other partially, removed. The plant very generally has but a single flower, so that, by what has been stated, it will be seen that, with rare exceptions, no plant is ever fertilized by its own pollen. It is stated by Prof. Gray in his Manual of Botany that the *Arethusiæ*, to which group *Pogonia* belongs, all have the fertile anther like a lid over the column, and that this lid after a time is deciduous; it may be questioned on this account whether it might not here prove to be directly capable of self-fertilization; but in one of the plants examined, in which the pollinia had been removed, the stigmatic surface smeared with pollen, and the petals of the flower quite withered, the lid still remained, and no loss of elasticity in the hinge was noticed, so that the anther probably does not fall off till a period subsequent to the fertilization of the plant. In another plant not yet showing any signs of decay, where the pollen had been partially removed, that which remained was much discolored, and even seemed to show signs of decay, as if but a temporary exposure to the atmosphere were injurious to it.

This Orchid agrees more nearly with *Dendrobium chrysanthum* than with any other mentioned by Darwin, but differs peculiarly from that

in altogether wanting a rostellum,* a second of the characteristic features shared by most Orchids which is wanting in this plant, the pollinia being the first. By noticing the peculiar action of the anther-lid in *Dendrobium*, resulting mainly from the remarkable elasticity of the hinge of the lid (or filament of the anther), we may understand better the structure of the same parts in *Pogonia*, and shall discover in the slight projection of its opening anther-lid that which, attaining its development in *Dendrobium*, forms so remarkable and important a feature in its economy.

Mr. Scudder also stated that he had noticed in the middle of the previous month the operations of the minute *Platygaster*, which attacks the eggs of the canker-worm moth, *Anisopteryx vernata* Harr. After moving round a long while in search of a suitable place to lay its eggs, using its ovipositor as a sort of feeler, the abdomen is plunged down into the space between three contiguous eggs, and the ovipositor perforates the side of one of them, out of view. The body of the insect assumes a position perpendicular to their exposed surfaces, supported in the rear by the wings, which, folded over the back, are placed against the surface behind, while the hind-legs, spread widely apart, sustain the insect on either side, and the middle pair are placed nearer together in the front; with the fore-legs dangling it remains motionless, with the exception of a slight movement of the antennæ, for some three or four minutes, after which it moves off, seldom flying, in search of another place. They were very abundant, eight or ten specimens being frequently seen upon a single bunch of eggs. This parasite was first observed by the late Mr. E. C. Herrick, of New Haven.

Prof. J. Wyman described some of the phases of development in the exterior of the human body, and pointed out some of the resemblances between the limbs of the human embryo and the permanent condition of the limbs of the lower animals. In some human embryos about an inch in length, recently examined by him, he found that the great toe was shorter than the others, and, instead of being parallel to them, projected at an angle from the side of the foot, thus corresponding with the permanent condition of this part in the quadrumana.

Mr. George D. Smith was elected Resident Member.

* It would be interesting in this connection to know whether, as in *Cypripedium*, the stigmatic surface is trifid, or, as in *Cephalanthera grandiflora*, it is bifid; the importance of the knowledge of this fact was not recognized when the examination of the fresh flowers was made.

December 17, 1862.

The President in the chair.

Mr. A. Agassiz gave an account of the changes in size of the yolk in the eggs of starfishes before segmentation commences.

Dr. J. Wyman stated that since the last meeting he had been able, through the kindness of Prof. Agassiz, to examine another specimen of Python Sebæ, and had found a single individual each of the male and female *Pentastoma* in the lungs.

He also stated that soon after a recent snow-storm, while the ground was entirely covered, he had made some microscopic examinations of the dust of the outer air, collected on plates of glass covered with glycerine. In addition to particles of mineral dust, probably that of coal ashes and of soot, he had detected spores of cryptogams, starch granules and pollen. Fragments of coniferous and other woods were also found. The objects most unexpected at this season of the year were the grains of pollen. It was suggested whether these might not have been derived from the trees, where they may have been lodged in the crevices of the bark, or other irregularities of the surface, and from time to time detached by the wind.

The Librarian called attention to the very valuable series of works upon Fungi recently purchased from the Library of Mr. C. J. Sprague.

The following persons were elected Resident Members:— Messrs. T. B. Wales, N. C. Munson, N. A. Thompson, S. P. Ruggles, Samuel Johnson, Jr., Joshua Stetson, John Simmons, Nathaniel Cummings, C. Berkley Johnson, Charles C. Little, Augustus Flagg, N. B. Gibbs, J. D. Bates, E. Dale, Benjamin S. Rotch, J. C. Cooper, Amos A. Lawrence.

DONATIONS TO THE MUSEUM.

Nov. 5. Cast of the *Megatherium* in the British Museum, by Joshua Bates, Esq. A small box of Insects from Beaufort, N. C.; nest of a *Pelopœus;* specimens of fossil coral; shell-conglomerate from Newbern, N. C.; a shell of *Glyptemys insculpta* from Littleton, Mass., by Dr. S. Kneeland; a specimen of *Aluterus* from the coast of North Carolina, by Dr. J Curtis.

Dec. 3. *Didelphis* from South America, by Dr. C. F. Winslow; *Anobium* in safflower from Brazil, by Mr. Chas. A. Andrews.

Dec. 17. Portions of the skeleton of a Porpoise from the coast of North Carolina, by Dr. S. Kneeland.

BOOKS RECEIVED DURING THE QUARTER ENDING DEC. 31, 1862.

Der Typische Frühsommer-Katarrh oder das sogenannte Heufieber, Heu-Asthma. Von Philipp Phoebus. 12mo. Giessen, 1862. *From the Author.*

On the extraction of Cobalt Oxide. By Thomas Macfarlane. 8vo. Pamph. *From the Author.*

Der Schweizerischen Universität Basel bringt zur feier Ihres Vierhundertjährigen Jubiläums die J. M. Universität zu Würtzburg ihre Besten. Gluckwunsche dar durch ihren vertreter A. Kölliker. 4to. Pamph. 1860. Leipzig. *From the Author.*

Bidrag til Kundskal om det aabne Havs Snyltekrebs og Lernæer samt om nogle andre nye eller hidtil kun ufuldstændigt kjendte Parasitiske Copepoder af J. Jap. Sm. Steenstrup og Chr. Fred. Lutken. 4to. Kjobenhavn, 1861. Pamph. *From C. F. Lutken.*

Materials for a Monograph of the North American Orthoptera. By Samuel H. Scudder. 8vo. Pamph. Cambridge, 1862. *From the Author.*

On the Footprints of Limulus. By J. W. Dawson, LL. D. 8vo. Pamph. *From the Author.*

Uber das Wanken der Locomotiven. Von Dr. G. Zeuner. 4to. Pamph. Zurich, 1861. *From the Author.*

Descriptions of New Species of Fossils. By Prof. James Hall. 8vo. Pamph. Albany, 1861-2. *From the Author.*

Description of a new Genus (Trypanostoma) of the Melanidæ, and of forty-five new Species. Description of ten new Species of Unionidæ of the U S. Description of two new Species of Exotic Uniones and one Monocondylæa. Description of a new Genus (Goniobasis) of Melanidæ, and eighty-two Species. Description of eleven new Species of Melanidæ of the U. S. By Isaac Lea, LL.D. 8vo. Pamph. Philadelphia, 1862. *From the Author.*

Treatise on Turpentine Farming. By G. W. Perry. 12mo. Newbern, N. C., 1859. *From Dr. S. Kneeland.*

On the Saliferous Rocks and Salt Springs of Michigan. By Alexander Winchell. 8vo. Pamph.

Descriptions of Fossils from the Marshall and Huron Groups of Michigan. By Alexander Winchell. 8vo. Pamph. 1862. *From the Author.*

Memorial Volume of the First Fifty Years of the American Board of Commissioners for Foreign Missions. 8vo. Boston, 1862.

Miscellaneous pamphlets relating to the Missions. *From the Secretaries of the A. B. C. F. M.*

Der Zoologische Garten. Nos. 1-6. 8vo. Pamph. 1862. Frankfurt, A. M.

Archiv für Naturgeschichte. Nos. 5, 6. 1861. No. 1. 1862.

Elfter Jahresbericht der Naturhistorischen Gesellschaft zu Hannover. 4to. Pamph.

Sitzungsberichte der K. Akademie der Wissenchaften. Band 45. Zweite Abtheilung. Heft 1-4. Band 45. Erste Abtheilung. Heft 1, 2. 8vo. Wien, 1862.

Neunter Bericht der Oberhessischen Gesellschaft für Natur-und Heilkunde. 8vo. Pamph. Giessen, 1862.

Memoirs of Geological Survey of India. Palæontologia Indica. By Thomas Oldham, LD. D. 4to. Calcutta, 1861.

Memoirs of Literary and Philosophical Society of Manchester (England). Vol. I. 8vo. 1862. Vol. II., pp. 1-268. Also Rules of the Society. 8vo. Pamph. 1861.

Proceedings of the Royal Geographical Society of London. Vol. VI., Nos. 2, 4. 8vo. Pamph. 1862.

Transactions of the Literary and Historical Society of Quebec, Vol. IV. Appendix. Vol. V., No. 1. 8vo. Pamph.

Canadian Naturalist and Geologist. Vol. VII., No. 5. 8vo. Montreal, 1862.

Canadian Journal of Industry, Science and Art. Nos. 41, 42, Sept. Nov., 1862.

Annual Report of Board of Regents of the Smithsonian Institution for 1861. 8vo. Washington.

Forty-fourth Annual Report of the Trustees of the New York State Library. 8vo. Pamph. Albany, 1862.

Silliman's American Journal of Science and Arts. No. 102, for Nov., 1862.

Transactions of the American Philosophical Society. Vol. XII. Parts 1, 2. 4to. Philadelphia, 1862.

Proceedings of the American Academy of Arts and Sciences. Vol. V. 8vo. Boston, 1862.

Journal of the Academy of Natural Sciences of Philadelphia. Vol. V. Part 2. 4to.

Proceedings of the Academy of Natural Sciences of Philadelphia. Nos. 7, 8, 9, July-Sept., 1862; also No. 9, Sept. 1862.

Proceedings of the Essex Institute. Vol. II., pp. 353 to end of vol. Salem, 1862.

Proceedings of the Entomological Society of Philadelphia for Aug. and Sept., 1862. *By exchange.*

Annals and Magazine of Natural History. Nos. 58-60, for Oct.-Dec., 1862. 8vo. London.

Quarterly Journal of Geological Society. No. 72, for Nov., 1862. 8vo. London. *From Courtis Fund.*

Among the Pines; or, Life in Secession Time. By Edm. Kirke. 12mo. New York, 1862.

America before Europe. By Count Agénor de Gasparin. 12mo. New York, 1862.

Life and Letters of Washington Irving. By Pierre W. Irving. Vol. II. 12mo. New York, 1862.

History of Friedrich the Second, called Frederick the Great. Vol. III. By Thomas Carlyle. 12mo. New York, 1862.

History of Greece. By Geo. Grote, Esq. 12 vols. 12mo. New York, 1861. *Deposited by the Republican Institution.*

January 7, 1863.

The President in the chair.

Dr. Wm. Stimpson presented a paper entitled, "Monograph of the Genus Callinectes, by Albert Ordway."

Prof. H. J. Clark read a paper under the title, "Prodromus of the History, Structure and Physiology of the order Lucernariæ."

Mr. S. H. Scudder made a few remarks on the history of the parasite (*Ophion cecropiæ* Harr.) which attacks the Hyalophora cecropia