PROCEEDINGS

OF THE

ELLIOTT SOCIETY OF NATURAL HISTORY

OF

CHARLESTON, SOUTH-CAROLINA.

VOL. I.

NOV. 1853—DEC. 1858.

CHARLESTON:
RUSSELL & JONES.
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1859.

NOTICE.

Hereafter, the proceedings of this Society will be regularly published, and copies forwarded to all learned bodies, in exchange for their own transactions.

ERRATA.

P. 22, line 10, *for* Mannorata, *read* Marmorata.
" 22, " 11, " tergiminus, " tergeminus.
" 26, " 24, " Peifferianum, " Pfeifferianum.
" 31, " 12, " parchment, " parchments.
" 34, " 18, " frustrum, " frustum.
" 35, " 36, " " " "
" 36, " 2, " carapace, " carapax.
" 55, " 6, " 1857, " 1851.
" 59, " 10, " otolithes, " otoliths.
" 66, " 16, " Tubulariœ, " Tubulariæ.
" 68, " 6, " fissiparious, " fissiparous.
" 69, " 25, " scyphon, " siphon.
" 70, " 16, " " " "
" 70, " 28, " sunction, " suction.
" 71, " 9, " scyphons, " siphons.
" 71, " 39, " " " "
" 71, " 41, " " " "
" 72, " 21, " " " "
" 72, " 27, " deposites, " deposits.
" 75, " 17, " appear from, " appear projecting from.
" 75, " 19, " chrystals, " crystals.
" 75, " 22, " " " "
" 75, " 35, " Discophoræ, " Discophora.
" 86, " 18, " " " "
" 89, " 27, " pendents, " pendants.
" 89, " 32, " " " "
" 89, " 41, " syphons, " siphons.
" 90, " 20, " pendents, " pendants.
" 90, " 29, " constructions, " constrictions.
" 90, " 35, " chrystals, " crystals,
" 98, " 29, *supply* at *between* feet *and* the.
" 101, " 22, *for* lea, *read* lead.
" 104, " 36, *after* Löven, *supply a comma.*
" 112, " 28, *dele* *.
" 114, " 12, " *the comma after* analogy.
" 115, " 27, *for* 4ieme, *read* 4me.
" 116, " 31, *after* mouth *supply* and.
" 121, " 32, *for* Aeginidæ, *read* Aequoridæ.
" 125, " 18–19, *for* Corynedendrium, *read* Corydendrium.
" 125, " 27, *after* Epenthesis, *supply* Phortis.
" 125, " 28, *for* Dinamena, *read* Dynamena.
" 137, " 17, " 3ieme, " 3me.
" 160, " 16, " fig. 10, pl. 1a, " pl. 10, fig. 1a.
" 163, " 34, *for* Bougainvillia, *read* Bougainvillea.
" 167, " 24, " *ramosa*, " *ramosum.*
" 172, " 32, " two's, " twos.
" 175, " 7, " Physophidæ, " Physophoridæ.
" 184, " 18, " proboscidi-form, " proboscidiform.
" 184, " 30, " medusa, " medusæ.
" 189, " 33, " concretionary, " marginal.
" 190, " 29, " exhibit, " exhibits.
" 196, " 7, " rootsof, " roots of.

P. 196, line 20, *for* 1865, *read* 1856.
" 198, " 27, " Dinamena, " Dynamena.
" 199, " 8, " universally, " uniserially.
" 201, " 10, " proboscidifrom, " proboscidiform.
" 201, " 25, " *pacciferum*, " *bacciferum*.
" 202, " 34, " pcl " pol--
" 204, " 32, *for* proboscidi from, *read* proboscidiform.
" 205, " 7, " tubuli form, " tubuliform.
" 205, " 24, " proboscidi form, " proboscidiform.
" 210, " 9, " *mediterranea*, " *Mediterranea*.
" 215, " 2, " Depurena, " Dipurena.
" 215, " 20, " sub-generictypes, " subgeneric types.
" 215, " 25, " analagous, " analogous.
" 217, " 20, " T. Titania and T. apicata, *read* S. Titania and S. apicata.
" 220, " 44, " f', *read* f′.
" 222, " 10, " MELLER, *read* MUELLER.
" 224, " 26, " honorary, " ordinary.
" 224, " 17, " *gigantea*, " *giganteum*.
" 226, " 5, " breath, " breadth.
" 226, " 23, " pairs, " hairs.
" 226, " 39, " spine, " spines.
" 229, " 17, " Graptoliteis, *read* Graptolites.
" 230, " 40, " Paleontologei, " Paléontologie.
" 232, " 8, " is, " in.
" 236, " 11, " Paliontologie, " Paléontologie.
" 239, " 35, " Eudendriun, " Eudendrium.
" 240, " 31, *after* President, *supply* L. R. Gibbes.
" 241, " 31, *for* under lying, *read* underlying.
" 255, " 16, " .45 in., " .045 in.
" 255, " 33, " equi-distant, " equidistant.
" 257, " 37, " descended, " descend.
" 261, " 23, " Muller, " Müller.
" 261, " 24, " Kolliker, " Kölliker.
" 263, " 7, " avoidal, " ovoidal.
" 264, " 6, " organism, " organisms.
" 265, " 39, *supply* be *after* direction.
" 269, " 39, *for* cxtent, *read* extent.
" 272, " 14, " Collefic, " College.
" 285, " 3, " J. R. Mordecai, *read* C. F. Panknin.

The following specific names are erroneously headed with capitals, on the pages referred to:

P. 3, line 27, Strix flammea.
" 22, " 10, Calappa marmorata.
" 25, " 18, Ardea nycticorax.
" 28, " 21, Carcharodon megalodon.
" 29, " 14, Ostrea edulis.

The Reader's attention is particularly called to the following corrections:

Mr. William Jervey was elected an *ordinary*, not an honorary member, p. 224.

Page 285.—Mr. C. F. Panknin presented the stuffed specimens of European Weasel and Fox. Mr. J. R. Mordecai presented a specimen of the snake-nut of Demerara.

Page 255.—By the misprint of .45 in. for .045 in., the proportions of the embryo are completely misrepresented.

PROCEEDINGS

OF THE

Elliott Society of Natural History,

OF

CHARLESTON, SOUTH-CAROLINA.

NOVEMBER 1st, 1853.

OFFICERS ELECTED.

President.

Rev. Dr. JOHN BACHMAN.

Vice-Presidents.

Prof. L. R. GIBBES.
Prof. E. GEDDINGS.
Prof. S. H. DICKSON.
Prof. JAMES MOULTRIE.
Prof. WM. HUME.
Dr. EDMUND RAVENEL.

Secretary.

Prof. F. S. HOLMES.

Treasurer.

Dr. FRANCIS T. MILES.

Curators.

Dr. S. W. Barker.
Dr. Thos. L. Burden.
Dr. J. P. Chazal.
Dr. L. A. Frampton.
Dr. P. C. Gaillard.
Dr. J. F. M. Geddings.
John McCrady, Esq.
Dr. M. Michel.
Dr. F. T. Miles.
Dr. F. Peyre Porcher.
Dr. St. Julien Ravenel.
Henry W. Ravenel, Esq.
W. Wragg Smith, Esq.

President Bachman, on taking the chair, asked leave to express his thanks to the Society for the honor of being appointed their President, and as an introduction to the pursuits which are the special objects of cultivation by this Society, gave an interesting retrospective sketch of Natural History in South Carolina, with short memoirs of the early cultivators of the science.

On motion of Prof. Wm. Hume, the President was requested to write out the details of his remarks made this evening, and that they be published with the proceedings of the Society.

Members Elected.

Hon. Wm. Aiken.
Hon. T. L. Hutchinson.
Thomas B. Bennett, Esq.
Rev. F. Carr.
Col. Jos. D. Aiken.
Robert Hume, Esq.
Dr. J. B. Waring.
Prof. J. E. Holbrook.

Contributions to Museum.

Prof. S. H. Dickson presented a fine specimen of *Menopoma*, from Buncombe County, North Carolina; two Bats from Mammoth Cave, Kentucky; and one specimen *Astacus Bartoni*, from Buncombe, North Carolina.

Rev. E. A. Wagner presented specimens of Ants, which have for many years infested the library of the Protestant Episcopal Society of Charleston. Accompanying the specimens is a book showing their destructive ravages.

Mr. Arminius Oemler, of Savannah, Georgia, presented, through the Secretary, a small case containing about fifty specimens of Butterflies, from Germany.

On motion of Professor Holmes, a committee was appointed, by the Chair, to obtain a copy of the bust of the late Stephen Elliott, Esq., for the use of the Society.

The committee of Curators was charged with providing a common Seal for the Association.

JANUARY 18TH, 1854.

Vice-President L. R. Gibbes in the chair.

Contributions to Museum.

Dr. Burden presented two specimens of young reptiles supposed to be *Menobranchus punctatus*, L. R. GIBBES, from St. George's Parish.

Robert Hume, Esq.—Nest of the Bottle-Wasp.

Prof. L. R. Gibbes—*Sorex*, from Santee.

Prof. Poey, of Cuba—Skin of *Iguana tuberculata.*

Prof. F. S. Holmes—Young of Shark, *Scymnus*, in spirits, with umbilical chord and placenta? The mother from which these specimens were taken was caught in Charleston harbor in July. She had nine young ones.

Dr. Edmund Ravenel—Egg-cases of a Gasteropod, from Coast of Florida.

Dr. T. P. Cleveland—Mastodon's Tooth, Florida.

Dr. John P. Barratt—Insects, in spirits, and two specimens of Carolina Parrot, *Psittacus Carolinensis.*

Professor Poey—*Solenodon paradoxum*, BRANT. Vulgo *Almigui*, Cuba.

Prof. L. R. Gibbes—*Menobranchus punctatus*, in spirits, and skeleton of the same.

Dr. Thomas Y. Simons—Bald or white headed Eagle, changing plumage.

Dr. Samuel Wilson—Two Marbled Godwits, and six Sandpipers.

Rev. J. Stuart Hanckel—Barn Owl, *Strix Flammea.*

Dr. O. L. White—Two specimens of the same; young birds, four months old.

Henry W. Ravenel, Esq.—Viviparous Fish, from Barnwell District.

Dr. F. Y. Glover—Skeleton of a Black Bear, killed on his plantation, Pon Pon, S. C.

Edmund Ruffin, Esq., of Virginia—Box of Miocene Shells.

Robt. F. Gyles, Esq.—Nutmegs, with shell and mace.

The Secretary read the following extract from a letter received by him from Professor Agassiz, dated Cambridge, January 9th, 1854.

"As a preliminary step in preparing a monograph of the fossil sharks of the tertiary of South Carolina, from the fine set of specimens you have placed in my hands, I have carefully examined all the Sharks and Skates living upon the coast of the United States. Eight genera, not contained in Dr. Storer's synopsis, have been thus added to our fauna, with a number of species. The first result obtained in comparing these with the fossils, both of Europe and this country is, that the present Shark fauna, of North America, has the same *antique character* which I have already noticed in other families; or, in other words, that the living Sharks and Skates, of North America, resemble those of the *tertiary period* more than they resemble those *now living along the coast of Europe.* Another result of the close affinity of the tertiary Sharks with those living upon the coast of the United States will be the necessity of making more alterations in the determinations of the fossils as given in the "Poissons Fossiles." *Lamna contortidens*, for instance, is an *Odontaspis*, of which I know *two living species now on this coast*, yours and one observed in large numbers, last summer, at Nantucket."

Prof. L. R. Gibbes presented a paper for publication in the Proceedings, on the *Genus Porcellana*, with drawings of six species. Referred to Curators.

The committee appointed to procure a copy of the bust of Stephen Elliott, reported progress.

The Secretary informed the Society that a competent draughtsman was engaged to prepare a copy of the bust of the late Stephen Elliott, for the seals of the Society.

Members Elected.

Hon. M. King.	Rev. Dr. Lynch.
John Russell, Esq.	Wm. McKenzie Parker, Esq.
Dr. Wm. T. Wragg.	Jos. T. Caldwell, Esq.

APRIL 11th, 1854.

Vice-President L. R. Gibbes in the chair.

The Chair informed the Society that the meeting had been called for the purpose of appointing delegates to the Commercial Convention, now assembled in this city.

Resolved, That the Chair appoint four delegates to represent this Society in the Convention of the South and Southwestern States, now in session in Charleston, and that they be requested to urge upon that body the importance of making thorough Geological surveys of the above named States, in order to the full development of their mineral resources, etc.

The following gentlemen were appointed: John McCrady, Esq., Prof. S. H. Dickson, Dr. L. A. Frampton, and Prof. Holmes.

MAY 2ND, 1854.

Vice-President L. R. Gibbes in the chair.

The committee of Curators, to whom was referred Prof. Gibbes' paper on the genus *Porcellana*, recommend that it be published with the proceedings.

The Chair presented to the Society a classified catalogue of the Botanical works in his library, one hundred and sixty-seven volumes, and a list of the Zoological works in his possession, and suggested to the members the propriety of each preparing a catalogue of the books in his own library, and of depositing the same with the Secretary of this Society.

Members Elected.

Rev. C. Wallace.
Dr. E. H. Frost.
Dr. Elias Horlbeck.
Rev. E. Wagner.
Prof. Shepherd.

Correspondents Elected.

Dr. A. A. Gould.
Prof. M. Tuomey.
Prof. S. T. Baird.
Dr. W. J. Burnett.
Dr. R. W. Gibbes.
Rev. M. A. Curtis.
Charles Girard, Esq.
Charles O. Boutelle, Esq.

Description, with figures, of six species of Porcellana, inhabiting Eastern Coast of North America. By L. R. Gibbes.

A.—FRONT NEARLY STRAIGHT.

1. Porcellana macrocheles. *Plate I. fig.* 5, *natural size.*

Synonyme. P. macrocheles, Gibbes, *Pro. Am. As. Sci.*, 3d vol. p. 191. 1850.

Description.—*Body* thick, *carapax* transverse, length to breadth as three to four, convex longitudinally; *front* very slightly prominent, anterior edge nearly straight, *eyes* small, not prominent; *external antennæ* with massive basal segment, completely filling up the groove in which it is placed in the shell, and bearing on its outer angle the moveable peduncle, which is thus entirely separated from the eye; the groove is not prolonged backwards under the lateral portion of the shell as usual, but that course is marked by a fissure; the *filament* about as long as the carapax.

Anterior feet unequal, right largest in the three individuals examined; *third segment* conspicuous, subcubical, rounded posteriorly, with a projecting lamellar lobe anteriorly; *carpus* as long as the carapax, thick, subcylindrical, with anterior edge curved, lamellar, projecting, without teeth or spines; the *larger hand*, long, thick, subcylindrical, anterior edge for three-fifths of its extent straight, ciliate, with thumb falcate, acute, and finger straight, hooked at tip, with a large tooth on middle of trenchant edge; larger hand with finger is twice the length of the shell; *smaller hand*, more slender and compressed. The four *posterior feet*, with short tarsus armed with short spines crowded at the tip.

Color, whitish or flesh color.

Geo. Distr.—*Coast of South-Carolina*, first found by Dr. T. L. Burden, of Charleston, a single individual only; a few more have been since obtained by others. Readily distinguished by its straight front, and transverse subcylindric body.

Remarks.—I find that the specific name had been previously used by Pœppig, but as the species so named by him, is the same as Guerin's *P. violacea*, and this last name has priority, the specific name above used may stand.

B.—FRONT PROMINENT, TRIANGULAR, NOT DENTATE.

2. Porcellana magnifica. *Plate I., fig.* 3, *natural size.*

Synonyme. P. magnifica, Gibbes, *Pro. Amer. Assoc.*, 3d vol. p. 191. 1850.

Description.—*Carapax* with length and breadth nearly equal, smooth, polished, punctate, with traces of rugæ near the lateral edges, which are marked with a moderately distinct line, no spines in any part; *front* not trifid, moderately prominent, triangular, with a central linear depression; *external antennæ*, with moderately robust basal segment, furnished with a stout spine on the inside or side next the eye, spine stout, curved, pointing towards the eye.

Anterior feet unequal, left largest in the only individual examined; *carpus* long, about three times as long as broad, and as long as the carapax, anterior edge with three distant teeth, posterior marked with a few denticulations near the articulations with the hand; *hand* broad, flat, with thumb included sub-triangular in outline, but the lower edge, or anterior edge when folded in repose, is regularly arched from the articulation round to the tip of the finger, palmar portion as long as the carpus; *finger* and *thumb* with their opposing edges straight, without teeth, slightly hooked at tip; surface of carpus and hand shining, but roughened with a multitude of exceedingly minute granulations on the upper surface; on the lower the granulations are few and scattered and the surface comparatively smooth and polished.

Color of carapax and anterior, seen in the dry specimen, a beautiful red verging on crimson.

Geo. Distr.—*Gulf of Mexico;* a single specimen brought from Vera Cruz by Dr. Cleveland, of Charleston. Distinguished by the large size of its hands compared with the body, and the polished red surface of the carapax and anterior feet.

Remarks.—The antennæ are not represented in the figure, as they were mutilated in the specimen from which the drawing was made. The figure gives too much the appearance of longitudinal rugæ, which do not exist, as the carapax is perfectly smooth and polished.

3. Porcellana galathina. *Plate I., fig.* 1, *natural size.*

Synonymes.—Porcellana galathina, Bosc, *Hist. Nat. des Crust.*, 1e edition, vol. 1, p. 233, pl. 6, fig. 2. 1802.

Porcellana galathina, Lamarck, *Anim. sans Vert.*, 1e edition, tom. V. p. 230. 1818.

Porcellana galathina, Say, *Jour. Acad. Nat. Sci.*, vol. I., p. 458. 1818.

Pisidia Sayana, Leach, *Dict. des Sci. Nat.*, tom. xviii. p. 54. 1820.

Pisidia Sayana, Desmarest, *Consid. Gen. sur les Crust.*, p. 199. 1825.

Porcellana galathina, Bosc, *Hist. Nat. des Crust.*, 2de edit., vol. I., p. 299, pl. 6, fig. 2. 1830.

Porcellana galathina, Milne Edwards, *Hist. Nat. des Crust.*, tom. II., p. 258. 1837.

Porcellana galathina, Lamarck, *Anim. sans Vert.*, 2de edition, tom. V., p. 407. 1838.

Porcellana rugosa, Milne Edwards, *Hist. Nat. des Crust.*, tom. II., p. 252. 1837.

Porcellana sexspinosa, L. R. Gibbes, *Proc. Amer. Assoc.*, vol. III., p. 190. 1850.

Description.—*Carapax*, with length and breadth nearly equal, covered with transverse, slightly elevated but distinct piliferous ridges, giving it a well marked rugous appearance; each transverse ridge on the anterior portion subdivided by the depressions marking the regions of the carapax into three portions, a middle and two lateral, nearly continuous; hairs parallel, nearly equal in length, directed forwards, appressed to the carapax; *front* not trifid, middle portion prominent, lateral portions rounded, very slightly prominent; on each side of the front, just over the eye, there is a spine, forming, as it were, the inner angle of the *orbit*, the outer angle is also formed by a spine, short but very distinct, behind which, at a little distance, on the carapax, is another, from which a marked ridge runs backward, forming a border to the shell, but before reaching the posterior edge, turns upward and forms one of the transverse ridges on the back; *external antennæ* with a stout spine on the basal joint, *filament* three or four times the length of carapax.

Anterior feet subequal, right (frequently the left) somewhat the larger; *third segment* inconspicuous, terminated at inner anterior angle with a tooth, rugose like the carapax, upper edge spinous; *carpus* nearly as long as the carapax, with five broad subequal teeth on anterior edge, the last forming the angle at the articulation with the hand, the tooth on the third segment nearly equal to these, and appearing as the first of a series of six; outer edge of carpus with five or six small spines; *hand* subtriangular, serrate and ciliate on the lower or outer edge, rugose, as also the carpus, with piliferous lines or ridges like those of the carapax, ridges running entirely across the carpus; moveable finger prolonged and hooked at tip, closing under the other, which is also distinctly hooked.

Color, red, more intense on the piliferous lines or rugæ, the hairs grey or ash color.

Dimensions.—The figure was drawn from the largest specimen in my possession at the time; I have since seen some larger, 0.53 inch in length, 0.55 in breadth.

Geo. Distr.—*Key West*, whence it was brought me by Dr. Wurdemann in 1845; also occasionally found on *Coast of South-Carolina.*

Remarks.—Some reasons should be given for presenting the synonymy in the manner I have done, and it is requisite to make some statement of the facts on which that view is based.

As far as I can ascertain, the name *Porcellana galathina* was first used by Bosc for a new species described by him, in his Histoire Naturelle des Crustacés, published by Deterville, in 2 vols. 18mo., Paris, an X., as part of the *suites à Buffon.* A second edition of this work was published in Paris in 1830, under the superintendence of Desmarest, and this edition is the only one in my possession, or accessible to me, and from it only can I quote, without being able in every case to separate Bosc's original matter from Desmarest's additions. In this work there is a description at page 298, of "a new species of *Porcellana*, remarkable for the structure of its carapax, absolutely similar to that of *Galathea striata*, and which we will consequently call *Porcellana galathina.*" The description which follows, placed under the general remarks upon the genus and given somewhat in detail, is entirely applicable to our species, mentioning distinctly the *transverse* piliferous striæ; the only important omissions are, the spine forming the external angle of the eye, the spine on the carapax behind the eye, the number of the teeth on the anterior edge of the carpus, and the spines on its posterior edge. The figure, pl. 5, fig. 2, is like most of those in the work, very stiff, and inartistic, as well as inaccurate, exhibiting dots instead of striæ, and gives but little help in determining the species; it shews, however, five or six teeth on the carpus. In the specific descriptions, the description is given in reduced terms, and these are inaccurate, for the carapax is said to be striated *longitudinally* (*striè longitudinalement*), although the detailed description represents it as covered with *tranverse* striæ, (*couvert de stries transverses*,) which must be correct, as the comparison with *Galathea* shews. The native country of Bosc's species is said to be unknown.

Next, Say in 1818, in the Journal of the Academy of Natural Sciences, Philadelphia, vol. 1, p. 458, makes the following note. "Porcellana galathina. We found many specimens on the coast of Georgia and Florida." No reference is made to Bosc or to any author or describer of the species, nor does any description of the species observed, accompany the note.

In the Dictionnaire des Sciences Naturelles, tome xviii., p. 54, about the year 1820,* Leach writes thus under the article *Pisidia*, a subdivision of *Porcellana* made by him. "Pisidia Sayana, (Porcellana galathina, Say.) Test et la quatrième paire de pattes marqués par de lignes courtes et transverses; front trifide, le prolongement de milieu encore sous-trifide et finement granulé. Habite les côtes de la Floride dans l'Amerique. Communiqué par mon ami, M. Say sous le nom de Porcellana galathina." This is the whole account given of the species.

In 1825, Desmarest in his Considérations Génerales sur la classe des Crustacés, following in the main, the system of Leach, under his *Pisidia Sayana*, p. 199, refers to Leach as above, and repeats his description, with a few verbal alterations. He mentions Bosc's P. galathina, but considers it as allied to, and probably the same as *P. sociata* of Say, which view is manifestly erroneous.

In neither edition of Lamarck's Animaux sans Vertèbres, is there any description of the species, but in each there is reference to Bosc's figure.

In 1850, misled by the inaccurate phrase "*longitudinally* striated" in Bosc's specific description, and overlooking the more detailed account, given just before, of the same species, I considered the synonymy so unsettled as to be induced to give (Proceed. Amer. Assoc., vol. iii., p. 190) to our species the name *P. sexpinosa*. Reviewing the facts as above presented, and remembering that Bosc resided some time in Charleston (acting as Consul, if I am rightly informed), and that some of our Crustacea bear his names, I think it

* I have not now access to the work, and my notes do not give the year.

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not improbable that his *P. galathina* may have proceeded from our Southern coast, although its country is said to be unknown. Say has applied the name to one from our coast. Leach and Desmarest have given descriptions of that one which apply to our present species, as also does Bosc's own description; and lastly the name has not been applied to any species proceeding from other localities; I therefore now apply the name P. galathina to the present species, and think the synonymy ought to stand as I have presented it.

In 1837, Milne Edwards described, in the work already quoted, his *P. rugosa.* This description of this species, whose origin is also said, singularly enough, to be unknown, applies in every particular to our species; he also notices the spine on the carapax a little distance behind the external angle of the eye; the only deviation of importance, if deviation it can be called, is that "the front is almost as prominent *laterally* as in the middle." I consider therefore this species of M. Edwards as the same as ours. Possibly the specimens he described were the identical ones of Bosc, deposited in the collection of the Museum in Paris. M. Edwards, although he mentions Bosc's work (in terms of perhaps just censure,) in his sketch of the History of Carcinology, in the introduction to his work, and quotes him under *Pagurus vittatus* (tome ii., p. 237) makes no reference to him whatever under *Porcellana,* not even when quoting Say's *P. galathina.* So much for Say's omission, in not referring to Bosc, when he used the name of his species.

After stating the conclusions drawn from published notes and descriptions which may be presumed to be accessible to all Naturalists, it is proper to make mention of some facts opposed to these conclusions, especially as these facts are at present accessible to few. Since writing, in 1850, the description of *P. sexpinosa*, above referred to, Dr. A. A. Gould, of Boston, kindly placed in my hands a small packet of Say's manuscript notes on Crustacea and Insects, chiefly of the United States, whose examination I hoped would enable me to decide what species he referred to under the name *P. galathina.* Three species of *Porcellana* are mentioned; the first is called *P. galathina,* but the incomplete description does not, where points sufficiently characteristic are seized, apply to our present species, nor to any other that I know on our coast. The description of his second species (without specific name) seems to apply to our *P. armata.* His third is mentioned thus, in a sheet detached from the others: "The large Porcellana I found on the coast of Florida is perhaps the same as the species in Mr. L'Herminier's collection, and which I have taken to be *P. galathina;* the general colour is reddish, brown, etc." and then follows a description, chiefly of coloration, which applies generally to our *P. ocellata* and not to *P. galathina.* These notes certainly cast some doubt on the determination of Say's P. galathina, but I think I am justified in saying that they do not require the alteration of the synonomy as above presented.

The only closely allied species is the *P. Boscii* of Savigny (*Exped. á l' Egypte, Crust. pl.* 7, *fig.* 2) which is quite distinct.

Note.—Since writing the above, I have seen the text and plates of the Crustacea of the Exploring Expedition under Capt. Wilkes, and can now (Feb. 1856) quote another allied species, the *P. Boscii* of that work. It is, however, distinct from the *P. Boscii* of Savigny, and I would propose for it the name of its describer, Prof. James D. Dana, and call it *P. Danæ*. The three species will form one section of the genus, and may be characterised thus:

§§ Carapax transversely rugose, with piliferous ridges.

1. *P. galathina*, Bosc. The piliferous ridges nearly continuous across the carapax; a spine on the carapax behind the exterior angle of the eye; anterior edge of carpus with five (rarely four or six) teeth, the anterior one forming the angle, posterior edge with several spines; hand one-half broader than the carpus.

Color, cherry red; length about 0.5 of inch. Southern Atlantic Coast of United States.

2. *P. Danæ*, (P. Boscii, Dana. *Crust. Explor. Exped. page* 421, *pl.* 26, *fig.* 11.) The piliferous ridges nearly continuous across the carapax; no spine on the carapax behind the eye; anterior edge of carpus with four teeth, the anterior one at a little distance from the angle formed at the articular edge, which is truncate, posterior edge with a few spines; hand nearly twice the breadth of carpus.

Color, cherry red; length about 0.9 of inch. Rio Janeiro and Coast of Brazil.

4. *P. Boscii*, Savigny. The piliferous ridges interrupted or broken up into numerous short curved ridges, convex forwards; a spine on the carapax behind the external angle of the eye; anterior edge of carpus with four teeth, the anterior one at a little distance from the angle, articular edge festooned with three obtuse teeth, and a sharpe spine at posterior angle, the posterior border with spines; hand about as broad as carpus.

Color, ; length about 0.4 of inch. Coast of Egypt.

4. P. armata. *Plate I., fig.* 4, *natural size.*

Synonyme. P. armata, Gibbes, *Proc. Amer. Assoc.*, vol. 2, p. 190. 1850.

Description.—*Carapax* of nearly equal length and breadth, nearly smooth, but exhibiting, under a lens, minute, piliferous lines; *front* not trifid, middle portion prominent, lateral portions rounded; *eyes* prominent, as also in the last species, outer angle of orbits obtuse; at a little distance behind it, on the edge of the carapax, an acute spine, from which an indistinct border runs back; *exterior antennæ* with filament about twice the length of carapax.

Anterior feet nearly equal, right somewhat the larger; *carpus* about $\frac{3}{4}$ length of body, twice as long as broad, anterior edge with three acute teeth, posterior edge with four or five small spines beyond the middle; *hand* subtriangular in outline, lower or outer edge serrulate with minute spines; upper surface, as also that of carpus, covered with minute granulations, sometimes becoming short ridges. *Posterior feet*, the three first pair with the upper edge spinulose, and a small spine at the anterior termination of lower edge.

Color, a reddish brown in the dry specimen.

GEO. DISTR.—*Florida Coast.*

REMARKS.—Say's description of the second species in the manuscript notes above mentioned applies to this species; he uses no specific name. Dana's *P. armata*, Crust. U. S. Explor. Exp., is a different species, and he has since changed the name to *P. spinuligera*, Crust. Expl. Exp., 1593.

C.—FRONT TRIDENTATE.

5. PORCELLANA SOCIATA. *Plate I., fig.* 6, *natural size.*

SYNONYMES.—Porcellana soriata, SAY, *Jr. Ac. Nat. Sci.*, vol. I., p. 456. 1818.
Pisidia sociata, LEACH, *Dict. des Sci. Nat.*, tom. xviii., p. 54. 1820.
Pisidia sociata, DESMAREST, *Consid. Gen. sur les Crust.*, p. 199. 1825.
Porcellana sociata, MILNE EDWARDS, *Hist. Nat. des Crust.*, vol. II., p. 258. 1837.
Porcellana sociata, GIBBES, *Proc. Amer. Assoc.*, vol. III., p. 190. 1850.

DESCRIPTION.—*Carapax* nearly smooth, tuberculate before, tubercles in a transverse line of four, obtuse, giving the *front* the appearance of being depressed rather suddenly, edge of the front bent down, three toothed; *eye* not very prominent; *external antennæ*, with filament about the length of carapax.

Anterior feet nearly equal, in some the right, in others the left, the greater; *carpus*, about two-thirds the length of carapax, smooth beneath, tuberculate above, tubercles granulate, anterior edge granulate, with a large tooth near articulation with third segment; *hand* smooth beneath, tuberculate above, tubercles, granular like those of carpus, with a tendency to a longitudinal linear arrangement; *finger* granulate, hooked at tip, opposing edges with fine granular teeth.

Color, dirty ivory white; length about 0.2 of inch.

GEO. DISTR.—*Atlantic Coast of Southern United States.*

REMARKS.—In Say's original description the specific name is as I have given it above, *soriata*. Leach, who received specimens from Say, gives the specific name *sociata*, so that *soriata* is most probably a typographical error. Desmarest and Edwards use Leach's specific name, and I have done the same, as there can scarcely be a doubt that it was the one intended by Say to be applied to his species. In 1847, Say's original specimens were in the collection of the Academy of Natural Sciences in Philadelphia, but the label could not be found to determine how he wrote the name.

6. P. OCELLATA. *Plate I., fig.* 2, *natural size.*

SYNONYME. P. ocellata, GIBBES, *Proc. Amer. Assoc.*, vol. 3, p. 190. 1850.

DESCRIPTION.—*Carapax* about as long as broad, nearly smooth, without spines, with distinct border running back; *front* trifid, middle lobe most prominent, with central depression, in some individuals subacute with subdenticulate edges; outer angle of *eye* acute but without spine, from it a distinct border to carapax runs back for two-thirds of its length; *exterior antennæ* with filament about the length of carapax or a little shorter.

Anterior feet subequal, in some individuals the right, in others the left is the larger, *carpus* short, about half the length of body, and a little longer than broad, with a projecting lobe at base of inner edge, this edge without spines, outer edge with a slightly raised border, and a single spine at articulation with hand; *hand* about as long as carapax, subtriangular in outline, lower edge ciliate, finger and thumb with opposing edges nearly straight and without teeth, the tip of former incurved and folding within the slightly incurved tip of latter. Four pair of *posterior feet*, without spines, and ciliate on the edges of the different segments.

Color. In the recent specimen the carapax and anterior feet are ocellate with white spots on a reddish ground, which is frequently deeper around the spots; posterior part of carapax and abdomen with alternating whitish and reddish longitudinal bands, posterior feet with transverse reddish bands, in which the ocelli may frequently be perceived. All these markings are less distinct in the dry specimen.

Geo. Distr.—*Coast of South Carolina.* Readily distinguished by its trifid front and ocellate markings, and short carpus.

Remarks.—Say's description of the third species in the manuscript notes above mentioned applies to this species.

JUNE 6th, 1854.

Vice-President L. R. Gibbes in the chair.

Professor F. S. Holmes submitted a paper entitled Descriptions of new fossil Balani from the Eocene marl of Ashley River, South Carolina; intended for publication in the Proceedings. Referred to Curators.

Professor Holmes read the following extract from a letter received from Lieut. Herndon, late Commander of the United States Expedition to explore the River Amazon, and submitted the specimens therein named to the inspection of the members.

"I have in my possession, apart from the specimens belonging to the government, a pair of "heads" obtained from the Mundrucus Indians of the River Tapajos. These are the heads of their enemies, the Mahuc's, of the same district, which the Mundrucus preserve and keep in their houses as a sort of "Fetish" or charm. Whenever a Mundrucus goes out to work his little plantation of tobacco, plantains, maize, etc., he puts one of these heads on a pole, and sticks the pole in the earth near where he is at work, as a protection against his enemies and evil spirits.

"I tell the tale as t'was told to me." From my knowledge of most of the Indians of the Amazon, I doubt if they have any idea of other spirits than *ardent spirits.*

These heads I have requested Lieut. Maury to forward to you; they may be interesting to you, as showing that these ignorant savages have the art of preserving animal substances. The heads look as if they were merely dessicated, but I know that the climate of the country, in which these people live, is very unfavorable to such a process; the atmosphere being almost always heavily laden with moisture. They may, however, have been dried by fire. I leave that point for your investigation."

Professor L. R. Gibbes submitted a paper for publication in the Proceedings, entitled Monograph of the Genus Cryptopodia. Referred to Curators.

The Secretary read letters from the following gentlemen, severally acknowledging the notice of their election as Correspondents of the Society. Dr. A. A. Gould, Boston; Prof. Baird, Smithsonian Institute; Rev. M. A. Curtis, Society Hill, S. C.; Dr. R. W. Gibbes, Columbia, S. C.

Contributions to Museum.

Dr. S. W. Barker presented a living specimen of *Siren lacertina*, and the nest of the Chimney Swallow, *Chætura pelasgica*, Linn.

Henry W. Ravenel, Esq., a collection of dried plants from Europe.

Plowden C. J. Weston, Esq., *Scincus fasciatus* and *Plestiodon erythrocephalus.*

Dr. J. P. Chazal, *Libinia canaliculata,* and intestinal worms.

Dr. Elias Horlbeck, *Tropidonotus fasciatus.*

W. Wragg Smith, Esq.—Eggs and nest of Wood-Pewee, *Muscicapa rapax.*

Robt. F. Gyles, Esq.—Eggs of the broad-mouthed Cat-fish, *Arius Milberti*. Charleston Harbor.

Señor Don F. A. Sauvalle, of Cuba, two specimens of living *Iguana tuberculata*.

Dr. Wm. T. Wragg.—Iron ore, from Iron Mountain, near St. Louis.

Mr. Robt. Wilson—Nest of Orchard Oriole, *Oriolus mutatus*.

Dr. H. R. Frost.—*Ostrea Georgiana*, Savannah River; and *Lycopodium sempervirens*, California.

John P. Ford, Esq., Black River, S. C.—Two specimens of *Amphiuma*.

H. H. Sams, Esq.—Tail of Sting Ray, *Myliobatis;* and Clam-Cracker, *Ætobatis guttata*.

Professor Jeffries Wyman, of Cambridge.—Four skulls of Seals, *Phoca vitulina*.

JANUARY 9TH, 1855.

Vice-President Hume in the chair.

Dr. Frampton's amendment to Art. 2 of Chap. 1st of By-Laws, which was laid upon the table at the meeting held in May, 1854, was, according to rule, taken up, discussed and adopted. The article will now read—

"The Society shall consist of members, correspondents, and *twenty* honorary members."

The Committee of Curators reported, in accordance with instructions of the Society at their meeting in May last, a selected list of fifteen names of suitable persons to be elected honorary members.

On motion of Professor Holmes, laid on the table.

On motion of Dr. Frampton, the Society proceeded to the election of Corresponding members, and the following gentlemen were duly elected.

Correspondents Elected.

Lieut. Herndon, U. S. N.
T. A. Conrad, Esq.
Rt. Revd. Stephen Elliott, of Georgia.
Dr. J. P. Kirtland,
Prof. H. D. Rogers,
Prof. W. B. Rogers,
Dr. W. S. W. Ruschenberger,
Dr. W. S. W. Zantzinger,
Dr. John LeConte,
Prof. B. Silliman, Jr.
Prof. Robert Bridges,
Charles M. Wheatly, Esq.
George Ord, Esq.
John Cassin, Esq.
Capt. Charles Wilkes,
Sir Charles Gray,
Dr. Thomas Horsfield,
Prof. Jeffries Wyman,
J. Hamilton Couper,
Wm. Heyward, Esq., S. C.
Hugh Miller, Esq.
Prof. Jos. Leidy,
Dr. Robt. Wilson,
Edmund Ruffin, Esq.
Dr. John P. Barratt,
Hon. Wm. Elliott, S. C.
Rev. A. Glennie, Waccamaw.
Señor Don F. A. Sauvalle, Havana, Cuba.

Contributions to Museum.

Dr. A. M. Forster, of Georgetown, S. C., presented several fine specimens of *Menopoma*, from North Carolina.

Rev. A. Glennie, of Waccamaw, a fine collection of *Echinoderms*, etc., from the coast.

Miss E. Richmond, *Chamois head*, from Switzerland, and shells and minerals, etc., from Europe.

Robert Lucas, Esq., *Salamanders*, from Flat Rock, N. C.

Prof. J. Wyman, *Embryonic specimens*, in alchohol.

Contributions to Library.

Prof. F. A. Porcher—Four vols. British Zoology.

Dr. F. Peyre Porcher—A bound copy of his "Report to the American Medical Association, on the medical, poisonous, and dietetic properties of the Cryptogamic plants of the United States."

Dr. S. W. Woodhouse—Sitgreave's Expedition to the Zuñi and Colorado Rivers.

Prof. Holmes announced the death of Dr. Thomas Legare Burden, late an active member and Curator of this Society.

He died May 14th, 1854, aged forty-three years. Dr. Burden was a zealous student of Natural History, and one of the founders of this Society. As an evidence of the interest he took in its prosperity, he bequeathed his entire collection of fossils, shells, plants, etc., to its Museum.

The Secretary also announced the death of Dr. Waldo J. Burnet, a correspondent of the Society, and an ardent cultivator of Natural History.

On motion of Dr. Frampton, it was

Resolved, That in the death of Dr. Thomas Legare Burden the Elliott Society of Natural History has sustained a great loss.

Resolved, That in consideration of his merits, and as a memorial of his many virtues, a blank page of its journal be inscribed to his memory.

Resolved, That a copy of these resolutions be sent to his afflicted family.

THIS PAGE

IS,

BY THE UNANIMOUS VOTE OF THE MEMBERS

OF THE

ELLIOTT SOCIETY OF NATURAL HISTORY,

INSCRIBED TO

The Memory

OF

DR. THOMAS LEGARE BURDEN,

WHO DIED MAY 14TH, 1854.

AGED 43 YEARS.

A CURATOR OF THIS SOCIETY AND ONE OF

ITS FOUNDERS.

MARCH 6TH, 1855.

Professor Holmes in the chair.

Letters were read from the following gentlemen, severally acknowledging having received a notice of their election as correspondents. J. Hamilton Couper, Esq., Darien, Geo.; T. A. Conrad, Esq., Philadelphia; Geo. Ord, Esq., Philadelphia; Prof. Joseph Leidy, Philadelphia; Rev. A. Glennie, Waccamaw, S. C.; Prof. J. P. Kirtland, Cleveland, Ohio; Señor Don Francis A. Sauvalle, Havana; Prof. J. Wyman, Cambridge, Mass.; Dr. Wm. S. Zantzinger, Philadelphia; Charles O. Boutelle, Esq., U. S. Coast Survey.

Members Elected.

Dr. Julius T. Porcher. Dr. Geo. S. Pelzer.
Rev. U. Sinclair Bird.

The committee of Curators, to whom was referred the paper of Prof. Holmes, describing new fossil Balani from the Eocene marl of South Carolina, reported the same for publication in the proceedings.

Descriptions of New Fossil Balani, from the Eocene Marl of Ashley River, S. C. By Francis S. Holmes.

Balanus digitatus. *Plate I., figs.* 9 *to* 12.

Shell subconical, oblique; valves with longitudinal furrows, having prominent ribs, which are sometimes digitated near the base, one or more uniting to form a single rib, which is continuous to the summit, or interrupted by lines of growth, often rugged, and causing abrupt transverse ridges; interstices smooth, narrow, deep.

Balanus calceolus. *Plate I., figs.* 7 *to* 8.

Shell elongated before and behind; anterior and posterior valves compressed, carinated; valves longitudinally and finely striated; interstices wide with indistinct flat ribs extending from base to summit, and regularly and beautifully striated transversely.

Contributions to Museum.

Hon. John S. Ashe—Head and antlers of Moose Deer *Cervus Alces*, and a large collection of curious antlers of the Carolina deer *Cervus Virginianus*.

Prince Maximillian, of Neuweid on the Rhine—One box containing many specimens of birds, reptiles, fish, and dried plants of Europe.

Charles H. West, Esq.—Skin of the great Ant-Eater *Myrmecophaga jubata*—the *Tamanoir* of South America.

Wm. E. Simmons, Esq., Young's Island, S. C.—Two fine specimens of young Sheep-head.

Dr. Wm. H. Ford, of Charleston.—Mounted skeleton of Domestic Cat.

Dr. Thomas Ogier.—*Calappa Mannorata*, from this coast.

Prof. J. E. Holbrook.—*Crotalophorus tergiminus.*

Bufo lentiginosus, from Florida.

Coluber vernalis, from Illinois.

Cistuda Blandingii, from Wisconsin.

Testudo polyphemus, from Georgia.

Testudinæ, from Mobile.

JUNE 6TH, 1855.

Prof. Wm. Hume in the chair.

A paper was presented for publication in the Proceedings entitled " description of a new species of Ostrea, *O. triangularis*," from Edisto River, near the sea coast of South Carolina, by F. S. Holmes. Referred to Curators.

Specimens of this Ostrea were presented by Prof. Holmes for the Museum.

A letter was read from Bishop Elliott, of Savannah, Geo., acknowledging having received a notice of his election as a correspondent of this Society.

Contributions to Museum.

John Harleston, Esq., Cooper River, St. Johns—Mastodon tooth, found on his plantation.

Frederick A. Ford, Esq.—*Testudo polyphemus*, a large Gopher, found in the street at Aiken, S. C.

Dr. John B. Waring.—Mounted specimen of Loggerhead turtle, *Chelonia caretta*.

Capt. John Branch.—Portion of the skull of *Phocodon Holmesii*, from the marl of Goose Creek, S. C.

Contributions to Library.

Charles Girard, Esq.—Life in its Physical aspects.

Prof. Poey—No. 33, *Index Molluscorum* of the Island of Cuba.

Señor F. A. Sauvalle—Catalogue of the birds of Cuba, by Don Ramora De La Sagra.

JULY 24TH, 1855.

Prof. Holmes in the chair.

Members Elected.

Col. A. H. BELIN. C. R. BREWSTER, Esq.

Correspondent.

Dr. JAMES MORROW.

The Chairman read the following letter, received from Mr. J. Lee, of Camden, S. C.

To Professor Holmes:

SIR:—The years 1829 and 1842, and this present year, 1855, are, in the upper part of the State termed Locust years. In each of the above years I have observed the red, or rather yellow Locust.

They come from the ground in myriads. The males first appear, climbing the shrub or tree that occurs nearest to them; the grub-shell splits open in the back and the perfect insect creeps forth; they climb to the top of the tree and bask at the extremities of the limbs, waiting the advent of the females. The woods ring with their chirpings; the male alone possesses the musical organ, it is placed under their wings.

The female has a strong ovipositor, with which she rasps a longitudinal incision in the new wood, and under the bark, thus raised, she deposits a row of small white eggs, and these are hatched in a few days. So far I have followed them; the probability is that the grub falls to the ground, enters it, and there remains for *thirteen years*. The proof of this is that in 1842 I gathered a bundle of twigs containing the eggs—scattered the twigs in a piece of woods thirty miles from the nearest *Locust woods*, and this year they have come from the ground in the same season with those from whence they were taken. I cannot say what insect transformations they have gone through in this long interval. They certainly came from a great depth. Hogs root for them two weeks before they appear.

You will find a number of living specimens in a box I send you by this conveyance, also the shells, and one I picked up whose complete escape from the shell was never made.

They have not yet commenced laying their eggs, but I have directed some twigs, containing eggs, to be sent me. If you wish to see some of them I will, when received, forward some to you. It is supposed by some persons that they migrate, and from the fact that the year 1843 was "Locust year" in Virginia, I thought it probable, but now my experiment of scattering their eggs in 1842 sets that at rest. They eat nothing. The males sing, the females lay their eggs and die. Apple and other soft wood trees die in the terminal branches, making it probable that with the eggs she ejects a fluid, in some degree fatal to the branch. Oak and other hard wood recover readily from the wounds made.

I could give you many fanciful stories on the subject, but prefer confining myself to the facts about this curious insect.

JANUARY 18TH, 1856.

Vice President L. R. Gibbes in the chair.

Correspondents Elected.

PROF. JOHN LECONTE, Athens, Ga.
DR. W. E. DANIELL, Savannah, Ga.
DR. A. J. SKILTON, Troy, N. Y.
DR. FRANCIS Y. GLOVER, Walterborough, S. C.
GEO. CUTHBERT, ESQ., Beaufort, S. C.
CAPT. H. H. SAMS, Beaufort, S. C.
ROBERT CHISOLM, ESQ., Beaufort, S. C.
PROF. ST. JOHN, Hudson, Ohio.
CAPT. A. H. BOWMAN, U. S. Engineer Department.
LIEUT. I. D. KURTZ, U. S. Engineer Department.
M. VATTEMARE, Paris.
PROF. A. D. WELLS, Boston.

Donations to Museum.

Mr. James Shoolbred, Santee, S. C., presented a specimen of Night Heron, *Ardea Nycticorax.*

Señor Don F. A. Sauvalle, of Havana, Cuba, a living Boa. A living *Testudo tabulata*—vulg. *Morrocoyo*—of which he remarks:

"Though found throughout the Island, it is supposed to have been introduced. It is quite tame, and has been running about my house and in my kitchen for several months, and does not bite. It is a male, and has the anus at the very end of the tail, and not at the posterior end of the body, as in other animals; the tail is kept doubled under the shell."

Also, the following Birds, Insects and Shells.

Sabanero, vulgo: *Sturnella hippocrepis.*—Wagl. Male.
Pedorrera, vulgo: *Todus Portoricensis.*—Lesson. Male.
Sunsun, vulgo: *Orthorhynchus Ricordii.*—Gerv. Male.
Carpintero verde, vulgo: *Picus percussus.*—Temm. Male.
Carpintero jabado, vulgo: *Colaptes superciliaris.*—Temm. Female.

Carpintero churroso, vulgo: *Colaptes Fernandinæi.* Vigors. Male.

Arriero, vulgo: *Saurothera merlini.*—Orb. Male.

Siju, vulgo: *Noctua siju* —Orb. Male and female.

Siguapa, vulgo: *Otus siguapa.*—Orb. Young one.

Zorzal Real, vulgo: *Turdus rubripes.*—Temminck.—Male.

Cabrero, vulgo: *Tanagra Pretrei.*—Less. Male.

Insects.

La Muerte, vulgo: *Phasma.* Male and female, in the act of copulation.

Octopoda.

Alacramde *Guinea*, vulgo; *Telyphonus.*

"Found only in the mountains, where they are said to be so very venomous as to produce death. I put one under a shade with a small frog, and the latter died immediately, though not bitten. It might have been through fright, or want of air."

Land Shells.

Cyclostoma Huberanium, Orbigny; Matanzas, Cojimar.
" *claudicans*, Poey; Rangel of F. A. Sauvalle.
" *Ottonis*, Peiffer; Almendares Guajaibon.
" *salebrosum*, Morelet; Organos mountains.
" *Petrei*, Orbigny; Guajaibon.
" *Peifferianum*, Poey; Camoa mountains.
" *Rangelinum*, Poey; Rangel.
" *majusculum*, Morelet; Organos.
" *verecundum*, Poey; Var. a Catalina.
" *verecundum*, Poey; Var. b. San Diego Springs.
" *rotundatum*, Poey; Organos.
Megalostoma ventricosum, Orb.; Guajaibon.
" *mani*. Poey; Rangel.
Helicina Sagraina, Orbigny; Organ.
" *regina*, Morelet; Virginea, Orbigny.
" *columellaria*, Gunlach; Rangel (Culumellario).
" *Blandiana*, Gundlach; Baths of St. Diego.
" *Sloani*, Orbigny; Camoa mountains.
" *rubro-marginata*, Gunglach; Guajaibon.

Helicina straminea, Morelet; Cacarajicaras.
" *politula*, Poey; Rangel.
" *rotunda*, Orbigny; Organ mountains.
" *chrysochasma*, Poey; Var. a. and b. Rangel.
" *adspersa*, Pfeiffer; common.
" *globulosa*, Orbigny; Rangel.
Proserpina depressa, Orbigny; Organ mountains.
Helix Rangelina, Pfeiffer; Rangel.
" *Sagraiana*, Orbigny; Guaijaibon.
" *Parraiana*, Orbigny; Organos.
" *Bonplandi*, Lamark; common.
" *stigmatica*, Pfeiffer: Rangel.
" *tichostoma*, Pfeiffer; Guanabacoa.
" *vortex*, Pfeiffer; Matanzas, Rangel.
Bulimus acuticostatus, Orbigny; Organos.
Tubulina octona, Chemnitz; all the island.
Achatina Blainiana, Poey; Rangel.
Glandina Ottonis, Pfeiffer; Rangel.
" *solidula*, Pfeiffer; all over Island.
Pupa nitidula, Pfeiffer; Cojimar, Matanzas.
Cylindrella Sauvalleiana, Gundlach; Rangel.
" *Poeyana*, Orbigny; Cojimar.
" *Oviedoiana*, Orbigny; Camoa.
" *torquata*, Morelet; Rangel.
Limnæa Cubensis, Pfeiffer; in all springs or fresh water.
Melania brevis, Orbigny; Rivers of Organos.
" *ornata*, Poey; Rivers of Organos.
" *pallida*, Gundlach; San Diego de Tapia.
Neritina Virginea, Lamark; at mouth of all rivers.
Unio scamnata, Morelet; Taco taco river.
Achatina fasciata; Müll.
Streptostyla Cubaniana, Orbigny; Rangel.

Mr. Joseph W. Harrisson presented a fine specimen of the lower jaw and teeth of the sperm whale, *Physeter macrocephalus?* captured by his brother, Capt. G. P. Harrisson, in the Indian Ocean, lat. 26° 20' S., lon. 108° 50' E. Also, two necklaces, made of shells of the *Natica mammilla;* four swords, made of sharks' teeth, and a series of plates of whalebone, from the mouth of the right whale.

Donation to Library.

Professor J. E. Holbrook presented a copy of his work on the Fishes of Florida, Georgia, etc.

The Chairman read and presented for publication in the proceedings, description of a new species of "*Baptisia*," found near Aiken, S. C., with specimens and drawings, by Henry W. Ravenel, Esq. Referred, in accordance with the rules of the Society, to the Committee of Curators.

MARCH 7TH, 1856.

Vice-President L. R. Gibbes in the chair.

Contributions to Museum.

Fossil horse teeth, from the Tunnel Mountain, Georgia, by Capt. V. D. V. Jamison, of Orangeburg, S. C.

Two species of *Cordiceps*—*C. Ravenelii*—(Beck & Curtis) and *C. Carolinensis*—(Beck & Curtis)—presented by H. W. Ravenel, Esq., Aiken, S. C.

One *Coluber punctatus*, by the same.

One fossil Shark's tooth, very large—*Carcharodon Megalodon*—by Col. T. P. Huger, from excavations of the North Eastern Railroad, twenty miles from Charleston.

The committee appointed to wait upon the President of this Society, and request a copy of his address, delivered at its inauguration, reported the loss of Dr. Bachman's notes and his inability, from ill-health, to complete his essay as promised.

The committee of Curators, to whom was referred Prof. Holmes' description of a new *Ostrea*, recommend the same for publication in the proceedings.

Description of a new species of Ostrea, found living in the waters of the coast of South-Carolina. By FRANCIS S. HOLMES.

OSTREA TRIANGULARIS.

Shell sub-triangular, sub-equivalve, sub-equilateral, thick, laminated; beaks produced, acutely pointed, angular and slightly curved towards each other; margins rounded; cavity of the shell circular; muscular impression very large, in proportion to the size of the shell, and placed near the margin of the base.

This Ostrea resembles the *O. Edulis* of the European coast, but is more regular in form. Its triangnlar shape, large muscular impression and pointed beaks, readily distinguishes it from that species.

A single specimen was found by the late Rev. Thomas J. Young near the mouth of the Edisto River, and by him considered a new species and presented to me. Lately, I obtained another specimen of the same animal from Wadmalaw Sound, an arm of the Edisto River. I am not aware of its having been found on any other part of the coast of South-Carolina.

JUNE 6TH, 1856.

Professor Holmes in the chair.

A letter from Dr. Bachman was read, declining a re-election as President of this Society, in consequence of continued ill-health, which unfitted him for the duties of the office.

The following officers were elected to serve one year.

Prof. L. R. GIBBES, *President.*

Vice-Presidents.

Prof. S. H. DICKSON. Prof. JAMES MOULTRIE.
Prof. WILLIAM HUME. Dr. EDMUND RAVENEL.

Prof. F. S. HOLMES, *Secretary.*

Dr. F. T. MILES, *Treasurer.*

Curators.

Prof. JOHN McCRADY. Dr. P. C. GAILLARD.
Dr. S. W. BARKER. Dr. ST. JULIEN RAVENEL.
Dr. J. P. CHAZAL. Dr. F. T. MILES.
Dr. J. M. MICHEL. Dr. J. F. M. GEDDINGS.
Dr. L. A. FRAMPTON. HENRY W. RAVENEL.
W. WRAGG SMITH, Esq.

The Secretary reported the first number of the proceedings as published, and distributed to the members, correspondents, and many learned Societies, both in Europe and America.

JUNE 11TH, 1856.

President L. R. Gibbes in the chair.

Correspondents Elected.

HENRY PROBASCO, Esq., Cincinnati, Ohio.
Prof. JAMES HALL, Albany, N. Y.
Dr. JAMES JONES, Savannah, Ga.
DAVID H. SHAFFER, Esq., Cincinnati, Ohio.
DAVID CHRISTY, Esq., Oxford, Butler county, Ohio.
Prof. C. ZIMMERMAN, Columbia, S. C.

Contributions to Museum.

Pecten dislocatus, coast of South Carolina, by Mr. R. F. Gyles.

A large collection of *Meiocene* fossil shells from Virginia, by Edmund Ruffin, Esq.

Skin of purple Gallinule—*Gallinula Martinica*—LINN. Killed in St. Paul's Parish, S., C, by Dr. Clement.

Contributions to Library.

Lieut. Maury presented two volumes Astronomical Observations, 1846 and 1847.

John H. Hickcox, Esq., of Albany, New York.—Eulogy on the character and life of T. Romeyn Beck, M. D , LL.D.

The Trustees of the New York State Library—Sixty-ninth annual report of the Regents of the University of the State of New York.

Catalogue of Maps and Surveys in the offices of the Secretary of State, of the State Engineer, and in the New York State Library.

Catalogue of the Historical papers and parchment received from the office of the Secretary of State and deposited in the New York State Library.

Annual report of the Trustees of the New York State Library, January, 1856.

Appendix F. Catalogue of the Fishes inhabiting the State of New York, as classified and described in part IV. of the New York fauna, by James DeKay.

Catalogue of the Coins and Medals belonging to the New York State Library.

Index to the documents of the Legislature of New York, from 1842 to 1854 inclusive, by Bogart.

Fourth, sixth and seventh annual reports of the Regents of the University of New York, on the condition of the State Cabinet of Natural History, and the Historical and Antiquarian collection annexed thereto, 1851, 1853, 1854.

Catalogue of the New York State Cabinet.

A paper was presented for publication in the Proceedings, entitled Contributions to the Natural History of the American Devil-fish, with descriptions of a new genus from the harbour of Charleston, S. C., by F. S. Holmes. Referred to Curators.

The committee of Curators, to whom was referred Prof. L. R. Gibbes' paper on the genus *Cryptopodia*, and Henry

W. Ravenel's description of a new species of *Baptisia*, recommend the same for publication in the Proceedings.

Monograph of the Genus Cryptopodia. By L. R. Gibbes.

Description.—*Carapax* moderately convex, sub-triangular, broader than long, this great breadth due to a lateral prolongation of the carapax, more or less lamellar; this prolongation conceals behind the insertion of the abdomen, and on the sides conceals entirely the four last pair of feet when folded, and allows but the terminal joints of them to be seen when they are extended. *Rostrum* semi-oval or triangular, nearly horizontal, prominent, upper surface plane, and prolonged backwards on the carapax, for about one-third the length of the latter, and bounded laterally by ridges; from the posterior boundary of this surface, a ridge on each side, more or less distinctly marked, runs to the latero-posterior angles of the carapax, dividing the rest of the carapax into three portions, two latero-anterior, and one posterior.

Eyes small and retractile. *Internal antennæ*, folding longitudinally with slight inclination outwards. *External antennæ*, with three basal segments, and a short filament of few segments; the third basal segment reaches the front and the filament lies in the internal canthus of the orbit. *Epistoma* broader than long. *External maxillipeds*, with third segment sub-quadrate, having articulation with the fourth at its intero-anterior angle.

Anterior feet very long, sub-prismatic, transverse section triangular, *hand* about as long as the carapax, moveable finger, when closed on the fixed one, nearly at a right angle to the axis of the hand. *Posterior feet*, compressed, concealed by the lateral expansion of the carapax, when folded. *Abdomen* of seven articulations in male and female.

Remarks.—This genus was founded by M. Edwards in 1844, in his Histoire Naturelle des Crustacés, (tome i., p. 360) on the *Cancer fornicatus* of Fabricius; the discovery of a new species of the genus requires the revision, given above, of the generic characters. Two species are now known, one from the Indian Ocean and coasts of Hindostan, and one from the Southern Atlantic Coast of the North American States. Their description follows:

1. Cryptopodia fornicata.

Synonymes.—Cancer fornicatus, Fabricius, *Species Insectorum*, t. ii., append. p. 502.* 1781.

Cancer fornicatus, Herbst, *Naturgeschichte der Krabben*, B. I. s. 204, tab. xiii., fig. 79-80. 1790.

Cancer fornicatus, Fabricius, *Entomologia Systematica*, t. ii. p. 453.† 1793.

Parthenope fornicata, Fabricius, *Supplem.*, p. 352.† 1798.

*Quoted from Herbst. I have never seen the work.

†Quoted from M. Edwards. I have never seen the work.

Calappa albicans, Bosc, *Histoire Naturelle des Crustacés*, 1re edit. t. i., p. 185.† 1802.

Maia fornicata, Bosc, *Histoire Naturelle des Crustacés*, 1re edit. t. i., p. 250.† 1802.

Maia fornicata, LATREILLE, *Histoire Naturelle des Crustacés* t. iv., p. 104. 1804.

Œthra fornicata, LAMARCK, *Anim. sans. Verteb.* 1re edit., t. v., p. 265. 1818.

Œthra fornicata, DESMAREST, *Consid. Gen. sur les Crust.*, p. 110. 1825.

Calappa albicans, Bosc, *Hist. Nat. des Crustac.*, 2e edit., t. i. p. 213. 1830.

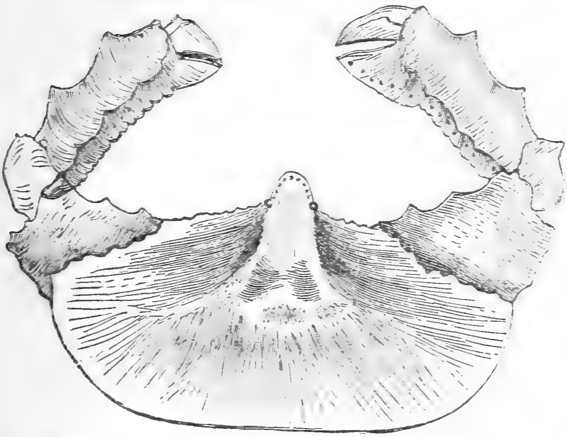
Cryptopodia fornicata, M. EDWARDS, *Hist. Nat. des Crustac.*, t. i., p. 362. 1834.

Œthra fornicata, LAMARCK, *Anim. sans Verteb.* 2e edit., t. v., p. 483. 1838.

Cryptopodia fornicata, L. R. GIBBES, *Proceed. Amer. Assoc.*, vol. iii., p. 173. 1850.

Cryptopodia fornicata, DANA, *Crust. Explor. Exped.*, p. 140. 1852.

Cryptopodia fornicata, ADAMS and WHITE, *Voyage of Samarang*, pl. vi., fig. 4.



DESCRIPTION.—*Carapax* in outline has the form of a triangle much rounded at the angles of the base; posterior edge straight, with crenations slightly prominent; latero-anterior edges with prominent triangular acute teeth, ser-

†Quoted from M. Edwards. I have never seen the work.

rated on their edges; *rostrum* with a line of punctures near the edge, its surface is prolonged backwards, widening as it proceeds, for nearly half the length of the carapax, and is bounded laterally by ridges marked by granulations and punctures, from which the general surface of the carapax slopes downwards on each side; these ridges are continued backwards and outwards with a moderate curvature forwards, and gradually become effaced before reaching the edge of the carapax; from about the middle of one of these ridges to the other runs a transverse ridge, most distinct at the extremities, where it is marked by very prominent tubercles, and at the middle, where it is marked by granulations; this transverse ridge, which is about midway between the tip of the rostrum and the posterior edge of the carapax, is the posterior boundary of a triangular surface, which is the most elevated part of the carapax, and from which the surface slopes down on every side; the anterior portion of this surface, which properly belongs to the rostrum, is nearly plane, with a slight central depression, the posterior portion separated from the other by a line of granulations, is more undulating and is marked by two slight longitudinal depressions. The form of the carapax may be compared to that of a frustrum of a low triangular pyramid.

Exterior antennæ, with basal segment small, the second about as broad as long, with a small external tooth; third segment about equal in length to the first; *Buccal frame* a little longer than broad; *third pair of maxillipeds* exactly closing the mouth, third segment nearly square, its articulation with the second being near a straight line, and having the fourth segment articulated rather on its interior edge than on interior angle.

Anterior pair of feet sub-equal, about twice as long as carapax: *third segment* triangularly prismatic, one of the planes forming the upper surface; the opposite edge (of course beneath) slightly granulated; posterior edge dentated, lamellar, and much dilated as it approaches the articulation with the carpus, forming an angle where most dilated; anterior edge lamellar, and but slightly dilated, dentate, three of the teeth more prominent than the rest, distant; *carpus*, with outer edge lamellar, prolonged anteriorly into a tooth; *hand* triangularly prismatic, one of the surfaces inferior, the opposite edge superior, crested dentate, teeth large: anterior or outer edge, with three prominent distant teeth; edge of crest between the teeth curved so that the three teeth, with the one on the carpus, enclose three curves, forming festoons; superior and exterior edges confluent at articulation of moveable finger; interior or posterior edge crenate, crenatures marked by pits on both the surfaces which unite to form the edge; moveable finger falcate, crested, dentate, crest with bifurcations running backwards to condyles of articulations; *four posterior pairs of feet*, with the third segment armed on anterior and posterior edges with lamellar laciniate teeth; in the second and fifth pair the anterior and posterior sets of teeth are sub-equal, in third and fourth the anterior set are smaller; tarsi styliform, those of second and third pair projecting slightly beyond the vaulted portion of carapace, when the legs are extended laterally; those of fourth and fifth barely reaching it in like circumstances.

Dimensions.—Length 1.30 of inch, breadth 2.40 of inch.

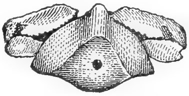
Color.—In dry specimen, yellowish white or flesh color.

Inhabits Indian Ocean, and Coasts of Hindostan.

REMARKS.—The description above given, and the figure, are drawn from a specimen in the Collection of the Boston Society of Natural History, and accord in the main with the descriptions of Herbst, Desmarest, and M. Edwards. The only figure that we have seen, and, indeed, the only one to which reference is made by the authors within our reach, is Herbst's figure. Herbst says that he received his specimen from Fabricius himself, who appears to be the first describer of the species under the name of *Cancer fornicatus;* his figure differs from our specimen in some points, the number of the teeth or dentations on the anterior edge of the third segment of the first pair of feet are much more numerous than in the individual we have described, and he represents the rostrum with a sharp point and serrated edge, in our specimen it was rounded at tip, at the edge was entire.

2. CRYPTOPODIA GRANULATA.

SYNONYMES.—Cryptopodia granulata, L. R. GIBBES, *Proceed. Amer. Assoc.*, vol. 3, p. 173. 1850.



DESCRIPTION.—*Carapax* in outline in form of triangle, with sides slightly convex, and middle two-thirds of base rather prominent; the altitude of triangle being a little more than half its base; *rostrum* horizontal, rounded at the apex, upper surface plane, prolonged backwards for one-third of the length of the carapace; this surface bounded laterally by parallel ridges, and posteriorly by a transverse ridge; from this ridge, on each side, there runs backwards and outwards a ridge nearly parallel to latero-anterior edge of carapax, and terminating on the posterior edge at a point distant from lateral angle of carapax, about one-sixth of the length of posterior edge; these two ridges, with the part of the posterior edge, comprised between them, enclose a surface nearly plane and of triangular form, in the centre of which rises a rounded boss or prominence, covered with granules closely set; from these two ridges, above mentioned, the surface slopes precipitously to the latero-anterior edges; these sloping surfaces are in the form of low trapezoids, and the shape of the shell may be compared to a low frustrum of a triangular pyramid inclining backwards; whole upper surface of the carapace smooth, except the edges and ridges, which are lined with small granulations; under surface of shell smooth, prolonged laterally in the form of a vault over the feet, an indistinct ridge running from the basal articulation of the first pair of feet to the lateral angle of carapace. *Sternal plate* one-third the breadth of the carapax, estimated from one lateral angle to the other, and one-half its length granulated over almost its whole surface, twice as long as broad. *Abdomen* of seven segments in both sexes, with transverse granulated ridges, prominent on the three first, less distinct on the rest.

Eyes with orbits circular, lower outer edge with a notch.

External antennæ of three basal segments of nearly equal length, the third reaching the front and lying in the hiatus of orbit; the terminal stem short of few (3-4) segments. *Epistoma* moderate, twice as broad as long. *Mouth* rectangular, nearly square.

Feet of first pair, sub-equal, large, twice the length of carapax; *third segment*, lying, when in repose, transversely to axis of body, projecting one-half its length beyond lateral angle of carapax, triangularly prismatic, flattened horizontally with acute edge posterior, upper surface slightly dilated as it approaches articulation with fourth segment; *hand* as long as third segment, triangularly prismatic, flattened horizontally with acute edge turned posteriorly when the hand is extended in a line with third segment, inferior surface dilated as it approaches articulation with finger. Hand and carpus, when in repose, flexed on third segment, the opposite tips being a small distance asunder; all the edges of the first pair of feet are lined with granules, except that on the hand, which runs to the top of the immoveable finger.

Feet of other pairs, small, sub-equal, flattened vertically, edges granulated, inferior one more distinctly; *tarsi* conic, acute, as long as preceding segment, tips of those of the second pair, when extended, reaching to the extremity of third segment of first pair, and the extremity of the fourth segment attaining the angle of the carapax. The vault of the carapax conceals the second, third and fourth pairs when in repose, the fifth generally exposed behind the carapax.

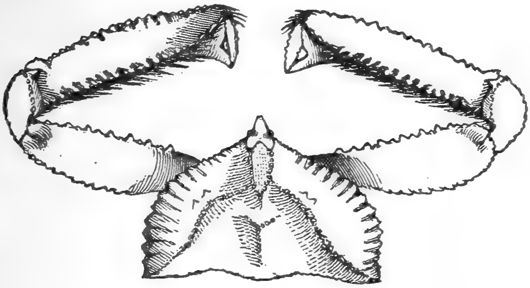
Color.—Variable, carapax generally mottled with brown and green of dull hues, hand greenish with a white band; one specimen was ivory white in every part.

Inhabits coast of South Carolina, where it was first found by Dr. T. L. Burden about 1845, drawn up on a bit of sponge by a hook and line. Several specimens have been since obtained.

Dimensions.—Length 0.5 of inch, breadth 0.6 of inch.

Postscript, June, 1856.—Since presenting the preceding paper to the Society, Prof. James D. Dana, of New Haven, has published (Am. Jour. Sci. [2] xviii. 430) a description, with a figure, of a new species of this genus, which we transcribe here, illustrated by the same figure, which he has kindly furnished.

3. Cryptopodia occidentalis. *Dana.*



Description.—*Carapax* rectangular behind, with the postero-lateral angles acute, posterior edge nearly straight, transverse, antero-lateral edge arcuate, and denticulate on the sides; a triangular sharp edged prominence on the medial line behind the middle; a doubly curving subtuberculate ridge extending to the posterior angles; a small denticulate ridge extending from near the middle to either side of the base of the beak, the two enclosing a narrow area.

First pair of feet very long, triangularly prismatic, angles sharp and unequally subspinulose; *hand* as long as the carapax is broad, upper surface plane. *Four pairs* of posterior feet slightly compressed, third, fourth and fifth segments bialate, tarsus slender, quadralate.

Color not given.

Dimensions.—Length 1 inch, breadth 1½ inches; length of hand 1⅓ in. of carpus, 5 lines, of arm 1 inch.

Inhabits coast of California, near Monterey or Monterey harbour.

Prof. Dana has also transmitted, at our request, the references to the two following species, with copies of the characters given by the authors, and tracings of the figures which accompanied them. We insert the characters here to render more complete our view of the genus, and we have appended to the synonymes, on page 33, an additional reference for figure of *C. fornicata*, furnished by Prof. D.

4. Cryptopodia dorsalis.

Cryptopodia dorsalis, Adams & White, *Voyage of Samarang*, *Crust.*, p. 30, pl. 6, fig. 5.

Description.—*Carapax* depressed, large, triangular, slightly elevated in the middle, twice as broad as long, behind somewhat sinuate; margins with large rounded very distinct crenations; greater part of the back covered with small pustular elevations; two deep furrows in the posterior part of the carapax, placed longitudinally and slightly inclined so as to exhibit the form of a lyre. *Rostrum* horizontal, much produced, rounded anteriorly, with three subacute crenulations on each side. *Eyes* small, retractile.

From the Sulu Sea, East Indies.

Our figure of *C. fornicata*, given on preceeding page, appears to combine several peculiarities of form exhibited in the figures given by Adams & White, of *C. fornicata* and of *C. dorsalis*, so as to make it doubtful whether the two are distinct.

5. Cryptopodia angulosa.

Cryptopodia angulosa, Edwards and Haime, *Archives du Museum d'Hist. Nat.*, tome. ii., p. 481, pl. 28, fig. 6.

Description.—*Carapax* pentagonal, with crenate margins; length 1.12 inches, breadth 2.40 inches. Locality unknown.

Description of a new Baptisia found near Aiken, S. C. By H. W. Ravenel.

I desire to make this Society the medium of publishing a new species of *Baptisia*, which I have discovered in the "Sand hills," in the neighbourhood of Aiken.

The honoured Botanist, whose name this Society bears, aided by his numerous friends and correspondents, has scrutinized, with such diligence and ability, the floral regions of our State, that his "Sketch," which modestly claimed but a fragment of the harvest, has left for future reapers only scanty gleanings in the field of Phænogamous Botany. The "Sand hill" region of our State, the Flora of which is well marked and characteristic, has furnished two species of *Baptisia*, which seem to have escaped his observation, viz. the subject of the present notice, whose characters are given below; and *Baptisia Serenæ*, Curtis, found some five or six years ago in the Sand hills, about Society Hill, and published by Dr. Curtis in vol. vii. of Silliman's Journal for 1849, p. 406, and which I have also found here. These two, and *B. perfoliata*, R. Br., appear to be confined to the "Sand hills."

The two former are rather rare, (of *Baptisia Serenæ*, I have found but two specimens) but the latter is very common here; and with *Ceratiola Ericoides* and *Eriogonum tomentosum*, is a peculiar characteristic of this region.

In addition to these three, just named, I find *Baptisia tinctoria*, R. Br., *B. alba*, R. Br., and *B. leucophæa*, Nuttall. These three last have a wider range.

Baptisia stipulacea. *Plate II.*

Species nova glabra; caule ramosissimo, ramisque patentibus. Foliis trifoliolatis, petiolatis, foliolis subrotundo-obovatis, basi cuneatis, petiolum excedentibus. *Stipulis foliaceis, auriculato-cordatis, obtusis, subamplexicaulibus, persistentibus, petiolo longioribus.* Racemis terminalibus, laxifloris, declinatis. Leguminibus inflatis, sub rotundis, pedicellatis.

Stem two to three feet high, diffusely branched, glabrous. Leaflets roundish-obovate, strongly reticulated on the under side, glabrous on both surfaces. Stipules large, roundish and unequally cordate at base, sessile and embracing the stem, persistent. Flowers yellow, pedicellate, axillary and forming short racemes at the extremities of the branches (like those of B. tinctoria), the upper leaves sometimes becoming unifoliolate and bract like. Teeth of the calyx short, triangular. Legumes short, inflated, on pedicel half inch long, pointed with the long recurved indurated style. Plant not blackening in drying. Flowers in June and July. Root perennial.

Professor John McCrady introduced for publication, in the proceedings, a paper on the *Naked-eyed Medusæ*, of Charleston harbor. Ordered to be registered.

JULY 30TH, 1856.

President L. R. Gibbes in the chair.

The Committee of Curators to whom was referred Prof. F. S. Holmes' paper on a new genus of Raiidæ, etc., recommend the same for publication in the Proceedings.

Contributions to the Natural History of the American Devil Fish, with descriptions of a new genus from the harbour of Charleston, South Carolina. By F. S. HOLMES.

READ BEFORE THE ELLIOTT SOCIETY OF NATURAL HISTORY, JUNE 11TH, 1856.

The Devil-fish or Sea-Devil, as known to the planters of the sea-board of South Carolina, appear in great numbers in our bays and harbors about the first of June. They enter the inlets, from the ocean, at half-tide, feed upon the shrimps and small fish that abound along the shores, and retire again to sea on the ebb tide. They disappear from the coast towards the early part of September.

These fish are viviparous, producing only one at a birth, and it would appear that it is for this purpose they visit our shores.

The author of "Carolina Sports," the Hon. Wm. Elliott, of Beaufort, has captured a greater number than perhaps any other man, and has had ample opportunity, of which he always availed himself, to observe their habits and characteristics. "Some years back," he observes, "the Devil-fish were sought for only in August. Last year, (1843) for the first time, in July, and now, it appears, they may be taken in June. I am convinced, from what I have myself observed, that they visit our inlets not occasionally only, and in limited numbers, but annually, and in considerable shoals. They feed mostly upon the windward shores of the inlet, where the small fish chiefly congregate; and their presence upon the feeding ground is indicated by a slight projection above the water of one of their wings. The motion is so rapid and bird-like, that none who have once seen it will mistake, or ascribe it to any other fish. Sometimes, though not often, you may approach him while feeding in shallow water, near enough to strike; but the best opportunity is offered by waiting quietly near the spot where he has disappeared, until having ceased to feed, he strikes out for the deep water, and having reached it, begins a series of somersets, that give the sportsman a capital chance to strike him. It is a very curious exhibition. You first see his horns or feelers thrown out of the water; then the white stomach, marked with five gills or branchial apertures on each side, (for the fish is on his back) then his tail emerges. After a disappearance for a few seconds, the revolution is repeated, sometimes as often as six times. It happens occasionally, that in making these somersets, the fish does not rise quite to the surface, but is several feet below; so that his revolutions are detected by the appearance and disappearance of the white or under part of his body, dimly seen through the turbid water in which he delights. Sometimes indeed he is unseen; but his presence is shown to the observant sportsman by the boiling of the water from below, as from a great cauldron. With no better guide than this, the harpoon has been darted down, and reached him twelve feet below the surface.

When one of these fish is struck, he commonly darts off with great rapidity, running out the forty fathoms of rope, and then dragging along the boat with quite as much speed as is agreeable. If several boats are in company, they attach themselves to the first, and the little fleet is dragged merrily along. The prudent sportsman will not draw too violently on him at first, but will suffer him to exhaust himself by his efforts, when he is as quietly as possible drawn to the surface, by putting three or four hands to the rope. When seen, a second harpoon is driven into his body. Then commences the serious conflict. He is forced up by the line—he flounders and lashes the waves with his immense wings, or plunges desperately for the bottom, to which he sometimes *clings for hours*, till exhausted at last he yields to the force which draws him to the surface, and is despatched with many wounds. Occasionally, after having three harpoons fastened in him, and as many lances plunged into his body, he strikes out indomitably for the ocean, and escapes. I have been carried twenty-five miles in the course of a few hours by two of these fish, (having struck a relay when my first escaped, and losing both,) with three boats in train!!

It is the habit of this fish to ply its arms rapidly before its mouth while it swims, and to clasp with the utmost closeness and obstinacy whatever body it has once enclosed. In this way the boats of fishermen have often been dragged from their moorings and overset by the Devil-fish having laid hold of the grapnel."

The first intimation we have of this monster inhabiting the waters of the

South-eastern coast of the United States, is by Catesby, who published his "Natural History of Carolina, Florida, and the Bahama Islands" in 1731-'43 in London. He does not fully describe the animal, but simply notices the existence of such a fish in the harbour of "*Charles-Town.*" He called it "DIABOLUS MARINUS" Sea Devil or "*Devil-fish.*" See Catesby, Vol. I., p. 32.

Dr. S. L. Mitchell, in 1823 (September 15), read before the New York Lyceum of Natural History, a description of a fish, taken in the Atlantic Ocean, near the entrance of Delaware Bay. He does not consider it the same as Catesby's Devil-fish, but "*a nearly similar animal,*" and named it "*The Vampire of the Ocean,*" "CEPHALOPTERA VAMPYRUS." See Annals of Lyceum, N. Y., 1823, Vol. I, p. 23. From his description we make the following extracts. "The skin of the back was brown approaching to black; of the belly, black calicoed with milk white. There were neither scales nor spinous processes, nor proper prickles, on any part of it. There were two upper lips, an outer and an inner, and both destitute of teeth. There was a single lower lip, beset with small rough processes, resembling those of a rasp, instead of teeth. There was one dorsal fin, somewhat forward of the root of the tail. It was of a triangnlar form and consisted of thirty-six rays. In lieu of a second dorsal fin there was a lump, bump or callous knob, a few inches behind it. The tail was covered with rather a coarser set of eminences, like a file or rasp than the other parts, and they were not so keenly scabrous; there was no caudal fin at the end, nor any aculeus or sting on the upper side, near the junction with the body. There was no proper bone in the skeleton except in one spot, a *hump* or *knob* about the size of a hen's egg at the root of the tail, behind the dorsal fin. The *individual brought* here was a female. The species is viviparous, for another female that was struggling after having been wounded, brought forth in her agony a living young one, as Capt. Potter related. And Mr. Patchen, while he showed me the orifices through which sucking is probably performed, declared, that on dissection mammary organs were found which discharged a pailful of milk."

In a paper read before the Academy of Natural Sciences of Philadelphia, August 17th, 1824, by M. Lesueur, he describes a Devil-fish then in the Philadelphia Museum, which, he says, "was captured near the entrance of Delaware bay, and brought there towards the end of August, 1822." He also says "another large specimen of Ray was captured at the same time and place, and was transported to New York, where it was exhibited under the name of the *Vampire of the Ocean.* An account of this specimen was read to the Lyceum of that city by their late President (Mitchell?), and published in the Annals of that Institution, with a figure."

Lesueur considered the Philadelphia specimen the same species as the one found in the Mediterranean, and at the Azores, and adopts for it the name "*Cephaloptera Giorna.*" His description differs greatly from Mitchell's, as he says—"tail four or five inches longer than the body, armed above, *beyond* *the dorsal* fin with a short serrated spine, near which is an indentation, probably the seat of a former spine, which has disappeared." "Colour,—above blackish, a little tinged with reddish, somewhat clouded. Beneath white, dusky on the posterior margin, with many darker spots, irregular in form and disposition; the largest of which are on the abdomen, and the smaller on the margin and middle of the fins." A female fœtus of the preceeding has the same form, and the lanceolate spine of the tail preceeded by a slight depression for the replacing spine."

We are inclined to think the above described *female* and *fœtus* are the same alluded to by Mitchell, and that Lesueur is mistaken as to dates, though it may possibly be a typographical error, making it in Mitchell's description 1823 instead of 1822.

Dr. DeKay, in his New York Zoological Report, 1842, retains Mitchell's name for this animal, "*Cephaloptera Vampyrus;*" but his description and figure differ not only from Mitchell's but also from Lesueur's, and he says the latter described from the same specimen that the former examined, though we can find nothing in Mitchell's paper, nor in Lesueur's to warrant such an assertion. That they were captured at the same time and place, we have not the slightest doubt, and from the descriptions and figures which they have published, they certainly must be distinct species.

As regards DeKay's description, abounding in the grossest errors, we cannot, in justice to himself, believe he ever saw a Devil-fish, alive or dead; it is only an attempt to reconcile the descriptions of Mitchell and Lesueur. We make a few short extracts. He says—" mouth subterminal with very small teeth in seven or eight rows in the lower jaw, distant and in quincunx; those of the upper jaw scarcely visible. Colour.—Blue-black above; dusky, varied with large opaque white clouds beneath. Dorsal fin small, triangular, with thirty-six rays, and placed over the base of the tail between the ventrals; *a short serrated spine just anterior to it.*"

Mr. Elliott, in his Incidents of Devil-fishing, to which we have already referred, alludes, to De Kay's description of the Northern fish and points to the characters which distinguish it from the Carolina fish.

He says "the length of tail is to that of the body as six to ten; and I have observed in all the specimens examined there was not one which was armed with a spine serrated or otherwise. The socket or groove where such a formidable weapon may have been placed, was found it is true in all; but the spine in none. It was placed below the dorsal fin and just where the spine is usually found in the sting-ray (Pasternaca?) but I do not believe it is ever found in this fish, in which opinion I am confirmed by remarking, that the young Devil-fish to be seen at Vanucchi's exhibition room in Charleston is without a spine."

The Colour,—"Blue-black above; White varied with dusky opake clouds beneath. In every case the white has predominated, and in a few cases there were no dusky spots at all."

As far as we can learn, this is all that has been published up to 1854 descriptive of the American Devil-fish. In the month of June, of that year a large fish was accidentally captured in the harbour of Charleston, by becoming entangled in the hawser of a schooner moored near Sullivan's Island.

After dragging the schooner's anchor and all, a distance of about half a mile he was hauled alongside and despatched with harpoons and lances.—It was purchased, prepared and mounted by us, and may now be seen at the Museum of the College of Charleston. There is also a fœtus in the Museum belonging to a female fish captured here many years ago; this fœtus was born after the mother was hauled upon the wharf.

From a careful examination of the Sullivan's Island specimen we were satisfied that it was an undescribed *species*, corresponding in part with the description given by Mr. Elliot, but unlike those by De Kay, Lesueur, and others; We therefore published an account of it in the Charleston Mercury June 24th 1854, and named it "*Cephaloptera Elliotti*" in compliment to Mr. Elliott who was the first to notice its characteristics.

Neither this specimen nor the fœtus, has a spine anterior or posterior to the dorsal fin, but the knot and groove alluded to by Mr. Elliott, are very prominent and distinct, in the adult specimen.

In color, the back corresponds with Lesueur's description—"*black, a little reddish*;" but beneath, with Elliott's,—"white, varied with dusky opaque clouds."

The lower jaw contains ten to twelve rows of slender teeth, placed in quincunx;—the tail shorter than body, (see annexed table of dimensions.)

On the tenth of the present month (June 1856,) another large specimen was taken at Mount Pleasant, Harbor of Charleston; it corresponds very nearly if not exactly with the Sullivan's Island, specimen, but more white beneath. And has from twelve to fifteen rows of teeth which are more slender than those of the other fish.

It was not preserved, but we were fortunate in obtaining accurate drawings and careful measurements. Through the kindness of the proprietor we were presented with a part of the vertebral column extending from the anterior base of the dorsal fin, including the knob and groove and part of the tail. Provided with this interesting portion, and from an adult specimen too, we proceeded carefully by dissection to ascertain if possible, there was not some fragment of a spine or spines remaining concealed beneath the skin of the tail, at the anterior end of the groove or posterior base of the knob. Nothing of the kind could be found, though greatly to our surprise we discovered, that, the bump or knob, was in fact a modified spine—an accumulation of strictly *osseous fibre—or bone*, having on the upper side, near the posterior end, a very small, but distinct and beautifully serrated and ribbed spine, about one fourth of an inch in length. The whole was covered with the skin and small tubercles or scales; no part of the bone or the spine, being exposed.

On the posterior end of the knob, outside of the skin, is a smooth groove or depression, about one inch long and from a quarter to three eighths in width, at the base terminations above in an obtuse point; another three inches in length, extends along the dorsal surface of the tail the anterior or widest part being within an inch of the knob. These, we think are nothing more than a modification of the "great plan" upon which all of that family of fish, the Rays,—are constructed.

The bone—the only bone in the fish—is therefore a *modified sting or spine;* and the teeth, like the spine, instead of being very large aud in proportion to the size of the animal, is reduced or modified in like manner to a simple band of semi-cartilage, containing from twelve to fifteen rows of slender enamelled processes or asperities, which are true teeth.

The following table exhibits the dimensions of the several specimens which have been described:

	Mitchell's.		Lesueur's.		Charleston. College Museum		Mount Pleasant.	
	ft.	in.	ft.	in.	ft.	in.	ft.	in.
From the fore-margin of the head to the root of the tail,	10	9	7	10	7	1	6	2
Length of tail, - - -	4		8	3	5	2	4	2
Across the pectorals, - -	18		16		14	4	14	
Number of rows of teeth, -	numerous		8		12		14	
Spines or stings on tail, - -	none		1 or 2		none		none	
Colour.	Above brown, approaching to black. Beneath black, calicoed with white.		Blackish, a little tinged with reddish; somewhat clouded. Beneath white, dusky on the posterior margin, with many irregular darker spots.		Blue black above; beneath white, varied with dusky opaque clouds.		Colour the same as Charleston Museum.	

The characteristics of Dumeril's genus "Cephaloptera," are—"Tail slender; the spine, small dorsal, and pectorals broad as in Myliobatis; but the teeth are still more tenuous than those of a Trygon, and finely serrated. The anterior part of the head is truncated, and the pectorals instead of clasp-ing it, have each of their anterior extremities extended into a salient point, which gives the fish the appearance of having two horns." McMurtrie's Cuvier, Vol. 2, p. 295.

The American fish differs from the above in having a modified second dorsal fin at the base of the tail; containing a spine, which is never visible but rudimentary, and imbedded in a bony base, covered by the skin of the tail, forming a knob or bump posterior to the first dorsal fin. Behind the knob is a groove or depression in the upper surface of the tail, two or three inches in length, and another about one inch long in the posterior dorsal end of the bump; its other generic characters are the same as in Cephaloptera of Dumeril.

We propose to distinguish this genus by calling it *Diabolicthys*, derived from the Greek, and signifying Devil-fish. The specific name, Elliotti, we retain.

The synonymy will therefore stand thus:

FAMILY RAIIDÆ.—Linn. Cuv.

Genus.—Diabolicthys.

Diabolicthys Elliotti.

Synonymes.—Diabolus Marinus, Catesby, *Nat. Hist. of Carolina*, London, 1731–1743.

Cephaloptera vampirus, Mitchell, *Annals Lyceum*, New York, Vol. I., p. 23, plate 2, fig. 1, 1823.

Cephaloptera Giorna, Lesueur, *Jour. Acad. Nat. Sciences*, Philadelphia, vol. 4, p. 117, plate 6, fig. 1.

Cephaloptera vampirus, DeKay, *Nat. History N. Y. Zoology*, 1842. Part I, p. 377, plate 67, fig. 219.

Devil Fish, Elliott, *Sports of Carolina*, Charleston, 1846.

Cephaloptera Elliotti, Holmes, *Charleston Mercury*, *June 24th*, 1854.

As the Carolina fish is undoubtedly a new species, we called it *Cephaloptera Elliotti.—Mercury*, *June 24th*, 1854.

The male taken in the harbor of Charleston, (June, 1854) and preserved in the Museum of the College of Charleston is of this species, as is also the young specimen captured many years ago.

	ft.	in.
Length from the superior margin of mouth to base of dorsal fin,	6	1
Length of tail from anterior base of dorsal to extremity,	5	9
Length of frontal appendices or horns, - - - - -	1	9
Breadth, - - - - - - - - - - -		8
Width across tip of pectorals, - - - - - - - -	14	3
Length of base of dorsal proper, - - - - - -	1	
Height of do. - - - - - -		8
Length of knob posterior to dorsal fin, - - - - -		5

	ft.	in.
Space between eyes, - - - - - - - - -	4	
Mouth, from corner to corner, - - - - - - -	2	7
From corner of mouth to eye, - - - - - -		9
Gape of mouth, - - - - - - - - - -	1	8
Length of ventrals, - - - - - - - - -	1	3
Semi-cartilaginous band in which the teeth of lower jaw are inserted,	1	11

Another specimen, captured after the above was written, 1856, is also without a fin, but corresponds in every other particular with this description.

NOVEMBER 14th, 1856.

President L. R. Gibbes in the chair.

Contributions to Museum.

Dr. Geo. Smith presented six specimens *Cistuda clausa—Harlan.* Three specimens *Emys Muhlenbergii.*

Prof. Lewis R. Gibbes: young of *Zygaena* (fœtus). Sullivan's Island.

Dr. John P. Chazal: *Amadina oryzivora.* Java Ricebird. *Trichiurus lepturus*—Charleston Harbor.

Dr. Elias Horlbeck: Eggs of *Trionyx ferox.*

Arthur F. Holmes, Esq.: Stick from Tea tree.

John Hamlin, Esq.: *Vidua paridisea*—-Whydah bird; South Africa. Escaped from a vessel in the Harbor, and killed at Mount Pleasant.

—— Tucker: Eggs of *Alligator Mississippiensis.*

Edward Horlbeck: *Rhinoptera quadriloba* (female), with young, born after its capture. Charleston Harbor.

W. H. Ravenel: Package of Italian Plants.

Contributions to Library.

Academy Natural Science. Philadelphia. No. 4, vol. viii.

Prof. Dana: Science of the Bible. No. 2. (Pamphlet).

Dr. C. Girard: Contributions to the Ichthyology of the Western Coast of the United States. (Pamphlet).

Boston Society of Natural History: Proceedings Nos. 22, 23, 25, vol. v. No. 1, vol. vi.

Regents of the University of New York: Ninth Annual Report on Condition of the State Cabinet of Natural History, &c.

Prof. Joseph Leidy: Descriptions of some remains of Fishes from the Carboniferous and Devonian formations of the United States, and some remains of Extinct Mammalia.

The Secretary read letters from the following gentlemen, acknowledging their election as Correspondents.

Prof. John Leconte, Columbia, S. C.
Capt. A. H. Bowman, U. S. A.
Robert Chisholm, Esq. Beaufort, S. C.
Capt. H. H. Sams, " "
Dr. F. Y. Glover, Walterborough, S. C.
Dr. John P. Barratt, Abbeville, S. C.

Letters were read from the Boston Society of Natural History, acknowledging the receipt of No. 1 of the Proceedings of this Society, and also from the American Philosophical Society, Philadelphia, British Museum, and Geological Society of London.

The following letter was received from Mr. J. Lee, of Camden, S. C., in relation to the Cicadae, and ordered to be registered.

"In the spring of 1855, I sent you a few of the thirteen-year Locust (seventeen years they are called)—I have never seen an individual of that species, except at an interval of thirteen years, which is in North Carolina and Virginia the year of their appearance."

"Last year, in this State, we had myriads—this year, not an individual. I passed over the Locust ground, and carefully inquired this spring. Not one had appeared. We have a black insect closely resembling the red, which is now in full blast, and I will try and get you one if possible. They are shy, and keep on the tops of the highest trees."

Henry W. Ravenel, Esq., presented for publication the following paper:

Notice of some New and Rare Phænogamous Plants found in this State. By H. W. Ravenel.

A few years ago I published in the Southern Medical Journal and Review an enumeration of some fifty Phænogamous Plants, inhabiting this State, which were not described in Elliott's Sketch. Since then, I have been able to add a few more to the number, a notice of which will comprise the substance of the present paper.

LEGUMINOSÆ.

Baptisia Serenæ—*Curtis in Sill. Journal.* First discovered by

Rev. M. A. Curtis, in the Sand Hills about Society Hill. I have lately found it near Aiken.

Baptisia stipulacea—*Ravenel in Proceedings of Elliott Society.* On light sandy soils about Aiken.

UMBELLIFERÆ.

Eryngium prælatum—*Gray.* (*E. Virginianum Ell. Sk.; E. aquaticum Michx—non Linn*). In Cooper river swamp—very common.

Eryngium Ravenelii—*Gray.* In flat pine woods near head of Cooper river.

Neither Elliott nor MacBride appear to have seen this plant, or if so, it was confounded with *E. Plukenetii Ell.*, which is the true *E. Virginianum* of Lamark. These two plants, with Elliott's *E. Plukenetii*, were sent to Prof. Gray several years since, with my notes, calling his attention to the confusion which rested upon their synonyms. He has since published them under the foregoing names in his "Plantæ Lindheimerianæ," p. 209.

GRAMINEÆ.

Panicum carinatum—*Torrey.* At the margin of the Santee Canal at Black Oak.

Poa ciliaris—*Linn.* In old yards and lawns in Upper St. Johns.

CYPERACEÆ.

Eleocharis melanocarpa—*Torrey.* In a pond on the Race Course near Pineville.

Eleocharis arvincola—*Torrey.* In low wet places in St. Johns, and also on Sullivan's Island.

Rhynchospora divergens—*Chapman in Sill. Journal.* Damp places in St. Johns and St. Stephens.

Rhynchospora Chapmanii—*Curtis in Sill. Journal.* In the same locality with the preceding.

FLUVIATILES.

Najas flexilis— Submerged—in the Santee Canal.

CHARACEÆ.

Nitella spiculifera—*A. Braun.* This plant was sent through Dr. Engelman, of St. Louis, to Prof. Braun, of Berlin, who has given special attention to the Characeæ. He pronounces it new, and has given it the above name. Growing in the bottom of the

Santee Canal, near the white bridge, entirely submerged. Fruits in June and July.

CONIFERÆ.

PINUS GLABRA—*Walter.* Walter, in his Flora Caroliniana, gives descriptions of five species of Pine, two of them as new, viz: *Pinus squarrosa* and *P. glabra.* His *Pinus squarrosa* is undoubtedly the tree now known as *Pinus mitis, Michx.*—(*P. variabilis, Ell. Sk.*) His Pinus glabra has been lost to our later Botanists, and its name has been excluded from the books. Pursh makes no mention of either of Walter's species, though his Flora was published twenty-six years after the Flora Caroliniana. Elliott quotes as a synonym, under his Pinus variabilis (*P. mitis Michx.*) Walter's P. glabra with a mark of doubt; and under his *Pinus inops, Aiton,* he quotes the *P. squarrosa, Walter,* as a synonym, also with a mark of doubt; and then makes this remark: "It (*Pinus inops*) is said by Pursh to grow in Carolina, and it is probably one of the two-leaved species described by Walter." *Pinus inops* does grow in South Carolina, but I have never seen it lower down than Aiken, where it is found on the poor chalk hills among the Kalmia bushes.

Though Walter's Herbarium is still in existence in England, in the possession of the Fraser family, it can scarcely throw any light upon this question from the meagreness of his specimens, the whole collection occupying but a single volume. But I believe that the obscurity which has rested on his two species, may now be satisfactorily cleared up.

There are but two two-leaved species of Pine which grow in the neighborhood of Walter's residence, or within a hundred miles perhaps of his collecting grounds, viz: *P. mitis, Michx.,* (and the tree which I suppose to be his P. glabra.) The *Pinus inops,* as I observed before, does not grow in the low country. The former, *P. mitis,* is very common in woods and old fields, and must have been familiar to him. It could not have been included under his *P. palustris, P. lutea,* or *P. cedrus,* for his characters of these species forbid. The description of his new species is short, but the "*foliis geminatis, cortice scabro,*" identifies his *P. squarrosa* with *Pinus mitis, Michx.;* and the "*foliis geminatis, cortice glabro,*" distinguishes his P. glabra from all other species. The three others now known, which contain two leaves in the sheath, are all rough and scaly; this is remarkable for its smooth and whitish bark.

As Walter's Pine should now take its place in our Flora again, from which it has been so long excluded, I give a brief description, which will serve to identify it hereafter.

Pinus glabra—*Walter.* Trunk forty to sixty feet high, with a diameter of twelve to eighteen inches, much disposed to branch near the ground. Bark more resembling the Oaks than any of our Pines. Branches and upper parts of the tree smooth and whitish. Leaves three to four inches long, united by pairs in the sheath, not so numerous or densely clustered as in *P. mitis.* Cones small, generally solitary, about two inches long, somewhat *cylindrical,* with *small, nearly obsolete spines* near the summit of the scales. Membranaceous wings of the seed *lighter coloured, more tapering, longer and less gibbous* than those of *P. mitis.* The wood of this tree is soft and white; and is known about the country as "Spruce Pine." Its habitat, as far as I know, is quite limited. I have seen a few trees in the neighborhood of Black Oak on the Santee Canal, growing in close rich soils, and also in the Santee swamp, at Vance's Ferry, but no where in sufficient numbers to give a character to the forrests as our other pines do.

EUPHORBIACEÆ.

Stillingia sebifera—*Tallow tree of China.* This tree is now naturalized, and from its hardy habits, will probably continue among us. It should, therefore, have a place in our Flora. Grows along the road side and old banks near Charleston, and higher up in the country.

On a late visit which I made to Walter's former residence on the banks of the Santee, in St. John's Parish, I found two clusters of this tree, bearing the marks of age. They, with one or two other things, were the only memorials left of his Botanical garden. The present trees, one of which has attained a height of about thirty feet, are off-shoots from a half decayed stump of at least one foot in diameter. That he was familiar with this plant, is evident, from an allusion which he makes to it in the preface to his Flora Caroliniana. For seventy years they have survived the want of culture, and resisted the inroads of the surrounding native vegetation; and may, therefore, lay claim to full and complete acclimation.

In the midst of this grove, there stands a solitary grave stone, marking the last resting place of this early pioneer of American Science. It is a plain marble slab, and bears this simple record of filial love:

"IN MEMORY OF
THOMAS WALTER,
A native of Hampshire, in England, and many years
A resident in this State. He died in the beginning of the year 1788.
ÆTATIS CIR. 48 ANN.
To a mind liberally endowed by nature, and refined by a liberal
education, he added a taste for the study of Natural His-
tory, and in the department of Botany, Science
is much indebted to his labours.
At his desire, he was buried on this spot, once the garden in which
were cultivated most of the plants of his "Flora Caroliniana."
From motives of filial affection, his only surviving children, Ann
and Mary, have placed this memorial."

Prof. L. R. Gibbes stated that he is now engaged upon a revision of the genus Pinus of the Southern States, and intends the same for publication in the Proceedings.

Members Elected.

C. G. Memminger, Esq., Henry W. Peronneau, Esq.

DECEMBER 1st, 1856.

The President, L. R. Gibbes in the chair.

In the temporary absence of the Secretary, Prof. Holmes, the following resolution was unanimously adopted:

Resolved, That the thanks of this Society be formally tendered to Prof. F. S. Holmes, for the zealous manner in which he has heretofore voluntarily attended to the business of the Society.

The following paper was read by Prof. John McCrady:

Description of Oceania (Turritopsis) nutricula nov. spec. and the embryological history of a singular Medusan Larva, found in the Cavity of its Bell.—By John McCrady.

In the year 1851, Prof. Joh. Müller described a remarkable Acaleph and its embryology as observed by him at Marseilles and Nice. Vide Müller's Arch. 1857, p. 272, plate xi. This animal had a hemi-spherical disk whose margin was scalloped, and from the upper part of which proceeded two long and peculiar tentacula. The development of this species to which Müller gave the name *Æginopsis mediterranea*, was evidently a direct metamorphosis, being unlike that of other Medusæ, not subjected to alternation of generation. At a later date (1852) the same Medusa was observed by Kölliker, at Messina, and in addition to the details given by Müller, he was enabled to state that the digestive cavity terminated in a simple oral opening, and was connected with eight lobes in which he found ova or spermatozoa, according to the sex of the individual. None of the specimens, examined by Müller, had probably arrived at maturity, Kölliker having observed a difference of form between the perfect individuals, and those which had not yet acquired sexual organs, which tended to identify the latter with the last stage observed by Müller. He also found on the margin of the disk, at the middle of each lobe, an otolithic vesicle (Gehörorgan.) Gegenbaur, in Zeitschrift f. Wissen. Zool. 1856, in a valuable paper on the Medusæ, confirms the observations of Müller and Kölliker, having observed repeatedly, at Messina (1852–53,) the embryology of this species which he characterises as an *Homogone*, a direct metamorphosis without the intervention of alternate generation. He also places the animal in his family of Æginidæ, whose principal characteristic is a large and broad digestive cavity from the margins of which proceed pouches corresponding to the number of lobes of the scalloped disk margin. These pouches appear to contain the sexual products when present, but it is to be observed that these have not been observed for the greater part of the species. The presence of otolithic capsules (Randkörper,) and the peculiar position of the tentacula are likewise characteristic of this family.

In 1853, at Messina also was found by Kölliker a Medusa, *Eurystoma rubiginosum*, in the disk cavity of which were found larvæ. These developed themselves afterwards into a form of Medusa which he named *Stenogaster complanatus*, and which also evidently, from his description, refers itself to the Æginidæ.

In the summer of 1856, I had myself the good fortune to meet with, and follow out more in detail a mode of embryonic development on the whole entirely analogous to the preceding, though differing from them in some points. But what is most surprising is the fact that the Medusa on which these observations were made, was not a member of the Æginide family, but belonged to the highest group of the Naked-eyed Medusæ, that of Oceanidæ.

On the 10th of June, of the past summer (1856,) I first took with the dip-net a small Medusa, closely allied to Turris in appearance. Its relations to Oceania were not less striking but still there are points of structure which appear to distinguish it from either. Most of these specimens were about the tenth of an inch in height, but one of them was of still less size, and about a month afterwards I took together quite a number of specimens rather more than double the size of those first found, and which I afterwards ascertained were full grown individuals. The smallest size was never met with afterwards.—But three larger sizes continued to be found from time to time until the early part of October. (Oct. 4.)

This is an animal of rare beauty which my inexperienced pencil has attempted to give some faint idea of in Pl. 4. ff. 1 & 2, etc. I regret the circumstance that no artist could be procured at the time to do it justice.

The principal difference between the genera Oceania and Turris, as defined by Prof. Ed. Forbes, is the presence in the latter of distinct longitudinal muscular bands, four in number, which alternate with the four vertical chymiferous tubes. Both of these genera, as well as Saphenia, are represented by that eminent naturalist, as possessing regularly and beautifully convoluted sexual organs. I have to mention, at once, that neither in the present Medusa, nor in a beautiful Saphenia, also taken by me in our harbor, have I found any appearance confirming this observation.

The present sub-genus, for which I propose the name Turritopsis, is distinguished from Turris by the following peculiarities. The swimbell is remarkably thin, having no accumulation of transparent tissue above as in Oceania and Turris, but the whole appears to be a muscular mass covered by epithelium within and without. The vertical muscular bands are replaced by a single line or seam which does not reach the marginal tube; the tentacula, which, as in Turris, are very numerous and solid, have an elongated bulb at base, on the inner surface of which is an eye-speck composed of a constellation of pigment spots. (Pl. 4, fig. 9.) The peduncle is quite different in form. The stomach surrounded by the ovaries occupies the lower half, but above is a mass of very large cells filled with a clear substance like that in the upper part of the disk in Oceania. This portion is traversed by the four ascending chymiferous tubes, around which the large cells are arranged with much regularity, and which, on reaching the muscular disk, arch over to descend through its substance as vertical tubes. A structure like this has been described in the Larva of Cephea, by Dr. A. von Frantzius.—(Vide Siebold und Kölliker, Zeitschrift f. Wissenschaft. Zoolog. iv. Bd., 1 Hft, 1852.) His figures are very good. Thus the stomach of Turritopsis is in the end of a proboscis as in Geryonia and Tima, the difference between it and Oceania or Turris, in this respect, reminding us of the difference between those two genera and Thaumantias. One other feature ought also, perhaps, to be noticed—it is the smoothness of the tentacula, which are composed of a central axis of large coin-shaped cells, invested with a cellular coat or sheath, in which are scattered thread-cells, these, however, increase in number towards the extremity, which is clavate and crowded on all sides with thread-cells. The bulb, with the lassos hanging from it, is represented in Pl. 5, fig. 11. It will be observed from the description, that these tentacula, the ocellary bulb excepted, are extremely similar to those of many hydræ. Probably on account of the position of the ocelli they are scarcely ever allowed to hang down for more than a few seconds, and that only in active swimming.

The remaining characters are like those of Turris. The circular muscular tissue is of a high order of development, resembling strongly that represented by Prof. Forbes in Turris. The four sexual lobes are opaque, so that the outline of the stomach cannot be seen. They are, however, not convoluted. The mouth is produced into four leaflets bordered by little bunches of thread-cells, a pair of which are represented in Pl. 4, fig. 12. There is no bulb at the junction of the vertical and peripheral tubes.

It will be seen, at once, that this is not improbably generically identical with the *Oceania pusilla* of Gosse, figured in his work, entitled "Rambles of a Naturalist on the Devonshire Coast." Unfortunately, few details of that species are given, and, in all probability, his specimen was young, having only twenty-one tentacula, besides being very small. The character of the tentacula, the position of the ocelli, and their mode of carriage, all agree with those features in the species of our harbor. There also appears to have been, from his drawing, though not noticed in his description, a hyaline body in the upper part of the proboscis, which, however, seems to be more conspicuous in its continuation over the sexual lobes than in our own species.

Turritopsis nutricula, as I propose to call the subject of this paper, is in shape a deep bell, whose lateral outline is somewhat emarginate near the summit of the dome, and this latter appears almost a flat surface except while the animal is freely swimming, when a slight conical apex is visible. See Pl. 4, ff. 3, 4, 5. This bell is transparent, yet not so clearly so as the disk of Thaumantias or Hippocrene, since the large size of the muscular cells give it a corrugated appearance and refract the rays of light along their edges to a greater extent. They are not arranged in continuous rows, but are apparently felted together, their longitudinal diameter always parallel to the marginal tube. The internal surface of the bell is covered by an epithelium of very small cells, on which I have not observed cilia, yet I am inclined to think they are present. Overlying the layer of muscular cells is a tissue composed of larger and more oblong cells than those of the epithelium on the inner surface. See Pl. 4, fig. 15, A and B. This, so far as I have been able to discover, is the external layer, and on its outer surface are discernible only a few scattered circular cells, fig. 15, *a*. The only indication of vertical fibres which I have been able to identify are the four longitudinal seams already spoken of, as representing the longitudinal bands of Turris, but even now I am unable to say positively whether they are muscular fibres or not.

The disk is traversed by four rather flat and broad vertical chymiferous tubes which enter it at its junction with the clear cellular mass forming the upper part of proboscis. (Pl. 4, fig. 1.) Arching slightly outward these descend to the tentaculated margin, where they communicate simply with the circular canal, i. e., they form no bulb-like enlargement. This latter canal is of about the same width as the vertical, and presents the same flattened appearance.

The tubes are lined with a granular tissue, somewhat more opaque white than the remainder of the bell. They are, therefore, conspicuous, and at times are filled with a rapid current, densely crowded with granules held in suspension, which appear to be urged onward by ciliary action. An interval decidedly wider than usual in these Medusæ, intervenes between the circle of tentacula and the marginal canal. The tentacula, as usual, spring from the border or rim of the bell, which is somewhat thickened, but I cannot say that I have seen anything which I could consider a nervous thread. The tentacula, which are about one hundred in number, being sometimes a few more or less, according to the size of the specimen, are inserted into this thickened rim, each by a conical radix, and they have each a basal bulb or thickened portion which strongly resembles that portion of the tentacle in Thaumantias and the allied genera. It is composed of an outer envelope, which when viewed in profile, appears as two thickened crura surrounding a darker nucleus in which I have discovered no otolithes. This bulb may be elongated so as to seem merely a thicker portion of the tentacle, and at its extremity, on its inner side near the origin of the lash, bears an ocellus composed of many pigment spots. See fig. 9. The lash of the tentaculum has been already described, it is capable of being so much contracted that, at times, I have lost sight of it altogether, as represented in fig. 8, when the whole organ appears as a bulb with an ocellus at tip. The lashes, though transparent, when seen under a low power and by a reflected light, have a slight purplish tint, the terminal club being touched with red. They are capable of being stretched considerably more than the diameter of the disk, and are, in swimming, either curled up tightly or slightly so, as represented in fig. 1, or extended to the utmost, some horizontally and some directed upwards, a few perhaps obliquely downwards, the object apparently being to have the ocelli of the greater number of tentacula turned outwards.

Immediately from the tentaculated rim, stretches inward a delicate veil of medium width, which is, as usual, of filmy transparency, and appears to be highly contractile in all directions.

Returning now to the vertical tubes, we find that before entering the tissues of the bell they traverse the clear portion of the proboscis. Here they do not preserve the even somewhat flattened form, which they have in the disk, but assume a rather irregular outline. This appears to be due to the circumstance, that the canal occupies the somewhat irregular cavity left between the juxtaposed ends of the large cells composing the transparent part of the proboscis. How these cells are arranged radiately, around each tube, is shown in a diagrammatic cross-section at fig. 7. A small quadrangular space, also mentioned by Gosse in *Oceania pusilla*, is left between the four masses thus formed, which is, probably, filled with the same clear substance which fills the cells. The tissue so formed is not confined to the tubes, though it has there its greatest development; it spreads also downwards over the several lobes, but in this portion the cells are very much smaller. Around the tubes the cells are of a somewhat pyramidal form, their bases turned outwards, the apices inwards, to meet the chymiferous canal. The substance which fills them is not at all unlike, in appearance, the white of a fresh egg. I have discovered no granules in it, nor any appearance of fluidity. Indeed, I feel quite sure that there are no cavities within the cells, and no communication, consequently, between them and the radiating tubes. The only changes visible in the appearance of the part, are those produced by contraction, of which it seems capable to a very considerable degree.

The lower portion of the proboscis is occupied by the stomach, the form of which, from the opacity of its walls, cannot be perceived. Judging from the four-lobed character of this part, however, it is likely that its cross-section would be quadrangular. The walls are colored a somewhat orange yellow in the lobes; with lake in the interstices. Directly overlying the walls of the stomach is the sexual glandular layer, not apparently continued around the whole organ, but only occupying the four lobes. The sexual products are thus developed between the proper wall of the stomach and the external layer of clear cells already spoken of, as the continuation of that around the origin of the vertical tubes. I have never been able to discover the outlets of these organs, and am, consequently, ignorant of the manner in which their products escape. There appears, also, to be no tangible difference, in form between the males and females—the only test I have been, up to this time, able to discover, being the obvious one of the presence or absence of ova. Yet this I am sure cannot be wholly relied on, since there is, in all probability, a period when the female having the eggs very small, presents scarcely a difference in appearance from the male, and so far I have never obtained a view of the spermatozoa, or their developing cysts (if such exist) in any specimen. This portion of the proboscis is as contractile as any other portion of the animal, and when both ovaries and stomach are empty, may be puckered up so as to appear a mere border to the clear mass above. See fig. 25a, Pl. 5.

The tissues of the proboscis are gathered together below this stomachic bulb, to form a short narrow neck, from the lower part of which spring four leaflike appendages or labial tentacula of very graceful outline. Each one of these corresponds to the sulcus between two of the sexual lobes. When the animal is very young these appear as four knobs or stumps, and, indeed, in the smallest specimen found early in the season, I did not observe them at all. Their borders are furnished with many bunches of thread-cells, which, when the leaf or any portion of it is contracted, may be brought together in pairs, or still more crowdedly, and, on its expansion, they may be just as widely separated, giving a considerable variety of appearance to this part of the proboscis. But this is not all, each of these leaflets may be very much elongated and stretched upward along the furrows, between the sexual lobes, so as even to appear on their upper surface, when the animal is looked at from above. See fig. **2**, *b*, Pl. **4**. Again, the oral orifice may be exceedingly enlarged, and the leaflets so contracted as almost entirely to disappear, a knot of thread cells here and there alone discovering their position. The oral appendages may then be contracted into a puckered row of thread-cell-bunches, while the orifice of the mouth still remains open as represented, Pl. **5**, fig. **28**b, *m*. And they may even assume a form similar to that described in the younger specimens. When expanded, the tissue, of which these lips are composed, is of a whitish transparence, with a yellow tinge near their origin, but when contracted, as in fig. **28**b, Pl. **5**, they lose their transparency.

The whole proboscis thus described is capable of limited elongation and contraction. It usually hangs as low as is represented Pl. 4, fig. 1, the oral leaflets appearing just a little above the circlet of marginal tentacula. It sometimes seems so far elongated that the appendages of the mouth are entirely visible without the cavity of the bell, beneath the veil, and, as already mentioned, when the stomach and sexual glands are empty, may be considerably shortened. It is also capable of flexion from side to side within the bell, as will hereafter be more particularly noticed. See Pl. **5**, fig. **28**b.

It is not at all an unfrequent occurrence, for the thin bell-wall to be much contracted, and gathered in puckers around the upper part of the proboscis, though not so much as figured by Gosse in *T. neglecta*. A short time afterwards the whole bell may be found entirely reverted, turned inside out, when the thin filmy vail is stretched into such a narrow strip, as not to be recognizable. The contraction of the disk or bell generally takes place when the stomach is full of food undergoing digestion, the animal at that time becoming rather inactive, sinking to the bottom of the jar, and there remaining, and I incline to think that it may sometimes be a provision for the discharge of the hard-parts of the prey at once without the cavity of the bell. Yet I have seen this discharge take place, with the proboscis even somewhat contracted within the bell, which was in its normal position. With regard to the reversion, perhaps I should rather say the inversion of the bell, though I have seen specimens still somewhat active in that condition, yet I am pretty sure that it is a sickly sign, and I do not recollect any instance in which a specimen survived very long after it had taken place, nor any in which the normal position was resumed. Yet, it is not only in confinement that this phenomenon occurs, for I have taken the animal with the dipnet so reverted, and that in the midst of its breeding time, the young hydræ holding on to the inverted bell.

Turritopsis nutricula is a lively animal, swimming gaily about near the surface of the water, with very regular rythmical pulsations. I have so frequently taken numbers together in the same spot, that I incline to think it gregarious, like Geryonia. And another circumstance of peculiar interest is, that usually, only individuals of the same stage of growth flock together. Its motion in swimming is peculiar. Though it does not shoot forward so far at every stroke as Sarsia, yet each throb of the disk gives it a considerable impetus. Now, if we examine a Thaumantias or Geryonia, or Tima, while swimming, we see it propelled by many successive pulsations in a straight line, corresponding to the vertical axis of the animal, but this is not the case in Turritopsis. The pulsations here are slow, measured, powerful, each appearing to have a more special design in it than the oft repeated pulsations of Thaumantias, and each, instead of driving the animal directly forward towards the points whither its whole course tends, propels it in a direction crossing that line diagonally, like the course of a ship in tacking or traverse sailing. It is thus propelled first to one side of its course and then to the other, its actual track being a zig-zag. This shows that the pulsation is not given equally by all parts of the transparent bell, but that the sides alternate slightly, and so produce the zig-zag motion. It, therefore, shows a tendency to specialization between the sides of the bell, which is an approach to bilateral symmetry, not observed in other Discophores. Analogically, also, it reminds us of the manner in which, among the higher animals, especially the birds and man, the weight of the body is thrown first on one side and then on the other in progression.

This is the motion of Turritopsis when performing a long journey, but he may be often seen sporting about the surface, taking a few side-long leaps like those described, and then, with the mouth of the bell downwards, expanding himself to the utmost, all his tentacula, which in progression were tightly curled up, now gradually disentangling and stretching themselves to their greatest length, turned upwards or horizontally, while the motionless parachute slowly sinks to the bottom. However, the tentacula thus extended seem to be keenly alive to every passing particle, and every now and then one or two or more of them may be seen to contract with great rapidity, as if they had come in contact with something to be seized or avoided. At this time the Turritopsis has spread all his snares, and his tentacula radiating on all sides, form a circle probably equally efficacious with the spider's web. Indeed, I have found small crustacea, their principal food, frequently dead or dying in the embrace of these tentacula, or rather simply hanging to them by invisible attachments, illustrating in another instance the deadly properties of those wonderful thread-cells. After, however, the Turritopsis has been sinking for some time, (he may even allow himself to touch the bottom of the jar,) he suddenly draws in, more or less, all his tentacula, and beats up again towards the surface in the same old zig-zag way, now and then running along for a little distance in a horizontal direction, but generally going quite up to the surface, and there expanding himself, mouth downwards, again to sink slowly towards the bottom. The animal may continue fishing in this way a whole morning.

I come now to treat of that part of the history of Turritopsis which is most full of interest. I mean its development. I believe that, up to the present time, nothing is known of the embryology of those genera, associated by Forbes in his family of Oceanidæ, except some fragmentary observations on *Oceania flavidula*, by Gegenbaur, (which I have not seen,) and the few though important observations of Gosse, on the re-production of *Turris neglecta.* These latter showed that the ovum of Turris is cast a planule, becomes elongated, forming a creeping root attached to some object, and that from it, in a short time, a four-tentaculated hydra shoots up. This establishes the fact that, in its first stages, the development of Turris is like that of all other known Naked-eyed

Medusæ. In confirmation of this Gegenbaur asserts, that the nurses of Oceanidæ, so far as known, are Syncorynidæ. Not so, however, with the embryological history observed in Turritopsis. Here I have encountered a chapter in nature so full of interest, so beautiful in many respects, and yet, at the same time, so novel when compared with our former knowledge of the class, that I think I should have been slow to believe it, had it not unmistakeably passed before my own eyes.

In the early part of July I found the first full-grown specimens of Turritopsis. Among them was one somewhat larger, perhaps, than the rest, which I took with the bell inverted. When placed under the microscope, conceive my astonishment to find, clinging to the bell and sides of the proboscis, numerous little animals of singular aspect, each of which appeared to be sustaining his hold by a four-legged pedestal, and to be writhing about in the water a long appendage, the meaning of which I could not understand. In a very few moments, however, in spite of the difference in proportion of parts, the resemblance of these beings to the free young hydra of Tubularia was unmistakeable, and though at the time I entirely mistook the oral end of the body for the stem-end, and the stem-end for the oral, yet a field of research was open to me in an instant, which, from the peculiarity of the circumstances only, I felt must be full of extreme interest.

It was not until the 15th of August, that I again encountered the same phenomenon, in a smaller size of Turritopsis, of which quite a number were taken. I found the cavity of the bell around the proboscis occupied again by these larvæ, but besides those formerly observed, were others, which were gradually becoming Medusæ, and still others which had assumed the Medusa-form already, and, lastly, to complete my satisfaction, I saw them, after expulsion from their former abode, swimming about freely in the water with the rythmical contractions of Medusæ.

It was quite plain from this, that expulsion had taken place, but still I had not seen the expelled animals until some time after the occurrence, and it was not until a later date, Sept. 18th, that I had an opportunity of observing the condition of the larva at the time of expulsion. From this I learnt that, shortly after assuming independence, the larva changes the Medusa form, under which it is first freed, for another which is more persistent, so that here again was a phasis of much interest to the systematist.

But I will now proceed to describe this metamorphosis in as detailed a manner as my observations for the past summer permit.

EMBRYONIC DEVELOPMENT.

The earliest condition of the ovum of Turritopsis nutricula, which has come under my observation, is that of an ellipsoid cell, very small, and of faintly granular content, without any definite nucleus. The next stage is that in which the germinal vesicle and dot have appeared. The ovum now increases in size, and, at this stage, I have observed the yolk to be more distinctly granular, and the germinative vesicle to be itself a nucleolated cell. After this, the granular yolk becomes denser, apparently by the multiplication of granules, and almost opaque, the germinative vesicle has disappeared, and the centre of the egg is occupied by a translucent, ill-defined circular or oval nucleus, which is, perhaps, the clear oil globule known in ripe ova. Beyond this, I have not observed. The segmentation, after impregnation, still remains to be seen, as well as all the consecutive stages. The gradual growth of contiguous ova now produces compression, and the curvilinear outline is variously modified into more or less irregular rectilineal figures, some being even hexagonal, while others assume an elongated form rounded at one extremity, and pointed at the other. (Vide Pl. 5, ff. 16, 17, 18.) These I have never seen greatly elongated. A figure by Prof. Forbes, of the ova of *Turris neglecta* (Brit. Nak. Med. Pl. 3, fig. 2, *e*.) shows that a long process may be developed from the sharp extremity of this ovoid embryo, which, in all probability, takes place in the generality of cases within the ovary. I would have supposed this to be the incipient proboscis of the larva, but the observations of Gosse show that, in *Turris neglecta*, the eggs fall and produce elongated root-like appendages, which become fixed before the hydra shoots from the body of the germ mass. It is, therefore, probable that this process is such an incipient radix. No phasis like this is in any manner indicated in the ova of Turritopsis.

Notwithstanding my good fortune in having had specimens of Turritopsis alive in water many times since the 10th of June of the past year, I have never been so fortunate as to observe the expulsion of the ova, and cannot, therefore, say whether they make their exit by the mouth or otherwise. But I think it may be safely believed that they pass out either by the mouth or by some openings immediately in its vicinity, perhaps on the labial fimbriated border for, on one occasion, when ova were expelled by artificial compression, they were only found immediately near the opening of the mouth.

I am, consequently, also, as yet, ignorant of the form of the genital product at the time of expulsion. On one occasion I observed, in the upper part of the disk cavity of a large specimen, several opaque spherical ova resembling those I had, on a previous occasion, forced out by compression, and which were entirely without either proboscidian elongation or indications of tentacula—unfortunately, I was compelled to leave the observation at that moment, and have never had a recurrence of the phenomenon. But the specimen in which this was observed was not in a healthy condition, and it is not at all unlikely that the expulsion may have been premature and abnormal.

If, however, this be the real condition of the young when born, we will have here a state of things like that in some Tubulariœ, where the young passes as a globular planule into the bell concave between the proboscis and wall of the cavity, and there remains until the tentacula are developed. But while this easily takes place in such fixed Medusæ, as deriving their nourishment through Hydra mouths, can keep the vailed rim of the bell closed, it is difficult to conceive how, in the swimming Turritopsis, the globular germs could be kept from expulsion into the water at any pulsation of the parent's disk. It is, however, possible from the peculiar shape of the disk, that the contents of the upper portion of the sub-umbrella do not receive the downward impulse given by the contraction of the bell. In that case, the embryo noticed above may have been even kept in position by the parent's pulsations.

Still further, in regard to this stage of the development, the most imperfect form of larva which has yet fallen into my hands, was one of which I give two much magnified outlines, Pl. 6, fig. 19. It was proboscidian, and apparently unprovided with tentacula. I suppose during the present summer I have seen very little fewer, if not more, than an hundred larvæ, but among all these this was the only untentaculated specimen, not the product of gemmation, which fell under my observation. It was clinging to the tentaculiferous border of the parent's disk, by means of the extremity of its own proboscis. This circumstance also was peculiar, since in no other instance have I seen the larva to use the proboscis as even a means of temporary adherence for the purpose of locomotion. Its position, also, at the border of the disk is worthy of especial notice, for the habitual position of the tentaculated larvæ is on the sides of the proboscis of the parent, or clinging to the inner surface of the upper part of the swim-bell, and in no other instance have I been able to satisfy myself that there was any adhesion to the tentaculiferous border. Just within the cavity, and almost on the border of the vail, it clung with such tenacity that, notwithstanding the powerful contractions of the parent, by which it would be thrown, now within and now without the opening of the swim-bell, its hold was never lost. Yet it appeared to be in contracted condition from the constant irritation to which, by its position, it was subjected. From the same cause I was prevented from making any thing but an outline, opportunity for which was given me by a very short interval of repose in the parent. The condition of the digestive cavity was not observed. That portion of the body which contains the stomach, however, in the more developed larvæ, was large and nearly globular, having near its upper surface obscure and somewhat irregular tubers, which may have been either the buttons formed by contracted tentacula, or the first appearance of developing tentacula. To the latter construction I strongly incline, from the fact that I have never observed a larva of Turritopsis to adhere by any other part of the body when the tentacula were unmistakeably developed, nor have I, in any instance, observed the larval tentacula to contract in any degree approaching to disappearance. These considerations, in the absence of better proof, render it probable, and I, therefore, believe that I have found in this specimen one of the earliest stages of the embryo.

The next stage of the growth is represented in fig. 20, Pl. 6. Two long flexible tentacula have sprouted from the upper or (with reference to the oral extremity) the posterior side of the stomachic bulb. A well defined digestive cavity occupies the centre of the bulb, and is prolonged in a blind œsophagean canal to the oral extremity of the proboscis, which has not been yet perforated by the formation of a mouth. The tentacula are solid, and terminated by a bulb exactly resembling, in structure, that of the adult Turritopsis. The axis is composed, as in the adult, of a pile of compressed coin-shaped cells, capable of contraction and elongation. This is covered by a cellular transparent sheath, in the outer surface of which are many thread-cells. These are so numerous on the terminal bulb as, in the end, completely to cover it; but I have never seen lashes extending from them. The parenchyma of the body at this stage is composed of two layers of cellular membrane; the outer or epithelial being that which forms also the sheath of the tentacula, the interior that which forms the very contractile wall of the digestive cavity and œsophagus. I have also observed at this stage the earliest instance of fissiparious division which takes place as in Hydra. (See Pl. **6**, ff. **24** and **26**.) From the posterior or stem-end of the bi-tentaculate hydra proceeds a conical diverticulum, (f. 26, f, f,) this soon shows a separation of outline from that of the original larva, with which it is connected by a short neck. The bud thus formed contains an offset of the main cavity of the original larva, and a short wide communication between the cavities of the two traverses the neck. In a short time, from the prominent circular ridge of the body, are developed two tentacula, as in the original larva, by which time this latter may have acquired four, but there are cases where the development of the new bud is so rapid that its two tentacula are produced while the original larva is still bi-tentaculate. The number of buds is not limited to one, but is in fact most generally two, and at times I have been led to doubt whether there were not even more than this number, but the maze of tentacula, proboscides and bodies in various stages of advancement, seen through the thickness of the animal's swim-bell, and often against the densely opaque mass of the parent's proboscis, rendered it impossible to untie this Gordian knot. At the same time there is an argument against the probability of their being ever more than two buds, in the circumstance that from the peculiar form of the Hydroid before separation, it would be impossible that a greater number than three such forms should be so grouped together, each in such a position as to be able to reach the parent's mouth with its own elongated proboscis, without overlying and overcrowding the others. This may, however, occasionally take place.

The youngest bud I have figured is the smaller of the two, *f. f.* in fig. 26, Pl. 6. It will be observed that both these buds originate from the posterior or stem-surface, and this is the universal rule from which I have seen no deviation. The buds in this instance are still lozenge-shaped in outline, the proboscis is represented by the free conical blunt projections, which have not yet anything like their subsequent form. It will be noticed also that the original larva from which these hang, is so far advanced that the incipient lobes of the medusa-disk are already considerably developed at *g.*

Hydroid larvæ, therefore, are thus developed by gemmation, even when the stock-hydroid larva is already partially changed into a medusa, and the process also takes place as early as the bi-tentaculate stage. I have even reason to believe that, in some instances, it is going on, that is, that the stock-hydra is found still organically connected with other younger larvæ produced by gemmation, when the larva is still further advanced in metamorphosis, but in all these cases, the first appearance of the bud dates, in all probability, before the appearance of the medusa-disk.

The next stage is that where the proboscis has assumed its elongated tubular form, and two tentacula have appeared. An instance in which only one such bud had been developed, is seen in fig. **21**, Pl. **6**; and another with two bi-tentaculate buds is given, fig. **24**, Pl. **6**. In the first the stock-larva was quadri-tentaculate at the time of the observation, and its mouth was fully formed. That of the bud, however, formed at the time of the observation. The oral extremity appeared very much enlarged, loosened cells were seen hanging from it at intervals of considerable regularity. Not many minutes after the oral extremity had assumed the bi-labial form, frequently seen in the fully developed mouth, which may be seen in outline at fig. **21**, and at *b*, in the diagram, fig. **22**. In this diagram it will be seen that the digestive cavities of these two hydroids were in full communication with each other, although the mouths of both were developed. In fig. **24**, where the proboscidian scyphons are more extended, there are still only two tentacula developed on the stock larva. Here, from the position of the compound hydroid, the mouths were not visible, and it could not be determined whether they were yet open, for circulation in the proboscidian canal is no sign whatever, that the mouth exists, since before its formation ciliary circulation of the remaining unassimilated yolk cells, which have probably much increased by fissiparous multiplication, is distinctly visible. I have particularly noticed it at this stage, forming a kind of whirlpool in the cavity of the imperforate oral-bulb of the proboscis.

Probably not long after the formation of the mouth, we have the next distinct stage of growth. The larva having gradually increased in size up to this time, now develops two more tentacula having their bases in a line at right angles to that passing through the bases of the two first developed. I have seen them at their first sprouting from the disk, they begin as small knobs. (See Pl. **6**, fig. **24**, *b*.) However, they speedily attain equality with the original pair, so that the larva is next provided with four perfectly similar tentacula. Fig. 25, Pl. 6, is a larva at this stage of development. It is now a perfect hydra, differing in nothing from other four armed hydras, except in the proportion of parts in which they differ among themselves. The proboscis is excessively long, three, or four, or five times the length of the body, and very extensible, while that which represents the stem-end of the Tubularian larva is almost null, gradually, however, acquiring a greater protuberance, never for the purpose of forming a stem or other organ of attachment, (for the present larva never fixes itself,) but simply to produce the rounded dorsal surface of the future Medusa. This is the earliest stage at which I have observed a phenomenon, doubtless one of the most singular in the economy of this singular Medusa. I allude to the circumstance that the larva derives its nourishment from the body of the parent by introducing its elongated proboscidian scyphon into her mouth, and so sucking out, by ciliary action, the mixed water and chyme prepared in the stomach. Pl. 5, fig. 28b, exhibits three larvæ of different stages, with their proboscides so introduced. This, as first stated, is the earliest stage at which I have observed the phenomenon, and the latest is exhibited in the larva marked *a*, in the same figure. It doubtless, however, is the only mode of obtaining food with which they are provided, and probably will be found in operation from the time that the mouth is formed in the bi-tentaculate stage, to that period hereafter to be described, when the medusa-disk nearly complete enough for swimming, the shortening of the proboscis, which takes place at this time, prevents its being protruded so far as to serve the purpose of a sunction tube. After the parent has devoured some small animal, (which in every instance I have been able to observe was a small Crustacean,) and after digestion has so far proceeded that the hard parts are ready to be regurgitated, I have seen the process going on, and, on one occasion, regurgitation taking place, one of the larvæ, at the same time withdrawing its proboscis, was seen apparently endeavoring to catch with open mouth some of the few smaller floating particles vomited out with the empty limbs of the Crustacean. But this is the only occasion on which I have ever certainly seen the larva attempting to take food without having its own mouth within that of the mother. Also, the proboscides, are observed, all introduced at times when it is impossible to be seen that there is any *fresh* food in the stomach of the parent. But during this larvigerous period an examination will generally show, from the plentiful streams of granular fluid in the chymiferous tubes, that the parent is probably provided with an unusual quantity of food, and this is, doubtless, a principal cause why it is very difficult to keep the mother alive for any length of time in captivity at this stage. To describe the process as it takes place, I must begin by stating what seems even more extraordinary when we consider the low organization of the Medusæ. For I have seen the proboscis of the parent distinctly contracted, and, as it were, turned on one side to receive the scyphons of her offspring, while these were endeavoring also, on their own part, to reach the mouth of the parent. How this takes place will be seen in the figure just referred to, pl. 5, fig. 28b, *b* and *m*, where the lateral flexion of the proboscis is conspicuous. However, it does not always take place, occurring, indeed, only when larvæ on one side are to be supplied, but when, as is frequently the case, the larvæ are so numerous as almost to surround the proboscis of the parent, that organ appears to be simply shortened so considerably as to admit of their being introduced on all sides. In either case, however, the action shows a degree of what is termed parental instinct, very far superior to anything we have reason to expect in animals in which the nervous system is rudimentary even with the higher forms. So extraordinary has this fact appeared to myself, that only repeated observations have assured me of its truth, and I could not justly find fault with any one who should be disposed to doubt the accuracy of my observations, until they shall be confirmed by the researches of a greater number of observers.

When free the proboscides of the larvæ are usually in rather active motion, writhing and twisting about in a somewhat worm-like manner, in the clear cavity of the bell, but as soon as they are once introduced into the parent's mouth they become distended and usually arched with considerable regularity, and quite still, as represented fig. 28b, Pl. 5. At such a time a current may be seen passing through the œsophageal tube towards the digestive cavity, bearing with it granules and cells of exactly the same appearance as those seen in the chymiferous tubes of the parent. Unfortunately, however, the density of the parent's stomach and even of the contracted lips at such a time render it impossible to see the introduced extremities of the larval scyphons. Such a view would at once have determined what I cannot now know, *i. e.* how far the scyphons are thrust into the stomach, whether or not they reach the origin of the chymiferous tubes, and so whether the streams for the larva's nourishment are not sometimes drawn even from the circulating fluid itself of the parent.—Another question, which would also have been immediately set at rest by such an observation, is that as to the nature of the imbibing process. For myself, however, I can have no doubt from the following considerations, that it is in no respect other than a simple ciliary phenomenon. In the first place the act of suction, properly speaking, necessarily implies a cavity exhausted by the action of muscular or at least contractile tissues, whereas as before stated, the proboscidian tube and whole body of the larva in this instance is never so still and moveless as when engaged in the process of imbibition. On the other hand I have observed strong ciliary action over the oral bulb of the larva, when moving free in the bell-concave, which is amply sufficient to account for the whole phenomenon of imbibition. If, for example, we suppose the proboscis to be plunged into the stomach when full of fluid chyme into which its oral extremity would thus be dipped, ciliary currents round the oral bulb could be so co-ordinated as to centre in the mouth as a vortex, where the fluid so introduced would be immediately taken up by the ciliary action within the scyphon and driven on in a current towards the stomach, and it is this current which is visible through the transparent tissues of the larva when feeding.

Up to this point in the growth of the larva we observe no difference between it and other hydroids saving only its manner of feeding, to which no parallel, that I am aware of, has yet been noticed. If my reasoning be correct, it deposites itself in the bell-concave of the parent medusa, perhaps as a spherical planula, assumes an elongated proboscidian form, developes first two tentacula, then four, by which it moves or locates itself, or when located maintains its hold. Up to this stage, then, it is the exact analogue of what takes place in Tubularia up to the time of the escape of the young hydroid, from what has been called its ovarian capsule, but which, in the species of our own coast, at least, is a genuine proboscidian Medusa, differing in no essential respect from other Medusæ, unless we make an artificial distinction of the circumstance, that it lives and produces its young without becoming free. If the Medusa of Tubularia is only an ovarian capsule, then our free swimming instinct-gifted Turritopsis is an ovarian capsule also. In both there are distinct sexual organs surrounding a proboscis containing the digestive cavity—in both there is a swim-bell containing a cavity or interspace between its internal walls and the proboscis, in which the young planulæ are first seen. Here, in both instances, they remain and develope tentacula, in the Turritopsis larva only four, in that of Tubularia sometimes four, but usually six. Up to this point, also, neither larva is fixed, and each uses its tentacula as means of locomotion. But here the history of the Tubularian larva diverges from that of Turritopsis. Its first locomotive act is to free itself from the bell-concave, of the parent Medusa, and after this is accomplished, it for a time moves about very actively by means of the enlarged tips of its tentacula, and then fixes itself, for the first time, by the now somewhat elongated stem-end of the body, and thence forward is a fixed hydroid. Another identity of phenomenon, with difference in the relative time of its manifestation remains to be noticed. It is that the multiplication of *hydroids* by *gemmation* which, in Turritopsis, takes place in a free larva, in Tubularia never occurs, that I am aware of, until the larva becomes fixed. But the gemmation of the hydroid larva of Turritopsis corresponds exactly with what is already known of the corresponding mode of multiplication in the fresh-water Hydra. In proportion of parts, this, the typical hydra, is exactly the reverse of our larva. The proboscis in hydra is null, in our larva it is enormously developed, the stem-end or pedicle is of considerable length in the former, but is null in the latter, and the tentacula which in hydra are often prodigiously elongated in the larva of Turritopsis are of medium length, and are never seen to vary to any considerable degree. Both, however, are free, neither being rooted to a particular spot, and the typical hydra, as well as the present larva, uses its tentacula as at least accessory means of locomotion. And remembering that the footstalk of Hydra is the homologue of the posterior flat region between the tentacula, (fig. 20, Pl. 6,) we see that the modes of budding in the two animals are precisely homologous. And, indeed, there are no rooted hydroids known to me, and I believe none known to Science, which produce hydra buds from any other part of the body than this, which is, of course, homologous with the whole ramified stem of compound genera. Thus, we never find any other than Medusa-buds produced among the tentacula or in the clear surface between the principal circle of tentacula and the extremity of the proboscis. Of course, in the view of those who consider Strobila an hydroid polyp, its tentacular gemmation would be considered as overthrowing this view. But the structure of that larval Discophore as given by Prof. Steenstrup, is unanswerable proof of its being, what he considers it, a foot-stalked Medusa, representing to a great degree, in the embryonic history of the hooded-eyed section of the order, that structure which is permanent among the naked-eyed genera. It is not surprising, therefore, since it has the circular and radiate tubes, the vail, bell-cavity and proboscis of a naked-eyed Acaleph, that it should also exhibit a mode of budding which Prof. Forbes has shown to take place in the genus Sarsia, (*S. prolifera.*)

The strange mode of budding known to occur among the Cyathophyllidæ in the class of true Polypi, by which one, two or three polyp-buds are developed on the tentacular disk, is the indubitable homologue of this mode of budding among hydroids. And so we find that the two modes of generation which occur among the true Polypi, occur also in their embryonic representatives, the hydroids, save only that among the latter the basal or, as it has been called, the lateral mode of budding is that on which the multiplication of hydroids by gemmation is wholly dependent, while the tentacular mode is entirely confined to the production of Medusa-buds, exhibiting thus a further specialization in the gemmiparous economy of these hydroids corresponding to their higher position in the scale of being, as being not true Polypi, but polypoid stages of Medusan larvæ.

The consideration of this tentacular mode of budding leads us directly, and naturally, to the next stage in the development of Turritopsis. It is precisely in this region, between the tentacula and mouth of the hydroid, in which Medusa-buds only are produced, that, in the present larva, a series of changes now occur, tending towards the metamorphosis of the whole larva into a free swimming Medusoid. Before, however, entering upon the delineation of their changes it would be, perhaps, best to assume some position as the normal one, by which we will be able to make definite reference in using the words *above* and *below*. Most hydroids in nature assume all positions, and individuals of the same species are found with mouth indifferently directed either upwards or downward, or with the oro-basal axis of the animal horizontal, or inclined at any intermediate angle. This, also, is essentially true of the larvæ of Turritopsis, but if we assume the natural position of the parent to be that of a swinging bell, mouth downwards, we find that the position of the larva is, on the whole, rather a constant one, having the reverted tentacula clinging to the upper part of the parent's bell-concave, and the mouth hanging downwards. I shall, therefore, speak hereafter of the region of the proboscis and about the mouth as the *lower* parts of the larva and the tentacula and gemmiparous area as *upper* parts.

Just *beneath* the circle of tentacula then, at this period, we observe an incipient bulging from the surface of the hydroid, which extends around the whole digestive bulb. This may be seen at fig. 26, *g*, Pl. 6, and was also observable in a still more rudimentary degree in the smallest of the three feeding larvæ already referred to, Pl. 5, fig. 28b. This bulging fold now becomes conspicuous, and about the same time a new tentacular knob begins to be visible in the interspace between each pair of tentacula, as represented in the figures last referred to, where, however, their appearance seems to be rather earlier than usual. The appearance of these tentacula, nevertheless, may be considered as nearly synchronous with that of the bulging fold. Immediately after this, eight points, at equal distances from each other, appear, from the somewhat hanging or overlapping border of the fold. (Pl. 6, fig. 27, t, t.) These points elongate somewhat, and may now be discovered to contain each two otolithic chrystals placed one below the other, the lowermost being always the larger of the two. (Pl. 4, fig. 28a, a much magnified outline.) These are otolithic cysts, but I have never observed the chrystals to vibrate. There are now eight distinct tentacula, the four new ones having become somewhat more elongated and distinct as seen Pl. 6, fig. 28. Each of the otolithic cysts corresponds in position to the interspace between two tentacula. Shortly the border of the fold between the auditory cysts assumes a more specialized appearance resembling a cord around the margin. At the same time the gemmiparous area of the larva becomes more rounded and protuberent, assuming gradually the form of the upper surface of a free Medusa. The larva at this stage is represented Pl. 6, fig. 28. The disk is now so far developed, the growing fold so far overbrows the sides of the body that it is seen to be capable of contraction and dilatation exactly in the manner of the pulmograde movements of Discophoræ, yet not in the rapid rythmical succession which distinguishes those perfect forms, but very slowly, so that several, perhaps many minutes may elapse between a single contraction and the following expansion, and indeed these movements at this time do not seem to have any co-ordination or rythmical relation between their successive acts. That phasis does not appear until later. Synchronous with those movements, however, is the first tolerably distinct indication of lobation in the outstanding fold or disk. A division of it into eight peripheral lobes, each of which is so placed as to have an otolithic cyst at its rounded outer apex, and between every two of which is the base of one of the eight muscular areas hereafter to be described, is the last stage at present known to me. A further development of these lobes next takes place, the marginal cord which has heretofore appeared nearly straight in its course, is now bent out at the interspaces between the tentacula, giving it, at the same time, the appearance of being looped up towards the base of each tentacle so that the disk is now divided into eight free peripheral lobes, each of which bears at its outer free edge an otolothic cyst, as represented Pl. 6, fig. 28, and also at a somewhat more advanced stage, Pl. 5, fig. 28b, at *a*. In the notches or fissures between these lobes shortly now begins to appear a delicate membrane of different cellular structure from the surrounding parts, which is the rudimentary vail. It doubtless, at the same time, is continuous on the lower edge of each lobe, stretching thus from notch to notch around the whole periphery, but I have not been able to trace it, with certainty. This is visible in the figure last referred to at *a*. At the same time the cord, represented in the figure by the dark outline of the lobes, is distinctly looped up as it were by each tentaculum, and the disk has assumed in outline all its chief peculiarities.

Up to this time no great change has occurred in the proboscis or digestive cavity of the larva, except that the former has become enormously elongated, and the latter has followed above the more protuberant outline of the gemmiparous surface, while at the same time the whole digestive bulb has increased considerably in diameter, especially in that part surrounded by the Medusa-disk. The process of feeding from the stomach of the mother also still takes place as represented in the figure. But now some slight indications of change in form are visible, in that part of the digestive cavity surrounded by the disk already referred to as having increased in diameter. In outline it has been hitherto circular, but it now begins to exhibit faint indications of an octagonal form, each angle of which is at the base of a tentaculum. No further change immediately occurs worthy of especial notice until the larva is nearly ready for freedom. The disk continues to grow, each of the characters just described in their incipience becomes more and more developed, until it presents a sufficient expanse to be used as an umbrella-like swimming organ. The time for expulsion is now at hand, the proboscis loses its inordinate length, the digestive cavity has assumed distinctly the eight-pointed form represented Pl. 7, fig. 32, and the larva quits its hold of the parent's body, and is driven out the next time the bell is emptied of its watery contents.

Immediately after expulsion, I have observed the discophorous larva to remain still for a short time, allowing itself to sink, and seeming to wait for some necessary stimulus to the exertion of its new powers of pulsatile motion. Then begin a few wavering strokes, as if it were just trying its wings, and a short time after the young animal may be swimming about like any other Medusa, with its proboscis hanging down like that of a Tima or Geryona as exhibited in fig. 31, Pl. 7.

If, now, we carefully consider fig. 31 and 32, Pl. 7, of which one is a profile view of the larva at this stage, and the other a view from above, we see, that it is no longer a hydra, but a veritable, though imperfect, *Medusa*, in which the radiating tubes are not yet formed. The veil by this time is so highly developed as to be entirely unmistakable, forming a delicate membranous ring beneath the scalloped margin of the watchglass-shaped disk to whose thickened cordlike border it is attached, following the margins of the lobes, and so projecting in their interspaces up to the very base of the eight tentacula. This is, of course, the position of the vail in all the Naked-eyed Medusæ, and the thickened border of the disk, is also conspicuous in Thaumantias and the allied Genera, the only difference being, that there it follows a straight course round the straight margin, while here, the margin being lobed, the attachment of the vail must, of course, follow its sinuosities. In both cases the tentacula are in immediate connection with this cord and the vail, and in both cases the otolithic vesicles here attached just to the nether edge of the chord have the same relative position. A comparison with the otolithic vesicles round the margin of the young habitually reversed Campanularian Medusa will give the same result. Just above each of the otolithic vesicles, and apparently in connection with the marginal cord is a conspicuous prominence, of a somewhat different cellular structure from the surrounding parts. This may be a rudimentary tentaculum, and at least it strongly reminds us of the similar prominences in Thaumantias, and also of that described by Milne Edw. in Æquorea, save that here there is no indication whatever of a marginal tube, and consequently no connection between this knob and the circulating system. Again, there is no structure in any known hydroid comparable to the eight lobular muscular areas which are the true homologues of the muscular bell of Discophora, and like it they are the only organ of swimming, and are employed for no other purpose. The form of the digestive cavity is that which is known in the genus Polyxenia (Eschscholtz,) and with the addition of sexual glands in the form of diverticula, in the family of Æginidæ.

But, before proceeding with such a comparison, another and most important change, which is in progress at that moment of which we are speaking, must be noticed. The long proboscis which has already been observed to shorten before the ejection of the larva, upon attentive observation is now found to be rapidly diminishing in length and increasing in relative width. So rapidly does this progress, that within twenty-four hours after ejectment the whole proboscis has frequently entirely disappeared, at least is reduced to a mere button. This vestige, however, sometimes is still visible for a while, and I have even seen it take the form represented Pl. 7, fig. 31a. But as seen in Pl. 7, 32b, the final condition of the digestive cavity is a simple eight-pointed, depressed chamber, with a mouth, which, when open, is a simple aperture with a thickened rim in the lower wall of the cavity. When open, the mouth may have a circular or oval outline, but when closed, I have seen it present the cruciform appearance characretistic of many Medusæ, represented Pl. 7, fig. 32c. Sometimes even the four corners are a little more prominent than at others, and an appearance of four rudimentary lips is thus presented. For a short distance, on all sides about the mouth, the wall of the stomach appears to be a little thicker than in other parts, and especially in a stage just anterior to that represented Pl. 7, fig. 34, is conspicuously colored with light orange like the proboscis of the parent Turritopsis. This simple oral aperture of the larva is ordinarily carried wide agap, like the mouth of Æquorea, so that, as in that genus, the water of the sea fills the internal cavity or stomach (whose walls appear to be lined with vibratile cilia,) and it is probably by such means that the larva obtains its nourishment at this period. (Vide Pl. 7, ff. 33 and 34.)

No other remarkable changes occur at this stage, save that just described. The disk, perhaps, only increases a little in relative size, the lobes becoming somewhat larger in proportion to the auditory vesicles which hang like drops from them. The Medusa is now about .09 in. in diameter, nearly 2‴, and is of a complete watch-glass form, or rather it has the shape of a shallow glass dish with scalloped rim. This strongly reminds us of the *Polyxenia cyanostyla* of Eschscholtz, save only that from the small number of details given of that species we hardly have as much ground for considering it a true Medusa, as we have shown for this stage of our Turritopsis larva. Unfortunately, I know only Blainville's copy of his drawing, having been, up to this time, unsuccessful in procuring the "System der Acalephen" of the German naturalist. In this figure, if it is a faithful copy, there is no indication of sense-bodies of any kind, either of sight or hearing, there are no radiating and no circular tubes, and these are represented by simple triangular projections of the digestive cavity that proceed centrifugally to the bases of the tentacula, which are alternately long and short. We have also in this figure no indication of a vail, and the only feature which remains to be noticed is the marginal row of areas between the tentacula and the digestive cavity, which are doubtless homologous with the muscular lobes of the Turritopsis larva. The only two differences that need be noticed, are the greater number of tentacula, and correspondingly more numerous "triangular areas" or projections from the stomach, and the absence of lobation round the disk in *P. cyanostyla.* With regard to the former, it is no more than the difference between Stomobrachium and Thaumantias, and the latter is only such a difference as exists between young and adult Medusæ in the genus Sarsia. Indeed, among the vail-bearing Medusæ lobation of the disk-border seems to be rather an embryonic peculiarity, so that, as a general rule, we might almost at once decide that of two adult Naked-eyed Discophores, that which has a lobed margin, is of a typically lower grade than that which has not.

But the description of *Stenogaster complanatus* (Kölliker) also shows a Medusa, found at Messina, having, in all essential respects, a close resemblance with the last stage of the Turritopsis larva. The number of tentacula and otolithic capsules is double that of these parts in our embryo, and there is only one otolith in each capsule. Both, however, are colourless small medusæ, with scalloped ("wellenformig Rand," Köll.) margin to the disk,—each possesses a vail running up between the lobes of the disk, simple mouth, and stiffish, striate tentacula, each with a radix. Neither possesses chymiferous tubes, and the simple mouth in both sometimes assumes the four-rayed form. The little conical knob of the *Stenogaster complanatus,* is evidently analagous to the similar process which surmounts the centre of the disk's upper surface in several Medusæ, and has only the value of a specific distinction.

In fact, Eurystoma and Pachysoma of the same author, appear to be closely allied to Stenogaster and our embryo, and their embryological history would be of the greatest interest.

We have now traced the larva of Turritopsis through successive changes, from its early condition of an untentaculated Hydra, to that stage in which we find it a free swimming Medusa. So gradual are these changes that it would be impossible to draw, with precision, a line of demarcation between the Hydroid and Medusoid stages, unless we say that the first appearance of the otolithic vesicles should be so considered. But at that stage, the larva still has a distinctly hydroid form, and still moves by its tentacula, like the yet unfixed larva of Tubularia. And, indeed, the power of moving itself in this manner, when resting upon any surface, does not appear to be wholly lost in the most advanced medusoid larva I have seen. In short, all these transformations lapse so gradually, one into the other, that we may safely consider the development of Turritopsis, so far, as genuine a *metamorphosis,* as that of the caterpillar into the pupa among Butterflies. What changes follow these, I have been heretofore foiled in every effort to discover. With all my pains I have never succeeded in keeping this Protomedusan form alive for more than a fortnight, and in that time no new change of importance can be observed. I have sometimes believed that the triangular prolongations of the stomach were lengthened in that time, assuming more the form of radiating tubes, and that the tentacula at their apices, which are, the ocelli only excepted, identical with those of the adult Turritopsis, had approached more nearly to the outer edge of the disk; but this observation has always been brought into doubt, by the circumstance that the larvæ, at such times, have appeared more or less sickly, and the stomach somewhat contracted, rendering it not by any means certain that the apparent elongation of those projections, was not merely a temporary change in apparent proportion of parts. Yet it would seem probable from the nature of the development, so far as I have been able to trace it, that the Polyxenoid medusa is directly metamorphosed into a Turritopsis, exactly in the same manner as Ephyra is into the adult Cyanæa—and this probability is certainly not lessened by the fact that the youngest Turritopsis I have yet seen, and which was taken early in the summer (1856) had only *eight* tentacula, while a fully grown adult has about one hundred. The eight tentacula of the medusan larva, though alternately long and short, still are identical with each other in structure, and setting aside the single circumstance that they are yet unprovided with ocelli, as before remarked, differ in no essential respect from those of the parent. When we consider the transformation of the lobed margin of the young Sarsia bud into the unbroken border of the adult, there is no difficulty in supposing an analogous metamorphosis of that part in the present instance. But there still remains one notable difference between this last of the observed stages of the Larva and the structure of the adult Turritopsis, and this consists in the circumstance that Turritopsis has but four radiating tubes, while there are no less than twice that number of triangular prolongations of the digestive cavity in the larval medusa.

But if this Larva be not metamorphosed into Turritopsis, the only other supposition which appears to me to present any probability, is that of gemmation. It is not impossible that the present larva may live for some time, and at a later period, develop Turritopsis-buds. If it should so prove, however, this would evidently be not strictly analogous with the development of the Sarsia from its larva Coryne. But with the development of Sarsia-buds from the free swimming Sarsia,—it would be the budding of one, and that a perfect form of *Medusa,* from another and an imperfect form of *Medusa,* not the budding of a perfect Medusa from an *Hydroid.* It would also be, in some respects, analogous to the development of a Hooded-eyed Medusa, from its Scyphystoma-Strobila that singular combination of metamorphosis and fissiparous multiplication,—analogous in the circumstance that a perfect is developed from an imperfect Medusa, but diverging in the circumstance that, in this instance, the pullulating takes the place of the fissiparous method of multiplication.

It will be well, nevertheless, in seeking for the remaining history of this Medusa, to bear in mind the remarkable fissiparous multiplication of individuals observed by Kölliker, in *Stomobrachium mirabile,* while gradually developing itself into *Mesonema coerulescens*—fission, in this instance, taking place after the Medusa form had been unmistakeably assumed, and even after sexual organs had appeared. (Zeitsch. f. Wissensch. Zool. iv. Bd. p. 327.)

It now remains to say a few words with regard to the histological structure of this embryonic form of Medusa. Its whole structure at this time appears to be eminently cellular, nothing which can be certainly considered a fibre being discoverable. In contraction, however, folds and plications of the surface are formed in the muscular areas which indicate at least the presence of contractile cells acting in regular lines. These are represented in Pl. 7, fig. 37. Two sets of plications in different directions were observed at different times, one probably representing circular fibres stretching transversely across the muscular lobes, but bending outwards, to some extent following the convex outline of the lobe. It will be observed also, Pl. 7, fig. 34, *x*, that between the prolongations of the digestive cavity and stretching from one tentacular bulb to another is a delicate thread. This consists of somewhat elongated oval cells (fig. 42,) differing in appearance from those about them, and which I have not observed to contract. Possibly they may be the rudiment of a nervous circle around the stomach. On each side of this thread and radiately with respect to the central axis of the animal, can be observed plications resulting from contraction, which have a direction corresponding to that of the longitudinal fibres described by Agassiz in Sarsia. These are all the indications of muscular tissue. The walls of the digestive cavity are formed by a tissue of circular cells which are larger and more densely crowded at the junction of the upper and lower wall. A thickening of the lower wall of this cavity forms the border of this simple mouth, and is coloured yellow, being the only coloured part of the larva. The vail is composed of larger and sometimes slightly elongated cells of a different aspect, they are arranged so as sometimes to present an appearance of obscure rows transverse to the diameter of the vail, and are undoubtedly contractile (Fig. 34, *v*.) These peculiar cells of the vail, but with less regular juxta-position, characterise the prolongations of that membrane between the muscular lobes, up to the bases of the tentacula. (Fig. 35, *a*.) The thickened cord or border of the lobes appears to pass into the bulb of the tentaculum as in Thaumantias, forming that outer sheath which when viewed by transmitted light, presents the appearance of two thickened crura. From this bulb projects inwardly into the thickened border of the stomach a prolongation of the large cell structure forming the core of the tentaculum. It is represented fig. 36, *e*. The form of the terminal club-like enlargement of the tentacle is represented Pl. 5, fig. 29. That this bulb does actually and forcibly attach itself is shown in fig. 30, Pl. 6, where a portion of the inner surface of the parent is pulled up, after the tentacular bulbs which tenaciously maintain their hold, even when the larva has been forced somewhat away from its original position. Certainly this hold is not maintained by suckers, and it is more than likely that is due entirely to the action of filifereous cells, but I have not seen the threads. The small rounded prominence just above the otolithic cyst on each of the muscular lobes, which has already been noticed as probably a rudimentary tentaculum or representative of an ocellary or nervous bulb, appears to be in connection with the marginal cord, and consists of round cells somewhat larger than those in their vicinity, (ff. 39, 40, 41, *p.*) I did not distinctly recognize in them the structure of the thread cells, but they may be such in process of development. I saw, however, nothing in them which countenances the supposition of Kölliker that the corresponding parts in Stenogaster might be sexual organs, independently of which, analogy would rather bear out the opinion I have expressed above, of their homology to the "*tubercules ayant la forme d'un petit mamelon,*" described by Milne Edwards in Æquorea.

We may now sum up the various stages of this embryonic development as follows:

First stage—an un-tentaculate, club-like, proboscidian larva.

Second—a bi-tentaculate larva with long neck, digestive cavity, and œsophagus, but imperforate mouth. Here gemmation begins on the posterior surface.

Third—Four tentacula, mouth sometimes assuming a bi-labial form.

Fourth—Medusa disk begins to grow beneath the tentacula, and four new tentacula begin to sprout. Shortly two otoliths are seen in each of the incipient lobes of the disk.

Fifth—The hydra assumes the form of a proboscidian Medusa, with octagonal stomach, a scalloped margin, eight tentacula, four large and four small, recessed from the margin of the disk, eight muscular lobes, and eight otolithic vesicles, above each of which is a rudimentary knob. At this stage the Medusa escapes from the mother's disk.

Seventh—The proboscis disappears, and the digestive cavity assumes the form known in the Æginidæ, with the exception that it has no sexual organs.

With regard to the number of lobes, tentacula, etc., there are occasional monstrosities, both by defect and excess, and I have even observed two otolithic vesicles on the same muscular lobe, a phenomenon sometimes observed in the Æginidæ.

Comparing now the development of Turritopsis nutricula with that of *Æginopsis mediterranea* as observed by Müller, and confirmed by Kölliker and Gegenbaur, we see that in all essential respects they are the same. Though the ciliated embryo of *Æginopsis mediterranea* swims freely in the sea, and accomplishes its metamorphosis without shelter or protection from the parent, while that of Turritopsis remains within the bell of the mother and feeding from her mouth, until it is ready to begin its Medusa-life, yet this is a difference analogous only to that between the ciliated planule of Companularia, and the locomotive hydra of Tubularia. One important distinction, however, is to be noted,—the earliest hydra form of each is bi-tentaculate, but the larva of Æginopsis preserves this bi-tentaculate form through life apparently, while that of Turritopsis exchanges it early for a multi-tentaculate form. This is consonant with the inferior type of Æginopsis, which, according to Kölliker, attains sexual maturity, under a form which would refer it, as both Müller and Gegenbaur have actually done, to the group of Æginidæ, while Turritopsis belongs to that of Oceanidæ. The ultimate stage of Æginopsis is analogous to the last which I have traced in the history of the Turritopsis embryo.

The embryology of *Stenogaster complanatus* in the disk cavity of *Eurystoma rubiginosum* is also identical with that of the larva I have described, with the exception that there the tentacula appear to be developed one by one, instead of appearing in pairs. No sexual organs have been observed, either in Stenogaster or the similar form I have described.

This singular family of Æginidæ, to which perhaps should be referred *Polyxenia cyanostyla* (Eschscholtz) contains at least very few forms in which sexual organs have been recognized. While it is extremely probable from the considerable size of many of the species, that they reach maturity under the Æginoid form, yet it appears more probable that the smaller species, even though possessing spermatozoa and ova, may be the larvæ of higher Medusæ. It may perhaps be found that *Æginopsis mediterranea* is a larval Saphenia. On the other hand, it is true that I have not observed the actual metamorphosis of the larva described in the preceding pages, into the form of Turritopsis. But the fact that when larvæ are present in the bell of the presumed parent her ovaries are either entirely empty of ova, or nearly so, seems to me to render it scarcely doubtful that these larvæ are truly the young of Turritopsis, and must eventually, either directly or through the medium of gemmation reach the form of Oceanidæ.

Our wonder at this mode of development is enhanced when we compare it with that of *Turris neglecta* as observed by Gosse. The genus Turris is at most not distantly allied to Turritopsis, and indeed so close are its structural affinities that throughout my notes, to within a very short time, I uniformly ranked this Turritopsis in that genus. Certainly the two genera, as well as Oceania and Saphenia, structurally considered, belong to one family. Yet Gosse has shown that the ova of Turris fall as planules, attach themselves and develope hydræ like those of other Naked-eyed Medusæ, undergoing, in all probability, a genuine specialized metamorphosis, or alternate generation. While our neighboring genus Turritopsis, which is perhaps even more closely allied to Oceania, undergoes a direct and regular metamorphosis in which the hydra form never becomes attached. I have been tempted at times to think that perhaps these two modes of development might exist in the same genus, but if that described had existed in Turris or Oceania, it is hardly possible that it should have escaped observation so long. In the species of our own harbor a great many specimens occur with larvæ in the cavity of the bell, and these are so conspicuous as even to be observable with the naked eye, and there is not the least probability that an observer of even ordinary carefulness should have overlooked them. On the other hand, I have never seen anything which could even have led me to the suspicion that Turritopsis had any other mode of development. It seems, then, that if these two modes of development do not occur in the same species and genus they at least occur in the same family.

The generic affinities of Turritopsis, with Oceania, are still more striking, and I am yet in considerable doubt as to whether they are not one and the same. Yet the descriptions of European species seems to render it probable that there are two groups in the genus—one characterized by long, and comparatively few, tentacula, with ocelli on the outer side, and with the peduncle or proboscis containing only the opaque sexual organs and digestive cavity, while in the other (sub-genus Turritopsis) the tentacula are very numerous, comparatively short, bearing their ocelli on the inner side, while the upper part of the peduncle is formed by a mass of large clear cells surrounding the origin of the chymiferous tubes. To this sub-genus, I think, is referable the *O. pusilla* of Gosse. If, in addition to the characters noticed above, the mode of embryological development I have just described should be found in the species of this latter group, and not in those of the former, the sub-generic distinction will be complete.

Gegenbaur, in the paper above referred to, states that so far as known the hydroids of Oceania are Syncorynidæ. If, then, the embryological development just described be really as I have treated it, the development of Turritopsis nutricula, and not the parasitic development of an inferior Medusa upon a structurally superior one, (which is the only alternative,) we are not only taught by it how small is the difference between alternate generation and direct metamorphosis, but we may be led to inquire in other directions for the embryology of some genera, whose fixed hydræ we have not been able to find, though they are evidently related to others known to go through a regular alternation of generation of the ordinary type. In any case, the existence of at least three instances wherein the hydra is directly metamorphosed into the Medusa, viz: Æginopsis, Stenogaster, and the Medusan form in Turritopsis, appears to destroy the universality of the so-called alternation of generation as a character of Discophoræ.

POSTSCRIPT.

This account of the development observed in the disk-cavity of Turritopsis, was written before I was acquainted with the observations of Müller and Kölliker upon the embryology, of Æginopsis, and Stenogaster in the Mediterranean. Though I have since prefixed a notice of these observations and introduced some references to them in the body of this Article, I have preferred not to alter its general tone. I may, however, here observe, that the last stage of the larva observed by myself, is by no means distantly allied to *Stenogaster complanatus* differing only, so far as I can determine from a description without figure, in the number of the tentacula, and otolithic vesicles, and in the absence of the little knob on the upper part of disk. This resemblance strengthens the probability that my larva is only a parasite upon Turritopsis nutricula, though certainly if this be the true construction, its history appears yet more extraordinary, when we consider the manner in which it is fed by its foster-mother. Yet the two forms of Medusæ in whose disk-cavities these similar larvæ are developed, differ more from each other than do the larvæ.

Before, however, venturing any positive conclusions as to the proper solution of this interesting question, we must wait for the results of future researches.

In conclusion, I sum up, in connected view, the reasons which induced me to treat the foregoing as really the embryonic development of Oceania (Turritopsis) nutricula, and not the parasitic embryology of an Æginoid Medusa.

1st. When larvæ are present in the bell of Turritopsis nutricula, the ovaries are either empty, or nearly so. Showing that all or the greater part of the ova have been discharged.

2d. That these hydroid larvæ are to all appearance willingly fed by the presumed parent Turritopsis.

3d. That the number of tentacula, in the oldest larval Medusæ, was the same as that observed in the youngest and smallest Turritopsis found—namely, eight.

4th. That these tentacula were, in the main, identical in structure in both the larval Medusæ and the adult Turritopsis, with the exception that those of the latter possessed ocelli which were wanting in the larvæ.

5th. That the supposition which takes it for granted, from the circumstances, that Turritopsis is really the parent of these larvæ, is the most natural explanation of the facts, isolately considered.

6th. That it is already known that, in Tubularia, the young hydræ are developed in the same manner, as these larvæ are developed in Turritopsis—namely, under the protection of the Medusa-disk.

7th. That there is yet no certainly-known instance of the parasitic development of one Medusa, within the bell-concave of another.

EXPLANATION OF THE PLATES, 4, 5, 6, 7.

PLATE 4.

Fig. 1 *to* 6.—Oceania (Turritopsis) nutricula in several positions and states of expansion. Fig. 3. 1, 4, 5, are profile views, the tentacula being fully stretched out in fig. 5—tightly curled and knotted together in fig. 3, and in ff. 1 and 4 they are seen at intermediate stages of expansion. Ff. 2 and 6 are views from above. In fig. 2. the tentacula are fully extended, in fig. 4, contracted. In fig. 1, and fig. 2, the following are the references of the letters:

a, the upper hyaline portion of the proboscis.

d, the four lips or oral leaflets, two of which in fig. 2 are so elongated and turned upwards as to appear on the upper portion of the lateral surface of the proboscis.

c, the four vertical chymiferous tubes.

b, the four opaque sexual lobes.

Fig. 7.—A transverse diagrammatic section of the upper hyaline portion of the trunk or proboscis (ff. 1 and 2, *a*) showing the radiate arrangement of the large pyramidal cells.

Fig. 8.—A view of the rim of the bell very much magnified, but in a state of strong contraction, so that nothing appears to be left of the tentacula but their bulbs, two of which are seen bearing at their extremities the ocelli. Immediately above at *a*, is the junction of the very wide vertical and circular chymiferous tubes, which is seen to be simple.

Fig. 9.—A view of the bulb of a tentaculum with the lash extended, showing the aggregate character of the pigmentary ocellus.

Fig. 10.—A transverse section of a tentaculum taken across the bulb, showing the ocellus in profile.

PLATE 5.

Fig. 11.—The terminal enlargement of a tentaculum, showing the lashes of the terminal thread-cells extended.

PLATE 4.

Fig. 12.—Two of the thread-cell bunches on the lips brought close together. Much magnified.

Figs. 13, 14, 15.—Fig. 13 represents the small epithelial cells of the inner surface of the bell. Fig. 14, the elongate cells of the circular muscular tissue. Fig. 15, the cells of the external layer overlying the muscular tissues. A and B represent the appearance of these cells in two different lights, in one of which, B, they appear nucleated; *a*, three of the small, round cells, perhaps thread-cells, which are scattered on the outer surface of the animal.

PLATE 5.

Figs. 16, 17, 18.—Ova in different stages of development. The two smaller ova in fig. 16 are the youngest I have seen, simple utricles filled with granular content. In the two larger, f. 17, one contains a nucleated, the other a nucleolated germinative vesicle. The dark ova in this and f. 18 represent, a stage when the germinative vesicle has become ill-defined from being surrounded by semi-opaque, granular substance.

PLATE 6.

The figures on this and the succeeding plate represent various stages of development of the larva.

Fig. 19, *a* and *b*.—Two outlines of an un-tentaculated larva, the youngest stage observed.

Fig. 20.—The next or bi-tentaculate stage; *p*, is the yet imperforate oral bulb; the dark space within, *s*, represents the digestive cavity and œsophageal canal.

Fig. 24.—Represents the stage immediately succeeding this, wherein gemmation has already progressed quite far. In the stock-hydra at the point *b*, is seen the outline of one of the second pair of tentacula just budding from the surface.

Fig. 25.—Is a larva which has attained its second pair of the tentacula. The space within distinguished by lighter shading is the digestive cavity and œsophageal canal.

Fig. 25a.—Is a reverted Turritopsis with three larvæ clinging to the contracted proboscis.

a, the hyaline part of proboscis.

d, the very much contracted dark ovaries and stomach.
c, the chymiferous radiating tubes now turned backward
e, bell wall reverted.
f, tentacula hanging within the cavity formed by the reverted bell.
x, very small bi-tentaculate larva.
y, larger " "
z, quadri-tentaculate "

Fig. 21, Pl. 6.—A quadri-tentaculate larva *a*, which has connected with it a bi-tentaculate bud by the neck *x*. At the other extremity of this bi-tentaculate bud opposite the neck is seen the opening mouth *b*, with loosened cells hanging to its margin.

Fig. 22.—A section of the foregoing a short time after when the mouth *b* had assumed its bi-labial form. In this section the form of the inter-communicating digestive cavities is shown.

Fig. 23.—A bi-tentaculate larva which had apparently been separated from its stock before *a*, which I take to be the oral end had been perforated. A globule of air apparently filled this oral bulb: *c* is the tentaculiferous portion of the body, where the outlines of the digestive cavity could not be traced, on account of the opacity due to a state of contraction: *b* represents the stem end of the hydra, in whose cavity was a mass of nutritive matter, probably yolk cells: *g* represents what was probably a fragment of the membranes which connected this larva with its stock.

Fig. 26.—Is the stage consequent to that represented fig. 25. The stock larva is quadri-tentaculate, and on the area just below the tentacula is seen the circular fold or crest. *g*, the incipient disk just issuing. *f*, *f*, represents two young buds from the upper surface.

Fig. 27.—In this stage the otolithic pendents, *t*. *t*, are distinctly visible. The four new tentacula are beginning to bud, two of which are seen at *c*, *c*. The other letters are—*b*, the old tentacula; *s*, the digestive cavity; *j*, the inner, and *o*, the outer margin of the body wall; *m*, the mouth, and *j* at this bulb, the thickened portion of the inner wall.

Fig, 28.—The new tentacula *c*, have grown longer and above the otolithic pendents, the muscular areas begin to be stretched out.

N. Dotted outlines indicate the position of parts which could not be seen in the light or at the focus used for the remainder.

PLATE 4.

Fig. 28a.—One of the muscular areas seen in profile, with the otolithic capsule, not yet divided from it by constriction, but containing two otoliths.

PLATE 5.

Fig. 28b.—Outline of the interior of the bell of the adult, from the top of which hangs the large trunk, or proboscis, terminating in the oral appendages, *m*, which here are puckered together. Above, between the proboscis and wall of the bell, are three larvæ, of different ages, whose syphons *o*, *o*, *o*, are introduced into the mouth *m* of the parent. The larva *a*, represents a stage of development next succeeding that represented f. 28, Pl. 6.

Fig. 29.—The terminal enlargement of one of the larval tentacula, showing the round cells, supposed to be thread cells, with which it is covered.

PLATE 6.

Fig. 30.—Two larval tentacula attached to the surface of the parent. The diverging lines about the bulb are intended to represent the creases made in the surface when it is thus pinched up by the tentaculum.

PLATE 7.

Fig. 31.—The stage subsequent to f. 28b—*a.* The proboscis shortened and the disk now developed. Seen in profile.

Fig. 32.—A view of the same from above.

Fig. 32a.—The proboscis of the same becoming shorter and broader.

Fig. 32b.—A view from above of the digestive cavity when the proboscidian appendage has entirely disappeared. The small opening in the centre is the mouth.

Fig. 31a.—Is a profile outline which I have observed the appendage to assume, when passing from form 32a to form 32b.

Fig. 32c.—The mouth of the larva about this stage, thrown into a quadriform shape.

Fig. 33.—A profile view of the larva at the next stage of development—the proboscis has disappeared. The tentacula 4 + 4=8. This figure is not made directly from nature since it was impossible to keep the delicate discoid embryo in this position long enough to make the drawing.

Fig. 33a.—A sketch of the larva at this stage, swimming freely in the water, made with the aid of a pocket lens. It is swimming downward.

Fig. 34.—A much magnified view of the larva from above—*m*, the gaping mouth; *s*, the Æquorea-like stomach; *b*, the greater, and *c*, the alternate lesser tentacula, all somewhat contracted; *g*, the muscular areas; *t*, the otolithic pendents; *p*, the small fleshy tubercle above; *v*, the vail with its large cells seen through the muscular areas; *x*, the chord which stretches through the muscular areas, from one tentaculum to another.

Fig 35.—An enlarged view of the parts about the origin of the tentaculum—*a*, the upward prolongation of the vail between the muscular areas, *c*, *c*; *p*, the tentaculum; *e*, outline of its radix; *d*, tentaculum; *b*, outline of part of the thickened perimeter of the digestive cavity formed by the junction of its upper and lower walls. The lines across *c*, show the directions of the several muscular constructions.

Fig. 36.—Structure of a tentaculum and its attachment—*d*, tentaculum; *e*, radix, showing the cells.

Fig. 37.—Diagram, showing the direction of muscular constrictions; *z*, concentric constrictions; *y*, radiate constrictions.

Fig. 38.—Somewhat magnified otolithic cyst, and its attachment.

Fig. 39.—Otolithic cyst, with two chrystals, the outline of one of which is more clearly exhibited below.

Fig. 39.—*p*.—Outline of the fleshy tubercle, showing several small round cells which may be thread cells.

Fig. 40.—The fleshy tubercle *p*, from a specimen decomposing, showing its structure and relations to the marginal thread, represented by the cellular tissue below.

Fig. 41.—*p*, another appearance of the same.

Fig. 42.—Cells of the supposed nervous chord *x*, f. 34, stretching between the tentacula.

DECEMBER 15th, 1856.

Robert Hume, Esq., in the chair.

Dr. J. P. Chazal exhibited to the Society two specimens of ore from the Morgan Mines, Spartanburg District, S. C. These specimens were presented by Mr. Heart, Editor of the Charleston Mercury, to the Museum of the College of Charleston. One specimen, the larger, was lead ore, said to yield 103 lbs. of lead to 119 lbs. of ore. The smaller, a copper ore, said to enclose the former, and to contain 27 to 33 per cent. of copper. This ore was referred to Dr. Lingard A. Frampton, from the Mineralogical Sub-Committee, for analysis.

A second part of Prof. McCrady's paper, entitled "*Description of Oceania* (*Turritopsis*) *nutricula, &c.*" containing general remarks on the history of this animal was read, but has not been received for publication.

JANUARY 2d, 1857.

The President, Prof. L. R. Gibbes, in the chair.

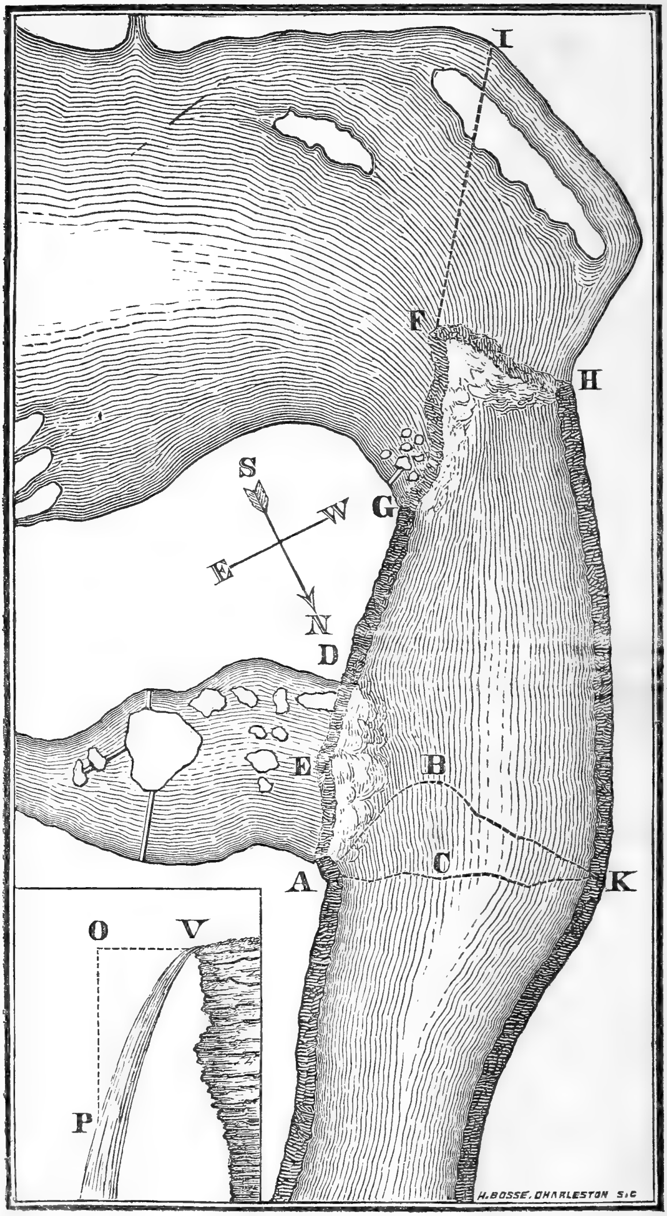
The following gentlemen, proposed as members at the last meeting, were unanimously elected:

Henry W. Wright, Esq.
Prof. H. R. Frost.
Dr. F. Peyre Porcher.
Dr. States Lee Lockwood.
Dr. G. E. Manigault.
Edw. McCrady, Jr., Esq.

The President Prof. L. R. Gibbes, after calling Dr. Samuel H. Dickson to the chair, read the following paper:

On some points which have been overlooked in the past and present condition of Niagara Falls. By Lewis R. Gibbes.

Among the problems presented for solution by the phenomena of this mighty cataract, the most interesting, perhaps, is the determination of the interval of time which has elapsed since first began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its majestic fall over the bluffs at Lewiston, and during which it cut the wonderful gorge or chasm, at whose head it now continues to exercise its resistless power. Several writers have endeavored to form an approximate determination of this interval from the rate at which the Falls recede. This rate has been variously estimated from a yard or more to a foot per annum, and as the length of the chasm is about 7 miles, or 35,000 feet, the length of the resulting interval has varied from 10,000 to 35,000 years. This last estimate given by Sir Charles Lyell, (Travels in N. Amer. 1845, vol. I., p. 27,) has apparently been adopted by some writers as an established fact. The fact of recession is evident, the interval is undoubtedly immense, but no one can yet pretend to have data sufficiently accurate to attempt to estimate its length even approximately.

In the third volume of the Bulletin de la Société des Sciences Naturelles de Neufchâtel, M. Desor endeavors to correct the last estimate given above. He estimates at 40 yards, the utmost amount of retreat of the American Fall from the straight line joining the banks of the chasm above and below the Fall, and says, that if we suppose the American Cataract to have begun its fall at no earlier date than the time of Hennepin, (who mentions its existence in 1678, and gives a figure of it,) we shall have an average retreat of *less than a foot* per annum. If, then, he proceeds, we regard the great probability that the American Fall originated at a date vastly more remote, the annual regress is a *mere fraction of a foot,* and the elapsed interval must be reckoned rather by *hundreds of thousands of years!*

Now, I cannot assent to his applying to the Canada Fall the result drawn from the American Fall, since he omits to take into consideration the very different rate of recession of the two Falls. If we assume, what is generally granted, that the gorge or chasm from the bluffs at Lewiston to the present position of the Canada Falls, has been excavated by the action of the Falls themselves, then there must have been a period anterior to the division of the Falls into two as at present, when there was but a single fall extending from A to K (woodcut page 92) just below the American Fall, whose brink was along some irregularly curved line as A B K, resembling that of the Canada Falls at present, or else along some irregular line as A C K approximating to the straight line joining A K, resembling, in this particular, the American Fall. Then, if we assume that the river or portion of the main stream now forming the American Fall did at that time communicate with the main stream by the outlet A D, it will follow that while the centre of the American Fall receded from B or C to E, the centre of the Canada Fall receded *in the same interval* from B or C to F. From C to F is at least three times the distance from C to E, and from B to F is about four times the distance from B to E, so that *the recession of the Canada Falls is, on this supposition, at least from three to four times as rapid as that of the American Fall.* This point is overlooked, or at least omitted by Desor, so that his result drawn from the American cannot be applied without modification to the Canada Fall.

I have carefully examined the accounts of the topography and phenomena of the Falls, and of the geological structure of the precipice and surrounding region, given by H. D. Rogers (Amer. Jour. Sci., March, 1835, vol. xxvii,* p. 326), G. E. Hayes, (ibid, 1839, vol. xxxv, p. 86,) James Hall (Report of Fourth Geol. Dist. of New York, p. 383), and C. Lyell (Travels in N. Amer., 1845, vol. i., p. 22), and do not find that any of these writers have discussed this inequality of recess, or alluded to the causes which have produced it.† Nor do I find that they use any specifically appropriate term to express the mode in which the rocky strata forming the precipice are removed, and the Falls recede. It is not by the wear of the rock by attrition or erosion, by the friction of the water merely, or by its friction and momentum combined. The process is described by Rogers (op. cit. p. 329), by Hall (op. cit. p. 385), and by Lyell (op. cit., p. 26); the softer shaly calcareous strata which form the lower part of the precipice, are more easily acted on by the agencies brought to bear upon it, moisture, frost, impact of water in motion, &c., and give way sooner than the harder limestone strata above; these latter are thus undermined, and fall in masses from the action of the weight and momentum of the waters above. To avoid misconception, I shall express the sum or result of these actions by the term *abruption.*

Having shown that the Canada Fall recedes not less than three or four times as fast as the American Fall, we must next look to

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* Hall refers erroneously to vol. xxviii.

† The only allusion I can find, on a second examination made since writing this paper, is the following remark of Rogers (op. cit., p. 328). "—— it is manifest that the American Fall is no part of the receding cataract. It enters the gorge *laterally*, having been left by the other fall at least *a quarter of a mile* in the rear. The true width of the valley at the Falls is, therefore, no greater than its average width below; as neither the American Cataract nor Goat Island contribute to its breadth." The italics are Rogers'.

the causes that may have operated to produce it. The following present themselves to me, and most probably the effect may be due to the joint action of two or more of them.

1st. The times of action of each Fall may have been unequal; that is, there may have existed across the outlet A D, a natural dam, (of which the small islands still existing may be the remains,) which gave way sometime after the main Fall had passed the point D, permitting the American Cataract then to begin its fall.

2d. The average volume of water passing over a linear yard of the brink of each Fall, may be unequal.

3d. There may be an unequal facility of abruption presented by the rocky strata at each Fall, or in the two different directions in which the Falls have respectively receded.

4th. The direction in which the strata dip may have some influence in promoting or retarding the recess of the one or the other Fall.

The first of these hypothesis having but little probability in its favor, and presenting no hold for discussion, we may be permitted to pass it by, for the present, at least until the others are examined.

Before proceeding to their discussion, we must call attention to a very remarkable circumstance, whose value in the discussion of the past and future condition of the Falls does not appear to have been insisted upon, or even noticed. It is this: That the four points, A, the northern extremity of the American Fall, F, the vertex of the Canada Fall, and D and G, the two angles of Goat Island, are *nearly in a right line, parallel to the general course of the gorge below*, and at right angles to the general direction A K of the brink of the Fall. It would appear, therefore, that the Fall which had excavated the gorge below A K, in a certain direction, had continued this excavation, in the same direction, uninfluenced by the presence and action of the American Fall, (except by the abstraction of so much water,) and had now assumed the position F H. With respect to its future condition the Canadian Fall may be regarded as consisting of two portions, the one F H corresponding, in its relations to the strata beneath, to the original Fall A K, and the other F G, in the like relations, corresponding to the American Fall. If this view be correct, the general course of the Canadian Fall will be towards the point I, and the formation, finally, of a Fall along the line G I, whose recession will be slower than formerly.

Now, on the view above taken, that the main Fall has cut its way independently, or nearly so, of the action of the American Fall, it will follow that, during the interval of time that the main Fall was receding from A K to F H, a distance of about 1,100 yards, the American Fall must have receded from some line, A D, left by the action of the main Fall to its present position. The amount of this recession, where greatest, is estimated by Mr. Desor, at 40 yards, and this would give a recession 25 times more rapid for the main Fall, than for the American Fall. This result must, however, be reduced in some ratio on account of the *gradual* development of the American Fall, while the main Fall was receding from A to D. The result of this gradual development may be regarded as the same as from the display of the whole force of the Fall for half that time, and as A D is about one-third of A F, if we suppose a nearly uniform rate of recession of the main Fall, the reduction will be one-sixth of the whole, leaving the ratio of recession as 1 to 20 or 21. If the angular or curved outline of the main Fall be regarded as not arising from the junction of two portions F H and F G, but as the normal form throughout the course from A G, it will still be true, that the main Fall has cut its path of nearly uniform width and direction, very nearly as though the American Fall did not exist. In this case the vertex of the Fall will have receded from some point B to the point F, and the ratio of recess would then be as 40 yards to about 800 yards, or as 1 to 20; this reduced one-fourth according to principles given above, would give a final ratio of recess of 1 to 15.

Having thus shown that the main Fall appears to have receded at least *fifteen* times as fast as the American Fall, we may return to the discussion of the remaining three causes above assigned to explain this inequality of recess. The first of these is the most probable cause by far, and to it the whole difference may possibly be due, and that we will first examine.

The volume of water passing over any linear yard of the brink of either Fall depends on the velocity and depth, and I am unable to form any close approximation to the value of either of these factors, or of their relative magnitude at each Fall; nor can I find, in the various publications relating to the Falls, data for making such approximation. It is twenty years since I visited the Falls, but from my own recollections, as well as from the representations of visitors, and the impression given by views of the Falls, there can be no doubt that the volume of the Canadian Fall is much greater than that of the American Fall, not only from greater length of circuit of brink, but from greater depth of water, and possibly, also, from greater velocity. As both Falls draw their waters from the same source above the eastern end of Goat Island, and the brink of the Canadian Fall is 8 feet lower than that of the American Fall, the velocity at the former must be greater than at the latter, (other things being equal), but in what ratio is unknown. It has been reported that the hull of a vessel 16 feet from deck to keel was sent over the Canada Fall, that the deck was level with the water at the time of passing over the brink, and that the keel met with no obstruction in its passage at that point of the brink; it may be hence inferred, that the depth of water at this Fall is *at least* 20 feet. The whole height of this Fall is 158 feet. I have been behind the sheet of water at this Fall, and proceeded some distance along the ledge of rock which forms the foot-hold of the adventurous visitor, but can form no reliable estimate of the height of the under-surface of the sheet of water over head; it can scarcely be less than 58 feet, leaving 100 feet as the *utmost possible* depth of water at the brink of the Fall.

Now, if for the American Fall, we suppose a depth of 10 feet, (which does not appear to us too great,) to give at the Canada Fall a volume 15 times as great to each linear yard of brink, would require a depth of 150 feet, almost equal to the whole height of the Fall; or if we suppose for the Canada Fall the *maximum* depth 100 feet, for the ratio of recess of the two Falls the *minimum* value 1 to 15, it would require a depth of a little less than 7 feet at the American Fall to make the volumes proportional to the rates of recess, and this value appears to us to be near the *minimum* depth to be assigned to the American Fall. As these numbers are all taken on the *verge of probabilities*, it would appear that the *most probable ratio of volumes*, even if the effect due to difference of velocity be included, *is less than that of the ratio of recess.* In such case we shall be compelled to look to the two remaining causes for the explanation of the difference, unless we suppose the mechanical effect, the abruption of the rock, as a complex result, to be proportioned not to the volumes simply, but to some undetermined higher power of the volumes, or to the product of the volume by some undetermined like power of the velocity.

The hypothesis next presented above, does not appear in itself to be a very probable one. I can at present see no reason why there should be a greater or less facility of abruption in one direction than in another, in the direction of dip,* for example, than in one oblique or transverse to it. We are driven to this view by the apparent inadequacy of other causes to the explanation of the phenomena, and the phrase "unequal facility of abruption" may be regarded as framed to express this result, and our ignorance of the real cause of the difference, and not intended to indicate a *difference of hardness or of texture*, possessed by the rocks in different directions. The mechanical actions resulting in the abruption of the rock, are too complex to be referred to any such sole point of difference.

The preceding views and discussions were communicated to Prof. Hall, the eminent Geologist of the New York Surveys, in August last. In his reply, he regards the chief points noticed above as well taken, but considers the hypothesis of unequal facility of abruption, (or as I then expressed it, of abrasion,) as untenable, and refers the more rapid recess of the main Fall to the fourth of the causes given above, namely, that this Fall gains or increases in depth of water, by receding in the line of dip, since the uppermost stratum, or bed of the Falls, sinks deeper and deeper, in the very direction in which the Falls recede; the American Fall losing, at the same time, in depth, as the other gains. He also says, "that the depth of water at Canadian Fall must be less than fifty feet, and is probably much less than that, while on the American Fall the water is very shallow; this is possibly more than five feet, but if the water were evenly distributed over the entire width of the Fall, it would be less than five feet." If, then, we take 40 feet as a near approximation to the depth of water at the Canadian Fall, also as above 1 to 15 as the minimum ratio of recess, it would then require a depth of only $2\frac{2}{3}$ feet a the American Fall, to make the volumes proportional to the rates of recess, and surely the depth cannot be less than that.

I may not clearly apprehend the views of Prof. Hall, but it does not appear to me that the dip of the strata can produce the whole effect that he has assigned to it. It is probable that, when there was but a single Fall at A K, and the two streams mingled their waters at the line A D, the level of the surface of the water was nearly the same in both streams. If it be true that the floor over which the main Fall poured its waters was, as the Fall receded

*The direction of the dip of the strata coincides very nearly with the general direction of the gorge or chasm.

from the point D, gradually lowered 10 feet by reason of the dip (which is about 25 feet per mile) it is also true, if I correctly understand the statements in his report, page 402, that the surface of the water at the main Fall is lower than the surface at the American Fall by about 8 feet, so that there has been *but little gain in depth* during the recess. There must have been, however, a gain in velocity from the increase of declivity from the top of the rapids to the top of the Fall, and there may have been a consequent diminution in volume of water at the American Fall. But, even if this gain in depth of water be granted, since our comparisons made above, with extreme numbers, taken from the Fall at their period of *greatest inequality in volume* barely serve on this view to explain the difference of rate of recess by difference in volume of water, the probability that this is the sole cause does not seem to be increased greatly by this view. It will be understood that, while the surface of the two streams stood at the same level at the line A D, the floors of the two streams were at different average levels, the larger volume of the main stream requiring a greater depth.

Throughout the preceding discussion we have compared the recess of the Canada Fall with that of the American Fall; but if our view above presented be correct, that the partial Fall F H be the true representative of the original Fall at A K, and have cut its way from G to F, precisely as it had already done from A to D and from D to F, then the comparison of the two Falls F H and F G, which cannot greatly differ in depth and velocity of water, will show still more strikingly that the different rate of recess in different directions, cannot be referred to difference in volume of water solely; nor is the gain in depth from dip of strata, adequate to account for the difference.

Good observations are wanting on the width, depth and velocity of the streams at several points above the two Falls, in order to estimate the volume of water passing over each, also of the velocity at or near the brink of each Fall; then from the known volume, linear length of brink, known from survey, and the known velocity at the brink, the depth of water there might be computed for each, if required. The ratio of volume of water compared with the ratio of recession would show how far inequality of resistance entered as a factor in the final effect.

Besides the usual modes of estimating the velocity of the current, such as a space passed through in a given time by objects floating in the stream, &c., the following method might be practiced, by observations on the parabolas described by the cascades at different points. Direct the centre of the cross wires of a theodolite to the vertex V, of the curve of the cascade at a distance from the instrument known by survey, then turn the telescope through a known *horizontal* angle to the point O, then depress the telescope through a known *vertical* angle, to a point P in the stream of water proceeding from V, then from these known angles, and the known depression of the points O and V below the centre of the instrument and the distance of V, find the length of O V and O P in *feet*, then will the required velocity v at the point V be given in feet by the equation $v = \frac{4 \times OV}{\sqrt{OP}}$ The chief difficulty will be in determining the point V or vertex of the parabolic curve.

The points I have sought to establish in this paper, on the supposition that the gorge is excavated by the action of the Falls themselves, are the following:

1. That, from the sameness of direction of the sides of the gorge above and below the American Fall, the main Fall has cut its way to G independently of the existence of a lateral stream or fall.

2. That in consequence of the continuity of the line A D G to F, it is probable that the abruption in the Canada Fall takes place chiefly along the line F H, and that the recession of this Fall will be in the direction of the line F I, so that finally the line of brink of the two Falls, Canadian and American, will be nearly the same along the line A I or one parallel to this.

3. That the recession of the Canada Fall is not less than fifteen times greater than that of the American Fall in the same time, and therefore, that no deduction from the recession of the latter is applicable to the former without modification.

4. That it is probable that the ratio of recess in the two Falls is greater than that of their volumes of water.*

The two following gentlemen were proposed as Curators, and unanimously elected:

ROBERT HUME, Esq. Dr. F. PEYRE PORCHER.

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*Prof. Hall informs me that my letter to him has been entered on the list of papers presented to the American Association at their last meeting, and that it will appear in their proceedings, accompanied by his remarks. The above paper may be regarded as a revised form of that communication.

MARCH 2d, 1857.

Prof. L. R. Gibbes, President, in the chair.
W. H. Wright, Esq., Acting Secretary.

Donation to Library.

Prof. L. R. Gibbes presented Espy's Second Report on Meteorology. Upon motion of Dr. Frampton, the thanks of the Society were tendered to Prof. Gibbes.

The President read a paper on the *Accentuation of Names in Natural History.* Referred to the Committee of Curators.

MARCH 16th, 1857.

President Lewis R. Gibbes in the chair.
W. H. Wright, Esq., Acting Secretary.

Dr. Frampton presented the following written Notice of an Ore of Argentiferous Galena

I submit for the inspection of the Society some lead and a globule of silver obtained from Galena ore, taken from Morgan's Mine in Spartanburg District, about 14 or 15 miles from the Court House, and near the Limestone Springs. The ore in question is imbedded in a matrix, consisting of copper pyrites and peroxide of iron; 2 grammes of the ore yielded 2 milligrammes of pure silver; from 27 grammes and 5 centigrammes of the ore we obtained 19 grammes, 2 decigrammes, and 5 centigrammes of lea. This Mine, we are informed by Prof. Shepard, is situated in the midst of extensive woodlands and near a deep rivulet. A Mine so rich in lead and possessing so many natural advantages, should it ever be rendered easily accessible by a good road, and even be able to command moderately cheap labor, would prove a mine of wealth to its fortunate possessors.

Prof. Shepard, who has inspected this Mine, and to whose kindness I am indebted for many interesting particulars concerning it, informs me that it has been penetrated by a shaft 40 feet deep, that it varies in width from 2 to 3 feet, and has been traced to a distance exceeding 250 yards.

President Gibbes communicated the fact that the fruit of one of our native and ordinary plants, commonly known as the Spanish Bayonet, or Palmetto Royal, a species of Yucca, (*Yucca Gloriosa,*) yields a juice which possesses the property of being readily acted upon by both acids and alkalis, thus furnishing a good and available test for the chemist; which is moreover easily preserved. It was shown, by experiment, that bibulous paper colored blue by immersion in the filtered juice was reddened by acids and turned green by alkalis. The aqueous solution keeps decidedly better than the alcoholic.

Members Elected.

Dr. T. L. Ogier, Dr. James P. Jervey.
Dr. Gabriel E. Manigault was elected a Curator.

APRIL 1st, 1857.

President L. R. Gibbes in the chair.
W. H. Wright, Esq., Acting Secretary.

A specimen of the Siren lacertina was placed upon the table by the President.

Contributions to Library.

The Trustees of the New York State Library presented 2 vols. of the Catalogue of the State Library; also, Catalogue of the New York State Cabinet; Hough's Meteorological Observations, N. Y., 1826–'50; Annual Reports of the Trustees of the State Library, 1855–'56–'57; Reports of the Regents of the Library, 3 vols.; Report of the Commissioners to superintend the completion of the Natural History of New York; and Catalogue of the Coins and Medals in the New York State Library.

Dr. Wm. H. Ford was elected a member.

The following appointments were, with the consent of the Meeting, made by the President:

Prof. Francis S. Holmes, Corresponding Secretary pro tem.
W. H. Wright, Esq., Recording " "

In the absence of Dr. Francis T. Miles, Treasurer, Robert Hume, Esq., was appointed by the President to fill the temporary vacancy thus caused.

The Committee of Curators, to whom was referred the paper of Prof. Lewis R. Gibbes, on *the Accentuation of Names in Natural History*, report, that this paper is likely to be of great usefulness in America, where many engaged in the pursuit of Natural History are unacquainted with the Latin and Greek languages. The Committee, therefore, recommend that it be published in a small and portable form, as a Manual, and so placed within the reach of every student, however limited his means.

APRIL 15th, 1857.

Dr. L. A Frampton, in the chair.

Prof. McCrady introduced the following paper:

Gymnopthalmata of Charleston Harbor. By John McCrady.

No class of the Animal Kingdom, perhaps, presents more or stronger attractions than that of Acalephæ. To the lover of what is beautiful, they exhibit a variety of forms unsurpassed in delicacy, grace, and harmony of color, by even the fairest flowers; to the physiologist they exhibit the functions of life, performed by structures of the most wonderful simplicity; and to the philosopher their development produces problems as marvellous to the fancy as they are essentially important to the processes of generalization. It is then, perhaps, due to the many obscure passages in their history, as well as to the small number of sea-side Naturalists, that

that our own rich shores have been so little interrogated for answers to the interesting questions which their history raises.

On the Medusæ of the United States, North or South, I believe there has been, until the present time, but a single special publication, and that consists of the two beautiful and valuable papers by Prof. Agassiz, entitled "Contributions towards a knowledge of the Acalephæ of the United States." Besides these, I am acquainted with only a very few desultory notices and descriptions, no native American Naturalist appearing to have turned his attention this way with any connected plan of research.

Yet so abundant are our Southern coasts in genera and species, that one might easily spend the greater portion of his life-time in investigating their astonishing variety, and the singular phases of their history. In a single locality, at the mouth of Charleston harbor, I have collected during the past summer (1856) nineteen species of Naked-eyed Medusa, belonging to fourteen genera, and I still feel quite satisfied that more are to be found. Among them was discovered a new and unsuspected instance of "*Homogony*," besides ample opportunity of throwing light on the method of de'velopment already known.

An account of the development of O. Turritopsis nutricula has already been given. I now proceed to present a descriptive account of our species, (all of which are new), hoping hereafter to devote a special paper to a more detailed account of the history and structure of each genus. Of these genera the greater number are new to our American Fauna.

It has been customary among naturalists to separate in description the Hydroidea from the Acalephae. The historical connection of the two groups is of itself something so wonderful, as to make it difficult to bring ourselves to an implicit reliance upon it as a general truth, and the somewhat discrepant observations upon which our conclusions are to be founded have, no doubt, contributed to the same result. The fact, however, that the Hydroidea are all larval or low forms of Medusæ, there is no longer any good reason to doubt. There have been so many observations by Sars, Dalyell, Van Beneden, Löven Steenstrup, Dujardin, Siebold, Agassiz, Kölliker and others, all tending to demonstrate the impossibility of separating these two groups in a natural classification, that scarcely more is needed. However, to my mind, the difficulty felt by some authors in the persistent individual-independence of the polyp-form in Tubularia, Campanularia, &c., is completely explained away by the development of *Aeginopsis Mediterranea* observed by Müller, Kölliker and Gegenbaur, of *Stenogaster complanatus* by Kölliker, and by the similar embryological history observed by myself in the bell-cavity of *Oceania* (*Turritopsis*) *nutricula*. In each of them the polyp or hydra-form is not persistent, and Medusæ are not produced by gemmation from Hydræ, but the Hydra itself is individually and totally metamorphosed into the Medusa, thus at once demonstrating that the Medusæ cannot be the *young* of the Hydræ, and that there is no essential difference between the so-called alternation of generations and a direct and regular metamorphosis, or homogony. The inevitable conclusion must be that Hydræ are either young or inferior forms of Acalephæ, and consequently that they are not entitled to independent positions as perfect animals, but must be described as Larvæ simply.

With regard to the difference between the Siphonophoræ and Hydroidea, it is greater in appearance than in reality. For the Campanularians, Tubularians and Hydractinians in which the Medusæ do not become free are just as really communities of hydroid and medusiform individuals as Siphonophoræ, differing only in the comparatively unimportant circumstance that they are attached forms, and that in them specialization is not carried so far, so that instead of having from three to five kinds of individuals, we there find only from two to three.

For the foregoing reasons, I include in this Report on the Hydroid Medusæ (Craspedota Gegenb.) of Charleston Harbor, all the Hydroidea and Siphonophoræ, known to me, describing the Hydroids as larval forms in connection with their perfect forms, where these have been ascertained, and giving them provisional names while their Medusæ are still unknown. At the same time I should state that I lay no claim to originality in thus limiting the order. The idea in some form or other has been floating in the minds of those who have particularly studied this subject ever since the appearance of Steenstrup's remarkable treatise on Alternate Generation, and Agassiz, Huxley, Leuckhart, Owen, Kölliker, and Gegenbaur have all expressed it in some form or other. Prof. Agassiz, in his lectures, has given the group those limits which I now assign it.*

*The delay which has unavoidably attended the publication of this paper, enables me to state that Prof. Agassiz, in the first of his elegant volumes on the Natural History of America, gives this order the limits which he had formerly given in his lectures, and applies the name of Hydroidea to it, according to the rule of priority. June, 1858.

The synonomy of the group stands thus:
Cryptocarpæ, Eschscholtz. (1829.)
Hydroidea, Johnston. (1838.)
Gymnopthalmata, Forbes. (1848.)
Craspedota, Gegenbaur. (1856.)

Of these, the first in order of time, that of Eschscholtz, expressing an erroneous view as to the economy of these animals, has been by common consent abandoned. The Gymnopthalmata of Forbes, and the Craspedota of Gegenbaur, besides being based upon characters which do not characterize all the genera in the group, are subsequent in time to the Hydroidea of Johnston. Two years ago Prof. Agassiz informed me of his intention to include the Hydroid Polyps, the Naked-eyed Medusæ, and the Siphonophoræ in a single order under the name Hydroidea. This appears to me the only solution of the question as to nomenclature.

Class ACALEPHÆ.

Order Hydroidea Agassiz.

Syn. *Gymnopthalmata*, Forbes.
Craspedota. Gegenbaur.
Hydroidea, Johnston.

This Order includes the lowest of the Acalephæ, and the animals which compose it are distinguished by the following characters:

The general form of the body varies within a wide range. It is sometimes acorn-shaped or conical, often mushroom-like, or with the form of an umbrella, in many forms lenticular, but most frequently distinctly campanulate. There are many compound forms where the Medusæ, developed by gemmation from their larvæ, remain organically connected with them during life, and thus form floating or fixed plant-like communities. The animals therefore are either fixed or free. When fixed, though possessing sexual organs, their other parts are frequently rudimentary, or even entirely wanting. Or the disk may be well developed while the digestive, sexual and tentacular systems are wanting, or the whole animal may have the form of a tentaculum, or of a leaflet pierced by tubes. Or again, the digestive trunk may be the only part developed.

The Hydroidea are distinguished by a simple digestive cavity, of various forms from that of a depressed chamber, to that of a very much elongated tube. The circulatory system consists of delicate tubes communicating directly with the stomach, and radiating towards the periphery of the disk, where they usually anastomose with a concentric tube passing around the margin. In the Aeginidæ, this tube is not only absent, but the radiating tubes themselves are represented only by short pointed projections of the digestive cavity, while in many of the fixed Hydroidea, there is neither any true digestive cavity, nor any circulatory canal, both of these systems being represented by a simple blind diverticulum of the larva's nutrient canal.

The nervous system is hardly known. Professor Agassiz has described as such a cellular cord which accompanies the circular tube and enlarges at intervals at the bases of the tentacula to form ganglion-like bodies which are also in connection with the ocelli when present. I have also made out this cord in the genus Eucheilota with distinctness, and I think also that I have done so in Hippocrene and Nemopsis, but was not so successful with Oceania, where however I have thought myself sometimes able to trace a delicate cord passing down beneath the radiate tubes. Pl. 12, fig. 1, 2, *exhibits a portion of this system in Eucheilota where it will be seen that there is a ganglion for each marginal sense-capsule. The sexual glands, whether ovaries or spermaries, are always situated between the walls of the digestive or circulatory organs, and the epithelium of the inferior surface of the body. They vary considerably in position, sometimes embracing the digestive cavity, sometimes the radiating tubes, sometimes being in connection with both of these at once, and in one genus, are connected with the radiate and marginal tubes at their junction. In Cunina and Aegina, &c., where the tubes do not exist, these glands are situate on the periphery of the depressed digestive cavity. In the most rudimentary fixed forms, they surround the blind diverticulum of the larva's nutrient canal, which we have already spoken of as representing both the digestive and circulatory systems. The spermatozoa of some species have been described; they have very much the form of thread-cells with the threads extended, but without the reverted hooks at the base of the lash. The ova appear to be impregnated within the sexual gland and are not discharged until they have reached the form of a round or ovoid embryo. This is sometimes ciliated and capable of independent motion, (Planula,) sometimes it merely falls to the

* See also the structure figured in this volume. Pl. 7, ff. 34, x, and 42.

ground where it takes the hydroid form, and at other times it remains within the bell-cavity of the parent until it has attained a digestive cavity and tentacula, when it escapes, and moving for awhile by means of these organs, at last becomes fixed like the ciliated forms. In two known cases the hydra-form never becomes fixed, and similar independence is probably realized by a third.

The embryological history of most of these Medusæ, so far as known, is one of Alternate Generation, or Metamorphosis, where two of the stages are represented by two distinct individuals.

There are, however, three stages: first, the Planule, next, the Hydra, and thirdly the Medusa, bearing the sexual organs.

In two instances, that of *Aeginopsis Mediterranea*, observed by Müller, Kölliker, and Gegenbaur, and the similar mode of development observed by myself in the bell-cavity of an Oceania, the hydroid and medusoid stages are not divided between two individuals, but the individual Hydra is wholly metamorphosed into the Medusa, thus forming a direct metamorphosis. In both modes there is no intermediate type of form between the hydra and the ultimate medusa stage.

These Medusæ are distinguished from the Discophores proper either by the entire absence of ocelli, or by having them unprotected (*Gymnopthalmata*, Forbes.) They also either entirely want the vail or have it as an unvascular organ which as a perforated septum partially closes the mouth of the bell-like disk. But the most constant difference lies in their embryology for the larva of the Hydroid Medusa passes directly from its polyp form into that of the Hydroid Medusa, while the researches of Steenstrup and Frantzius show that there is a stage in Cyanea and Cephea wherein the form of the Hydroid Medusa is assumed before the animal attains its final form as a Discophore.

With regard to the subdivisions which may be made in this order, it may be remarked, as Prof. Agassiz has already done in his beautiful monograph, that the organs of essential structure constitute so nearly the totality of a Gymnopthalmatous Medusa, that it is difficult to obtain characters founded on those minor structural details which are usually employed to distinguish genera and families. And Prof. Agassiz in that work expresses the idea that the whole of these animals constitute a single natural family. But when we come to include, as he has done, both the Siphonophoræ, the Hydroids proper and the Æginidæ in the one order, it appears to me scarcely possible that the varieties of form we find upon close study, should be only extremes of a single family group. Yet since we are in reality acquainted only with a comparatively small number of genera among Medusæ, and those of European and American seas only, we certainly are not yet fully prepared to define families by structural limits, a mode of classification which requires the most extensive comparison of generic forms. If, however, we call in the aid of Embryology, in connection with such knowledge of structure as we have, we may obtain views, it appears to me, which even should they not prove absolutely correct in the end, will still be suggestive and lead in time to the desired natural classification.

For taking it for granted as I do, that the Hydroid polyps and the Gymnopthalmata of Forbes constitute a single natural order, and knowing that in a considerable number of instances, as for example, in Clava, Hydractinia and some Tubulariæ, the Medusa never forsakes its polyp-stalk until death,* we see that we cannot omit in classification a careful consideration of the peculiarities of the Hydroids, which are so complex in their gradations that Ehrenberg formed two distinct groups upon the basis of the Linnean genera, Tubularia and Sertularia. These two groups, I believe, have been generally acknowledged by authors since the publication of Ehrenberg's work.† Not having this work, I quote the characters of these two groups from Johnston's British Zoophytes. They are distinguished by their different characteristic methods of producing reproductive buds, (*ovisacs* and *bulbules*, Johnston.) The Tubularina include those Hydroids which produce naked bulbules—that is, those in which the medusa-buds, while attaining sufficient growth to become free, are not protected by a horny theca. The second, the Sertularina, are those which have what are called ovisacs—horny thecæ or cases, bell-shaped usually, and closed at their free open extremities by a polyp-

* This occurs even in genera, where the rule is, that Medusæ are free. For example, I once had the opportunity of observing a fine specimen of *Sarsia mirabilis* (Agassiz,) which is one of the most abundant free species in Boston Harbor, wither on its stalk, never severing its connection with its Coryne, though in every respect, except ocelli, which were absent, it resembled the perfect animal. It unfolded its four long tentacula, exhibited strong rythmical contractions of the disk, and behaved in all respects like a perfect Medusa except that it never became free.

† Corall. der Roth. Meer. (1834.) Lamouroux had previously subdivided these genera, at the same time recognizing their affinity to each other more clearly than Lamarck.

head without tentacula, the medusa-buds being developed on that portion of the stem included between this polyp-head and the bottom of the case. They afterwards become free by passing between the lip of the horny case and the abortive polyp-head. This is at least true for the Campanularians. Among the Sertularians proper, especially such genera as Sertularia, Aglaophenia, and Thuiaria, where the Medusæ appear to be always abortive, more investigation is needed—at least my limited access to European authors has made me acquainted with no researches that entirely clear up the question of the relation of their planules to the fleshy parts of the polyp-stem.* But these groups differ, also, by the more complicated development of the polypidom among the Sertularina, and the position of the medusa buds. In the group just named, there is a considerable tendency to an observance of some of the rules of vegetable growth in the medusa-bearing capsules, as was first noticed by Edward Forbes. Each of these capsules, like the flower-bud in plants, may be considered as in some sense a modified branch of the polypidom, wherein all the lateral polyps undergo their full development into sexual Medusæ. Analogically, also, with the position of the flower-bud in plants, though never at the extremity of a branch, so far as I am aware, the medusa-capsules are generally at or near the *axils*, so to speak, of branches or of individual polyps which may be taken into the consideration as the analogues of the leaves in plants. Among the Tubularina on the other hand, the disposition is freer, and the medusa-buds are found among the tentacula, or beneath them, of the individual polyps, and sometimes scattered over the whole ramified stem of the polypidom.†

The researches which have of late years been made by authors, and which to a small extent I have had the opportunity of repeating, appear to me to add still another distinctive character to confirm this division of the Hydroids into two groups. It is the manner in which the Medusa disk is developed. Among the Corynidæ, Tubularidæ, &c., the Medusa emerges first as a bud, the outer covering of which becomes that of the disk of the free swimming

* In Hydractinia however which belongs, I think, to the Tubularina, the medusa-buds which are naked, are also developed on the stalk of an abortive untentaculated polyp.

† I do not here investigate the question whether both these modes of distribution may not in the end be referred to single common plan. They are at least different modifications, and as such I use them.

adult,—the cavity of the bell is, so to speak, hollowed out from the original substance of the bud—and the proboscidiform digestive cavity, is from the first enclosed by a parenchyma which becomes gradually metamorphosed into a moveable disciform or campanulate organ of motion. The lower aperture of the bell, which, in the adult is usually guarded by the vail, appears to be pierced through this original parenchyma, and the tentacula never originate near the attached base of the gradually growing proboscis, but on the contrary, near what is to be its free extremity. Now, a reference to Van Beneden's figures of the development of Campanularia, which, I think, in one of our species I have been able to confirm, will show a mode of growth which in some respects is entirely the reverse. There the proboscidiform digestive cavity is early conspicuous as a free projecting knob, and is not over-arched by the disk until some time after the Medusa becomes free, in several species. The tentacula, instead of originating near the free extremity of the proboscis, originate near its base—and that organ, instead of being from the beginning covered by the disk, is only gradually over-arched by it. And lastly, the aperture of the bell, instead of being formed by piercing the parenchyma of the bud, is formed by the border of the outgrowing lateral fold or disk which in this case is always free. The result is, that in its early stages, just before its independence, the young Campanularian Medusa bears an extremely close resemblance at first sight to the mere hydroid polyp from which it is bred, which is not the case among the Tubularina. Now, a reference to the description of the mode of growth exhibited by the larva of *Aeginopsis Mediterranea,* and that described by myself in the bell of an Oceania,* it will be seen at once that it is essentially the same as that of Campanularia, and this corresponds to the structural affinities of the Aeginidæ, which every one, I believe, considers more closely allied to the Thaumantiads than to the Sarsiadæ and the like.

But these differences are not confined to the Larval stages alone. The adult Medusæ, so far as known, belonging to these two groups, appear to be distinguished by general form and structural peculiarities in such a manner, that we must consider the Sertularian group inferior. I might notice, however, beforehand, that embryologically they appear to be lower, for while, if anything, their polyps are more complicated, and vegetative character more prom-

* This, I have since satisfied myself, is the parasitic young of a Cunina. See the descriptions of Turritopsis and Cunina below.

inent in them than in the other; there are, at the same time, a larger number of genera among them, which apparently never have free Medusæ. Now, on structural grounds, I think I may distinguish these two general groups of Medusæ, as follows:

First, as to general form. Among the Sarsiadæ and the correlated groups, we find that the general form is nearly always a deep bell; while in the Campanularian Medusæ, and their relatives, the general form of the disk has a constant tendency to being more or less shallow; the few deep-belled species which exist are the extraordinary forms. Both shallow and deep-belled species are found in each group, but in one of them the deep-bell is the prevailing form; in the other, the broad, shallow, cymbal-like or watch-glass shape predominates.

They differ also in the general character of important organs. The digestive cavity in the Sertularian group (if we include the Aeginidæ, for which I shall attempt to show there is reason,) varies through Aequorea and Staurophora, from the form of a depressed polygonal chamber, which may be said to be imbedded in the disk, to that of a flower-shaped organ, pendent from the vertex of the disk concavity. But in this group the prevailing characteristic of the organ is that it is comparatively shallow, and we see this still hold good, even where, as in Liriope and Tima, it is placed at the extremity of a long and habitually exserted peduncle or proboscis. Very different is the case in the Tubularian group. There, the prevailing character of the digestive cavity is that of a more or less long cylinder or tube, never imbedded in the disk, but always pendent from it. There are several forms, as Sarsia, Slabberia, and Dipurena,* with long exsertile peduncle, but here it is formed entirely of the digestive organ usually surrounded by the generative glands, and never is traversed by radiate tubes to the extent seen among Geryonidæ and in Tima.* Next, with regard to the radiate tubes, we find that in the genera allied to the Campanularian Medusæ, there is rather a tendency to a vegetative repetition of them, as in Aequorea, Berenice, &c.; while in the other group they appear to be more nearly limited to a small and definite number. We also observe that in the Campanularian group, there is a strong tendency to the formation of sinuses in the radiate tubes, while the junction of these with the marginal or

*In Turritopsis, however, as I have shown already, there is an arrangement somewhat analogous to that of Tima. Indeed, the Oceanidæ, as a group, are analogous to Thaumantiads.

peripheral tube is a simple anastomosis. In none of the Tubularian genera, on the other hand, is there any sinus in the length of the radiate tubes, but often there is a large sinus at the junction of these tubes with the marginal one. With regard to the position of the sexual glands, it varies, I think, in both groups, from immediate connection with the digestive cavity, to a position somewhere along the length of the radiate tubes.* But among the genera which I think referable to the Tubularian group, there are only two instances of such connection, the most remarkable being that of *Slabberia*, (Forbes;) and another, Nemopsis, (Agass.) in which latter the generative glands are connected at once with the digestive trunk and the radiate tubes. While among the Campanularians our only instance is Staurophora, which is evidently again related to the arrangement which takes place among the Aeginidæ. It is evident, therefore, that according to this arrangement, one of these positions of the sexual organs is in a general manner characteristic of the first of these groups, and the other of the second. Coming now to the vailed rim of the bell, we find it, in my view, quite characteristic in each of the groups. In the whole of the second, or Campanularian group, it is quite complicated, and we have the lash of the tentaculum usually simple, or only complicated by buttons of thread-cells as in the Campanularian polyps. The reverse is the case in the Tubularian group, where the rim of the bell is comparatively simple, so far as the variety of its appendages is concerned, though decidedly specialized in some genera, as Hippocrene, and on the contrary the lash of the tentaculum exhibits a decided tendency to specialization and complexity, as in Nemopsis, Cladonema, Zanclea, Slabberia, Dipurena, Corynitis, &c. When, on the other hand, the tentaculum is at all complicated in the Campanularian series, it is usually the basal portion of it, or what is called its bulb,† which in Eucheilota has even two small lateral tentacula of a different type; and, indeed, in this genus, sometimes these bulbs are

*In the singular genus Aglaura, which is referable to the Sertularian group, the sexual glands have a peculiar position. The chamber which exists to some extent in nearly all of this order, just above the digestive cavity, and towards which the radiate tubes converge, is here lengthened into a delicate pedicle, at the extremity of which is the digestive cavity of Thaumantioid type—and just above this point are the generative organs in the form of diverticula from the delicate pedicle. See Gegenbaur's paper, Zeits. f. Wissen. Zool. B. 8, ht. 2, pl. viii, fig. 13.

†However, in Liriope of this series, the tentacula are somewhat specialized into two sorts.

found with their small lateral tentacula, but with no ordinary lash. (Pl. 12, fig. 2.) Again, in the whole Tubularian group, we have not a single instance, at any age of the animal, of those remarkable sense-capsules, under the form of little pendent, transparent vesicles, containing corpuscles which sometimes appear to be inorganic concretions, while these are characteristic of nearly all the genera of the Sertularian group, including the Aeginidæ. In fact, ocellary pigment spots, which are characteristic of most genera among the Tubularina, are to be found only in Thaumantias,* Tiaropsis, and Staurophora, among the Sertularina, and their absence in the rest is supplied by the presence of sense-capsules. And I suggest the probability, from analogy, of Thaumantias and Tiaropsis, with Eucope, that these ocellated species will be found characterized by such marginal capsules in the early stages of their existence, for those organs are observed in Eucope and Cunina in the earliest stages of their Medusa form, while nothing like them are seen at any stage of existence in such genera belonging to the group of Tubularina, as have been observed.

There are two facts which appear to militate against this separation of Tubularina from Sertularina—the first that *Eudendrium ramosum* described by Van Beneden, appears to be an intermediate form between them. This genus produces free medusæ (which there is very strong reason to believe are Hippocrenidæ) after the ordinary Tubularian manner, but has, according to Van Beneden, some terminal enlargements of the branches very similar in appearance to the medusa-bearing capsules of Sertularians. thus leading to the impression that it may possess both modes of developing Medusæ. But certainly there are no observations to countenance this view, and it is very probable that Van Beneden was right in his conjecture that the enlargements referred to were produced by some parasite within the tube, or it is even quite possible that this may be the form which a creeping branch takes before it has fixed itself and begun giving rise to polyps. See below Hippocrene and Eudendrium.

Next, it may be thought that the mode of growth exhibited by the radiate tubes in the Tubularian method, renders the reality of

*It is evident that Forbes made no constant distinction between well defined ocellary spots and the mere coloration of the tentacular bulbs which often exists without the presence of ocelli. The greater ocellus in Tiaropsis, however, is perhaps a combination of the ocellus and the concretionary capsule.

our distinction questionable. But it appears pretty clear that the outer covering of the bud at the stage when this takes place, is the same that protected it before the tubes appeared, and if it were not the same as the external surface of the future medusa's disk, we should certainly observe at some point in the course of growth a casting or shedding of this original covering. Now nothing of this kind has ever occurred in the course of my own observations, nor been mentioned by any observer with whose writings I am ac-acquainted. The growth of the tubes, however, appear to be accomplished in the same centrifugal manner in both groups, with this difference, that in the Campanularians they grow out synchronously with the outgrowing disk, while in the Tubularians they are hollowed out in the disk after the digestive trunk is already covered by it.

There are still two groups among Hydroid Medusæ whose relations to these two we ought to determine as far as practicable. They are Siphonophoræ and the Aeginidæ, as well as the typical fresh water Hydra.

All the Siphonophoræ appear to be developed after the manner of the Tubularina, in free grape-like bunches as in Tubularia, (e. g. Physalia, Physophora, &c.) or as in Clava and Coryne (e. g. Porpita and Velella.) Huxley describes (Müller's Archives 1851) the development of Diphyes, and from his description and figures it is evident that the development of the bud proceeds according to the Tubularian method. The observations of Quatrefages on the structure of Physalia (Annales des Sciences Naturelles 4 ieme, Ser. vol. II. p. 128 and Pl. 4, 2) show pretty clearly, I think, that the development of the tubes in the sexual Medusa follows the Tubularian plan and that the disk covers the digestive trunk from the first. Also Kölliker has described in *Agalmopsis punctata* the growth of the swim-bells, and these, according to his description, have the disk closed in the earlier periods of existence, even until the tubes are formed, and the interior of the bell entirely without communication with the surrounding medium which it last gains by formation of an opening, in some manner not observed. This fact is specially to be remarked since here there is no digestive trunk nor sexual organ. The figures given by Kölliker (Schwimmpolypen von Messina) have all so general and striking a resemblance to the various appearances of the Medusa buds at various stages in Tubularia and Coryne, that I think it will at once be recognized. On the other hand the free Medusa of Velella is known through the researches of Huxley, Vogt, Kölliker and Gegenbaur, under the name Chrysomitra, and has already been referred to the neighborhood of Sarsiadæ, Cladonemidæ and Oceanidæ, by Gegenbaur, (Zeitsch *loc. cit.*) It has, however, some very remarkable peculiarities which I shall notice more particularly when I come to describe our own species of Willsia. Whether the Physophoridæ which seem to be communities of Medusæ rather than of Hydroid Polyps, should constitute a separate subdivision in the group of Tubularina on account of the wonderful degree of specialization among the individuals of a single community, I do not undertake to decide, since, unfortunately, my observations on our own species, in spite of my efforts to the contrary, have hitherto been too limited to enable me to add anything to our knowledge of the group. It should, however, it seems to me, be borne in mind that the social insects whose classes of individuals are also differentiated upon an embryological basis, just as is the case with Siphonophoræ, do not constitute a single group, but are distributed among different orders and different families in the same order. This analogy, though rather a remote one, should, it seems to me, be allowed some weight in guiding the investigation. The Velellidæ, on the other hand, seem to be floating polypidoms, with only one class of Medusæ, i. e., those with reproductive organs. The Physophoridæ are, to a certain extent, comparable to the budding Sarsias and Lizzias, and the Velellidæ to Tubularia, Hydractinia, &c.

The singular group of Aeginidæ comes up next for consideration. I have already mentioned that a series of gradations can be established between the genera Cunina, Aegina, Aegineta and Aeginopsis and Polyxenia, and the genus Eucope, the Medusa form of Campanularia. First, Equorea by its digestive cavity and mouth, the correspondence of other characters appears to be a form nearer to the Aeginidæ than to the Eucopidæ. Next comes Rhopalonema and Stomobrachium, in which the number of tubes is already reduced, and the sexual organs are found in the two forms, the circular and elongated, which are common in the subdivisions of Eucope.

While, therefore, there is a structural gradation between the two groups, we find a discrepance in their embryological history. In Campanularia, as is well known, there is a regular individualized metamorphosis or alternate generation. But among the Aeginidæ, where the embryology is known in at least three instances, *Aeginopsis*, (Müller, Kölliker and Gegenbaur,) *Stenogaster** (Kölliker,) and *Cunina*, (See p. 111, note,) it is in every case a homogony or direct metamorphosis, in which every individual hydra is metamorphosed into a perfect medusa of low type. I have shown that gemmation takes place, but the larvæ are never fixed and swim freely, or attach themselves as parasites to the bell cavity of other medusæ, and every bud assumes first the form of the hydra, from which it directly passes to that of the medusa along with the stock-hydra, from which it is bred. There the original hydra and all its buds become medusæ. A strong analogy exists, therefore, between this state of things and the communities of medusæ among Siphonophoræ such as Forskalia, where a considerable number of the parts possess circulatory tubes, and though much modified, appear to be referable to the medusa stage of growth, as well as the sexual buds. Add to this that in both instances the communities are free, that is, in the latter case attach themselves at will. But here the analogy ceases. The Siphonophoræ develop the medusæ after the Tubularian method, the disk inclosing the digestive trunk from the first. The contrary is the case in the Aeginidæ, as I have shown already in this volume. In the larval Cunina (Pl. 6 and 7.) which I have there described, the disk grows out from the base of the hydra as a circular fold and growing downward gradually overarches the gradually contracting siphon of the digestive cavity, so that the disk does not come wholly to include the digestive trunk until after it has attained its activity as a swimming organ. The digestive siphon gradually retires also within the vailed opening of the disk, having been originally without it; the same is the case with Campanularia, and exactly the reverse is the case with the Tubularians, where the digestive trunk is always originally wholly within the vailed rim of the bell and does not come without until the animal is either completely developed or nearly so. A glance at Müller's figures of the development of *Aeginopsis Mediterranea*, (Müller's Archives, 1851, p. 272) will show that there the disk must grow in the same manner. From this correspondence, therefore, in the growth of the swim-bell or disk, united with their structural affinities, I include the Aeginidæ in the Sertularian group.

To those who believe that there is a deep gulph between alter-

*The resemblance of Stenogaster to the Larva I have described in this volume, pp. 77–79 is so great that it will very probably, I think, turn out to be a Cunina or Aegineta. See below Cunina.

nate generation and direct metamorphosis, this must appear as an incongruous association.

But alternate generation is indeed only an individualized form of metamorphosis, wherein the budding power is specialized among the different parts of the embryonic mass, so that some of the individuals produced by it are permanently adapted to a lower *rôle* than others, and thus (Siphonophoræ) some become free sexual Medusæ, while others having neither digestive cavity nor sexual organ, are doomed to remain as mere motor-machines, or swim-bells, still others, as the canal-bearing bracts, are specialized to perform, perhaps, respiratory functions only, while other individuals assume the form of long tentacula, having nothing much developed about them but their thread-cell bunches, and many others remain still as simple digestive trunks provided with mouths. Now, in this there is no alternation of *generations*, for no one of these classes of individuals form a separate generation; there is but a single generation the result of a single generative act, and that generation includes all the classes of individuals, and would not be complete if any one of them were omitted. The only difference, then, between this and the direct metamorphosis of Cunina, is that there gemmation produces no permanent classes of individuals, but each individual entering into that single generation, unless abnormally aborted, is equal in rank to every other. There is therefore no distinction in kind, no essential and fundamental difference between these two forms of metamorphosis united with gemmation; the difference is one of degree only, and manner, in carrying out a single fundamental plan.

But we may bring these two modes of metamorphosis still closer together by the link supplied in the valuable observation of Gegenbaur, that his genus Trachynema, so nearly allied to the Eucopidæ is developed from a ciliated larva like Aeginopsis, which, as he observes, separates the Trachynemidæ from the Eucopidæ. On the other hand, they approach quite nearly to Eucope, in a structural point of view. It is to be remembered, also, that nothing is known as yet of the development of Circe, Aequorea, Geryonia, Liriope, as well as Sminthea and Eurybiopsis, while there is not much probability were it from fixed hydroids it would have escaped observation up to this time, in some one of these genera, and their affinity to Trachynemidæ on the one hand, and Aeginidæ on the other, render it probable that they have a direct form of metamorphosis. Also, the development of Stomobrachium into

Mesonema seems to indicate another complication of the embryological plan by the introduction of fissiparition.

This direct metamorphosis among Aeginidæ, is of lower rank than the alternate generation or individualized metamorphosis of the Campanularians and Tubularians. If we bear in mind the condition of the larva in its earlier stages among Campanularians, when producing only planules, we find that it is a free swimming embryo until it is ready to assume its polyp form, when it loses its power of locomotion and becomes fixed for life. This ciligrade movement, then, is the index of a low condition, and among the Aeginidæ we find, that the existence of this ciligrade locomotive condition is prolonged in Aeginopsis, until the Medusa form is assumed and in Stenogaster and Cunina, though probably it exists for a shorter time, yet the young hydroid never becomes fixed but only assumes that condition which we find in the larva of Tubularia, when with developed tentacula and freed from the bell of its medusa, it moves about by means of the tips of these tentacula, and selects a site to spend its remaining existence. Hence, when compared with the remaining Hydroid medusæ, the larval conditions of the Aeginidæ, are of low type, and we should not exclude from this consideration the fact, that they are in two instances parasitic in their character. If we compare this conclusion from embryology with that which we should derive from their low structure, we find that both would equally prove them to be the lowest of the Medusæ. At the same time the gentle gradations which superior knowledge is leading us to conclude, exists between the Aeginidæ on the one hand, and Eucope and Thaumantias on the other, gives weight to the belief that there is no essential difference of type between the direct metamorphosis of the one and the individualized metamorphosis of the other. In both at a particular stage, multiplication by gemmation takes place—but in one the buds are all of the same kind, and all become medusæ—in the other the buds originally similar, are gradually differentiated into different classes of individuals. And this latter mode is evidently only a development by specialization of the one fundamental plan of the embryology of the Hydroid Medusæ.

It seems pretty clear from the observations of Prof. Agassiz, (Boston Soc. Nat. Hist. Proc., vol. 3, p. 354,) that the fresh water Hydra produces free Medusæ. But having never had an opportunity of repeating this observation, I cannot give more than a conjecture as to the relations of this Medusa to the others. Prof. Agassiz's very short account, however, seems to indicate a medusa of numerous chymiferous tubes, a broad digestive cavity (?) and tentacula arising above an undulating margin which hangs below them. Also, a folded mouth. These characters, if I have conceived them rightly, would indicate something approaching the Aeginidæ and Aequorea, but I would not venture to speak more particularly.

To sum up the matter, it appears to me that the Hydroid Medusæ form two natural groups or sub-orders, based on general form, and an *ensemble* of structure characteristic of each, and also on a difference in the method by which the locomotive disk is formed; which difference will probably prove constant. That this corresponds in part to the distinction introduced by Ehrenberg between the different forms of the fixed hydroid larvæ of these Medusæ, by which he divided them into Tubularina and Sertularina. But that these groups are not sufficiently inclusive, since there are many hydroids which are never fixed—and that these should be united with the two foregoing groups, viz: the Siphonophoræ, with the Tubularina; and the Aeginidæ, and their allies with the Sertularina. Should subsequent research prove these two methods of developing the disk which we observe in Tubularia and Cunina to be constant for their groups respectively, to which I have referred them, I propose to name the two sub-orders so distinguished, Endostomata, including the Tubularina and Siphonophoræ and Exostomata, including the Sertularina and Aeginidæ.

We should next consider the Families which may naturally be formed under these groups. The subdivision of the Gymnopthalmata into families by Forbes, has already been criticised by Agassiz and Gegenbaur. His characters are the simple or branched forms of the radiate tubes, their number, and the position of the sexual organs; thus constituting Willsia, a distinct family, on account of its branching tubes. The characters of his other five families, it is difficult to sieze. They are besides Willsiadæ—Oceanidæ, Aequoridæ, Circeadæ, Geryonidæ, and Sarsiadæ. Oceanidæ and Sarsiadæ are natural groups. Circe, which alone constitutes the family of Circeadæ, with the addition of a new genus, Persa, described below, will probably also represent a natural group. Tima, among his Geryonidæ, is referable to the Eucopidæ; and it is at least doubtful whether Stomobrachium should be ranked with the Aequoridæ, while *Polyxenia Alderi* is probably the type of a new genus, whose position will hardly be assignable until further research has made it better known.*

*Is it a Hooded-eyed Medusa?

His names will probably be retained, all of them, except Sarsiadæ, being, however, strictly attributable to Eschscholtz.

Gegenbaur (*loc. cit.* p. 218,) divides these Medusæ, which he calls Craspedota, from the presence of the vail, into seven families. They are Oceanidæ, Thaumantiadæ, Aequoridæ, Eucopidæ, Trachynemidæ, Geryonidæ, and Aeginidæ. These divisions are founded on collective structure, so that the characters employed by Gegenbaur, are drawn from all the principal organs of these animals. The author also makes mention of the larva-type, as a subsidiary character in his diagnoses of the families. His Oceanidæ include the Oceanidæ, Sarsiadæ, and Willsiadæ of Forbes, with other genera, which he thus divides into sub-families:

Oceanidæ, proper, with short digestive trunk, simple tentacula, and simple radiate-tubes.

Sarsiadæ, with simple tentacula, simple radiate-tubes, and very much elongated digestive trunk.

Bougainvillidæ, with short digestive trunk, oral tentacula, and simple marginal tentacula grouped in bunches.

Willsiadæ, with branching radiate tubes and simple tentacula.

Cladonemidæ, with forked radiate tubes and branched tentacula.

These groups appear to me natural, but of unequal value; thus setting aside the fact, that the development of Willsia is not known, (and otherwise its proximity to Cladonema seems quite plausible,) the Bougainvillidæ are distinguished from all the rest by the presence of highly organized oral tentacula, and the grouping into bunches of their marginal tentacula, while so far as known, their larvæ are allies of Eudendrium and Tubularia. On the other hand Oceanidæ and Sarsiadæ agree in having Corynidæ for their larvæ, no oral tentacula, and their marginal tentacula, though frequently complicated in structure, never exhibiting that peculiar grouping characteristic of Bougainvillidæ. Again, Gegenbaur separates the Thaumantiadæ from the Eucopidæ, placing Aeginidæ between them. The genus Æquorea, on account of its large, broad-mouthed digestive cavity imbedded in the disk, is certainly more distantly related to either Thaumantiadæ or Eucopidæ than these are to each other, when we consider that the greatest distinction between them consists in the fact, that Thaumantias has ocelli and not marginal sense capsules, while the reverse is the case with Eucope. But Agassiz' genus Tiaropsis is certainly a Thaumantiad, and yet its larva is Campanularia, which is also true of Eucope. These two groups, therefore, are no further removed from each other than the Oceanidæ proper, and the Sarsiadæ. The Trachynemidæ and Geryonidæ of Gegenbaur and the Æquoridæ, can never be well located until we become better acquainted with their embryology. But it appears to me the Aequoridæ are certainly very closely related to the last family of Gegenbaur, the Aeginidæ, which no doubt constitute a family apart.

It is evident also from the name which Gegenbaur applies to this order, Craspedota (provided with a veil,) that he does not take into consideration those lower forms of Hydroidea which never attain so high a degree of complexity. All the Sertularians, proper, Clava and Hydractinia are left out by this mode of drawing the bounding line, and consequently do not appear among his families. The Siphonophoræ also with the exception of Chrysomitra find no place among these families.

In attempting to group the Hydroid Medusæ of Charleston harbor into families, I have of course been led to consider many forms which are not found in our waters, and it appears to me that families in this group are founded on certain apparently slight modifications in structure and combination of organs both in the larva and adult—that members of the same family of Medusæ are derived from hydroid larvæ of one type, or not differing from each other more than generically and that frequently on account of the low grade of development of the adult form, it is more easy to determine the family from the characters of the larva than from those of the adult. Thus *Tubularia coronata,* according to Van Beneden, produces medusa buds, which never become free; the same is true of a species in Charleston harbor, while the two other species described by Van Beneden, both produce free medusæ. The Medusæ which never become free, have no tentacula, while those that swim freely have them; yet certainly in spite of their differences of structure and condition, they belong to one family. Again, Sarsia and Callichora (Oceania ?), differing as they do in structural details, are all developed from Corynidæ, and it is almost impossible to decide whether such groups should hold the position of families or of sub-families, while from this group of Corynidæ I doubt whether it would be proper to exclude even Clava. In the same way Tiaropsis, an ocellated genus, belongs to the same group as Eucope, which is unocellated, for both are developed from Campanulariæ. The genera Nemopsis, Bougainvillia and Lizzia, on the other hand, seem to constitute a natural family, having fasciculated marginal tentacula and branching oral cirrhi, while so far as known they are separated from other groups also by their embryology. However, they are relatives of Tubularia proper, as I shall show further on.

Without, therefore, pretending to set the matter at rest, I present the following scheme as a sort of rough draught of the divisions which would probably result from the view I have taken. At the same time stating my belief that limited as are our observations as to the embryology of most genera, it will be impossible to assign any very definite limits to families, or even, in many cases, to decide to what family a given genus should be referred:

First Sub-Order. *Endostomata.* Digestive trunk at first enveloped by the imperforate disk. Marginal capsules never present at any stage of growth; general form deeply campanulate.	CORYNIDÆ	Oceanidæ	Oceania, Turritopsis, Turris, Modeeria ? Saphenia.
		Sarsiadæ	Sarsia, Corynitis, Dipurena, Slabberia.
		Clavidæ	Clava.
	VELELLIDÆ		Velella, Porpita, Chrysomitra, Rataria.
	TUBULARIDÆ	Pennaridæ	Cladonema, Zanclea ? Pennaria, Willsia ?
		Tubularidæ	Steenstruppia, Euphysa, Tubularia, Corymorphis.
		Hippocrenidæ	Nemopsis, Lizzia, Bongainvillea, Hippocrene, Cytæis, Eudendrium, Hydractinia?
	SIPHONOPHORÆ.	Physophoridæ	Forskalia, Agalma, Agalmopsis, Physophora, &c.
		Hippopodidæ	Hippopodias, Vogtia.
		Diphyidæ	Prayia, Diphyes, Eudoxia, &c.
		Physalidæ	Physalia.

2nd Sub-Order.
Exostomata.
Digestive trunk always free. Marginal capsules always present at an early stage of growth. Disk in free forms, most usually shallow.

- CAMPANULARIDÆ...
  - Thaumautiadæ: Thaumantias. Staurophora, Tiaropsis.
  - Eucopidæ.....: Geryonopsis, Tima, Eucope, Eucheilota, Epenthesis, Campanularia.
- SERTULARIDÆ.....: Sertularia, Halecium, Thuiaria, Plumularia, Aglaophenia, Antennularia.
- The family connections of these groups uncertain.
  - Circeadæ.......: Circe, Persa, Aglaura?
  - Trachynemidæ..: Trachynema, Rhopalonema,
  - Stomobrachidæ..: Stomobrachium, Mesonema.
  - Geryonidæ......: Geryonia, Liriope.
  - Æquoriadæ.....: Æquorea, Rachostoma.
- ÆGINIDÆ.....: Cunina, Ægina, Ægineta, Æginopsis, Polyxenia.

This scheme exhibits as nearly as I have hitherto been able to make them out, the actually known, and in cases where there is no actual knowledge, the probable embryological relations of the Hydroidæ. It is probable that such relations will hereafter serve as our principal guides in determining families. It is possible also that the families will be even more numerous than those already established among the Hydroid polyps or larvæ, and that such groups as the Oceanidæ and Hippocrenidæ will hereafter enjoy the rank of families, as well as the marked group of Æginidæ, which it is not unreasonable to expect will have to be sub-divided. Certainly the *generic* limits employed hitherto have been often too comprehensive. Prof. Agassiz's *Hippocrene superciliaris* differs from the *Bougainvillea Brittanica and B. nigritella*, by the position of its ocelli, and this difference is generic. The *Oceania* *flavidula* of Peron and *O. pusilla* of Gosse, are, by the position of their ocelli, separated from Oceania, and belong to the genus Turritopsis, about to be characterized. The Eucopes and Timas of Charleston harbor have lateral cirrhi to the bulbs of their tentacula and must be separated from their European representatives; while the number of marginal capsules should also serve as a distinctive character, since within certain limits it is constant for certain groups.

The Hydroidea of Charleston harbor, arrange themselves under the following genera: In the sub-order of Endostomata, we have representatives of the Corynidæ, Velellidæ, Tubularidæ, and Siphonophoræ. Among Corynidæ, the Oceanidæ are represented by the genera Turritopsis and Saphenia; Sarsiadæ by two new genera Corynitis and Dipurena, and by Sarsia; Clavidæ have no representative. The Velellidæ by the genus Porpita. Among Tubularidæ, the Pennaridæ, are represented by Zanclea,* Pennaria and Willsia; Tubularidæ by Tubularia proper; the Hippocrenidæ, by Nemopsis, Hippocrene, Eudendrium, Corynedendrium, and Hydractinia. Among Siphonophoræ, no representative of the group of Physophoridæ, or Hippopodidæ, have been found; Diphyes, Eudoxia, and perhaps Ersæa, represent the Diphyidæ—and the genus Physalia has a representative in a transient visitor of our waters.

In the second sub-order, the Exostomata—Campanularidæ and Sertularidæ, are pretty fully represented. It is doubtful whether Thaumantias has a representative. The Eucopidæ are represented by Eutima, Eucheilota, Epenthesis, Campanularia, and Laomedea; the Sertularidæ, by Dinamena. Plumularia and Aglaophenia; Circeadæ, by a new genus Persa allied to Circe; neither Trachynemidæ nor Stomobrachidæ, have representatives as yet; Geryonidæ, are represented by Liriope; Aequoridæ are without representatives. Lastly, the Aeginidæ are represented by a species which I have referred here to Cunina, but which will, in all probability, fall

*This approximation of Zanclea to the Pennaridæ, I owe to Professor Agassiz, and the delay which, from unavoidable causes, has retarded this publication.—Professor A. informed me this spring that he had observed the development of a genus like Zanclea, from a Pennaria-like Hydroid. I had before, however, suspected some relation between Zanclea and Cladonema, and a relation between the latter genus and Pennaria, on account of the characters of Stauridium.—June, 1858.

into another group when Cunina is finally sub-divided. We now proceed to the description of the species.

SUB-ORDER—ENDOSTOMATA.

Bell always deep, never disciform. Ocelli generally present; marginal capsules never, at any stage of growth. Development always an individualized metamorphosis or alternate generation. Bell-wall enclosing the digestive trunk in the medusa-bell from its first appearance. Or, since the digestive trunk is sometimes wanting, it may be, perhaps, better expressed—that the cavity of the bell is at first a blind sack, formed before the opening of vail, by which it subsequently communicates with the surrounding medium.

1st group CORYNIDÆ. Johnston.

Larva Coryne; consisting of a fusi-form polyp, with scattered tentacula usually clavate at tip. Among these tentacula, or just beneath them, are developed the Medusa-buds. External surface of the Medusa-bell usually beset with scattered thread-cells not arranged in regular lines. Tentacula varying in number. Digestive trunk nearly always elongate.

The group of Corynidæ contains three lesser divisions, which we distinguish as follows, so long as no connecting links between them are known to Science.

I. OCEANIDÆ. Eschscholtz.

General form, spherical, conical, or truncate, tentacula having elongate and mostly fusiform bulbs; their number is various, but usually great; position of the ocellus variable, sometimes it appears to be absent altogether; digestive trunk massive; sexual organs generally circumscribed and arranged in four distinct lobes about the digestive cavity; mouth surrounded by an armature of four leaf-shaped oral tentacula.

TURRITOPSIS, *nov. gen.*

General form deeply campanulate; tentacula numerous, making the entire circle of the bell-margin; no conspicuous vertical muscular bands as in Turris. Ocelli on the inner or lower side of the tentacula. The upper part of the tentaculum, which at its free extremity carries the ocellus, has the appearance of being slightly distinguished from the rest, even when extended, and is quite a distinct part when contracted. It may be characterized as an elongated ocelliferous bulb; upper portion of the digestive trunk composed of a hyaline mass of large cells surrounding the origin of the radiate tubes. This structure is an extraordinarily developed epithelium.

Larva?

Remark.—The several genera in this group, are very closely allied—Turris differs from Oceania only by its muscular bands—and Saphenia only by its two highly developed tentacula. The present genus Turritopsis, differs by the structure of its digestive trunk and the position of its ocelli. I am now pretty well satisfied that these characters are sufficient to distinguish it generically.

Distribution.—British Seas, Mediterranean, Charleston Harbor.

TURRITOPSIS NUTRICULA.

Syn. O. Turritopsis Nutricula. Proceedings of Elliott Society, Vol. I., p. 55, pl. 4 and 5.

Pl. 8, Fig. 1. (*young.*)

A deep-belled species, flat at top, with its profile descending nearly vertically from the top for about a third the animal's height, and sloping outwardly for the rest of the descent. The digestive trunk is massive, filling a large portion of the bell-cavity. The transparent or upper part in full-grown individuals, is nearly square and about equal (in its expanded state) in height to the height of the digestive cavity. The four sexual lobes are voluminous, rounded below and separated by deep furrows. The four leaflets, placed one for each of these furrows, are large, and have their margins tufted with many pads of thread-cells. They are capable of being extended upward along the corresponding furrows, so as to appear just above the sexual lobes, and thus be seen through the transparent tissues of the animal from above. The whole trunk thus described, generally hangs so low as nearly to reach the opening of the vail. Sometimes a specimen may be found with these oral prehensile organs protruded beyond the vail, and this even seems, in some cases, to be habitual; but it is not the ordinary carriage. The tentacula are about one hundred, sometimes a little over, sometimes under that number. They are slightly clavate at the extremity, and somewhat surpass the height of the disk in length. They are usually carried tightly curled at the extremity.

Although I have not been able to observe the hydroid larva of this species, yet I have been able to observe the medusa at a very young stage, when possessed of only eight tentacula, and measuring only .08 in. alt. and .06 in. lat. At this stage it has somewhat the form of *Sarsia turricula*, (pl. 8, fig. 6,) but its digestive trunk is of an elongate conical form, reaching nearly down to the vail. It resembles in form the trunk of Corynitis rather than that of Sarsia. The mass of large cells occupies but a limited space, about one-fourth the length of the trunk; is composed of few cells, and is quite narrow, scarcely exceeding in width the digestive portion of the trunk, which is slender, and rather resembling the trunk of a young Sarsia, than that of an adult Turritopsis. The trunk ends in a bluntly pointed muzzle, well stocked with thread-cells, which appears to constitute a single bunch. One peculiarity which should also be noted in this young stage is, that the transparent tissue of the upper portion of the disk, is, at this time, prolonged for a short space downwards, so that the large-celled transparent mass does not, at this time, abutt as it afterwards does against the wall of the bell above, but is united with it by a downwardly directed projection of the disk. This character afterwards disappears, but we still see a trace of it in figure 1, a more advanced specimen. Here the height of the bell is equalled by its width, the cavity is very roomy, and the general form of the animal approaches that of a sphere. The trunk has still its conical form, but the single bunch of thread-cells at the mouth now begins to divide itself into four; while the large-celled mass above has increased, in extent and the number of its cells, and the tentacula have reached the number of twelve. After this, the four labial appendages grow out gradually, the digestive cavity increases in size, the sexual organs begin to be developed, the large-celled mass fills up gradually the space between it and the bell-wall above, while the tentacula constantly increase in number. It may as well be observed here, that the tentacula of the young Turritopsis have a certain stiff appearance, which they afterwards lose almost entirely. This remark is applicable to other genera, as Corynitis, but not to Sarsia proper.

Since writing the article on *Turritopsis nutricula,* and the development of the medusan larva found in its bell (*supra*) I have become fully sensible of the error of supposing that larva to have been the young of Turritopsis, into which error I was misled by the analogy of Tubularia. I cannot doubt that the larva in question is the young of a Cunina, about to be described as an inhabitant of our harbor, and that it passes its embryonic life for the most part in the bell-cavity of *Turritopsis nutricula,* from whose stomach it appears to derive its nourishment until it is prepared to pursue an independent existence.

The coloration of this species is a rich and rather reddish orange on the sexual lobes, with deep lake in the furrows; the labial appendages frosted, as well as to a slight extent the outer surface of the disk; tentacula have sometimes a purplish tint, with a slight nucleus of lake in the clavate extremity. Found in Charleston Harbor from the early part of June to the early part of October.

SAPHENIA. Eschscholtz, (*Forbes*,)

General form varying from one having a profile emarginate on each side near the summit, to that of a hand-bell, in which the emargination has proceeded so far, as to make the upper part of the disk appear a more or less conical appendage to the lower The sexual glands are placed on the upper part of the digestive trunk, the two-fold character of each gland being quite distinct. To this part of the trunk the stomach proper seems also confined. The neck, which like the neck of a bottle, separates this upper portion from the mouth in all the genera of the group, is in Saphenia very long, and in the following species when contracted appears capable of forming a separate or lower cavity, Pl. 8, fig. **3** *a*. The circulatory canals are broad as usual in the group. Only two of the radiate canals have corresponding tentacula, and these two at their junction with the marginal canal form a sort of flat triangular sinus. The somewhat fusiform bulbs are proportionally large, and the characteristic of the tentacula are length and great contractility. There are no ocelli. Larva—unknown.

Remark. It may be reasonably questioned whether this genus is really that to which Eschscholtz intended to give the name Saphenia. Not having within reach the material for settling the doubt, I have continued to use Saphenia in Forbes' sense.

Distribution, (with the present limits of the genus.) British seas, Mediterranean and Charleston Harbor.

SAPHENIA APICATA, *nov. spec.*

Pl. 8. Ff. 2, 3.

Bell shallow, being almost square in profile; bell-wall thin throughout, and surmounted above with a long conical appendage tapering to a delicate point, which is sometimes turned jauntily on one side as in the figure. Digestive trunk very long, when extended, reaching very considerably below the bell-margin. It is also capable of contraction, so that the lips appear distinctly *within* the vail. The sexual glands abutt directly upon the upper portion of the bell-wall, and extend very slightly radiately with the radiate tubes. Four ridges corresponding to these glands extend downward along the neck of the flask-shaped trunk, merging themselves at its extremity each into one of the leaf-shaped oral tentacula, on the margins of which latter I have failed to find tufts of thread-cells. The bulbs of the two tentacula are as usual in the group, large and elongate. They seem to be separated from the lash of the tentaculum, by a slight constriction. The lash is very long and tapers gradually to its extremity—being throughout irregularly nodose, but especially towards its extremity. Its outline, also, is difficult of definition. There are traces of six other tentacula; two of these are larger than the rest, and are situate at the extremities of the two remaining radiate tubes. They are all very faint and small, and for a long time escaped my attention altogether.

The color of the ovaries is a pale yellow or straw-color, the tentacular bulbs are of a beautiful claret red; and the lashes of these organs have a whitish, almost frosted appearance by reflected light.

It is a beautiful sight to see this species in motion, swimming, like other shallow-belled species by rapidly repeated pulsations of the disk with swiftness, trailing after it, its long tentacula which alternately approach and recede from each other in graceful curves, now curled together in an inextricable tangle and instantly loosed again as if by magic, when suddenly they contract and put an end to the exhibition. I have taken but few specimens of S. apicata, one as early as June 5th, another as late as September 16th. It is therefore a rare summer species in all probability.

II. SARSIADÆ. Forbes.

These Corynidians are distinguished from Oceanidæ by having usually an elongate digestive trunk, around which the sexual organs are rather equally distributed. The digestive trunk is terminated by a simple mouth, or one with scarcely undulated margin. The number of tentacula appears to be limited to four. The principal distinction lies in the form of the ocellary bulb, which is concentrated, almost spherical, confined to the margin, and usually containing a sinus which connects the radiate and concentric canals. The ocellus is always placed in the transparent tissue which surrounds the darker mass of this bulb, and is therefore always marginal, not tentacular in its position.

The different genera included under this head differ widely in the form of the tentaculum which in Sarsia proper is long, very contractile, and lash-like, while in Dipurena and Corynitis it is short and clavate. Prof. Forbes' genus, Slabberia, also, is the only genus in the whole group of Endostomata, which appears to have the sexual organs entirely on the radiate tubes. With deference to that lamented and able observer, I must entertain a doubt as to the exactness of this observation for the present. In this group, also, occurs the only instance of which I know, in which the digestive cavity appears to be divided into two distinct stomachs. I refer to a new genus, Dipurena, described below.

CORYNITIS, *nov. gen.*

General form conico-campanulate. Bell-wall of great thickness above. External surface ornamented with scattered groups of small thread-cells, each enclosed in a containing cell. Digestive trunk massive—sexual organs confined to the upper portion. Between the four radiate tubes, the bell cavity rises in four over-arched spaces of unusual height. The four ocellated marginal bulbs of the short tentacula arising from them have the same massive character as the digestive trunk. The tentacula are clavate and bristle with large pads of thread-cells. A sinus occupies the interior of the ocellary bulb, and is connected by canal through the axis of the tentacular shaft with another and larger sinus occupying the interior of the enlarged extremity of the tentaculum. The inter-communicating canal may be completely obliterated by the contraction and closing together of its walls, and though this appears to be done at will in the younger stages of growth, I have not been able satisfactorily to ascertain that it was not a permanent condition in the full-grown adults.

The larva is a coryne with a short thick polyp and few tentacula. The medusa-buds grow in the usual position, just below or among the lower tentacula, and the peculiar character of the tentaculiferous bell-margin is conspicuous at an early age, Pl. 9, ff. 6, 7, 8, *a*. Two of the tentacula are developed a considerable time before the others. They at first appear as hollow enlargements of the margin at opposite poles of one of the diameters of the marginal circle. They increase in size and gradually project downwards, the cavity within elongating with them, fig. 6, *a*. At first there appears to be but one cavity; a slight constriction appears on the elongating tentaculum just below the margin, and in the next stage known to me, fig 5., there are two sinuses connected by a canal through the tentacular shaft, in the engraving represented by a median line passing from the dark central core of the ocellary bulb to the hollow enlargement *c*, at the extremity of the tentaculum. The young Medusa at this stage is free, with but two tentacula, though with four marginal bulbs. Each tentaculum has one or two patches of thread-cells, besides the enlargement at the end. The bell-wall is still very thin; the digestive trunk large, conical and pointed below; the mouth not yet perforate. In a day or two, from the remaining two bulbs, tentacula begin to sprout, which soon obtain a complete resemblance to the other two, though for some time after they are perceptibly inferior in size, thus giving a sort of bilateral symmetry to the animal. It should be remarked that the cavity or sinus in the terminal bulb of the tentaculum is lined by colored cells similar to those which line the cavity of the ocellary bulb, and in my opinion, also, to those which line the digestive cavity.

This development shows that we should be careful in founding new genera upon a difference in the number of tentacula.

Distribution. Charleston Harbor.

CORYNITIS AGASSIZII, *nov. spec.*

Pl. 9. Ff. 3—8.

When fully grown, this species is nearly of the size of *Turritopsis nutricula*, about .3 in. in height, which was the size of the specimen figured fig. 3; that from which fig. 4 was taken having been in contracted condition and smaller. The general form is mitrate, the outline swelling out as on either side it rises from the tentacular rim, and terminating above in a rather obtuse vertex. The outline is broken by slight protuberances at tolerably regular intervals, which are the bulging clusters of thread-cells, scattered over the whole outer surface. The massive digestive trunk has a little more than its upper third occupied by the digestive cavity and the sexual organs. The remainder is prolonged in the form of a tube terminated at the mouth by several (3? or 4?) indistinct lobes. This tube is capable of extending itself beyond the vail or of almost confounding itself with the upper and more stationary portion by contraction. The large ova, of which each ovary contains only a few, as they grow, swell the outline of the upper portion of the trunk in large sweeping curves. The whole trunk thus described, appears suspended in the bell-cavity by many radiately converging arches, like one of the massive pendants hanging from a gothic ceiling. The principal of these arches, (those with double lines,) are the result of the arrangement described in the diagnosis of the genus, by which the radiate tubes, springing from the upper surface of the dark-coloured digestive cavity, proceed, for a short time, in almost horizontal direction outwards, then with a bold curve sweep downwards almost vertically to the ocellary bulb. They nowheres, therefore, reach higher than the base of the digestive trunk. The cavity, however, of the disk is prolonged upwards in four over-arched spaces, between the arches of the radiate tubes, and the outline of these is marked out by the double outline of the epithelium clothing the inner surface of the bell, (figure **3**, *p*.) Above these at *q*, are two arches of single lines, disclosing a differentiation between the tissues in that part of the wall, the immediate purpose, and the homologies of which, I do not undertake at present to explain. The tentaculiferous margin of the bell is characterized by an unusual development of the transparent tissue which always surrounds the faintly-colored marginal tube and the colored ocellary bulbs. The bulbs, and the tentacula which they bear, are like the digestive trunk massive. The ocellus is borne in the surrounding clear tissue of the bulb near its upper margin. The shaft of the tentaculum tapers from the marginal bulb to its junction with the clavate extremity, and is ornamented with four or five oblong pads of thread-cells, whose longer axis is placed rather obliquely to the transverse axis of the shaft. These shafts possess considerable contractility, though it is very slow in operation, the tentacula never contracting suddenly to any great extent upon irritation. The shafts, however, may be so contracted gradually by continued stimulus, as to bring all the pads of thread-cells together, thus forming a spiral chain of them round the shaft; and finally the shaft be so contracted as almost entirely to disappear. The enlarged extremity of the tentaculum also partakes, to some extent, of this susceptibility, so that its usually ellipsoid bulb, (figure **3**, *c*,) is sometimes changed by contraction into an almost spherical ball, (figure **4**, *c*.)

The specimen represented, figure **4**, had but three sexual lobes, the fourth being abortive. At the same time the mouth presented a quadrate aperture. This reminds us of the corresponding discrepance between the numerical formulæ of the mouth and sexual organs in Cladonema, observed by Dujardin; but I have not been able to ascertain whether it is constant for all the specimens.

With regard to coloration—the peculiar ornamentation of the external surface, gives the animal a rich and obscurely frosted appearance. With this exception, the disk is colorless. The coloration of the digestive trunk is a combination of a deep red, with a rich orange, the lining membrane of the stomach being of the former color, and the sexual lobes of the latter. The red color characterizes also the opaque portion of each ocellary bulb, and to a rather less degree, the lining of the cavity in the terminal bulb. The transparent tissue surrounding these parts in both cases, is of the orange tint. The shaft of the tentaculum mostly colorless, but having occasionally, near the terminal bulb, a few fleckings of lake color. The pads of thread-cells have a whitish frosted appearance, which is peculiarly rich and agreeable to the eye, and which resembles that on the whole outer surface of the disk. These pads, and the external surface of the terminal bulb, are always bristling with innumerable points, which are the lashes of the thread-cells.

In comparing this figure of the adult (fig. 3) with the figures of the young, (ff. 5, 6, 7, 8,) we cannot but be struck with the fact, that in the young, (fig. 5,) the bell-wall is throughout thin, and that no trace exists of that complicated system of arches described in the adult as serving to suspend the digestive trunk. This constitutes one of the most marked distinctions between the bi-tentaculate and adult stages. Besides the difference of form already noticed, the animal, in its bi-tentaculate stage, has a bright lake nucleus just in the centre of the base of the digestive trunk whence spring the radiate tubes. It is at this stage apparently so awkward in its motions as almost to provoke laughter.

The coryne, which bears this Medusa, is rather rare, as is also the Medusa. It is found growing on sponges a little above dead low water mark. It has been found during the summer months, and whether or not it exists during the winter, (as in all probability it does,) has not been ascertained. A young bi-tentaculate, but free Medusa, has been taken as early as the 5th of June. A fully developed specimen has occurred in the end of July, while as late as the 12th of September, buds were still produced from the coryne, ff. 6, 7, and 8, having been drawn at this date. This leads me to say that I have not seen the actual separation of a bud from the Hydroid, and its assumption of the form of figure 5. My confidence that they are one and the same, is due to the very marked and almost unmistakeable peculiarities of the Medusa, which are plainly exhibited in the buds while attached to their hydra. To my former Master in Science, Professor Agassiz, to whom America owes the only special publication on her Medusæ, I inscribe this remarkable species.

DIPURENA, *nov. gen.*

General form rather conical; digestive trunk elongate, and divided into two cavities, one above and the other below, connected with each other and with the small quadrate chamber at the origin of the radiate tubes, each by a delicate slender tube; sexual glands arranged in two masses, one surrounding the upper and the other the lower digestive cavity, separated by a constriction; tentacula four, clavate, tubular, attached at the disk margin to colored bulbs, each of which bears an ocellus. This genus differs from Slabberia in the position of its sexual glands—and from Sarsia by its clavate tentacula, and the division of its sexual gland into two portions.

Remark..—This genus is certainly a remarkable one, on account of the number of chambers or sinuses in the course of the nutrient circulation. First the digestive cavity itself appears to be divided into an upper and lower cavity, besides which there is a separate chamber at the intersection of the radiate tubes as in Sarsia, then each of the marginal bulbs must be counted in this category as in Sarsia, to which in this genus appear to be added four other chambers in the terminal bulbs of the tentacula, making in all eleven chambers in the course of the digestive and circulatory systems.

Distribution. Charleston Harbor.

DIPURENA STRANGULATA, *nov spec.*

Pl. 8, Ff. 1–2.

General form of the disk ovoid, truncated below, of considerable thickness above the insertion of the digestive trunk, its outline converging above to a rather pointed apex. The four radiating tubes, very faint in outline, being indeed scarcely visible. The chamber into which they open at the base of the digestive trunk is quite distinct, separated from the digestive cavity by a constriction, and with a lake colored nucleus. Digestive trunk incapable of retraction within the bell. The constriction occurs about one third of its length from the point of insertion. The walls of the tubular digestive cavity are colored lake, and this cavity also, like the sexual gland, appears to be divided into two parts, an upper and lower. The sexual organs (ovaries in the specimen figured) are of an orange tint; and the mouth is small and appears to be a perfectly simple round opening. The marginal bulbs are conical in form, as in *Slabberia halterata,* with a small black ocellus. The shaft of the tentaculum is finely striated transversely, giving it an annulate appearance, the terminal bulb is oblong and ellipsoid in shape, colored by a dark red nucleus. Active circulation of granular fluid is visible in the canal which perforates the shaft, and appears to pass into the terminal bulb, which thence I conclude is also hollow, though the dark and opaque coloring of the walls of this presumed cavity prevented my seeing the circulation within it. The tentacula, though short, are borne in rather graceful waving curves, and not carried stiffly or at right angles, as Forbes relates of those of *Slabberia halterata.*

This is also a rare species. I have hitherto taken but two specimens, one on 12th June, the other two months later, 11th August.

DIPURENA CERVICATA, *nov. spec ?*

I have met a specimen of Dipurena which had the slender tubular connection between the upper cavity of the digestive trunk and the intersection of the radiate tubes, so much longer than in the last species, that it equalled in length the height of the bell-cavity, and thus caused the sexual organs and digestive cavities to lie wholly without the bell. This difference was accompanied by a difference of outline in the disk, which was narrower proportionately above, being more like that of *Turritopsis nutricula,* when viewed in profile, the outline sloping inwardly in its descent from the top to the tentacular rim. The tentacular bulbs also appeared to be slightly smaller than in the D. strangulata. There was no difference of coloration. This neck-like elongation of the digestive trunk in this specimen, appeared to be permanent, for in spite of the irritation of being laid flat upon its side in a watch-glass for examination, it was not contracted but remained hanging out.

With regard to the value of coloration upon which considerable stress seems to have been laid by Forbes, I may say a few words in this connection. So far as my observations go, there are two principal colors in these Medusæ—yellow and red. There are different shades of these—but the digestive cavity is nearly always red or orange colored, or red within and slightly yellow without. The same is true of the tentacular bulbs and of the clavate extremities of the tentacula in such genera as have them. Blue is found among the Siphonophoræ, and is said to tint the transparent disks of some Æquoreœ. But in this latter case as in that where by reflected light a green tint is given to the sexual organs of Tima, the color does not appear to be due to pigment cells. In fact color among these animals is very uniform, belonging not so much to ornamentation as to a connection with the functions of essential organs, and therefore hardly enters ordinarily into specific character as an important element. The peculiar tone and disposition of color might more safely be assumed as a source of generic than of specific character.

SARSIA. Lesson. 1843.

Syn. *Sthenyo* Dujardin, Ann. Sci. Nat. 3ieme. Ser. vol. 4, p. 275. (1845.)

General form more or less deeply campanulate. Digestive trunk, long, cylindrical tubiform, separated by a constriction from the intersection of the radiate tubes, where there is a small quadrate chamber. Sexual organ investing the digestive trunk; four radiate tubes forming four sinus-like enlargements at the four marginal bulbs, each of which bears an ocellus at its upper part, while from its lower springs a contractile, filiform, nodose tentaculum, which is tubular (?).

The larva is coryne (*Syncoryna*, Ehrenberg.) The medusa is developed among the tentacula, or immediately below them. In the course of development the disk is involute, and the tentacula first appear within it, at least in the species of Boston harbor.

Remark.—Forbes makes no mention whether the tentacula of his four Sarsiæ are tubular or not. Dujardin is similarly silent with respect to Sthenyo. *Sarsia mirabilis* of Boston harbor is known to possess tubular tentacula. The condition of Gegenbaur's *Oceania thelostyla* is, in this respect, also unknown, while in the following species I have as yet not been able to observe any canal in the tentaculum. The Sarsiæ of the Northern shores of Europe must be the true Sarsiæ, and since such a difference as that of solid and tubular tentacula would be of generic value, the question merits attention, and can only be settled by an examination of the English, French and Norwegian species, which from their general resemblance to *S. mirabilis* will probably be found to possess the same type of tentaculum. They also agree in general size, and especially in having usually long tentacula. *O. thelostyla*, and the following S. turricula, on the contrary, are both characterized by short tentacula, which are probably solid. Their digestive trunk also appears to be short. Such a generic distinction is not rendered less probable by the fact that it would be consonant with a difference in climatic distribution.

At the same time, it should be mentioned, that Gegenbaur's *O. thelostyla* is an immature animal, as also were all the specimens I have observed of the following species.

Distribution.—Seas of Norway, Great Britain, France and New England; and also, coast of Sicily(?), and of South Carolina(?).

SARSIA TURRICULA, *nov. spec.*

Pl. 8, Ff. 6-8.

This species has not been observed in its adult condition. It is tall, its length being somewhat greater in proportion to its breadth than that of *S. mirabilis*, Agass., and *Oceania thelostyla*, Gegenb. which I take to be a Sarsia, or a relative of Sarsia, with short tentacula. The latter species is much more closely allied to S. turricula than any other of which I know. They are both tall and cylindrical, and both have short and almost serrate tentacula, from the marked character of the thread-cell-bunches. The present species, however, seems to be separated from that of the Mediterranean by its greater height in proportion to its width. I have not observed the tentacula to be tubular. When younger than in fig. 6 this Sarsia sometimes has a quadrate form, which it afterwards loses, fig. 7. I have not observed its actual liberation from any hydroid, but can scarcely doubt that its larva is a branching Coryne, with eight or nine scattered tentacula, (sometimes however evincing a disposition in about three indistinct whorls,) and a somewhat elongated body, which grows commonly on the break-water of Sullivan's Island. Sarsiæ of this species were found in a jar where this Coryne had been kept a day or two. This Coryne grows in branching tufts upon algæ, or rather together with them, the alga and Coryne forming small pedunculated tufts above low-water mark. I have observed Medusa-buds upon it, which bore a resemblance to this Sarsia.

It is to be remarked that this Sarsia of Charleston harbor is analogous with that of the Mediterranean, and that these two have so distinct an appearance, on account of their short tentacula, that Gegenbaur considered *S. thelostyla* a new type of Medusa. With regard to the transparent tissue which clothes the bulb beneath, and to which Gegenbaur seems to attach some weight, according to my observations it exists not only in *S. mirabilis* and our own species, but in other large-bulbed genera, as for instance Corynitis where it is well marked.

The largest specimen of this species yet found did not equal a tenth of an inch in height, and though, as formerly remarked, not entirely mature, I have yet found specimens in which the incipient sexual organs, on the sides of the digestive trunk, were easily distinguishable, and I conclude that the greatest size attained by the species can hardly be much more than one tenth of an inch in vertical diameter.

Specimens have been found as early as the beginning of June, and as late as the latter part of September, but never have any been taken during the winter. It may probably with safety be set down as entirely a summer species.

The *Clavidæ* differ from the other Corynidæ by their filiform tentacula, which want the terminal buttons of thread-cells. A similar difference occurs between the oral tentacula of Tubularia and those of Pennaria, yet Tubularia, when very young, agrees with Pennaria in this respect. An analogous difference takes place between Sarsia and Corynitis, and I look upon it as only a slight distinction. The fresh-water genus, Cordylophora, also agrees with Clava in its tentacula, and I can scarcely doubt belongs to this group, of which there is as yet no representative known in our neighborhood. If I be correct in my conjecture, that the fresh-water hydra is an Exostome, both the sub-orders will thus have fresh-water representatives.

2ND GROUP. VELELLIDÆ. Eschscholtz.

The only free Medusa-form yet known in this group is Chrysomitra, which is characterized by a broad and unusually shallow bell for the sub-order. Its digestive trunk is also short and broad; its radiate tubes unusually numerous (16,) not branched, but each originating in the upper portion of the digestive cavity, and descending to a marginal sinus. The sexual organs are situated as usual among Endostomata, around the digestive trunk. There appears to be no distinctly circumscribed ocellus, and the (originally two?) short tentacula are terminated by a wheel-shaped appendage, which is attached, not by its circumference, but by its centre. The genus presents also the remarkable peculiarity (so far as I know, not observed in any other free Hydroid Medusa, unless it be Cladonema,) of having the inner surface of the disk, between the radiate tubes, conspicuously colored. A reference to the description of the Medusa-buds, in the following species of Porpita, will show that there is some probability that this is a family character, or at least not uncommon in the group. It has another character which is common to a large number of genera in the next group—that of Tubularidæ. It is the existence of rows of thread-cells, extending upward along the outer surface of the disk, from the margin towards the summit; a localization of these organs very different from their scattered state in the Corynidæ. It is something analogous to the localization of the pedicellariæ into belts (*fasciolæ*) among Spatangoids.

The larvæ of Velellidæ are free floating oceanic hydroids. We should consider each of them as a community of animals, which in some respects is analogous to the community formed by a single polyp-head of Tubularia, with its numerous pedunculated Medusæ. There is a central fibrous shield, consisting of numerous concentric air canals, which may be taken as the representative of the horny polypidomata of fixed genera. Around the periphery of this shield the general fleshy mass is produced in a sort of border. Immediately beneath this border radiate on every side, a number of organs which might be compared in position to the lower circle of tentacula in Tubularia or Pennaria. But it is doubtful whether, finally, we shall not be obliged to consider these as each an individual of a peculiar form. The centre of the lower surface of the disk is occupied by a large, broad-based polyp, of the form of an inverted cone; from its base pass towards the periphery, a sort of canals which communicate with the canals of the outer circle of the so-called tentacula, and with the cavities of the individuals next to be described. These are untentaculated polyps, which seem nevertheless to be provided each with a mouth and a digestive cavity. They should be compared to the ramified stem bearing the Medusæ in Tubularia, to which they are analogous in position. Each of these, however, is individually far more perfect than its analogue, and just as we see it in Hydractinia, the medusa-buds are borne on the side-walls of these untentaculated individuals, where they may be seen sometimes as dark specks, even with the unassisted eye. Imperfect otherwise, these individuals are provided with digestive cavity and mouth, which perform their functions independently of the great central polyp. The hepatic cells which exist in these animals are probably the homologues of the dark-colored cells which line the digestive cavity of many fixed hydroids.

I have placed the Velellidæ between the Corynidæ and the Tubularidæ, not because I consider them as really an intermediate group between these extremes, but because they have connections with genera yet included in these groups, and very little connection indeed with the Siphonophoræ, with which they are usually associated. The latter are more nearly related, I think, to Tubularia and its immediate allies than to Velellidæ, which, indeed, constitute a very distinct family. We should specially compare this group with Hydractinia.*

There have been, hitherto, but two genera in this group. They are founded on the differences of the hydroid entirely, and are due to Lamarck. It is, however, probable that more genera will be formed, so soon as we become acquainted with the medusa-forms of more species of the Hydroid. That of *Velella spirans*, from the Mediterranean, has been described above from the description of Gegenbaur.

The characteristics of Velella are a quadrangular shield, which supports a diagonally-placed pointed crest. Its marginal tentaculiform individuals are without buttons of thread-cells, but have rows of such organs disposed longitudinally upon them.

The characters of Rataria, a genus defined by Eschscholtz, are a contractile, not a fixed crest, a disk or shell disposed longitudinally, not diagonally with regard to the elliptical outline of the fleshy border, and supporting the crest which consequently has also this longitudinal position. Lastly, an absence of the marginal tentaculiform individuals of Velella and Porpita. The species hitherto known of this genus are all small, none of them exceeding three lines in diameter. In view of this, it is not unlikely that, as de Blainville supposed, they should prove to be the young of Velella.

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* Prof. Agassiz, in his *Nat. Hist. of U. S.* vol. 1st, speaks of a relation between Hydractinia and the Siphonophoræ. Vol. I, p. 72.

In the same way we should not shut our eyes to the fact that Lesson's genera Ratis and Acies are both very small, and their characters make it not improbable that they represent different stages in the growth of Porpita.

PORPITA. Lamarck.

So few have been the observations on the medusa-buds of Porpita, that we cannot proceed to give a generic diagnosis of them. Kölliker mentions that they are like the un-freed buds of Velella. I can from my own observations confirm this so far as agreement between the figures of the Velella-buds, given by Kölliker, and the buds I have seen upon the following Porpita are concerned. But I have never seen a Velella. The following were the principal characters of the bud at the highest stage of development which has come under my observation. The general form was pyramidal, the vertex corresponding to the attached extremity. The opening of the vail was, as far as could be ascertained, not yet formed. There were no tentacula, but the four points of the margin corresponding to the extremities of the radiate tubes, were prominent and armed each with a few thread-cells. The outline of the cavity to be expected within was not traced out with such clearness as to enable me to assert its existence from actual observation, but the arrangement of the parts within can hardly be consistent with any other supposition. Near the apex of the pyramid at the top of the bell-cavity was a lump of small dark cells semicircular when viewed in profile, but quadrate like the digestive trunks of most Hydroid medusæ when viewed from above, from which proceeded downward four lines, evidently the radiate tubes. These were of a whitish color, like that of ground glass, near the rudimentary digestive cavity, and this color became confounded below with a reddish orange-colored enlargement of the canal, showing that the perfectly developed medusa probably has something like a colored marginal bulb. They were large enough in nearly all the specimens to be brought, all the four quite close together, and I did not observe with certainty the circular tube, even in one or two specimens in which these bulbs were unusually separated. A character like one of Chrysomitra must be noted. In the neighborhood of the lower colored extremities of the radiate tubes were a number of scattered circular golden-colored cells, on the inner surface of the yet unopened bell-cavity which leads me to conclude that in the adult condition the bell-cavity is colored like that of Chrysomitra. At this stage of growth and with no trace that I could find of sexual organ, these buds became detached from the medusa-bearing polyps and sunk in clouds to the bottom of the vessel in which the larva was contained. This I believe to have been abnormal, for the bell-cavity was yet unopened and the buds consequently motionless. I suppose the premature fall to be due to the rough handling all the specimens I have seen, had received.

The buds at their first appearance were colorless. It will be seen from the foregoing description that the development of the disk in this genus is strictly according to the Endostome or closed manner. The larval community of Porpita is distinguished from that of Velella or Chrysomitra by having its air-shield circular and without a vertical crest. Its marginal tentaculiform individuals also are provided with three rows each of knobs along their sides.

No doubt as we increase our knowledge of the Medusa-forms of these species, Porpita will be sub-divided into new genera. Thus *P. gigantea* probably constitutes a new type with its numerous marginal individuals and their sessile knobs; while the distinction made by Lesson between the species with white and blue shields is probably founded upon structure, and therefore a good generic distinction. It may be due to the blue-disked species having the mantle prolonged upwards over the white shield. In that case, perhaps, *Polybrachionia*, a name given by Landsdown Guilding to a Carribbean species, might be retained for one of the groups. The species following belongs to the white-disked group. If I am right in my conjecture that Lesson's Ratis and Acies are types of two stages in the growth of this larval community, the following would be the method: First, a small free polyp having a conical mouth and digestive cavity, and, like Eudendrium, a single whorl of tentaculiform organs; an air-shield which is small and fleshy, not fibro-cartilaginous, placed on the base of the polyp. At this stage there are no medusa-bearing individuals. This corresponds to the Acies of Lesson. Next, the polyp which was originally as great in diameter as the shield, is now become, by the growth of the shield, relatively less, and within the row of marginal tentaculiform individuals a few medusa-bearing polyps have appeared. This stage would be Lesson's genus Ratis. Now this is the order of growth among the corresponding parts in our next group, the Tubularidæ, and I think such a coincidence enhances the probability that my suggestion will prove correct.

Distribution.—The genus Porpita is found in the Mediterranean, and appears to be distributed in all the tropical oceans extending north or south of the equator, probably not more than **40°** either way; though being a floating genus it is probably frequently driven to higher latitudes by storms.

PORPITA LINNEANA. Lesson.

Syn. *Polybrachionia Linneana.* Landsdown Guilding. Zool. Journ., vol. XI, p. 403.—(*Quoted from Lesson.*)

The form of the imperfect Medusa above mentioned is a four-sided pyramid, whose altitude is about equal to the width of its base, or slightly exceeds it. The uncolored parts are very transparent so as not to be easy of definition. The digestive trunk is of an earthy red, the lower portion of the radiate tubes of a reddish orange color. The digestive trunk was quite short and confined to the upper part of the yet unopened bell-cavity.

The Larval community is almost exactly of the size given by Guilding, that is, the whole disk, including the border, is generally about an inch in diameter. Sometimes, however, a large specimen will have an air-shield nearly an inch in diameter without the border which is in width between a tenth and two-tenths of an inch. When viewed in profile it is seen that this air-shield is not perfectly flat but that the centre is very slightly elevated above the border. The longest marginal tentaculiform organs are in length about equal to the diameter of the disk. They are, however, of three or four sizes, the smallest not emerging from under cover of the border. These tentaculiform organs are not straight but curve upwards at the end. The pedunculated buttons or knobs on the longest are further apart than on the shorter ones. Next beneath and within are the Medusa-bearing individuals. They are generally slender and tapering, the mouth appearing to be simple like that of the digestive polyp of Physalia, not cloven into lips as represented by Kölliker in *Porpita Mediterranea.* Only, when contracted, do they assume a sometimes flask-shaped, sometimes almost globular form. The Medusa-buds are not confined to the bases of these polyps but scattered over their length, sometimes appearing not far from the oral extremity. The coloration of these buds when advanced, is so distributed as to mark each with five spots, which, appearing as one to the naked eye, contrast strongly with the fleshy white of the polyps and give them a spotted or wharty appearance. The central polyp is, as usual, flask-shaped or funnel-shaped, and presents no distinctive character from those represented for other Porpitæ, or none which, without a direct comparison of the animals, I could seize. Its base is in width about one-fourth part the width of the disk. The mouth capable of such expansion as to equal the base in width, but according to my observation this only occurs when the polyp is contracted lengthwise, so as to lose altogether its polypoid appearance and assume the form of a mere fold around the centre of the disk's lower surface. The silvery white air-shield is marked as in *P. coerulea* Esch., with little tubercles or denticles, but they are according to my observation few in number and scattered, or rather occurring at rare and irregular intervals along the course of the radii. The shining silvery appearance is given to the shield by the presence of the air-bubbles in the multitudinous inter-communicating cells within. It is lost, when, at the death of the community the air disappears and the whole polypidom sinks to the bottom.

The border of the disk is not blue, strictly speaking, but a bluish green; there is little or no pure blue about the polypidom, that I can find. The stem of the tentaculiform individuals is of a pale transparent tint of yellow, and the knobs or buttons along its sides are of a green, rather bluer than that of the body. The medusa-bearing polyps are all of a fleshy white, as is also the central polyp. The color of the medusa-buds which appear to spot the polyps is, to the naked eye, a kind of reddish brown. The medusa-bearing polyps near the tentaculiform individuals are not blue, as stated by Eschscholtz to have been the case in *P. coerulea*. I have taken these animals only twice at an interval of nearly four years. The last time finding only a single specimen. They are not inhabitants, but only transient visitors of Charleston harbor, and appear there only after a prolonged southeast or southerly gale lasting several days, when large numbers of Physaliæ and this Porpita are brought in and thrown on the beach of Sullivan's Island. When obtained, consequently by me they were always more or less injured, principally in the border and the marginal individuals, which latter are so easily detached as to render it difficult or almost impossible to transfer the community to a vessel of water without depriving it of nearly the whole of them. To injury of this kind, I refer also the premature fall of the medusa-buds already mentioned. This circumstance gave me an opportunity, however, of observing what I believe has not been observed before; viz: that among the marginal tentaculiform individuals, when the longer ones are shed, the small ones immediately grow out, and in three or four days, according to their state of advancement, acquire equality with the longest of the original circle. I have observed this fact on both the occasions when I had these animals under examination.

I should here mention that this community is not merely passive and floating, nor is activity confined to the central polyp, but each of the three classes of individuals has its own peculiar kind and range of motion, and this is pretty actively kept up by each when the community is but little injured. The motion of each class also is independent, as to time, of the motion of any other class, considering the central polyp as the sole representative of its class. These motions, in the case of the two other classes, may be performed either by any individual singly, or (as, according to my observation, is rather oftener the case,) by all the individuals of each class together. The motion of the marginal tentaculiform individuals is a vertical one, the whole bending down vertically together, as mentioned by Guilding; but it is to be observed that, in this motion, there is no longitudinal contraction, but that the individual, remaining outstretched, sways downward with a motion somewhat resembling that with which one of the digestive polyps of Hydractinia, slowly sways itself from side to side. The medusa-bearing polyps, on the other hand, have a worm-like movement of contortion also, which is executed by each individual independently of the rest. But the individuals of this class have also a common motion, which I have at times observed to have a sort of rythmical relation between its successive acts, and I am inclined to think, that in a wholly uninjured community, this motion will be found to be kept up with but little cessation. It consists in an alternate elongation and contraction of the polyps in a vertical direction, which is executed synchronously by all of them, and with a sort of jerk, which distinguishes it from the elongation and contraction of the central polyp.

The months in which this Porpita has been found are June and September. At both times the fall of colored particles occurred, but it was only in June that their condition was examined, and the result was the imperfect medusa-bud described above. They could not, however, have been much further advanced in the September specimens, since after falling to the bottom of the vessel, they never rose from it.

Whether this is really Guilding's species of the Caribbean sea, or a new one, I cannot say, having never seen either Guilding's figure or description. That description is very meagre, as given by Lesson. I have, for the present, attributed to it Guilding's name, from unwillingness to create a species without an actually known difference of character, and because, as before stated, the species is brought to us by prolonged southerly winds, thus coming from the neighborhood of Guilding's *Polybrachionia linneana*. However I am, despite this reason, inclined to think it a new species.

3RD GROUP. TUBULARIDÆ. Johnston.

I have included in this group all those Endostomata whose larvæ have the tentacula distributed in one or two regular whorls, including thus Pennaria and Stauridium, besides Eudendrium, while a provisional position is also given here to Hydractinia, on whose probable affinities I shall venture a few remarks further on.

The Medusæ of this group are distinguished by a smooth exterior to the bell, or a peculiar ornamentation, like that described in Chrysomitra, viz: rows of thread-cells, extending upwards from the bell-margin towards the vertex of the bell. This is very different from the scattered condition of the thread-cells among Corynidæ. For, as will be seen in the representation of this structure in Gegenbaur's figures of Chrysomitra and Zanclea, in Van Beneden's figures of the medusa of Tubularia, (*Les Tubulaires*, pl. 5, fig. 20–25,) and in the figures of Willsia and Zanclea of this work, (pl. 9, f. 10, pl. 8, f. 4 *x*.,) the thread cells in this case are not only arranged in rows, but these rows are inclosed within a delicate bounding membrane. In Pennaria proper, these rows of thread-cells appear to be replaced by rows of pigment cells, occupying the same position; while among the Hippocrenidæ, the external surface appears to be smooth and unornamented throughout. Mehrtens, however, described certain villosities near the bell-margin of his species of Hippocrene, and it seems to be in this position that the thread-cell-rows first appear, afterward growing upwards towards the summit, which they seldom actually reach. There are besides various complications of the principal organs, which, though not constant among the Medusæ here brought together, are still of frequent occurrence and indicate the structural tendencies of the group. Thus the tentacula exhibit a marked tendency to specialization, both in number, grouping, and form. Ocelli are frequently wanting. There are also found in one part of the group, oral tentacula, which, like the marginal tentacula, in another part of the group, are branched. The radiate tubes also are sometimes branched.

The group, with these general characters, contains three minor groups, quite distinct from each other. They are Pennaridæ, Tubularidæ proper, and Hippocrenidæ, and are characterized as follows :

I. PENNARIDÆ. *mihi.*

The general range of form in this group (which must eventually be subdivided) is like that in the group of Sarsiadæ. We must, however, except the genus Willsia, which with Chrysomitra, is remarkable among Endostomata for the shortness of its vertical in comparison to its horizontal diameter. In the other genera, the bell is deep, the transverse diameter short, the digestive trunk more or less elongate, and Sarsioid in form. The mouth is simple, or provided with bunches of thread-cells, like that of the young in Oceanidæ. The radiate tubes are in two instances branched ; the tentacula vary, but the present group is the only one in which they are found branched. In all the genera here included, except Cladonema, there are no ocelli, and the exterior of the disk is ornamented with lines of thread-cells, or pigment cells, ascending from the bell-margin.

The Larvæ have two whorls of tentacula, of which the oral whorl are clavate at the tip like those of the very young larva of Tubularia proper. The body, also, of this larva is not expanded into a broad basal enlargement at the insertion of the whorl of lower or filiform tentacula, as in Tubularia when full grown, but the whole body preserves the cylindrical form of the same part in the young stage of Tubularia, at the moment when it becomes fixed. The genus Stauridium has but eight tentacula in all, and might be regarded perhaps as a connecting link between the Tubularidæ and Corynidæ; at any rate, notwithstanding its correspondence in character with Pennaria, when its medusæ are better known, Stauridium will probably form a new group.*

* Prof. Agassiz has mentioned to me his having found in Charleston harbor a Stauridioid genus, but I have not met with it.

The genus Pennaria is the only Endostome having a symmetrically branched polypidom for its fixed larva.

WILLSIA. Forbes.

The characters of this genus are a rather shallow bell for one of the Endostomata; a mouth surrounded with leaf-shaped labial tentacula, or a simply undulated movable margin; rather short digestive trunk, around which are placed the sexual glands; four or six radiate tubes which bifurcate near their origin, the branches thus formed again bifurcating before reaching the marginal tube, at which point is appended a single tentaculum to each branchlet of the radiate tubes; the tentaculum has a sessile bulb. Between every two tentacula passes upward on the outer surface of the disk, a structure resembling a knotted cord, consisting apparently of a delicate, superficial, membraneous tube, which widens at intervals, to contain groups of thread-cells. Forbes has described a complicated ocellus, but I have been unable to find that any such existed on the colored bulb of the tentaculum.

Larva unknown. But the shallow bell and short digestive cavity of Willsia seem to bring it into the neighborhood of Chrysomitra. I have placed it, provisionally however, in this group near Cladonema, on account of its branching circulatory tubes.

Distribution.—British Seas and Charleston harbor.

WILLSIA ORNATA, *nov. spec.*

Pl. 9, Fig. 9–11.

The form of the bell is rather more conical than that of *W. stellata* (Forbes,) bluntly pointed above; the mouth is surrounded with only an undulating frill-like margin, which I never saw assume the appearance of being divided into arms. The digestive trunk short and stout; radiate tubes only four in number; tentacula sixteen, rather short, lashes having a roughened surface. In the frill-like border of the mouth are implanted a series of large, oval, light-refracting bodies, which have the appearance of thread-cells, and in which I have at times thought I had detected the coil of the thread, but could never satisfy myself of it. They are much larger in proportion to the animal than thread-cells usually are in these medusæ. The same may be said of the peculiar rows of cells mentioned in the analysis of the genus, though these are rather smaller than those around the mouth. The arrangement of these bodies is peculiar, and a group of them in this species cannot but remind us in appearance of the ocellary body of Bolina among Beroid Medusæ. In Chrysomitra, as figured by Gegenbaur, and in this Willsia* they appear to be contained in a tube, which is connected with the marginal canal. When my single specimen of Willsia was dead and contracted, I observed that two of these groups, in some instances, each normally containing only three, four or five corpuscles, had been forced together, without destroying the continuity of the membranous wall by which they were surrounded; a large group had been thus formed, containing nine of these bodies, while the double outline of the membrane by which they were surrounded was still distinguishable. (See pl. 9, fig. 10, *b*.) As thread-cells they are of a peculiar type, and are much larger than the ordinary thread-cells on the tentacula, and probably have a peculiar function.

The single specimen obtained of this species was found July 4th. Its appearance and carriage in the water is very Thaumantioid, on account of its numerous tentacula, short digestive cavity and shallow bell.

ZANCLEA.† Gegenbaur.

General form nearly that of Sarsia. Exterior of the disk ornamented with four rows of thread-cells extending from the insertion of each tentaculum a greater or less distance upwards towards the summit of the bell. The thread-cells in the older animals are arranged one by one along the row, but in the younger there is simply a cluster of them above each tentaculum, as represented, Pl. 8, Fig. 4, *x*. Digestive trunk, more like that of Cladonema than of Sarsia, divided at its oral extremity into four short lappets. Sexual organs confined to the upper portion of the digestive trunk. Radiate tubes four, unbranched. Tentacula four ocelli wanting; marginal bulb very small; shaft of the tentaculum provided for the greater portion of its length with pediculated appendages, the enlarged utricular heads of which contain each a few cells which appear to be thread-cells.

Larva?—Probably as in Corynitis the young medusa has at first only two tentacula.

This genus, I think, is related to Cladonema, as Gegenbaur also believes, yet the tentacula are of a very distinct type. The four short appendages of the mouth, however, and the position of the sexual organs are approximations to that genus.

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* Gosse has figured the same structure in *Willsia stellata*.

† See p. 125 *note*.

It will be seen, however, from the following description, that it is possible this species may prove the type of a new genus closely allied to Zanclea, though not identical with it. For in the (unfortunately) young specimens which I obtained, there were but two tentacula, which were moreover of a different appearance from those of Zanclea, and the yet unopened mouth gave no generic character. Should the mature animal preserve the chief of these peculiarities, I propose for it *Gemmaria* as a generic name.

Distribution.—Mediterranean and Charleston Harbor.

ZANCLEA GEMMOSA, *nov. spec.*

Pl. 8, Fig. 4–5.

Of this singular looking species, I have unfortunately taken only a few individuals, all of which were quite young and possessed of but two tentacula. At this stage the breadth of the bell is nearly equal to its height. The digestive trunk reaches half way down the bell-cavity, is bluntly pointed at its yet imperforate oral extremity. The sinus at the intersection of the radiate tubes is very large. A slight swelling of the lateral outline of the trunk probably indicates the future sexual organs. A trace of the connection with the larva is still left. The bell-wall is thin throughout. The sinus at the junction of each radiate and marginal tube is small, but dark colored, and this color, though not deep, is continued down the core of the tentaculum, which may possibly be tubular. Immediately above each anastomosis and on the outer surface is a beautiful cluster of large cells which are certainly thread-cells, whose refractive powers give them a brilliancy such as to remind us irresistibly of clusters of precious stones. These brilliants are set in a membranous case as the similar less showy organs of Willsia. Their disposition in a cluster is probably a character of very young individuals, for I have found a specimen not differing much in size from the rest which had these cells arranged in a row one by one as in Gegenbaur's species. Their position, confined to the neighborhood of the bell-margin, is also due to the immaturity of the specimens. The tentacula are stout in the shaft. The lower surface is irregularly roughened with the prominences of a diaphanous epithelium. The appendages of the upper surface have a distinct, somewhat conical head, containing two or three round cell-like looking corpuscles each. The pedicle by which this head hangs to the tentaculum is extremely difficult of definition, like the small lateral tentacula of Eucheilota. I believe that I have not seen the true wall of this pedicle at all, and that the dark irregular line figured is only a sort of granular content of the cells, composing the pedicle. On each of the other two points where tentacula might be expected, there was only a dark colored spot, marking the position. From what has been related of Corynitis, however, it will be seen that it would not be safe to conclude that the species preserves this bi-tentaculate form through life. There was a remarkable tendency to fold these tentacula inwards, so as to bring them within the bell. After a careful search, I determined that the ocelli were entirely wanting, as Gegenbaur also has observed in his more mature *Z. costata.*

The few specimens of this species from which the above description was made, were taken during the summer and fall, in the months of June, August and October.

PENNARIA. Goldfuss. (1820?.)

Syn. *Globiceps.*—Ayres. Proceedings Boston Soc. Nat. Hist., vol. 4, (1852,) p. 193.
Eucoryne.—Leidy. Marine Invertebrata of N. Jersey, p. 4, pl. X, ff. 1–5, (1855.)

The general form of the Medusa is that of a deep bell, with short transverse axis giving an elongated cylindroid figure. External surface ornamented with rows of pigment cells ascending from the marginal bulbs. Digestive trunk elongate, surrounded by the sexual organs. Radiate tubes four, simple. Marginal bulbs large, almost colorless. Ocelli wanting, as in Zanclea. Tentacula, so far as yet known, mere rudimentary tubercles, four in number. Larva, a hydroid having a cylindrical body with two whorls of tentacula, of which those of the double oral whorl are clavate, those of the lower whorl, filiform as in Stauridium, but instead of being limited to four as in that genus, they are numerous in each whorl. The horny polypidom forms a regularly and beautifully branched plume, along the branchlets of which at pretty regular intervals and uniserially, are arranged the individual polyps, each attached to the branchlet by a distinctly annulate pedicle. The Medusa is developed as in Tubularia, between the upper and lower whorls of tentacula, and becomes free. Judging from the condition of the following species, which condition is probably the same for the *Sertularia pennaria* of Cavolini, several planules are developed in the cavity of the Medusa-bell during its growth, and are discharged at the time of the Medusa's liberation from its larva.

Distribution.—Mediterranean Sea, Long Island Sound, Charleston Harbor.

PENNARIA TIARELLA, (*mihi.*).

Syn. *Globiceps tiarella.* Ayres. *loc. cit.*
Eucoryne elegans. Leidy. *loc. cit.*

The form of the bell cylindrical and elongate tapers to a rather blunt apex above. The very elongate digestive trunk reaches rather lower than the vail, and protrudes through its aperture at every contraction of the disk; the cavity of the bell is very narrow, so that in repose its wall is scarcely separated from contact with the surface of the digestive trunk. On the external surface of the disk are marked the four longitudinal lines of red blotches, which lie over the radiate tubes and follow their course, are rather irregular though deep colored, and give a remarkable appearance to the Medusa. Tentacula mere rudimentary knobs, four in number, beneath the four marginal bulbs. The coloration of the digestive trunk is a deep opaque red, and the pigment of the vertical lines on the disk is of the same color.

The polypidom has already been described by Ayres and Leidy. I can find no difference, either in habit or appearance, between the species of Long Island Sound and the coast of New Jersey, as described and as figured by Leidy, and the species found at low water mark in Charleston harbor. The Medusæ are developed between the upper and lower sets of tentacula, and while attached to the stem, contain planules which give them their milky-white opacity mentioned by Leidy. They detach themselves, so far as my observations yet extend, *before* casting their planules, though this may not be an invariable rule. The first efforts of contraction appear to be directed to this result, and the planules when cast are untentaculated round embryos. I have observed the Medusa very apathetic after this, exhibiting contractions of the vail only, and these but three or four in succession, then a pause. This portion of its history was observed on the 14th of August. At a later date, September 16th, I found three specimens of the Medusa free and actively swimming about in my jar. Though these were probably more advanced than that of the former date, the tentacula had not increased in length, nor had ocelli made their appearance. The Medusa, before its liberation from the hydra, being greatly distended with large embryos, has an almost ovoid form, which is exchanged for the cylindrical one described, after their expulsion.

I found the hydroid of this Medusa as late as November 24th as well as during the summer months, but have not hitherto succeeded in procuring specimens of it during the winter. It may be, however, that only those polypidomata growing near the surface are killed by the cold, and consequently it may exist during winter at some distance below the surface.

Remark.—The identity of ***Eucoryne elegans*** (Leidy) with ***Globiceps tiarella*** (Ayres) is acknowledged, and was in fact pointed out to me by Prof. Leidy himself. The generic identity of Globiceps with the ***Sertularia pennaria*** of Cavolini may be seen at a glance by comparing this description and Leidy's figure and description (*loc. cit.*) with those of ***S. pennaria*** by Cavolini. (Polyp. Marin. p. **134**, pl. **5**, ff. **1–6**.)

II. TUBULARIDÆ.* Johnston.

General form spherical, conical or cylindrical. Tentacula sometimes four, sometimes one only, sometimes altogether wanting. Ocellus wanting. Digestive trunk cylindrical or flask-shaped, and probably in general it will be found elongate. Sexual organs apparently equally distributed around the walls of the digestive trunk. Mouth simple. But the character which, if constant, constitutes the greatest peculiarity of the group, is a series of longitudinal crests which in Euphysa, Steenstruppia, and certain attached species of Tubularia, ornament the bell-margin, springing from the line of junction of the bell-wall and vail and rising upward along the exterior of the disk for a short distance. These crests are distinct from the tentacula, existing frequently without them, and the tentacula when present are attached to their lower extremities. They are also distinct from the marginal bulbs, since they are out-standing processes of the exterior of the bell. They seem to be simple epidermal protuberances containing irregularly arranged thread-cells.

The larvæ of these Medusæ differ from Pennaridæ, by having both whorls of tentacula simple and inclavate. The lower basal

* It will be seen by reference to the scheme, p. 123 of this paper, that I include among Tubularidæ proper, Forbes' two genera Steenstruppia and Euphysa. To this I was led by a fact communicated to me some years ago by Prof. Agassiz, that he had observed the liberation of a species of Steenstruppia from a Tubularia of the coast of Massachusetts.

portion of the polyp's body also is dilated into a kind of disk, the circumference of which bears the lower whorl of tentacula. These latter, like the corresponding ones in Pennaria, are capable of only very limited contraction. The horny polypidom though sometimes branched is never branched so as to produce a regular pattern as in the case of Pennaria.

This group includes among its larvæ the largest of known hydroid polyps. The stems of *Tubularia indivisa* (?) sometimes attain a height of more than a foot. (See Dalyell's *Rare and Remarkable Animals of Scotland*, vol. 1, p. 3.) The only approach to them in size is made by the communities of the genus Physalia, (which, however, I look upon as communities of medusæ not of hydræ,) whose air-bladder, which must be looked upon as the base of a community, is sometimes nearly a foot in length, with the extended tentaculiform individuals measuring nearly three feet in length.

TUBULARIA. Linnæus.

The genus Tubularia contains those fixed hydroids whose pipe-like horny stem is surmounted by a polyp broad below and tapering above, and encircled by two whorls of simple tentacula, between the upper and lower of which the medusa-buds spring from the smooth untentaculated space. The polyp-stem is continued below in a creeping intertwining root.

The digestive cavity of the polyp does not extend into the expanded base, except during the young and locomotive stage of the larva. The tentacula in both whorls are generally numerous, and not clavate at their extremities. The medusa-buds are sometimes each separately attached by a short pedicle to the sides of the polyp; sometimes hang in several grape-like clusters of great beauty among the tentacula of the lower whorl.

There are at least two groups in this genus which may be distinguished by their Medusa-forms. In some, as in *T. calamaris*, and *T. Dumortierii*, whose development has been traced by Van Beneden, the Medusa has four tentacula and becomes free. In *T. indivisa* on the contrary, as observed by Dalyell; *T. coronata*, by Van Beneden; in a species of the Mediterranean observed by Kölliker, and the analogous species about to be described from Charleston Harbor, the Medusæ want tentacula, do not become free, but hanging in clusters, nurse within their bell-cavities, round embryos which there become tentaculated and at last escaping thrust themselves out by means of their tentacula, and afterwards by the same means crawl about with considerable activity, until they have selected a position upon which to fix themselves for the rest of their existence.

1st Group. TUBULARIA proper.

Medusæ without tentacula but provided with from four to eight crests disposed in a radiate manner around the opening of the bell-cavity. Digestive trunk quite large and surrounded by the sexual organ. Radiate tubes four. On the outside of the disk pass upward eight rib-like stripes which appear to contain round cells, (thread-cells ?) towards the top of the disk. The medusæ remain fixed to the hydra from which they hang in clusters. The females develop their embryos in the interior of the bell-cavity which they do not leave until provided with tentacula. After discharging its young in this manner the Medusa shrinks and gradually dwindles away.

2nd Group.

Medusa like the last in general structure—but provided with four tentacula—becomes free and never nurses its embryos.

TUBULARIA CRISTATA, *nov. spec.*

The pedunculated Medusa of this species is, when the disk is expanded, of a rather deeply campanulate form. The digestive trunk is very long and very frequently is thrust through beyond the opening of the vail. It is shaped like a Florence flask, being very broad near its junction with the bell, from which its outline is distinguished by a constriction. The margin of the bell has in this condition a lobulated appearance, and there are eight such lobules, and eight external rows of thread-cells(?) which run up the outer surface of the disk like meridian lines. When, however, the disk is distended with embryos in course of development it has a more or less spherical form, the opening of the vail being contracted as if by a sphinctor, and at this time, a number of crests, from four to eight, more or less elevated according to their state of expansion, are observed, disposed radiately around the closed opening and longitudinally with regard to the axes of the body. There are no tentacula, and the crests just described appear to me homologous not with tentacula but with the similar and similarly placed crests figured by Forbes in his Steenstruppia and Euphysa. What I believe to be the sexual organ, in which I think I have seen ova with germinative vesicle and dot, is at this stage broadest and most developed at the upper part of the digestive trunk near its junction with the bell, and gradually thins away as it passes over the slenderer portion of the organ. I have observed contractions of these Medusæ, independent of the hydra, but they are slow and slight, and the Medusæ never become free.

They are united several together in an irregularly alternate manner upon a stem, which grows out from the side of the polyp-form. The number of bunches thus encircling the untentaculate zone of the polyp is variable, but they are numerous.

The polyp is slender, the expansion which bears the lower circle of tentacula does not much exceed in diameter the width of the portion above it. The lower circle of tentacula (which appears to be uniserial) is composed of twenty or more uncontractile tentacula, the upper, which is at least bi-serial, contains eighteen or more. The tentacula of the lower whorl are whitish, slender, and exceeding the polyp itself in length; those of the upper are more reddish, short, and rather clumsy in appearance. The stem on which this polyp-head is mounted is generally about two inches in height, sometimes however exceeding this and reaching nearly three inches.

At the time of leaving the bell of the parent the young are provided with from three to eight or a few more long tentacula, four or five times the length of their own bodies. These belong to the lower circle, and are usually carried turned backwards acting as locomotory organs. The oral tentacula are also apparent, three or four in number around the mouth, and according to my observations, clavate at this stage, at their extremities, like the oral tentacula of Pennaria. After moving about a short time, the basal end of the body elongates and the young hydra attaches itself, after which it attains its maturity by increasing the length of the stem, multiplying tentacula and developing medusa-buds.

Found the year round at low-water mark and a little above it, attached to the rocks of a jettee exposed to the ocean on Sullivan's Island. I have also taken it, growing luxuriantly, from the bottom of a schooner which had been lying about six months in the harbor. The budding of the Medusæ begins at an early stage of the larva's growth, so at nearly all times of the year either the elegant grape-like bunches of medusæ or the budding knobs which represent them are to be found. I have observed the Medusæ fully grown and casting their larvæ as early as March 10th, and as late as September 13th, during all which time thousands of larvæ are continually shed, and in consequence thousands of new colonies established, their multiplication becoming so great durring a favorable season that the rocks literally appear clothed with the yellow stems and rose-colored blossom-like bodies of these flower-animals. There is, however, in their coloration, as is usual in these Medusæ a combination of yellow and a shade of red, which are not distributed in the same proportion in different clusters of individuals, so that a series of varieties are produced between an almost uniform yellow where the red is reduced to a minimum, and a most beautiful rosy tint which is characteristic generally of the finest and most vigorous clusters.

III. HIPPOCRENIDÆ.

General form of the Medusæ always more or less spherical; bell-wall very thick, especially above the digestive trunk, in free animals. Tentacula, grouped in bunches or tufts round the bell-margin; a single marginal bulb thus corresponding to a plurality of tentacula. Ocelli present in free animals, and borne sometimes on the bulb, sometimes on the tentaculum. Digestive trunk short, with the sexual organs disposed about it in four distinct lobes, which, in one genus, afterwards acquire an unusual connection with the radiate tubes; mouth with a simple or undulate border, and armed with four or more cirrhi, generally more or less branched.

The larvæ of these Medusæ present, at first sight, more dissimilarity to each other than those of the other groups of the same value. They are Tubularia-like hydræ, with sometimes two, sometimes only one whorl of tentacula; the larvæ are either fixed or free; the medusa-buds are developed either as in Tubularia, between the two whorls of tentacula, or upon different parts of the stem. Sometimes this stem is apparently altogether wanting; sometimes it is a branched, tree-like structure, nearly six inches in height. The free or fixed condition of the larvæ is a difference of no greater than generic consequence. The other difference, that in the number of tentacular whorls, is probably to be explained by the history of Stimpson's genus, Acaulis, which, at first, has two whorls, but afterwards loses the lower, which circumstance then gives the medusa-buds, growing originally, as in Tubularia, between the two whorls, the appearance of being developed upon a stem. It may be, however, that the same indifference as to whether the medusæ be developed on the stem or among the tentacula, which we see in Corynidæ, may be the true explanation here also. Stimpson's suggestion as to the homology of tentacula between Tubularidæ and Corynidæ is also well worthy of consideration. In that case the tentacula of Corynidæ would correspond to the upper or oral whorl of Tubularidæ, which are the latest in development, and the single whorl of Eudendrium proper would probably correspond to the lower whorl of Tubularia, thus representing a condition of the Tubularian hydra still earlier than that represented by Pennaria. But there are other Eudendrium-like larvæ, (Hippocrene,) in which the single whorl of tentacula seem, from their contractility, to be allied to the oral tentacula of Tubularia, not to the uncontractile tentacula of the lower whorl.

The *Eudendrium ramosum* of Van Beneden is peculiar, in having a funnel-shaped expansion of the horny polypidom to receive each polyp. This reminds us of the fixed Exostomata.

Remark.—If Cytaeis be a good genus, the compound tentacular bulb will not be a family character. But all the species hitherto referred to this genus, are extremely small, and since I know that Hippocrene sometimes passes through a stage in which it has all the character of Cytaeis, I, for the present, regard the compound bulb as a family character. (See Pl. 10, fig. 10.)

The *Oceania Blumenbachii* of Rathke (*Mem. Imp. Acad. St. Petersburg*, vol. 2nd, 1835, p. 321 and plate,) seems to be one of the Hippocrenidæ, possessing not only eight compound tentacular bulbs, like Lizzia, but eight radiate tubes also, while its oral cirrhi are but little developed.

NEMOPSIS. Agass. (1849.)

General form rather higher than that of Hippocrene. Oral tentacula large and very much branched. Sexual glands not only attached to the parietes of the digestive trunk, but also to the radiate tubes, hanging from them free in the concavity of the bell, and following their course towards the circular tube. Tentacular tufts four, as in Hippocrene, but the middle pair of tentacula are clavate, and borne aloft like the eyes of a crab. Each of the tentacula, the clavate as well as the others, has, at its origin, a small black ocellus, those of the clavate being on the inner and somewhat on the lower side, while those on the filiform tentacula are on the upper side of the base.

Professor Agassiz, who established this genus, in his "*Contributions to the Natural History of the Acalephæ of North America,*" Part I, page 289, remarks that it closely resembles Hippocrene, but "differs from it in having a more movable and bottle-shaped digestive cavity, which may be more or less protruded from the main cavity of the body, and is not so persistent in its form as that of Hippocrene. The tentacles are arranged, as in Hippocrene, in four bunches, with eye-specks at their base; but there are two of these eye-specks, supported upon two distinct stalks, rising above the others and above the tentacles, similar in appearance to the protruding eyes of a snail."

I have had frequent opportunity of examining this genus, and have particularly sought for an ocellus at the enlarged extremities of these tentacula, but I am satisfied that these bulbs in our species at least, contain no pigmentary matter, their deeper hue being owing to their greater thickness and their consequent approach to opacity. A true ocellus, however, is found at the base of each of these organs precisely, as in the filiform tentacula. See fig. 10, pl. 1*a*.

The larva of Nemopsis, (Pl. 10, fig. 7,) as observed by myself, is a free hydroid, with a base broader than that portion of the body which contains the digestive cavity. The stem is represented by a solid knob in the middle of this expanded base. There are two circles of tentacula, one about the expanded base, the other around the mouth. That around the base is composed of two rows, the tentacula of which alternate with one another. The medusa-buds are developed directly from the sides of the polyps, between the two circles of tentacula, as in Tubularia. They are not disposed in grape-like branches.

The tentacula of the Medusæ are developed *externally*, and may be distinguished, apparently, before the cavity of the bell is open. The sexual organs are at first confined to the walls of the digestive cavity, and do not grow downwards until comparatively late in the animal's life. The clavate tentacula are also absent until the animal has attained considerable size.

Distribution.—Coast of the United States, Long Island Sound, and Charleston Harbor.

NEMOPSIS GIBBESII, *nov. spec.*

Pl. 10, Ff. 1–7.

This species differs considerably from Prof. Agassiz's figure, *loc. cit.* The general form of the fully grown animal when at rest, is almost spherical, the tentaculiferous margin being then somewhat contracted, but when in motion it appears truncated below. The disk above the digestive trunk is very thick, the sexual ribbons extend about two-thirds of the distance from the digestive trunk to the marginal bulbs. In the males this gland is rounded below, rather opaque, and has the appearance of containing a somewhat twisted cord; in the female the ovary is pointed below, does not reach quite so low down as in the male, is more transparent, and never presents the twisted appearance, so far as my observations extend. The ova are plainly visible, and frequently so crowded as to lose their circular outline. The digestive cavity is fusiform, between the bases of the sexual glands, tapering in a sort of œsophagus towards the mouth, which is of waved outline, giving the impression of rudimentary lips. At a considerable distance above the mouth, between the sexual lobes, are inserted the oral tentacula, which are long and very much branched, (fig. 1,) and of precisely the same structure as those of Hippocrene. I have never seen the trunk approach extension beyond the vail, as Prof. Agassiz seems to indicate, occurs in *N. Bachei.* The four radiate tubes appear buried in the sexual glands for a considerable part of their course, and near the margin lose themselves in the opaque, compound, tentaculiferous bulbs. These have the structure figured by Forbes in *H. Brittanica.* The ocelli of the club-shaped tentacula are carried on their lower surface, turned somewhat inwards, that is, towards each other; the ocelli of the other tentacula on their upper surfaces, (fig. 1*a.*) In full grown individuals the number of tentacula to each bulb is $8+1+1+8=18$. They are very contractile, with the exception of the clavate pair, which possess the power of elongation and contraction in a very limited degree only. The filiform tentacula may be elongated, as in fig. 1, or reduced to mere knobs, as in fig. 3, while the clavate can only shorten themselves a little, or elongate themselves so far as to pass round the bulb, and just appear on the inside of the bell cavity.

The appearance of this Medusa is at once singular and beautiful. The conspicuous crescentic outline of the pale, orange-colored sexual ribbons, the vivacious movements of the mouth and its appendages, the graceful, waving outline of the flapping disk, with the clavate tentacula carried erect, as if always on the watch, the others floating in various curves or tightly curled at their extremities, make it an unusually remarkable object, even in this remarkable group.

It is with no small pleasure that I have here availed myself of an opportunity of connecting with this species the name of my friend, Prof. Lewis R. Gibbes, who pointed out to me the first specimens I examined, lying on the beach of Sullivan's Island.

The young buds on the hydra are at first mere buttons. (Pl. **10**, fig. **7**.) They grow and become heart-shaped in outline, as the four large, marginal bulbs are formed, with their very distinct sinuses. The external transparent tissue of each bulb becomes first bifid, as far as I can ascertain, then quadrifid or trifid, (ff. **6** and **5**.) At this time the digestive trunk almost entirely fills the cavity of the yet closed bell. The bud elongates; the tentacular bulbs make the bell broader at its lower than at its upper (attached) end. The little points of each quadrifid bulb next elongate; slight contractions are visible in the bell, which probably at this time becomes open. The next observation, a few hours later, finds the Medusa free, and having three or four straight, stiff tentacula, with rings of thread-cells, (fig. **4**.) At this stage the digestive trunk is still nearly of the height of the bell; when contracted, however, it forms only a hemispherical mass in the upper portion of the bell-cavity. No oral cirrhi; no distinguishable sexual organs. At this stage the N. Gibbesii may be distinguished from *Hippocrene Carolinensis*, by the large size of its marginal bulbs and digestive trunk, and the fact that it has three or four tentacula to each bulb.

In the next stage which has come under my observation, the base of the digestive trunk is very broad; its height less in proportion to that of the bell. There are four long-shafted, oral cirrhi, bifid at their extremity; the number of tentacula has increased. Shortly after, ocelli have appeared. The young medusa is still distinguishable from the young of *Hippocrene Carolinensis* by the long shafts of its oral cirrhi.

Some intermediate stages I have not been able to observe. The next form is that wherein the sexual glands are like those in Hippocrene, but have a broad base upon the four radiate tubes, being not constricted above, as in the genus just mentioned. See fig. **3**, pl. **10**. At the same time the clavate tentacula are quite conspicuous, and on each side of that pair there are four or five filiform tentacula to each bulb; **4+1+1+4**. Next, the sexual organs are discovered, already half-way down the radiate tubes. See fig. **2**. The animal increases in size, the tentacula in number, the oral cirrhi become very much branched, and their delicate dendritic form gives them an extreme beauty. Lastly, the sexual glands reach fully two-thirds of the distance from the base of the stomach to the marginal bulbs. Nemopsis thus passes through a form like that of Hippocrene, and must therefore be ranked above it.

I give the above details partly to show how important it is in describing Medusæ, to ascertain as far as possible all their changes during growth. Ff. 1 and 3, might very well be mistaken for distinct species.

The hydra of this species is extremely like Acaulis described by William Stimpson, in his *Marine Fauna of Grand Manan.* I have only observed the development in one specimen. It was floating at large, and taken with the dip-net. It lived five days, developing medusæ, but never fixed itself; only gradually dwindling away as the medusæ were developed. The tentacula were all, at last, retracted, especially those around the broad base. In its first activity it was incessantly moving about by means of its tentacula, mouth downwards.

I surmise that Acaulis belongs to this group of Medusæ. Together with this larva of Nemopsis, it should be compared with the young stage of Tubularia when first freed from the bell of the medusa.

Nemopsis Gibbesii is a winter species. I have found large specimens as early as the 10th December. It may be taken also as late as the 10th of June. It is frequent during May. I have found it in the latter part of April, and the larva and young just described were taken on the last day of January. I have never found a naked-eyed medusa in Charleston harbor during the early part of January.

HIPPOCRENE. Agass. (1849.) Mertens and Brandt (*pars.*) (1835.)

General form spherical. Sexual organs in four lobes round the digestive trunk, to which they are confined. Oral tentacula smaller and less ramified than in Nemopsis. Radiate tubes four. Compound marginal bulbs four also, bearing a variable number of similar, simple, solid, and extremely contractile tentacula, which bear their ocelli on the inner or under side, in this respect it differs from Bougainvillia, whose ocelli seem to be on the upper side of the tentaculum. Larva is a small Eudendrium-like hydroid polyp with a branching stem, whose twigs are each terminated by a conical mouth, surrounded by a single whorl of few tentacula. The body of the polyp is of the same width as the stem, and is not distinguished from it by a constriction, the stem itself apparently being a branching polyp-body, whose many mouths are each surrounded by a circle of tentacula. The medusa buds are developed indifferently at any point along the branching stem, and since the polyp has the faculty of contracting its tentacula like Hydractinia, the medusa buds growing near the extremity of a stem, sometimes appear to be unconnected with any hydra-like polyp. The tentacula of the medusa are developed in the involute manner, like those of Sarsia, and unlike the tentacula of Nemopsis, which, as described, are developed in the evolute or external manner, like those of Corynitis. When very young the medusa's bell is, as usual, thin, increasing to the great thickness of the same organ in the adult, as the animal grows older. The digestive cavity is small and the oral cirrhi are at first simple, and as they grow first bifurcate and afterwards repeat this until the specific character of the cirrhi is acquired. The number of tentacula to each bulb at the time of the medusa's liberation is probably two or three in most cases, but I have found a specimen (Pl. 10. fig. 10) fully representing the genus Cytaeis, having besides the simple oral cirrhi only a single tentaculum to each bulb.

Distribution.—Harbors of Boston and Charleston.

HIPPOCRENE CAROLINENSIS, *nov. spec.*

Pl. 10. ff. 8–10.

In general form this species approaches more nearly the *H. superciliaris* Agass. than either of the species described by Forbes. It varies slightly from a nearly globular form to one a little more elongated and oval. The largest specimens are usually the more globular. The marginal bulbs give origin to but six or eight tentacula each, at the base of each of which, on the under side, is a very small black ocellus. The tentacula are of medium length and usually carried tightly curled at the ends, one pair of each tuft borne quite stiffly upwards on the outside of the disk, and another pair turned within the cavity of the bell. The digestive trunk is quite elongate for Hippocrenidæ, though it appears to possess much contractility only in that part below the sexual glands. The trunks of the males have usually appeared rather longer than those of females. The oral tentacula are quite short and with very few branches, bifurcating only twice or thrice, and are never conspicuous. In some specimens the radiate tubes present an arched outline in passing the top of the bell-cavity, as seen in *H. superciliaris*, but not generally, their usual course being one of direct descent from their connection with the digestive trunk to the marginal tube. In females heavy with ova, the sexual lobes bulge downward at their lower extremities, so as somewhat to overhang the mouth coming down between the origins of the oral tentacula.

Disk of great transparency. Ovaries pale yellow. Digestive cavity has each of its two extremities marked with a red spot. Tentacular bulbs yellowish white, with a red spot within. There is a variety in which the whole digestive cavity is of a brickdust-red, and where this color is more conspicuous in the tentacular bulbs.

The larva of this species has about twelve contractile tentacula. The polypidom grows about an inch or slightly more in height. I have found it but once on a piece of wood which had evidently been submerged for some time and probably considerably below low water. I have not observed the actual liberation of the medusa, but have obtained a number of young H. carolinensis by keeping this hydra when in bud suspended according to Dalyell's plan, in a jar of water.

This species is one of the most common in our waters during the summer. I first took it June 2d, and continued to find it in greater or less abundance until November 4th, the last day on which a specimen was found. It appeared to be most abundant in June, somewhat less so in August, and again appearing more frequently in September, after which its numbers gradually diminish along with that of the other summer medusæ. I have taken it in warm fair weather, at times when thunder storms were rising, between heavy showers of rain, and after rain, in the afternoon as well as the morning. There are scarcely any times of day or any ordinary kinds of weather in which this medusa may not be taken, yet sometimes under the most auspicious circumstances, fair sky, warm sun, smooth water, not a specimen is to be found, while perhaps other species are abundant. This is more or less the case with every species. This genus is not spoken of from the Mediterranean. The latitude of Charleston harbor seems, therefore, to be its most tropical habitat, so far as our present knowledge extends. We might suppose that its presence here was due to our low mean annual temperature, but it is found only during our tropical summer.

EUDENDRIUM. Ehrenberg.

Medusæ but little known. According to Dalyell's account, they seem to be mere cysts, serving to protect the planules during their growth, and are developed on the twigs which bear the polyps, but usually near the bases of the latter.

The polypidom is branching and horny, attaining considerable size. The polyps are distinguished from those of the larvæ of Hippocrene by a slightly expanded base, bearing the circle of tentacula, and by having the oral prominence, a very contractile organ, sometimes separated by a slight constriction from the expanded base. The twigs which bear the polyps are more or less annulate.

Distribution.—Coasts of Great Britain and South Carolina.

EUDENDRIUM RAMOSUM.

If this species be not identical with the *E. ramosum* of Europe, I do not know by what characters to distinguish it since I have never been able to observe its medusa-buds.

The rose-colored polyps are quite small, and have about eight tentacula on a base, which is not much expanded, but I do not describe from the fully developed polyp. The mouth in the young polyps, at least, is more or less prominent and proboscidiform, sometimes assuming a spherical shape, being then distinguished by a constriction from the tentacular base. The branchlet on which each polyp is borne is annulate near the base of the polyp.

The polypidom is composed of slender branching dark-colored tubes, about six inches, sometimes perhaps even more in length, on which the polyp-branchlets are not disposed with much regularity.

It is evident that the *E. ramosum* of Van Beneden and the *E. ramosum* of Dalyell, are very different species from that of Johnston, with which, for the present, I consider this identical.

I observed, on one occasion, a singular deformity in a polyp of this species. The body of the animal was much enlarged below the bases of the somewhat stunted tentacula. There was no proboscidiform prominence to the mouth. The turgescence was so evidently occasioned by something within, that after it had remained a day or two in a jar of salt-water, I slit the polyp open beneath the microscope and found that it contained a reddish granular thread, coiled in such a manner as to remind one of the coiled threads of the greater thread-cell nodes of some of the Siphonoporæ figured by Kölliker. (See *Schwimmpolypen von Messina*, pl. 5, ff. 2–3.) I did not observe any organic connection, however between this thread and the polyp—nor did it exhibit any motions, nor appear to be ciliated. I do not venture to offer an explanation, having never observed anything of the kind before or since.

The branching polypidom of this Eudendrium, torn from its moorings, is frequently thrown up by the waves on the beach of Sullivan's Island, especially during the winter months. It is usually denuded of its polyps, but I have had them reproduced from the stem, in a jar of salt-water—as Dalyell relates of Tubularia as well as Eudendrium, and as I have also observed in that genus. I have never been so fortunate as to obtain a specimen with medusa-buds.

This species grows below low-water mark, and is always rare, but especially so in summer.

I have, on one occasion, found a single denuded but comparatively robust polypidom, whose general appearance was so much that of *E. rameum*, as to make it probable, that either this or a nearly allied species is an inhabitant of our harbor. I have also once found twining among algæ a small creeping polypidom, whose polyp's expanded base, and few and apparently contractile tentacula, make it probable that a species like Van Beneden's *E. ramosa* (*Corydendrium* Dana.) is also found here.

HYDRACTINIA. Van Beneden.

This genus preserves the form of a community. The Medusa does not become free, and attains but a very low stage of development. There is no distinction, that I can find, between the disk and the wall of the sexual organ; the males and females appear to reside in distinct communities. The sexual contents of the female ovary divides sometimes into several embryos.

The polyps, according to Van Beneden are from the first provided with but a single whorl of tentacula. These in the adult are cylindrical, (not clavate, nor pointed,) and very contractile. The polypidom is horny and covered with spines. It is neither dendritic nor climbing, but incrusting, and protecting only the base of each polyp. The medusa-buds are developed on clavate stems which are polyps, modified in form for the fulfillment of this function.

The two forms described by Van Beneden, from the coast of

Ostend, I suggest, are males and females of one species. I have found the same differences of habit and in the medusa-buds, between those of Charleston Harbor.

Remark.—The true position of Hydractinia is a question of some difficulty. Its affinities are complex, and probably indicate that it should constitute a minor group of itself. Its tentaculated polyps are like those of the larvæ of Hippocrene, from which it again differs in its horizontally expanding polypidom. On the other hand, its medusa-bearing polyps are untentaculated like those of the Velellidæ. For this reason I am disposed to think that it will constitute, when better known, an under-group in the neighborhood of Velellidæ.

Distribution.—England, Denmark, Holland, France, Long Island Sound, Charleston Harbor.

HYDRACTINIA ECHINATA. Johnston.

It is impossible to distinguish, with any certainty, this species from the European. There appears to me to be a greater delicacy and slenderness in the general form of the polyps. The tentacula appear to be more numerous, and I think also the spines, especially in the female polypidom, more marked and longer. But this comparison is made only from drawings.

I think there can be no doubt that this species is the same as that observed by Leidy at Point Judith in New Jersey. Has Hydractinia been observed in Massachusetts?

According to my observations, embryos are never found in the form which encrusts the shells (especially of Natica) inhabited by Pagurus. They have a form of medusa, also, in whose sexual organ no ova are seen, but which contain a much more prominent diverticulum of the polyp's canal, than does the egg-bearing, embryo-bearing medusa of the other form, which encrusts rocks. The latter form exists in countless thousands of individuals, covering yards of surface of rock, while the former are confined to the outer surface of shells scarcely more than an inch or an inch and a half in diameter, and are comparatively rarely met with. If these are, as I suppose them, male and female communities of the same species, it will explain the reason why, while the multitudinous females are stationary, the males, few in number, attach themselves to the shells of Paguri, whose nomadic habits thus insure a wider distribution of the seminal product.

4TH GROUP. SIPHONOPHORÆ.* Eschscholtz.

I have already separated from Siphonophoræ the Velellidæ as quite a distinct group, having a closer relation to the larval communities than the former, which it appears to me, from a careful consideration of the facts within my knowledge, receive their most natural explanation by a comparison with the budding Sarsiæ and Lizziæ. So far as I am acquainted with the literature of this subject, there is nothing really known of the *embryology* of these Medusæ. We are only acquainted with their medusa-stages, and the polypoid stage, in none of them, is known. To begin with what seems to me the simplest case that of Eudoxia and Ersaea, we have a modified medusa-disk as the base of the community, corresponding to the bell of the budding Lizzia, its digestive trunk (*tubulus suctorius* Esch.) corresponding to the same organ in Lizzia, and from the walls of this, proceeding as in Lizzia, Medusæ, which here, however, instead of being all sexual, are of three classes, one of which is confined to reproduction; another, has no other organ than a swim-bell, pierced by circulatory tubes, and restricted probably entirely to locomotive and respiratory functions; thirdly, there are growing from the walls of the digestive trunk, tentaculiform organs. Now, if my supposition be correct, these latter cannot be the homologues of the tentacula of the ordinary free Hydroid medusæ, but must be medusa-buds gradually modified into the form of tentacula, and if true here, the same is true for the tentacula of all Siphonophoræ. According to my observation, the ascending canal of the basal medusa's disk, in Eudoxia, contains air, (pl. 8, fig. 9, *a*,) and this is the homologue of the air-bladder in all the other Siphonophoræ, not excluding Physalia. The digestive trunk also of Eudoxia, appears to me the true homologue of the main stem in such genera as Physophora, and Agalmopsis, supporting the swim-bells and the so-called polyps, bracts, and tentacula, as well as the sexual individuals, all which I consider special modifications of medusa-buds, such as exist on the trunk of certain Lizzias and Sarsias. In Physalia, this tubular modification of the trunk appears to be reduced to a rudiment. In Prayia, which is certainly not distantly allied to Eudoxia, the basal medusa-disk and its cavity, as well as

* In his "Lectures on Comparative Embryology," Boston, 1849, Professor Agassiz already considers the Siphonophoræ communities of individuals.

its air-tube, are two-fold, while the tubuliform homologue of the digestive trunk is single, inducing an appearance which leads us to infer something like a partial fission of the single basal disk of Eudoxia. In the same genus the simple digestive trunk of Eudoxia assumes the elongate tubular form, contains at intervals, groups, each of which have all the principal elements of an Eudoxia, with the exception of the sexual individuals, which have not yet been observed. In many Diphyidæ, the same character of the digestive trunk is preserved, but in Abyla, the bracts disappear. In Diphyes and its immediate allies, there appear to be two bell-cavities to the basal medusa-disk, and, except in Prayia, a single air-tube, as if the fission-like modification of Prayia were only in part here preserved. The basal disk, therefore, is among the Diphyidæ highly developed, and assumes a variety of extraordinary forms, as in Cuboides. Among the Physophoridæ, on the contrary, it is entirely lost, being reduced to the mere parenchyma of the air-vesicle, which serves as the float of the community. Here, however, the swim-bells, which generally constitute the uppermost buds on the tubuliform stem, receive an extraordinary development in numbers, occupying a very great portion, sometimes almost the whole of the tubular trunk; a very different condition from the single swim-bell of Eudoxia. They also suffer extraordinary modifications of form in such genera as Hippopodias and Apolemia. All the other principal elements, however, of the gemmiferous trunk appear to remain in most genera of this group, such as the lateral digestive trunks or polyps, the bracts, the tentaculiform, and the sexual individuals. I have hitherto spoken (for the purpose of not at once making exceptions in the enunciation of a broad proposition) of the bracts as well as the "polyps" and "tentacula," as distinct individuals; but it is to be remarked, that the bract holds so constant a relation to the "polyp," that it were well worth to examine whether it does not represent, for each one of these digestive trunks, the disk; to which we are also led by a consideration of Prayia, where the helmet-shaped bract holds a similar relation to the digestive trunk as is held by the basal disk in Eudoxia to the analogous part. However this may be, in the next group, that of Physalidæ, not only the swim-bells, but the bracts also, entirely disappear, the air-bladder or float assumes an enormous development, and as we have said before, the tubuliform homologue of the original digestive trunk in Eudoxia, appears to be reduced to a most modified condition, all that we can recognize, so far as my acquaintance with that genus goes, as its homologue, being the multifid semi-cartilaginous process, which bears the grand train of digestive, tentaculiform, and sexual individuals.

The characters of the group, as it at present stands, therefore, may be imperfectly summed up as follows:

Larva unknown. Individuals living united together in communities, the base of which is a budding Medusa. They are specialized into classes, performing different functions, and which seem to be mainly these:—1st, the original or supporting Medusa; 2d, the locomotive individuals or swim-bells; 3d, the digestive individuals; 4th, the tentaculiform individuals; and if we do not unite the bracts with the digestive individuals, we have 5th, respiratory individuals, or bracts. The most general characteristics of the medusa-bell, when present, are a great thickness and cartilaginous firmness, and a tendency to the formation of processes from the upper external surface of the disk, (see pl. 8, fig. 10, *c.*) for the more perfect adaptation of the bell to its position in the community: an almost universal absence of color, even in the bell margin—an absence of tentacula, and, in their stead, the occasional presence of sharp triangular processes from the tentacular margin—an absence of ocelli. This absence of color in the medusa-bell, when the latter is present, is sometimes compensated by the intense coloration of the digestive trunks and tentaculiform individuals. The latter, also, which are sometimes branched, exhibit an extraordinary development of the thread-cells.

Of the group of Physophoridæ, I know no representatives in our harbor. There are representatives of Diphyidæ and Physalidæ, but the rareness with which they occur makes my knowledge of them very limited.

I. DIPHYIDÆ.

Basal disk highly developed; often provided with two bell-cavities; one of which gives exit to the budding modified digestive trunk with its appendages, including the single large swim-bell usually present in the genus; the other acts as a swim-bell. Digestive trunk bearing a variable number of appendages of four sorts, swim-bells, bracts, secondary digestive trunks, and tentaculiform individuals.

EUDOXIA. Eschscholtz.

Basal medusa with single bell-cavity; usually helmet-shaped. Digestive trunk single; that is, bearing no secondary digestive trunks, but having a swim-bell besides tentaculiform and sexual individuals growing from its walls; the basal medusa disk serving as a bract to this assemblage of individuals. The sexual individual in each community appears to be solitary. The bell-rim in the locomotive and sexual individuals is armed with four sharp-pointed processes from which run up along the outer surface of the disk, more or less distinct keels or raised lines towards the attached extremity.

Larva?

Distribution. Pacific Ocean; Mediterranean and Adriatic Seas; South Atlantic and Charleston Harbor (?)

EUDOXIA ALATA, *nov. spec.*

Pl. 8, Ff. 9–10.

The basal medusa of the community is small—the sexual medusa large, and the swim-bell or locomotive medusa of medium size. The four longitudinal keels of each of the two latter are small, and placed, so far as I could ascertain, not equally distant from each other, but two on each side nearer together than to the other two. Their terminal processes are pointed and small, the points turning outwards.

The base is helmet-shaped, somewhat conical; concavity shallow, open on one side, where the rim of the depression is continued upward as two converging ridges towards the apex of the cone. The tubular cavity (air-vessel) in the substance of this base was of about two-thirds of its thickness in length. I did not observe the digestive trunk.

The sexual medusa is broad in proportion to its length, its diameter being almost equal to its longitudinal axis. The longitudinal keels appear to be arranged by two's as in the swim-bell. One side of the medusa bulges out decidedly more than the other. The two keels on the less bulging side are much enlarged near the top of the bell, so as to form two conspicuous expansions, whence I have derived the specific name. The sexual organ (in both cases ovaries) was a fusiform appendage from the top of the bell-cavity like the digestive trunk of the Tubularian Medusa, but I did not find in it any thing to represent the digestive cavity as distinct from the sexual gland. The whole seemed to be a single cavity in which were well marked ova with germinative vesicle and dot, and I saw a granule moving within it at one time as if slowly impelled by cilia.

The foregoing imperfect description, was taken from the disconnected medusæ of two individual communities of this species found in a jar, the day after their collection. The parts being all separate and dead it is impossible to give any precise information as to the mode in which they are grouped together when alive. Also, the digestive trunk (*tubulus suctorius*) of the stock-medusa was gone. These two were the only specimens I have encountered. They were taken on the same day in the end of January.

DIPHYES. Cuvier.

The basal portion of the communities in this genus, is a transparent mass containing two swim-bells of which one is usually greater than the other. Between these in the substance of the double-belled base is a small canal or cylindrical cavity, from the lower part of which originates a long hollow stem, finding exit by a small cavity between the openings of the two bells. This stem which is very contractile, bears the digestive trunks, bracts, sexual medusæ and hollow tentaculiform individuals, so grouped that one of the bracts or leaf-shaped individuals overlies and covers an individual of each other kind. The sexes are found upon separate individuals according to Kölliker, who believes also that the female medusa becomes free.

Diphyes and Abyla appear to be intermediate links between Eudoxia and allied genera (which approach nearest to the budding Corynidian and Tubularian Medusæ,) and the other Physophoridæ. It would seem probable from the figure of *D. Boryi* that the inferior or hinder swim-bell is homologous with the single locomotive medusa in Eudoxia.

Distribution. Atlantic Ocean, South Lat., North Pacific, South Sea, Mediterranean and Atlantic, North of the Equator.

I have observed a species of this genus in our harbor, near in outline to Eschscholtz's *D. angustata,* but quite distinct from Kölliker's *D. Sieboldii,* from which it differed in having the inferior bell shorter, and less projecting downwards. I have seen two specimens, both small about two-tenths of an inch in height. The stem was never so extended as to allow an examination of the individuals appended to it. I therefore defer the description of this species, which may perhaps properly be called D. pusilla, to a future time.

These two specimens were taken in summer.

DIPHYES PUSILLA, *nov. spec.*

This small species in form is intermediate between Eschscholtz's *D. angustata* and Kölliker's *D. Sieboldii.* The greater swim-bell is relatively greater in height than in *D. angustata* while the smaller bell projects much less downwards than in *D. Sieboldii.*

II. PHYSOPHORIDÆ.

In this group the basal medusa, has its disk reduced to a small air vesicle, its digestive trunk usually long in proportion and bearing numerous appendages, of which the uppermost are the swim-bells which here reach their highest numerical development. Similarly numerous are the bracts which overlie the digestive trunks, and which in this group are still less like the bells of ordinary medusæ, than they are among Diphyidæ, while in the next group they are entirely wanting. The sexual medusæ are usually arranged in clusters as in Physalia, and appear to be more nearly allied in form to free ordinary Endostomata, than the sexual medusæ either of Diphyidæ or Physalidæ.

I have never seen any species referable to this group ; Charleston Harbor, so far as my observations yet extend, does not afford one. Even one or two injured transparent bells not here described, though evidently detached from some Siphonophorous community, appeared to me rather referable to Diphyidæ than Physophoridæ, so far as I am acquainted with the group from the writings and illustrations of others.

III. PHYSALIDÆ.

The communities of medusæ in this group, have the basal medusa reduced to a mere cyst containing an air-vessel surrounded by a cavity whose walls (perhaps corresponding to the upper portion of the cavity of the digestive trunk in Eudoxia,) are either prolonged in a single tubular stem (*Rhizophysa*) or metamorphosed by gemmation into a branched cartilaginous structure on the under side of an enormously developed air-vessel (*Physalia* and *Angela ?*). Its sub-divisions in this later case are tubular, and their canals communicate with the cavity between the outer and inner membranes of the air-vessel. These sub-divisions in Physalia and the tubular stem in Rhizophysa are in this view the homologues of the free digestive trunk in Eudoxia, and in both cases bear the specialized medusa-buds which in these communities perform the most essential functions of life.

The Physalidæ possess neither swim-bells nor bracts, and are by this negative character separated from Physophidæ. The sexual medusæ in Physalia, and apparently also in Rhyzophysa, are developed in grape-like bunches as in many Tubularidæ.

It is quite possible that Eschscholtz' genus, Discolabe, ought to be included in this group.

PHYSALIA.

The genus Physalia is distinguished by an air-vessel having a bilateral symmetry,* and surmounted by a crest divided internally by membranous partitions. The development of the budding diverticula from the digestive trunk, is so great, that the latter loses its character of an elongated tube. In certain species (*P. utriculus* Esch.) there are diverticula of uncertain nature on the upper surface of the medusa-bearing extremity of the air-bladder or basal-medusa, which are wanting in Physalia. These may constitute a distinct genus. The distinctions of the three principal groups of Lesson are perhaps due to difference in relative age.

So much for the air-bladder which represents the basal disk and upper portion of the digestive cavity in Eudoxia. The lower or free portion of the latter is cartilaginous and divaricates more and more as it grows older. From these divarications spring digestive trunks, each with a tentaculiform individual near its base, as in other genera. There are two (perhaps in some species even more) sizes of these digestive trunks and tentacula. The greater are the fewer in number. Besides these four classes there are near the extremity of the branches bundles of digestive trunks with no oral opening, containing peculiar brown cells which Quatrefages considers hepatic. The terminal divarications of the main branches support grape-like clusters of sexual medusæ. The outermost of the latter have the form of peduncu-

* That extremity of the air-vessel in which is found the aperture of communication with the external air has been called the anterior, but it is evident that such terms must be entirely arbitrary. If either extremity can receive such a designation, it would in my view be the opposite, since it would be that which is homologous with the anterior extremity of Holothuridæ.

lated medusa-bells, traversed by four radiate tubes containing within what is probably the cavity of the digestive trunk surrounded by the sexual organ. This medusa has no tentacula nor ocelli, and the digestive trunk with its enveloping sexual organ fills the whole cavity of the bell. The wall of the latter is of firmer consistence than is usual among free species of Endostomata. The sexual buds situate along the sides of the branches are mere ovoidal cysts containing a sexual organ, and in the species about to be described, these are so large in comparison with the terminal bell-shaped individuals as naturally to lead to the suspicion that they are not younger stages of the latter, but male medusæ, which do not need so great a development of the bell, since they are not intended to nurse embryos.

PHYSALIA AURIGERA, *nov. spec.*

The basal vesicular medusa measured in the largest specimen, I have examined about six inches longitudinally. Its height was about three inches. Its gemmiparous extremity is very much more inflated and rounded than the opposite pore-bearing pole. The posterior knob which sometimes appears to be divided off by a slight constriction as a distinct portion of the bladder, is rather over an inch in length. The pore is not situate at the extremity of the bladder, but at a very considerable distance behind it, and instead of being on the median line, denoted by the direction of the crest, is on one side of it, which according to those who consider this extremity anterior, would be the left side of the median line. The crest originates about a horizontal inch behind the inferior or budding extremity of the bladder, and extends backward to within nearly the same distance from the opposite or superior extremity. The descending internal partitions are alternately long and short, and vary in number according to the size of the specimen, the largest number counted being sixteen and the smallest nine. These partitions are longest and the intervening spaces greatest about the middle of the crest, becoming smaller as we approach its extremities. If we consider the crest as marking the mesial line, we must consider the racemose cartilaginous representative of the digestive trunk, which has an elongated, almost linear form, as placed obliquely,* the angle which it makes

* This of course must be considered as entirely a special description; for the crest, horizontal as it is in Physalia, is probably in a general way homologous with

with the line of the crest being very decided, and considerable. When viewed from below, it reaches quite to that extremity of the bladder which I have called inferior, and stretches backward to within five inches of the opposite extremity, and is slightly less than three inches in length. I have never been able to ascertain with exactitude the number of the main stems which proceed from this as a base. They are short, and disposed in pairs, of which I have counted in one instance twelve, making twenty four in all. One remarkable character observed in eight out of thirteen injured specimens taken at one time, was a peculiar digestive trunk, shorter and comparatively stouter than the other greater trunks situate at the inferior extremity of the bladder, and differentiated from the rest, not only by its form, but in its color, which is that of the reddish blue air-bladder, not the green of the other digestive trunks. In the specimens where this was wanting, since they had all been subjected to injury, I suppose that it had been torn away, before they fell into my hands. This trunk is so peculiar in its position as to have the appearance of a small separate compartment of the air-bladder, which appearance was enhanced by my not being able to ascertain positively that it possessed an oral aperture. There were three sizes of digestive trunks in addition to the blind sacs in the form of trunks which Quatrefages considers hepatic. The largest are those connected with the greater tentaculiform individuals, and are about six or eight, perhaps sometimes more in number according to the size of the specimen. They have the form of very much elongated flasks, with rounded bottoms and long necks. The general form of the digestive trunks near the inferior extremity of the bladder is like that of those described, with the exception that they are shorter and comparatively a little stouter in appearance and were not connected with greater tentaculiform individuals as in the case of the great trunks, which moreover are confined to the middle and hinder parts of the elongate area representing the digestive trunk of the basal medusa. In the smallest size of mouth-bearing trunks and in the brown-spotted blind-sacs considered hepatic, I found no distinctive char-

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one of the vertical lines of the disk in the other Siphonophoræ, perhaps the two ascending crests of the basal medusa in such genera as Eudoxia and Abyla. On the other hand we must probably refer the expansion of the branching trunk to a horizontal plane.

acter. The tentaculiform individuals are probably of three sizes, as described by Quatrefages; but, the transparent ones of the smallest size described by Quatrefages, were either entirely absent from the specimens I have examined, or so injured as to make it impossible to obtain any reliable result from their examination. Those which I have called above the greater tentaculiform individuals are of two sizes and bear each on one side a row of elongate transversely arranged pads of netting cells, which being highly colored give a colored appearance to the organism. They are of cylindrical form, and of two sizes differing in diameter. Contrary to what it would seem natural to expect, the pads of thread-cells are relatively more numerous and crowded on the greater than on the smaller individuals, and the former, at least, if not the latter, are so extensile, as to be capable of acquiring a length of three feet and probably considerably more in large specimens; in addition to this I have reason to believe that, all these tentaculiform individuals in my specimens had been considerably curtailed in their normal length by the rough usage to which they had been subjected. It is possible, therefore, that a perfect specimen floating freely in the water may have these individuals sometimes outstretched to the length of five or six feet.

The sexual medusæ are, as has been said, arranged in grape-like clusters of a full rounded form. They seem to be always at the extremities of the branches of the digestive trunk of the basal medusa, but in the specimens examined when uninjured, they appeared usually to be carried close under the bladder, though in one instance, a cluster hung nearly an inch lower than usual, making it inferable that the stems which bear appendages are contractile. The sexual individuals in one and the same cluster are of three forms and sizes. The smallest which are nearest the main stem, are of a round form, and appear to be composed of an outer homogeneous transparent uncolored envelope, corresponding to the bell-wall of a perfect medusa, and within is a round colored sexual organ, in course of development. The second size are the most numerous and occupy the greater portion of the ramifying stems of the cluster. Their longitudinal diameter is decidedly greater than that even of the third size, to which belongs the most highly developed medusæ in the community. They are thus of a much elongated ellipsoid form, and contain within what is probably a prolongation of the nutritive canal of the stems, representing in them the digestive trunk of a free medusa. The medusæ of the third size, are few in number and situate only at the extremities of the ultimate twigs of the cluster. These are decidedly shorter than those of the second size, but their breadth is proportionately greater, and their general appearance decidedly different. They are of companulate form, the bell-wall being very thick and transparent. Their attachment to the twigs is not by means of a slender pedicle as in most fixed hydroids but by a very broad transparent neck equalling at its origin the width of the medusa-bell and gradually lessening in diameter until it merges into the twig. In fact, the general form of this medusa reminds one of the form of Forbes' genus, Steenstruppia, with the exception that the conical part above is much greater in proportion to the depth of the bell. Below in the neighborhood of the bell-margin, the bell-wall has the same appearance of being suddenly sloped off towards the origin of the vail as in the above-mentioned genus and Euphysa. I did not make out the vail. The digestive trunk appears to be so enlarged by the developing sexual organ as entirely to fill the bell-cavity. The whole bell and its cavity excluding the conical part which connects it with the twig of the main stem, presents an almost quadrate form, the longitudinal diameter being but slightly greater than the transverse. I can scarcely say that I have made out any difference of character between these latter sexual medusæ and those of *P. Olfersii* figured by Quatrefages. I am inclined to think, however, that in our own species the longitudinal diameter is greater in proportion to the transverse than in the Rochelle specimens. We must now speak of the coloration of this community, which in intensity, beauty, and variety, is certainly equal to that of any other object in nature. The general color of the basal bladder-like medusa is a blue, rather light but sufficiently deep to make the bladder very conspicuous when thrown on the yellow sand of a beach. This blue is not pure but mixed with a certain proportion of rosy pink, which is so small in the middle portion of the bladder as to be only seen in certain lights, when it gives a slightly purplish tint to the blue. Towards the extremities of the bladder this pink increases in quantity and intensity, and both of the very extremities are characterized by it. The pore, however, is of a blue color somewhat deeper than that of the bladder-walls. The ground color of the crest is also blue, but along its upper edge it is characterized by a pink like that of the extremities. Beneath, this pink passes into vermillion which is prolonged downward in lines of varying length passing and fading away into the blue of the air-bladder. These lines correspond to the partition walls of the crest. On its outermost edge above, the crest is margined by a bright golden yellow or orange line, which adds greatly to the vividness as well as delicacy of the whole effect. The elongate racemose area which correspond to the digestive trunk is of a whitish and yellowish semi-transparency. The greater digestive trunks are of a rich, greenish tint, those towards the inferior extremity being bluer than the others. Of the great tentaculiform individuals, the greater have their pads of thread-cells of a green color, while the same parts in the less are of a lilac-like shade of purple. In the clusters of sexual medusæ, the individuals have their sexual organs colored a beautiful rose-pink within, shading off into delicate orange where it comes in contact with the hyaline bell-wall, and this combination gives to the clusters an indescribable softness and beauty. The coloration of the parts as given above is that of large and fully developed specimens. In small ones the crest is much less vividly colored, and the golden line so far as my observations extend, always wanting, while on the other hand the blue of the air-bladder in small specimens is much deeper and more intense than in the large. In general the pink colours are faint in small specimens and the blue more pronounced.

So slight is my knowledge of this Physalia, that I should have refrained from any attempt at description, were it not important in my opinion to present, as soon as possible, a general view of this much neglected class in its relation to the fauna of at least a portion of the Southern States of the Union. That Physalia aurifera is a new species, I can hardly doubt, since it differs from such species as have been described from the same latitudes or the same isothermal zones of the Atlantic. Yet the circumstances under which all my specimens have been taken render it probable that no one of them was perfect, and therefore the observations recorded, must most of them be used with caution. The golden line upon the crest, from which I have derived the trivial name, I do not find noticed in such descriptions of other species as are within my reach.

Physalia, like Porpita, is not an inhabitant of Charleston Harbor, nor is it brought from the ocean thither, so far as my observations extend, except by prolonged southerly winds.

SUB-ORDER—EXOSTOMATA.

Bell generally shallow, seldom deep. Ocelli rarely present; marginal capsules, always present, in the earlier stages of growth, and generally throughout life. Development sometimes by alternate generation sometimes by a direct metamorphosis, during which multiplication by gemmation or fission may take place. In either case the cavity of the disk or bell appears to be never a closed sack, but always open, being gradually formed by the growth outward and downward of a fold from the base of the proboscidiform projection which becomes the digestive trunk. The latter is thus uncovered and free during growth. In the numerous cases of alternate generation, the young medusa-buds appear to be almost universally protected as are the gemmiparous polyps by a horny case, which is an expansion of the hard rind of the polyp stems. In the case of direct metamorphosis, the free larvæ, sometimes seek protection in the bell-cavities of other medusæ, imitating as parasites the normal condition of the young Tubularia and like Endostomata. They appear also to derive their nourishment entirely from the medusæ upon which they fix themselves.

Remark.—The absence of ocelli is almost universal among these medusæ, such organs being found only in Thaumantias (Gegenb.) and a few allied genera. On the other hand, the remarkable marginal sense-capsules, (which, were either overlooked or confounded with ocelli, and incipient tentacula, by Forbes,) are unmistakably present in every genus well enough known to make its position in the group certain, with the single exception of Thaumantias, in which if representatives of these organs exist, they have not yet been pointed out. Ocelli and marginal capsules ("*the greater ocelli*" Agass,) exist together in the genus Tiaropsis as defined by its celebrated author. These capsules are certainly, in a general sense, as appendages of the disk-margin homologous with the tentacula, but they constitute a second and very distinct class of appendages. A tentaculum never becomes a capsule nor a capsule a tentaculum, but so far as my observations extend they are distinguished from each other in form, even in their earliest stages of growth. Besides this, the capsules are developed in a different position, *i. e.*, in a circle within or below the circle of tentacula, and these two circles do not coalesce until comparatively late in life, and even then their mode of distribution, especially in the higher genera, preserves an evident trace of their original independence; for while the capsules are *symmetrically* distributed when compared with each other in position, they are nearly always *asymmetrically* placed with regard to the tentacula in their neighborhood, each capsule being nearer to one of the two tentacula between which it occurs than to the other: and when, as in some instances, the capsule is actually connected with the base of a tentaculum, it is placed on one side of it. Nor is this want of symmetrical position, visible in the relation of the capsules to the tentacula only but it is frequently equally so, in their relative position to the radiate tubes, whose symmetrical relation is the same as that of the tentacula. In short, it appears, that we shall be obliged, as our knowledge increases, to look upon the membranous ring, which Forbes elegantly styled a *vail* (velum) as not merely a prolongation and folding in of the bell-wall but a very distinct structure, having its own peculiar appendages, distributed according to its own peculiar symmetrical law. In that case, from embryological data, we should regard the capsules as appendages of the vail, while the tentacula belong to the bell-wall, and though the bell-margin is formed by the union of these two structures, and their several appendages are brought thus closely together yet even in this union, the disagreement of their symmetrical laws is preserved, introducing thus one of those beautiful instances of the expression of special thought, by a departure from mathematical symmetry, which are so frequently exhibited in the works of the great Master-Artist, and to an imitation of which human art so rarely attains.

There are, however, a few genera in which the position of the capsules appears to be more nearly symmetrical with that of the tentacula than usual. But so far as my acquaintance with the subject goes, this occurs only where both kinds of appendages are numerously represented in adult and fully grown specimens, so that the original want of agreement in symmetry has been gradually disguised by the filling up of the unequal spaces through the multiplication of organs of both kinds. These remarkable organs may be described as each consisting of a transparent membranous oval or spherical cyst, projecting from the bell-margin, and connected with a ganglion-like enlargement of the marginal cord, (See pl. 12, fig. 2, *k*.). Within, each contains a variable number of round or polyedral corpuscles which have been considered otoliths, and certainly appear in some instances to contain inorganic deposit. Their function is still unknown.

In view of their idiosyncracy, their appearance at an early period of existence, and their almost universal presence among Exostomata, their entire absence even in the earliest stages of growth among Endostomata, introduces a marked distinction between the two sub-orders.

1st. group. CAMPANULARIDÆ.

The Medusæ belonging to this group are usually cymbaloid or disk-like in form; more rarely they are campanulate; sometimes umbrella shaped. The disk is of very various thickness and solidity, and its external surface apparently always perfectly smooth, and homogeneous. The digestive cavity is always a short cylindrical organ usually cleft into four petaloid labial tentacula around the mouth. It is sometimes sessile, sometimes pedunculate. The radiate tubes vary in number but usually they are limited to four. In their course are the sexual glands, which sometimes occupy but a very limited area, at points varying according to the genus; sometimes stretch from the base of the digestive trunk to the marginal tube; sometimes are connected at once with the wall of the digestive cavity, and with the radiate tubes. The tentacula are always (?) more than four, sometimes extremely numerous. They are usually provided with a prominent bulb at their point of attachment. Besides the tentacula there are nearly always present small prominences, bearing thread-cells, which I think are distinct from the rudiments of tentacula in course of development. All of these, besides the marginal capsules (present in the greater number of genera, comprising the group) are each connected with a ganglion-like enlargement of the colored marginal cords, (Pl. 12. fig. 1–2, *a, b, c,*) which I regard as the principal portion of the nervous system. There is a third class of tentacula, very small transpaent structures, belonging to a limited number of genera, which have no immediate connection with the marginal cord, but appear to be appendages of the outer cellular layer of the disk. These are variously arranged being sometimes nearly connected with the bases of the other tentacula, sometimes isolated. The marginal capsules are usually round or oval in form, (in the latter case attached by their longer side) and containing a variable number of corpuscles, which do not contain inorganic deposit. (?) They vary also in number, but the typical number appears to be eight and these are placed two between every two radiate tubes, so that one of the latter, always falls midway between two marginal capsules, which latter also are all at equal distances from each other. Coloration is confined to the digestive cavity, the sexual organs, and the tentacular bulbs. In a limited number of genera, ocelli are present according to observers of the most undoubted authority. They occur near the marginal cord on the bulbs of tentacula, and according to Professor Agassiz, on the upper part of the representatives of the marginal capsules in his genus Tiaropsis.

The larvæ are Campanularidæ, branching or creeping horny polypidomata of great delicacy; each polyp being housed in a rather deep, more or less conical or hemispherical horny cup. This cup, unlike the same part in the next group is mounted on an usually annulate foot-stalk or branchlet. Near the axils of these branchlets is the general position of the medusa-bearing polyps, whose cups are usually much deeper than those of the digestive polyps. The digestive polyps are distinguished from those of the next group by having the mouth at the extremity of a proboscidi-form process from the area within the circle of tentacula. The prolific individuals are said to be at first tentaculated polyps like the digestive ones, but they afterwards, dwindling, lose their tentacula, retaining only the mass of the body in which a trace (sometimes very distinct) of the digestive cavity may be seen, and which remains as a stopper over the mouth of the cup. On the slender outstretched pedicle of the polyp and in the cavity of the cup, the medusæ are developed, according to the Exostome method: frequently however remaining mere pedunculated cysts which nurse planules. As the medusa buds increase in size the polyp-head usually diminishes and at last dwindles so as to leave only a slight trace of its existence. Between it and the lid of the cup the liberated medusa, escape one by one, forcing themselves through by violent exertions. From their manner of growth their appearance before liberation is, except in deep-belled species, much more like that of the digestive polyps than is the case among Endostomata.

There are at least two under-groups in this division which are distinguished by the presence or absence of ocelli. The genus Obelia, (ex. *Thaumautias plana* Sars.) may perhaps constitute a third under-group on account of its depressed form, its stiff short numerous tentacula, and their connection with its marginal capsules.

I. THAUMANTIADÆ.

This group is distinguished from that which follows by the possession of ocelli. The bulbs of the tentacula are smaller than among Eucopidæ. The sexual organs occupy a great portion of the extent of the radiate tubes, and the marginal capsules are either absent or exist under a modified form. The other characters of the group appear to be, in the main, such as will be given for Eucopidæ. From the case of Tiaropsis, which Prof. Agassiz states is bred from a Campanularia of Boston Harbor, I have placed all these ocellated genera as one of the minor groups of Campanularidæ.

Charleston Harbor has, as yet, furnished no instance of an ocellated Exostome. Indeed, in all the opportunities I have had of examining forms belonging to the Sub-order, I have never come across a single instance of a circumscribed pigmentary spot in the outer surface of the tentacular bulb, such as constitutes the ocellus among Endostomata. The tentacular bulbs are on the other hand often highly colored, but this coloration is always easily distinguishable by being situated beneath the transparent parenchyma in the interior of the tentacular bulb, by occupying much more room than is ever appropriated to the true ocellus, and by having its outline gradually shaded off and not clear cut as comparatively it is in the ocellus. It appears to me that Forbes never consistently regarded this distinction.

II. EUCOPIDÆ.

The form of the disk varies from that of a circular plane, through the hemispherical to the campanulate form, while in one or two instances it is precisely that of an umbrella. Its general characteristic, however, is that of shallowness. The digestive trunk is cylindrical and short, with four or more (?) petaloid labial tentacula. The number of radiate tubes is probably always limited to four, except in cases of deformity by excess. In their course occur the sexual glands, usually four in number, and sometimes surrounding each a sinus of the radiate tube to which it belongs. The presence of marginal capsules distinguishes the group from that of Thaumantiadæ. Their typical number is eight, but in some genera the number is double or triple the typical number. The typical number of tentacula appears also to be eight, but they vary from four to over a hundred. Their bases have usually the form of pendent bulbs, and the lashes have considerable contractility. There are no ocelli.

Remark.—This group is a large one, and contains so great a variety of forms that it must eventually, it seems to me, be subdivided. *Thaumantias plana* Sars, *T. lucida* Forbes, *Eucope radiata* Gegenb., and *Obelia commissuralis* described below, are quite distinct from the remaining forms.

* *Lateral cirrhi to the bulbs of the tentacula.*

EUCHEILOTA, *nov. gen.*

The general form is hemispherical or bowl-like, the cavity of the bell rather deep, so that the disk is only of medium thickness, The digestive trunk is cylindrical and four-lipped as in Eucope, with a small quadrate base upon the junction of the four radiate tubes. The sexual organs are elongate, fusiform or oval, and often contain a large sinus of the radiate tube. They are situate about midway between the digestive trunk and the marginal canal. The bell margin is highly complicated. The marginal capsules are eight in number, two between every two radiate tubes. They are rather large and contain a plurality of corpuscles, probably always more than four. Corresponding to each is an easily discerned ganglion-like enlargement of the marginal cord. The tentacula are sixteen in number. They have large bulbs and slender lashes, bearing rings of thread-cells, and one is found at the extremity of each radiate tube, three more being found between every two tubes. On each side, in the angle formed by the junction of the bulb and margin, is found one of the small lateral tentacula. These are delicate, transparent, and composed of a shaft formed of a pile of cylindrical cells surrounded by a membranous sheath of great tenuity. The extremity has somewhat the appearance of a thread twisted in such a manner as to prevent its track being traced. I have not been able to make out to my satisfaction the nature of this part, but it is probable that the more easily discernible, somewhat disconnected masses of which it seems to be composed, are the contents of thread-cells; the matrix in which these latter are imbedded being of extreme transparency, and surrounded by a membrane so delicate as to be difficult of definition. I think these lateral tentacula are homologous with the small, transparent tentacula described and figured by Gegenbaur in Thaumantias. (See Gegenb. loc. cit. p. 239 pl. 8 fig. 3) Between every two of the sixteen great tentacula thus described, there are a few marginal tubercles, or knobs, bearing at their free extremities a few thread-cells. Each of them appears to be connected with a slight enlargement of the marginal cord. They differ from the bulbs of the great tentacula by their smaller size, their comparative want of color, and their want of the small lateral tentacula described above. The latter are found on the bulbs of the great tentacula in course of development before the lash has appeared.

This genus has a general resemblance to *Eucope thaumantioides*, Gegenb., but differs by the presence of the lateral cirrhi to the bulbs of the tentacula.

The larva is not known. The only observations I have made which may have any connection with the development, are the following:—Among a great number of specimens taken at various times during a summer, and nearly all of the same size, we find three different forms of the sexual organ similar to those upon which Gegenbaur separated as distinct species, his *Eucope thaumantioides* and *E. affinis*. In one of these I find the sexual organ a small fusiform gland, situated somewhat nearer to the digestive cavity than to the margin. Two of the glands in fig. 2, Pl. 11, are somewhat in this condition. The second is that represented fig. 3, on the same plate. It is oval in form and contains a distinct oval sinus of the radiate tubes. The third form has the sexual organ much elongated and containing a large oblong sinus of the tube. Such was the condition of the organ in fig. 1. Now, so far as my observations yet extend, I have not been able to discover any other constant differences between these forms than those of the sexual organs, and I incline, for the present at least, to look upon the latter not as Gegenbaur has done, as indicating distinct species, but merely as different stages in the growth of the sexual organs in maturing specimens. The case of *Nemopsis Gibbesii* gives us a remarkable instance of the various appearances which the sexual organ may assume, and leaving the point to further research, I shall give a name in this paper to but a single species.

EUCHEILOTA VENTRICULARIS, *nov. spec.*

Pl. 11, Ff. 1–3; and Pl. 12, Ff. 1–2.

The form is nearly that of a segment of a sphere less than the hemisphere. This is the case while the animal is in full activity and swimming in search of food, but when irritated or drooping, there is a sensible shortening of the diameter of the tentacular circle, imparting a more hemispherical outline. In some specimens, perhaps normally, and (I believe) in any specimen in certain conditions of declining activity, there exists a greater or less constriction below the summit of the disk, giving the appearance of a considerable emargination of the usual convex outline on each side (Pl. 11, fig. 2.) The disk is rather thick just above the digestive cavity, diminishing rapidly as it approaches the bell margin, which though seemingly an inconsiderable character, nevertheless imparts a certain peculiarity not long unobserved when comparing active specimens of the species with other Eucopidæ not similarly characterized. I have not observed any *specific* character in the form of the digestive cavity and oral appendages. The sexual organs are less pyriform and more cylindrical than those of *Eucope thaumantioides,* and in fully developed specimens are so long that when the disk is somewhat contracted they frequently appear to occupy nearly the whole distance from the digestive trunk to the margin, but on the whole approaching nearer the latter than the former. The bulbs of the tentacula (which vary from sixteen to twenty in number,) are large and somewhat conical; the lashes are contractile, but not to such a degree as to disappear, only gathering themselves up into small knots on the free extremity of the bulbs. I have never been able to set any limit approaching exactness to their power of elongation, but a specimen of the size represented in fig. 1, will sometimes drag a length of tentaculum after it not much less than six inches. The marginal capsules never exceed eight in number, except in cases of deformity. They usually contain each five or six corpuscles arranged in an arc of a circle.

The digestive trunk is of a general yellowish tint with a red nucleus. The sexual organs are uniformly yellow, and the tentacular bulbs have each a red nucleus to the bulb, while the lash has the whitish, almost frosted appearance, imparted by the presence of great numbers of thread-cells. The marginal cord also is of a light yellow color, whenever it enlarges to form a ganglion-like body for the tentacula, but this coloration is scarcely observable for those enlargements corresponding to the small marginal tubercles.

The graceful motions of this Medusa consist of a rapid succession of strokes,* by which the animal is impelled with considera-

* As a general rule, we may say (according to my observation,) that the rapidity of succession of the rythmical strokes of the disk is in inverse ratio to the depth of the bell. Thus taking a deep-belled and a shallow-belled species, each in full activity and of nearly the same size, the latter will require a greater number of

ble rapidity for a short distance; then comes a period of apparent rest, in which it generally sinks, but still possesses sufficient control over its motions to throw its train of tentacula into various curves, while they float in the wake of the disk, in such a manner as to spread them over a greater surface than could be the case when stretched in a straight line behind it. The motions by which the animal thus steers its course in sinking must be very slight, for I have not been able to observe them. However, it is perhaps effected by employing the mechanical friction of the tentacula against the water, as a means of partly arresting the gradual fall of one side of the disk, while the other side is allowed to fall almost with the full force of gravity by a continual lengthening of the tentacula issuing from it with such rapidity that their friction is not felt until they have reached the limit of extension.

I have not yet been so fortunate as to meet with the larva of this Medusa.

This is a spring, summer and fall species. I have found it from the middle of May, from time to time, until the beginning of November. With the exception of *Hippocrene Carolinensis*, we have no more common species.

EUTIMA, *nov. gen.*

Characters the same as those of Eucheilota, with the exception that the gelatinous disk is developed from the centre of the cavity of the bell into the form of a more or less long conical appendage, at the extremity of which is the digestive cavity, of the same character as the corresponding part in Eucope. The four radiate chymiferous tubes, originating at the base of the digestive cavity, ascend the external surface of the conical appendage and arching, connect themselves in the disk-margin with the circular tube as usual. Sexual organs linear in form in the course of the radiate tubes. Disk-margin with more or less numerous tentacula, whose basal bulbs like those of Eucope, are provided each with two lateral accessory tentacula, and two concretionary capsules between every two radiate tubes as in that genus.

The embryology of this genus is not yet known. Judging from its close resemblance in all essential points to Eucope, it is hardly probable that its larva will be other than a Campanularia.

strokes to carry it the same distance, than is required by the former. This of course, is what might be expected *a priori*, since the mechanical impulse given by a single stroke of the deep bell must be greater than that of a single stroke of the shallow bell.

Remark.—The specimens which I include under this genus were in the notes, taken during my observations, ranked as belonging to two distinct genera and three species. A considerable proportion of them had the sexual organs disposed in two masses on each radiate tube, one being on the proboscidiform appendage or peduncle, and the other in the disk, as in Thaumantias and Tima proper. Thus each possessed eight sexual glands, two to each of the four tubes. In fact, in one of the species this seemed to be the rule, but I have since ascertained that there are specimens in both the following forms, some of which have sexual organs in one of these positions only, others in the other position only. From which I have concluded that there are but two species, and that the sexual organs in this genus may be double, and that when single they are placed either on the proboscidian or disk-portion of the radiate tubes, and that all these varieties may occur in one and the same species.

EUTIMA MIRA, *nov. spec.*

Pl. 11, Fig. 8–9.

Proboscidiform appendage very long, (equalling in length four or five times the height of the shallow disk,) tapering and slender, the digestive cavity also rather deep,and of greater diameter than the peduncle at its junction. Oral leaflets deep cleft. Tentacula four only, and these tubular to the very end. The marginal cord between these tentacula exhibit a great many nodes, which are the only representatives of the rudiments of other tentacula. The disk is quite narrow transversely, and though shallow when compared with the deep-belled Eucope, is deep for the genus, in some specimens especially, presenting almost a quadrate outline, but the usual form is more like that of the figure, the outline being emarginate in its descent from the summit of the disk to its margin.

EUTIMA VARIABILIS, *nov. spec.*

This is the broadest species found in our waters. It differs very considerably from *E. mira*, being more like *Tima flavilabris*, Esch. in general form. The peduncle is not more than one or one and a half times as long as the disk is high. The disk is shallow and broad, the digestive cavity partaking of the same peculiarities, the oral leaflets shorter than in the preceding species, the peduncle tapering more rapidly. Tentacula twelve in number; four somewhat longer than the rest, placed one at the extremity of each radiate tube. Between every two tentacula are three nodes of the marginal cord, making thirty-six in all without tentacula, forty-eight if the tentacular nodes be included. The sexual organs either double on each tube and placed one on the proboscidian, the other on the disk portion of the tube, or single and then located in the disk.

* * *Tentacular bulbs without lateral cirrhi—lashes long and flexible.*

EPENTHESIS, *nov. gen.*

General form much like that of Eucheilota, but the disk is probably rather thinner above, and a vertical section of it would give a more truly crescentic outline than in that genus. There is no notable difference in the form of the digestive trunk, except that in my specimen it possessed five labial appendages instead of four, the typical number in Eucheilota. The radiate tubes are four in number, and the sexual organs are four rather round thick glands, bulging and hanging downwards in the cavity of the bell from its inner surface, and situate each on a radiate tube about one-fourth its length from the marginal canal. The tentacula in the present species appear to be the same in number as in Eucheilota, sixteen, and this is perhaps the typical number. ***They want the small lateral tentacula***, but otherwise resemble those of Eucheilota. The marginal capsules are small, and contain one or two corpuscles each. The ordinary numerical formula appears to be, one between every two tentacula, but sometimes by a sort of deformity, there are found two between two tentacula.

Larva unknown.

Remark.—This genus differs from ***Eucope thaumantioides*** in the form and position of its sexual organs and in the number of its marginal capsules Probably several of the species described by Forbes are referable to it, but I am unwilling to risk a conjecture based upon his figures merely.

Distribution.—Charleston Harbor, British Seas?

EPENTHESIS FOLLEATA, *nov. spec.*

The general form of the disk was that of a spherical segment somewhat greater than a hemisphere. Its cavity is deep and the bell-wall diminishes very gradually from the summit towards the tentacular margin. The possession of five labial tentacular imparted a peculiar aspect to the digestive trunk. The sexual glands are nearly hemispherical, their rounded surfaces projecting in the cavity of the disk. They are situate about one-fourth the length of a radiate tube from the bell-margin. The tentacula, sixteen in number, have very long and slender lashes, with bulbs of moderate size. The marginal capsules usually contain a single corpuscle each, and are quite small and not very conspicuously placed.

I have spoken of the cavity of the bell as deep in this species, but this is not the result of a campanulate form, such as is seen in *Campanularia noliformis*, but of the thinness of the bell-wall. In a slightly contracted condition my single specimen presented a rather unusually flaccid appearance, due to the thinness and hemispherical form of the disk, but, in full activity, its distended disk and long graceful tentacula made it a very beautiful object.

The only specimen found was taken on the 22d of May,

PHORTIS, *nov. gen.*

The general outline of the disk is probably hemispherical, but unlike the preceding genera the bell cavity is exceedingly shallow, and consequently the solid part of the disk of excessive thickness, giving a heavy-laden and clumsy appearance to the animal at first sight. The digestive trunk is not cylindrical, but narrows into a sort of neck above before reaching the radiate tubes, along whose course it sends out processes of sufficient length to give, when viewed from above, the appearance of a four-rayed star. The four radiate tubes are not regular in their curvature downwards, but first ascend slightly above the base of the digestive trunk. Nearly at the point where they begin to descend, begin the sexual organs, four elongate but not exactly cylindrical organs, which descend towards but do not reach the marginal canal. Their structure is peculiar. Within the sexual gland and on the sides of the radiate canal, are placed small reddish glandular bodies, in pairs, one on each side of the tube. There are in each sexual organ from three to four pairs of these glands. The margin is provided with from twelve to fourteen tentacula resembling those of Epenthesis, and wanting the small lateral tentacula of Eucheilota and Eutima. In the interior of each bulb however there is a pair of small reddish glands like those described in the sexual organ. Between every two tentacula there are one or two knobs provided with thread-cells and from three to four small marginal capsules, each bearing one or two corpuscles.

Larva unknown.

Distribution.—Charleston Harbor.

PHORTIS GIBBOSA, *nov. spec.*

The thickness of the disk above the digestive trunk does not fall far short of its width across the tentacular circle, except when the animal is much expanded. The curvature of the outline from the summit to the margin is not the arc of a circle, but rather paraboloid. The projection downwards of the disk-substance which gives attachment to the digestive trunk is so large as to occupy a very considerable portion of the cavity, converting it, indeed, into a sort of circular fossa, (as in Tima,) whose outer wall is much more steep than the inner. However this prominence does not reach the level of the vail, but gives attachment within the vail to a rather large digestive trunk, which hangs *without* the vail, and this carriage appears to be habitual. The sexual organs, quite elongate in large specimens, occupy nearly all that portion of the radiate tubes which traverses the steep side of the circular fossa representing the bell-cavity. They thus lie near the marginal tube but do not reach it. Though not pyriform, they grow rather larger as they approach the margin. The tentaculum is provided with a rather globular bulb and a slender and very extensile lash. The number of these organs varied among my few specimens from twelve to fourteen, probably sixteen is the highest number ever attained, and this only in cases of deformity by excess. Between the tentacula are found a variable number of tubercles bearing thread-cells and marginal capsules, which I have noticed in the diagnosis of the genus, though by no means certain that the *number* of these should not rather be included among specific characters.

Uninjured specimens of this species are by no means so clumsy in their motions as might be supposed from their heavy appearance. Though the disk-cavity is so very shallow, and though, from the excessive thickness of the disk-wall in its upper part, only a limited portion of it appears to be concerned in giving an impetus to the water, yet this is done with sufficient force and frequency to impart celerity and an air of liveliness, which makes an interesting contrast with the heavy form of the species.

My specimens of this species have all been taken in August. It is the largest Naked-eyed Medusa in our waters with the exception of the two species of Eutima.

CAMPANULARIA. *Mihi.*

Syn. *Clytia*, (*pars*) Lamaroux. (1812?)
Campanularia, (*pars*) Lamarck. (1813?)
Eucope, (*pars*) Gegenbaur. (1856.)

The bell is very deep for an Exostome. The digestive trunk rather long, and remains long unprovided with labial appendages. The radiate tube and sexual organs are each four in number, the latter appear to be of the same type as those of Obelia and Epenthesis. The tentacula are more or less long and flexible, wanting the stiff appearance visible in Obelia; they also want the re-entrant radix and have the type of bulb seen in Epenthesis. The tentacula are either four or eight in number, perhaps sometimes more but never numerous. The marginal capsules are eight in number and contain each only one (?) corpuscle.

The larvæ are those Campanularidæ which have usually creeping stems, and deep cups for the digestive polyps. The rim of these cups also is more or less deeply toothed, and the large vesicles of the prolific polyps are annulate, either near the base or throughout their whole extent. The deep character of the Medusa-bell is exhibited at a very early stage of the bud, while it is yet within the capsule, and it is never carried reverted as in Obelia.

To this genus are probably referable all the Medusæ from Campanularidæ like *C. volubilis.* Perhaps also such species as *Thaumantias quadrata* and *T. æronautica* of Forbes, and the *Eucope campanulata* of Gegenbaur.

Distribution.—British Seas, Coast of Holland, Mediterranean, Charleston Harbor.

CAMPANULARIA NOLIFORMIS, *nov. spec.*

Pl. 11, Fig. 4.

I have seen no specimen of this species which had attained maturity, consequently the sexual organs have not been observed. The young specimens possessing four tentacula, which have been from time to time bred in my jars, exhibited a form of less altitude than is represented by Gegenbaur in his *E. campanulata,* the height of the bell in the present species being nearly equal to its width. The diameter of the tentacular circle is not so much less than that of the bell as to give the ovate appearance seen in Gegenbaur's figure of the Mediterranean species. At this stage the marginal capsules contain only a single corpuscle each, and between every two of the four tentacula is a prominent bulb representing the four additional tentacula of *Eucope campanulata.*

The larva is found creeping upon various algæ and even upon denuded Gorgonia stems. The twigs bearing the polyps rise directly from the recumbent stem and attain considerable length. The cell has a pretty regularly conical form, the dentations of its margin are deep, and between the teeth thus formed stretches a delicate membrane of such tenuity as frequently to escape vision. The oral proboscidiform projection of the polyp is quite long, the number of tentacula from twenty to twenty-two. They appear to be arranged in a double row. The prolific capsule is not exactly sessile upon the creeping stem, but connected with it by a very short annulate neck. It is capacious and of an elegant urn-shape, annulate at base and very broad at its mouth, which is filled by a large untentaculate polyp-body. The digestive cavity of this polyp still remains as a large sinus while its medusa-buds are already far advanced. The campanulate form of the latter is visible, while they yet lie motionless buds within the capsule.

This species I have not, as yet, found during the winter, and only in July and September during the summer. It appears to grow below low water mark.

LAOMEDEA. Lamouroux.

As yet nothing is sufficiently known as to the adult condition of the Medusæ of this genus, to point out any distinction between them and the genus Eucope proper. The larva differs in the following particulars:

The whole polypidom appears rather more massive, not so delicate as in Campanularia. At the origin of each petiole supporting a polyp is an enlargement of the stem-canal. The aperture of the medusa-bearing cell is small, the cell being constricted above.

These differences seem tolerably constant through a number of species, and may possibly correspond to differences yet to be observed in the adult medusa.

Distribution.—British and Belgian Seas, New England, South Carolina.

LAOMEDEA DIVARICATA, *nov. spec.*

Of this species I have only once seen a single specimen. The branches of the polypidom parted from the stem at a large angle, the cup were quite shallow and broad at the top. The membrane which passes inward from the lip of the cup towards the base of the polyp was more distinct than I have ever seen it in any but the medusa-bearing cells of *Campanularia noliformis.* Tentacula numerous; the proboscidiform mouth was very large and prominent. The annulations of the petiole few, large and spherical. The medusa cells did not present any marked peculiarity, their proportions were similar to those of *L. geniculata* in Jonst. Brit. Zooph. pl. 25 fig. 32. They were found only near the rootsof the polypidom.

Unfortunately the Medusæ were only half developed, and I did not succeed in observing their full development, hence it is not impossible that I may be yet able to unite this larval form with one of the foregoing species.

This Laomedea was found on Sea-weed near low water about the middle of September.

* * * *Tentacular bulbs without lateral cirrhi, but with re-entrant radix—lashes short and rather stiff.*

OBELIA. Peron. (1809.)

Syn. *Clytia*, (*pars*) Lamouroux. (1812?)
Campanularia, (*pars*) Lamarck. (1813?)
Eucope, (*pars*) Gegenbaur. (1865.)

The general form of the locomotive organ is not, as usual, campanulate but truly discoid, or rather it has the form of a plate turned up at the edges all round. The digestive trunk has somewhat the form of that described in Phortis, being faintly constricted before joining the disk. The labial appendages, four in number, present however a distinction, which may prove constant in the fact that they have their edges not frilled. The radiate tubes are four, the chamber at their intersection small. The sexual organs are placed nearly midway their length, but the tendency is to have them nearer the margin than to the digestive trunk. They are round or oval, not provided with a distinct sinus, and like those of Epenthesis bulge downwards, so as to appear hanging in the shallow cavity of the disk. The tentacula vary in number but are always numerous, frequently over a hundred. They are short and have a certain stiff appearance not observable in the other genera here described. The pendent bulb is small and simple, and there is a re-entrant radix to each tentaculum, passing back into the disk, within the marginal cord. The marginal capsules are eight in number, usually containing a single corpuscle each. In some of the species, among which is the following, they are each connected with the bulb of a tentaculum, being placed beneath and somewhat on one side of it. Should this position be not constant for adult specimens of all the species, it may be necessary hereafter again to sub-divide the genus.

The larvæ are those Campanularidæ which have a rather shallow cup with an entire rim, and the horny vesicle of the budding polyps not transversely divided into annulations. When the medusæ first escape from their nurseries, the disk is small and more or less reverted, the mouth not infrequently simple, the tentacula few in number, twelve or sixteen, and the eight marginal capsules considerably distant from their bases. Also the sexual organs are either entirely indistinguishable, or barely traceable near the base of the prominent digestive trunk. The Medusæ referable to this genus appear never to attain a large size.

Distribution.—Seas of Norway, Holland and Great Britain, the Mediterranean and Charleston Harbor.

OBELIA COMMISSURALIS, *nov. spec.*

Pl. 11, Ff. 5–7.

The general form is not so flat as that of *Thaumantias plana* Sars, but when viewed in profile the outline is seen to project slightly at the summit of the disk, producing the form of a cone with very low altitude and very broad base. From the periphery of this base projects downward the lower part of the wall of the disk, like the upturned peripheral edge of a watch glass. The digestive trunk descends nearly to the level of the vail. The nearly round sexual organs are situate quite near the marginal tube. The transverse diameter of these organs exhibits a tendency to diminish towards the marginal tubes. Fig. 6 gives a striking instance of this. The largest number of tentacula counted in any specimen has been thirty-two, but I feel satisfied that the number in specimens attaining full maturity in their native element will be found to be much greater, especially since, even in this instance, new tentacula were springing up between the old ones. The tentacula are short and of stiff carriage, being borne nearly straight for about two-thirds their length from the bulb, and curved or hooked for the remainder.

The larva of this Medusa is a small, delicate, and in fall and winter much branched Campanularia, growing between tide-marks on Bowman's Jettee, Sullivan's Island. In spite of its abundance fully grown Medusæ are seldom taken with the dip-net.

Medusa-bearing capsules have been observed from April to October, and probably the production of medusæ only ceases in the dead of winter, between December and February.

2ND GROUP SERTULARIDÆ.

The Larvæ have their polyps protected by a cell-like expansion of the horny covering of the polypidom as among Campanularidæ, but their cells are sessile upon the main stem or its branches. The polyps themselves want the proboscidiform mouth which characterizes the last group. There are no known instances in which the Medusæ become free. They are developed in large capsules as in Campanularidæ, but remain mere cysts enveloping the sexual products.

In this group there is a particular tendency manifest to a grouping of the individual polyps in such a manner as to subordinate their individuality to the idea of the group. Thus we frequently find that the individual polyp-cells in a given section of the stem are unlike each other, and that the tenant of one only of them attains the fully developed polyp-form, while the remainder undeveloped are grouped round it in various patterns according to the genus. This grouping also is frequently visible in the prolific vesicles, producing what may be called compound vesicles. Instances of these peculiarities, such as Aglaophenia and Plumularia, will be noticed further on.

We should not overlook in this connection the possibility that the presence or absence of this compound character may be the means of distinguishing two minor groups among Sertularidæ. Sertularia, Thuiaria and Dinamena, as apparently also some plume-like species hitherto included in Plumularia, have no lesser polyps, while Antennularia, Plumularia, (which probably contains the types of several genera,) and Aglaophenia, (*vide infra*) all have lesser as well as great polyps, and their genera may be distinguished by the manner in which these are grouped together. Of these two groups Plumularidæ would, on the whole, from the generally funnel-shape of the polyp-cells, make a nearer approach to Campanularidæ than would Sertularidæ proper, whose cells are usually more tubular or even of less diameter at the aperture than below it. I have, however, refrained from insisting upon thus subdividing the group on account of my ignorance of the European species, the descriptions and figures of which by European authors, appear to leave much to be desired.

* *Cells of several orders forming groups—great cells of the digestive polyps funnel-shaped or campanulate.*

PLUMULARIA. Lamarck.

Syn. *Aglaophenia.* Lamouroux.

The polypidom branches regulary, so as to assume a plume-like form, but its tufts appear to be usually of less size than is attained in the following genus Aglaophenia. The greater polyp-cells are disposed universally upon the branchlets. The greater cells are not contracted at the mouth, but preserve a funnel-shape broadest at the mouth. There are always present (in species which I think referable to this genus,) two or three, sometimes four secondary cells with each of the cells destined to contain a greater polyp. These together form a characteristic group. So various are these groups among the species included usually under this genus, that I suggest they will furnish the means of subdividing it still further than my actual knowledge has permitted me to do at this time.

The prolific vesicles of Plumaria proper, according to authors, appear to be developed in the axils of the branchlets of the plume, or near the bases of the greater polyps. They are simple like those of Sertularia, which distinguishes them from those of the next genus.

PLUMULARIA QUADRIDENS, *nov. spec.*

The following description is taken from a detached plume found floating in the water. Its height was about a quarter of an inch. The branchlets were alternate. The main stem has a polyp and its cell at the base of each branchlet, and there are from three to four polyps on the branchlet, the last being terminal. Around each polyp-cell and closely connected with it are three secondary cells, one behind and two (one on each side,) in front, that is on the side towards which the recumbent primary cell inclines. Each of these consists of a rather stout pedicle whose base originates near the base of the greater polyp-cell, and whose top is surmounted by a small shallow hemisperical cup, in which is a round fleshy mass, representing, as I suppose, a polyp. Between every two such groups on the stem is a fourth small cell, even less developed than those around the greater polyp, being indeed scarcely more than a tooth-like process of the stem. What the function of these secondary polyps may be, is an interesting question for investigation. I saw one of those connected with the primary polyp-cell apparently discharging what seemed to be refuse matter.

The greater polyps have each the form of a hemisphere, attached by its plane surface to the pedicle which connnects it with the bottom of the cup. Around the periphery of the hemispherical body is a circle of from twelve to sixteen tentacula serrate with thread-cells, which being more crowded at the extremity formed a sort of terminal pad. The mouth appeared to be a simple opening on the summit of the curved surface, surrounded by a slight fold of the external membrane, in which were implanted at regular intervals from each other a dozen round corpuscles, which probably are thread-cells.

The polyps did not appear to be capable of stretching far beyond the opening of the cell. They simply expanded their tentacula over its rim, as is done by the polyps of Campanularidæ.

This specimen was taken on the last day of July, and at that season there were no prolific vesicles upon it.

The arrangement of the secondary cells around the primary ones, in this species, is more like that which obtains in Aglaophenia than any which I have seen figured. Indeed I know of no species of Plumularia in which the two lateral secondary polyps, which are never very obvious, have been described as existing at all. Even in Aglaophenia they seem to have been sometimes overlooked, and I can scarcely doubt that they will be observed in some of the European species, if carefully sought after.

AGLAOPHENIA. *Mihi.*

Syn. *Plumularia*, (*pars*) Lamarck.
Aglaophenia, (*pars*) Lamouroux.

Polypidom, consisting of an unbranched or sparingly branched main stem, with short, lateral pinnæ, which bear the polyp-cells. It is either erect or creeping. The erect form has a tortuous and loosely interlacing root-like prolongation, with which it entwines itself around other objects.

Each group of cells occupies a separate joint of the stem. The great cells are compound, each cell being composed of an anterior and posterior portion, of which the latter bears a projecting tubular process, or secondary cell, and the former the usually dentated opening of the great cell. Just beneath this circle issue from the stem, one on each side of the cell, two tubular processes, or secondary cells, like that which characterises the posterior portion of the cell. These two processes embrace the anterior portion of the great cell. The end of the main stem does not terminate in a point, but seems somewhat expanded, as if forming there a calicle for a terminal polyp. The appearance of a series of openings or pores in the main stem, like that described in *P. myriophyllum*, was observed in the species to be described, but the pores appear fewer and larger.

The polyp, according to Johnston, has ten tentacula, and a proboscidi from mouth.

The reproductive capsules are, like the cells, also compound. They occupy each the greater portion of one of the pinnæ, and are terminal. They appear to be the result of a metamorphosis of the polyps by which the cells are fused together, the polyps remaining distinct.

I take the *P. cristata* as the nucleus of this group. The *P. plumatella* is probably also referable to it, but we know nothing of its reproductive capsules. *P. myriophyllum* is equally uncertain The species found by Dr. Pickering, of the Wilkes' expedition, upon Gulf-weed, and figured in Dana's Zoophytes, p. 23, fig. 7 is undoubtedly a member of the same group, and a well marked and distinct species. I have some good specimens of it in alchohol, which I owe to Dr. Edmund Ravenel, to whom I have had to offer thanks on a previous occasion for similar favors. These specimens are attached to Gulf-weed, (*Sargassum pacciferum*) and were taken in the Atlantic by a homeward bound vessel. I think it in all probability identical with the *Plumularia pelasgica* of Lamarck, *Sertularia pelasgica* Bosc, *Dynamena pelasgica*, de Blainville.

It is characterised by cells quite long in proportion to their breadth—the posterior process is far behind; the anterior lateral processes, are rather weak and slender. The main stem is recumbent and creeping, giving off at intervals plume-like branches, so much like those of the ordinary true Plumularia, that it would readily be mistaken at first sight. On my specimens I have found no reproductive capsules. This important portion of the community, however, is represented in Dana's wood cut, *l. c.* It is turned *downwards*, thus depending from the stem; is this its natural position?

This species is not improbably an occasional visitant of our waters, but I have never encountered it on the Gulf-weed thrown on our beaches.

Distribution.—Southern coast of England and Ireland, Irish channel, Sargasso Sea, and Charleston Harbor.

AGLAOPHENIA CRISTATA. *Mihi.*

Syn. *Plumularia cristata*, Lamarck.

Main stems from five to seven inches in height, giving of, on their upper half, two or three pairs of opposite branches, and growing together in a bushy cluster usually upon the top of a worn and denuded stem of *Gorgonia virgulata*, about which their twining roots form a very intricate net-work The polyp-bearing pinnæ are found both on the stem itself and on its lateral branches. They are numerous, the points of the stems being very short, and a pinna, or branchlet being given off on each side of every joint. One side of the main stem, however, is always roughened by murications, which are the two processes mentioned on every joint of the stem, and which on the lateral pinnæ embrace the lower part of the cell-opening. The cells have each about eight or ten (?) prominences around the margin. In form they differ very decidedly from *A. pelasgica*, being much shorter in proportion to their length. The posterior process also is more nearly central in position, and the two lateral processes are stronger. In addition to this the transverse diameter of the cell in *A. pelasgica* is so much greater in proportion to that of the stem than in the present species, that the cell overhangs the stem when looked at in this position, decidedly more than in present species. The species has, therefore, a thick stem and small cell. The cell also appears to be somewhat more crescentic in profile, (concave above and convex below,) than in *A. cristata*, as figured by Johnston, though they approach that species very closely. If the figures of Johnston, (Brit. Zooph., pl. 23 fig. 2, and pl. 94 fig. 16,) be exact, the posterior process also is more conical and pointed, its opening being lateral and anterior, not terminal. With regard to the polyps and fleshy parts of the stem, I have not seen them but in their dead and contracted condition But it may be seen, even then, that a distinct prolongation of the fleshy core of the stem is carried up from the posterior portion of the pol yp's base into the conical process of the cell, which represents the posterior secondary cell, and that each of the anterior lateral processes, or secondary cells, has also such a prolongation.

The reproductive capsules have a very pod-like appearance, but appear rather more pointed behind than those of *A. cristata*, figured by Johnston, and increasing gradually in width towards the end of the branchlet which they terminate. I have seen only one or two of them, all of which were dry and empty.

This species is, probably, distinct from the European, but I have no specimens of that species with which to compare it, and the entire absence in Johnston's drawings of the two tubular processes at the anterior end of each joint, and which I have found in all the three species here described, show that these drawings cannot be relied on for so minute a comparison.

The main stems are of a yellowish, horny brown, the branchlets lighter in color, and the tips of the branches have a vivid, somewhat golden yellow color. The whole becomes very dark, almost black, by exposure and desiccation, with the exception of the polyp-cells, which retain great transparency. The coloration, at the tips of the branches, appears to be due to the fleshy pulp and the polyps themselves, not to the polypidom.

Found from time to time, winter and summer, thrown up on the beach on Sullivan's Island. A beautiful tuft of this species is in the Museum of the College of Charleston, taken by Prof. Holmes at one of the wharves of the city.

AGLAOPHENIA TRICUSPIS. *nov. spec.*

This species grows in solitary plumes, much taller than those of *A. pelasgica* and shorter than those *A. cristata*. The plumes also are of broader expanse than in the latter species and the individual polyp-cells are quite different. The three cusps which are placed, as in the species mentioned, are proportionately long and slender, or, which is the same thing, the polyp cell between them is quite shallow, and its rim, instead of appearing distinct from the single cusp behind it, appears to be united with it as with the others. I have also been unable to distinguish any denticulations on the rim, and these are quite conspicuous in the other two species.

The prolific vesicles of this species are as yet unknown. This species was found growing just below dead low water mark, on the submerged rocks of one of the upper jetties of Sullivan's Island. It was taken in midsummer.

*** Polyp-cells of one kind, only more or less tubular or flask-shaped, being generally contracted at the mouth.*

DYNAMENA, *de Blainville.*

The polypidom consists, usually, of a creeping stem which gives off short branches, on which the polyps are opposite and in pairs;

one pair corresponding to each joint of the stem. The cells are triangular, or more or less flask-shaped; the aperture being quite narrow. The polyps which are capable of being retracted entirely within the cells, when protruded stretch far beyond it, discovering an elongate body.

The prolific capsules appear to be developed on the sides of the stem, between the polyp-cells, and to be usually of a form resembling, generally, that seen among Campanularidae ; but in the following species I have observed from the same part of the stem the growth of very elongate, narrow, almost tubular vesicles, not much larger at the mouth than at the base, and twisted in partial spiral, like a horn. Whether, as Dalyell thinks is the case in Antennularia, there are more than one kind of vesicle to be found in the same species of this genus, my observations do not enable me yet to decide.

Distribution.—Seas of Europe, Charleston Harbor and East Indies.

DYNAMENA CORNICINA *nov. spec.*

This very delicate species consists of an unbranched stem, rarely, if ever, equalling half an inch in height. Each joint of the stem, with its two opposite polyp cells, instead of presenting a triangular outline, has the appearance of lateral emargination, from the fact that the aperture of the cells is slightly elongate and tubular and is continued not in the direction of the main axis of the stem, but is bent outward from it. The polyp, when extended, equals, in transverse diameter, the diameter of the cell-mouth, and its whole length somewhat surpasses twice that of the cell. At its free extremity is a circle of about sixteen, rather short and stout, but quite flexible tentacula, surrounding an oral area which, though usually of the rounded hemispherical form, which is generally characteristic of Sertularidæ, is capable of being occasionally protruded in a somewhat proboscidi form manner. Yet there is no distinct organ of this kind separated from the body by a well-marked constriction, as among Campanularidæ.

This species is found growing on denuded Gorgonia stems. The curved horn-shaped cells have been observed in the beginning of March, and in the end of June. They open in a direction at right angles to that of the ordinary sessile cells, and on the two occasions on which they were observed, they bore polyps *with tentacula,* in one instance, eight to twelve in number. That these afterwards became medusa-bearing capsules, I saw nothing to warrant me in believing, since there were no signs of incipient buds on the stems, within the tubular cells. However, this negative observation is no proof to the contrary.

III. CIRCEADÆ. Forbes.

Form in general deeply campanulate, digestive trunk more or less elongate, with unusually deep and tubuli form digestive cavity, for the Sub-order. Mouth provided with labial tentacula. Radiate tubes probably of variable number. Sexual glands varying also from two to six. Tentacula numerous, short and very contractile. Marginal capsules present, but on account of their small size and great transparency, their number and symmetric arrangement is not yet ascertained.

Development unknown. Is it from a free larva?

Remarks.—Forbes is as silent with regard to the marginal capsules in Circe as in other genera, yet their presence in the following allied genus, would make their entire absence in Circe an extraordinary peculiarity, and therefore improbable. The Circeadæ appear to me not distantly related to the following group, that of Geryonidæ.

PERSA, *nov. gen.*

General form like Circe, but broader in proportion to its height. Digestive cavity, colorless, elongate, nearly sessile upon the top of the bell-cavity, instead of being at the end of a proboscidi form appendage. Mouth with four labial appendages. Radiate tubes, eight? Sexual organs, *two*, massive, oblong, cylindrical glands, in which I did not discover any sinus of the radiate tube. These glands hang free in the cavity of the bell. Tentacula numerous, very short or absent. Concretionary capsules probably eight in number, four large and four small, alternating with each other; small, sessile and containing a single corpuscle each. There appears to me to be the same amount of difference between this genus and Circe, that exists between Eucheilota and Eutima. In the three specimens taken, I made great efforts to determine the exact number of radiate tubes and of the marginal capsules, (which latter are of that peculiar type seen in the free capsules of Liriope,) but I was unsuccessful. Of radiate tubes I saw only two with any approach to certainty, and these were those which bore the two sexual glands.

Distribution.—Charleston Harbor.

PERSA INCOLORATA, *nov. spec.*

Pl. 12, Fig. 3.

The form is deeply campanulate, or thimble-shaped, rounded above; widening very gradually downwards. Bell-wall, thin, except just above the digestive trunk, where it thickens to form a low pedestal for the digestive trunk. Digestive trunk, cylindrical, transparent, parted at the mouth into four labial tentacula, rather long for the group, each furnished with a little knot of thread-cells, on its inner margin, not far from its free extremity. These labia, when folded back, have an appearance like that represented by Gegenbaur in *Trachynema ciliatum*. This is the only mature medusa I have seen with a wholly colorless digestive cavity. The radiate tubes are extremely delicate; I could not trace them into the digestive cavity. The sexual glands were placed a little below the mid-height of the bell. They were large and rounded at their poles. The ova observed in one specimen were large, like those figured in Saphenia. The sexual organs were the only distinctly colored portion of the animal; they were of a pale yellow color. The margin of the bell was set all round with thickly crowded (thread-cell bearing?) nodes, which took the place of tentacula. I never saw these exhibit any disposition to stretch out their lashes, if they possessed them. The marginal vesicles were all small, and of two kinds; a larger sort had each a single round light-refracting corpuscle. Between every two of this kind was another smaller, and containing a less transparent corpuscle, of a somewhat granular appearance. If the capsules in Circe are as small as these, and as closely couched among the tentacular knobs upon the margin, they may very well have been overlooked by Forbes. There is a slight break in the chain of tentacular nodes at each point, where there is placed one of these sense capsules. The vail is voluminous and was always turned within the cavity of the bell, during my observation, and the numerous folds into which it was thrown, obscured the view of the other side of the bell-margin.

I have seen but three specimens of this Medusa of different sizes, but no one had more than two sexual glands, nor even a trace of more, as is the case with Eucope, when similarly deficient. These specimens had the exterior of the disk so beset with minute Diatomaceæ and Desmidiaceæ at the time of observation, that they were thrown into a state of contraction by them, and the bell acquired a certain obscurity which rendered it impossible to trace the tubes with certainty. When contracted, and this may be a generic character, there is scarcely any longitudinal shortening of the body, but the contraction produces deep longitudinal furrows which proceed from the bell-margin up to the thickened basis of the digestive trunk. The largest of these specimens was not quite the tenth of an inch in height.

I did not ascertain any facts with regard to its embryological history.

The three specimens of this species were taken in the last week of January, on the same day. Another taken 22d of May, did not throw any further light upon the obscure characters of the species.

IV. GERYONIDÆ.

The form is, generally, more or less that of an umbrella, with a long peduncle which, according to Gegenbaur, contains in Geryonia, proper, a large cavity, interposed between the digestive cavity, proper, (which as in Tima and Eutima is terminal,) and the origin of the radiate tubes. This is probably homologous with the cavity of the slender pedicle, which in Aglaura supports the large digestive organ. In Liriope, I have not observed any such cavity. The mouth is provided with labial tentacula. The number of radiate tubes vary, but it seems to be always a multiple of two, rather than of four. The marginal canal, according to the author just cited, gives off in Geryonia proper a number of blind diverticula, which penetrate the disk centripetally, and are of various lengths. The sexual organs are large, oval, circular, or cordate sinuses in the course of the radiate tubes. They are flat and do not bulge out into the cavity of the disk, as is more or less the case with the foregoing genera. Their number probably is uniform with that of the radiate tubes. The tentacula exceed the radiate tubes in their number, which, however, appears to be still a multiple of two, rather than of four. They are usually of two sorts. The number of marginal capsules is the same as that of the tentacula, with whose bases they are connected. This connection in Liriope is, as in Obelia, *asymmetrical;* and probably closer inspection would show it to be so in all cases. In Liriope occurs a singular instance of a double marginal capsule, which is also connected in an unusual manner with the outer surface of the disk.

The development of the Medusæ of this group, which are by no means uncommon, has never yet been observed. This suggests the probability that it is a direct metamorphosis from a free larva.

LIRIOPE. Lesson. (1843.) Gegenbaur. (1856.)

Lesson is entitled to no more than the name of this genus, having, in reality, failed to distinguish it from true Geryonia. It is Gegenbaur's Liriope which I here adopt, and which corresponds to the Geryonia of Forbes. General form resembling that of *Eutima mira;* the peduncle of similar conical form, terminating in a digestive flower-shaped organ, with four (or six?) oral leaflets. The sexual organs occupying four or six (?) heart-shaped or circular sinuses of the radiate tubes and located in the disk. Tentacula eight, and of two sorts, four long and four short, the short being provided with a series of thread-cell bunches. Concretionary capsules of two sorts, a small round vesicle containing a concretionary corpuscle at each of the shorter and complex tentacula, and at each of the longer and simple tentacula a double capsule, consisting of two cysts, one above the other, and connected by an intermediate (tubular?) thread, apparently a continuation of the membrane of the cysts.

The embryology of this genus is as yet unknown. The same may be said of Geryonia. Both of them, however, are by no means very distantly related to Aequorea, and this latter has very evident relationship with the Aeginidæ, from the form of its digestive cavity and mouth, the number of its radiate tubes and concretionary capsules. These capsules in Liriope also are unusual in number and complication, when compared with the Eucopidæ, and it further resembles the Aequoreæ and Aeginidæ in the remarkable transparency of its uncolored parts. The very large sinuses of the generative organs certainly also remind us of the large lateral pouches devoted to the same functions in Cunina. Still the position of these organs, as well as the form and position of the digestive cup at the end of a proboscidian prolongation, certainly bring us back to the Eucopidæ, more especially the genus Tima. The true position of the two genera, then, lies between the Eucopidæ and the Aeginidæ, and their embryology will settle the question which of these groups they most nearly approach.

Distribution.—Mediterranean, British Seas, Indian Ocean, (?) Brazil, (?) Carolinian Coast.

LIRIOPE SCUTIGERA, *nov. spec.*

A very transparent and rather small species. Its most distinguishing character is the great size and circular form of the generative organs. They are four in number, and are so large that they very nearly touch each other laterally, and stretch very nearly from top to bottom of the disk-cavity, thus occupying almost the whole inner surface of the bell. When viewed from above, their unyielding structure gives the disk a quadrate outline, and viewed in profile they appear as large circular shields, especially when at the death of the animal they assume a marked white coloration. The proboscidian elongation of the disk is rather slender below, increasing in diameter rapidly above the digestive cavity; the oral leaflets not so long as in *Eutima mira,* and the four extensile tentacula, I do not recollect ever to have seen stretched more than twice, occasionally, perhaps, thrice the length of the trunk, including the height of the disk. The upper surface of the umbrella is usually very spherical and smooth, sometimes, however, the outline viewed in profile becomes somewhat emarginate in its descent from the vertex to the tentacular rim.

This species is evidently gregarious, great numbers being found together in nearly every instance when I have found it at all. It is bold and rapid in its movements and very rapacious. I have seen one of this species so extremely diaphanous as to make the impression of nothing but a set of outlines—sieze upon a small fish fully thrice as large as itself, and securing itself by spreading out its lips upon it, making them act as suckers, and then entangling about the poor animal its four long tentacula, hang on in this manner despite the violent struggles of the fish, which alarmed swam violently about the jar, until at last apparently from sheer exhaustion, it was evident he was dying. At last changing color, the fish turned over on his side and expired.

I have found specimens of this species from time to time during five months of summer, beginning with the first week in June and ending with the last of October. It may be considered one of the most common of our species.

V. AEGINIDÆ.

In the present state of our knowledge this is the most aberrant and distinctly characterized group of Hydroidea. It is at the same time the lowest in type, both as to structure and development. The general form for the most part is flat and discoid, sometimes thickening into a more hemispherical shape. The mouth is usually simple, the digestive cavity broad, flat, and imbedded in the disk. Radiate tubes rudimentary or altogether wanting. No marginal canal. Sexual organs so far as known, in the periphery of the digestive cavity, where there are usually broad diverticula of that cavity for their reception. The muscular portion of the bell is represented by a narrow circle of lobes around the digestive cavity, to which on their lower margins is attached the vail which is very distinctly developed. There are no ocelli, but concretionary capsules exist in profusion and in very variable number. The tentacula are in comparison to those of most Hydroidea, stiff and wanting in contractility.

The development is known in *Aeginopsis mediterranea*, and the species of Cunina described below. We should probably also include here the development of *Stenogaster complanatus*, (Kölliker.) The polyp is directly metamorphosed into the Medusa, though multiplication by budding goes on during the metamorphosis in Cunina. In the cases of Cunina and Stenogaster, the larva lives as a parasite in the cavity of another Medusa's bell.

The type of this family is synthetic. It belongs to the Hydroidea, but it has analogies which ought not to be overlooked with the Discophoræ, in the broad imbedded digestive cavity, the position of the sexual organs, and the frequently pendent and slashed vail. Indeed, it is impossible sometimes to avoid being struck with the resemblance between a Cunina and some forms of Ephyra.

CUNINA *Esch.*

Disk more or less broad and low. Tentacula placed each at the end of one of the diverticula from the stomach. Every other character in this genus as at present circumscribed is inconstant. The diverticula, tentacula and concretionary capsules, vary in number among the species. The form of the diverticulum varies from that of a broad tube (*C. vitrea* Gegenb.) to a subquadrate form, which is more usual. Gegenbaur mentions that the broad vail is perforated by several canals which originate in the diverticula of the stomach and end blindly near the margin of the vail. This would constitute a still nearer approach to the Hooded-eyed Medusæ. I saw nothing of this kind in the species about to be described. Larva, a free hydra, like the free stage of the Tubularia; embryo moving about by its tentacula. The stem end of the body flat—the oral prolonged into a siphon-like appendage, terminated by the mouth. Development a homogony. The larva is parasitic.

CUNINA OCTONARIA, *nov. spec.*

Pl. 12, Fig. 4–5. Also, Pl. 4, 5, 6 and 7, Proceedings Elliott Society, vol. 1st.

This species has somewhat the form of *Cunina lativentris* Gegenb. It is rather pointed above. The muscular lobes are eight in number. Tentacula and diverticula of the digestive cavity, the same in number as the muscular lobes. Tentacula alternately long and short. The concretionary capsules are three on each lobe, that at its apex being largest. Each contains from two to three corpuscles. Above each of these is a small, fleshy tubercle, like that described and figured in the Larvä found in the bell of Turritopsis. The animal is little less than a third of an inch in diameter.

The digestive cavity is more than half the diameter of the disk, and surrounded by a sinuous wall of a yellow color, forming diverticula, which evince a tendency to increase in breadth as they recede from the cavity. They preserve, however, a nearly quadrate form, their breadth being nearly equal to their length. The mouth may be expanded until it equals the stomach in width or contracted into the four lobed form exhibited in the drawing, pl. 7, fig. 32 *c*. The spaces between the diverticula are quite open. Across these, from one diverticulum to the next, stretches a band of slightly darker color than the surrounding tissue, fig. 4, pl. 12. Compare this with the chain of cells figured pl. 7, fig. 34, *x*. of this volume. The eight muscular lobes are, more or less, gibbous in appearance and are separated from one another by ascending portions of the vail which reach the bases of the tentacula. On their outer margins they bear, each, three concretionary capsules; the middle one of which is the largest and always contains two corpuscles. The other two, smaller, are lateral and contain, each, two or three small corpuscles. Over each one of these organs is a small fleshy tubercle, like that figured, over the single capsule in the young medusa, pl. 7, fig. 34, *p*. That, over the middle capsule, is again the largest. The eight tentacula though differing but slightly in size, are still very distinctly different from each other in this respect. The four greater ones are in length about half the width of the disk—the four less are a little shorter. The difference, however, is rather more distinct in their conical pointed insertions, which project each, into a corresponding diverticulum of the digestive cavity. This structure in the long tentaculum reaches nearly as far inward as do the walls which separate the diverticula, while that of the less tentaculum is decidedly shorter, fig. 4. The tentacula are rather stiff, commonly carried slightly bent downward. They have the marked transversely striate structure, which is so conspicuous in Ægenidæ.

I cannot doubt, from the identity of general form, of the number of lobes and alternating tentacula, that this species is the same as that found parasitic in the bell of Turritopsis, and which from the analogy of Tubularia I was at first induced to look upon as the young of *T. nutricula.* The principal difference between the oldest form figured in pl. 7, and that here described pl. 12, fig. 4–5, is that in this more mature form the diverticula are quadrate and deeper, and the muscular lobes, instead of a single capsule and tubercle, each, are provided with three capsules and three tubercles each. This, I think, merely a difference in stage of growth. If this be true, Cunina octonaria is probably first a free swimming planule which seeks the bell of *Turritopsis nutricula,* developes two tentacula, and a tubular mouth, which it uses to draw food from the stomach of its foster-parent. It developes there four, and at last eight tentacula, beneath which grows a medusa-disk with concretionary corpuscles, then assumes the form of a proboscidian medusa, becomes free, and at last by the shrinking of the oral tube, becomes a flat Aeginoid medusa.

The specimen figured is the only one I have taken at this state of maturity. Its motion in swimming, though not very swift, is very lively, being effected by many rapidly repeated strokes, and has more resemblance to that of an Ephyra than of any Hybroid medusa with which I am acquainted. It was taken in the beginning of August. The larvæ were observed in the bell of Turritopsis from the early part of July to the middle of September.

Concluding Remarks.—At the close of these descriptions and in review of the characters assigned to the various groups of genera, the single remark should be made, that it is probable the greater and more inclusive groups, viz: Corynidæ, Velellidæ, Tubularidæ and Siphonophoræ, among Endostomata, with Campanularidæ, Sertularidæ, among Exostomata, will, as our knowledge increases, appear to be founded on less palpable distinctions than at present seem to divide them from each other. These distinctions are drawn principally from characters of the larvæ, and in certain instances we may already see that these groups of embryonic forms exhibit a tendency to pass into each other by insensible degrees.

For instance, Stauridium is a link of close connection between Tubularidæ and Corynidæ, and researches into the embryology of Velellidæ and Siphonophoræ, coupled with the discovery of new forms may lay open to our view closer connections with the two former groups than are yet apparent. In fact the free floating larva of Nemopsis, with its medusa-buds, may already furnish a suggestion as to what may possibly be the unknown embryonic condition of the Siphonophoræ. And this is not rendered less probable by the fact that Lizzia which belongs to the same group, (Hippocrenidæ) as Nemopsis, exhibits an instance of the same tendency to gemmation in the medusa-stage, which is characteristic of all the genera included at present among Siphonophoræ. Whether the dividing line now drawn between the larval forms of Campanularidæ and Sertularidæ, will always remain as distinct as it seems at present, must be determined by future researches, but my own observations lead me to suspect that it will not. With regard to such minor groups as Circeadæ, Trachynemidæ, Stomobrachidæ, Geryonidæ and Æquoridæ, the embryology of only one of them, Trachynemidæ, is even yet guessed at, and that exhibits some analogy with the embryology of the Æginidæ, a very different group. The very fact that researches hitherto among fixed Hydroids have not yet discovered the larvæ of these groups, renders it probable that, like those of Trachynemidæ and Æginidæ, they are free swimming Hydroids. Yet the forms of these minor groups, (though the discovery of new genera may possibly diminish their number, by uniting two or more of them,) are in the main quite distinct and probably sufficiently so to distinguish them as families, even should their embryology be found to exhibit a character common to them and the Æginidæ.

I therefore reiterate the remarks made at the opening of these descriptions, that the families of Hydroid Medusæ will probably be found more numerous than those which have hitherto been founded among the fixed hydroids, the Siphonophoræ, and the free, oceanic Exostomata. In other words, that the greater groups which, in this monograph I have endeavored to distinguish as faithfully as possible, in accordance with such information as I have, will be found untenable in a natural classification, and that the minor groups, considerably modified, perhaps, from the form in which I have at present given them, will be, nevertheless, found to be the true family groups of Hydroidea.

Geographical Relations.

In considering this subject, two sets of relations present themselves between different Faunas, and these may be termed, 1st, continental relations; 2d, isothermal, or climatic relations. The first are those typical relations which, existing between all the genera composing the Fauna of a continent, impart to that Fauna an idiosyncrasy distinguishing it from the Faunæ of other continents. The second are those analogical relations found generally between the specific forms, more rarely between the groups of higher value, which belong to the same isothermal zones, but to different continents. Lastly, there are certain relations which are established by comparatively accidental circumstances, such as the course of oceanic currents, &c. All of these relations appear to find exemplification in the Fauna of Charleston Harbor, so far as regards the Hydroid Medusæ.

There are but two harbors in America whose Medusæ have yet been made known, namely, those of Boston and Charleston. In the former, from its northern latitude, we should naturally expect to find a less variety of genera and species than in the latter. Yet it is probable that Prof. Agassiz' forthcoming work will give us a knowledge of a greater number of forms than were described in his admirable memoir before quoted, devoted as it was more especially to an investigation of the structure of certain species, than to a combined view of all the genera comprised in the Fauna of Boston Harbor. Nevertheless, we see that the genus Hippocrene, as distinguished from the European Bougainvillea, is common to both Boston and Charleston Harbor. The Fauna of Grand Manan, as made known by Stimpson in his valuable paper, published in the Smithsonian Contributions to Knowledge, does not differ from that of Boston, except in the presence of the genus Acaulis, which has not yet been noticed from any other locality. The Fauna, of Long Island Sound, also, is partly known through the joint contributions of Ayres, Agassiz, and Leidy, and if it is not premature to form conjectures from only partial knowledge, we may consider it different from the Fauna of the eastern shore of New England.* In it we find the genus Nemopsis, which has also a representative in Charleston Harbor, but has not yet been

* The genus Clava, however, not yet observed in Charleston, is found on both shores of New England.

observed in Europe or elsewhere. In Charleston, the following genera are peculiar: Corynitis, Depurena, Eutima, Eucheilota, and Persa. The genera, so far known only in America, therefore may be summed up as follows:

American.		*European.*
Acaulis,		———
Hippocrene,		Bougamvillea,
Nemopsis,		Lizzia,
Corynitis,		———
Dipurena,	With which may be compared	Slabberia,
Staurophora,		———
Eutima,		Tima or Geryonopsis,
Eucheilota,		Eucope,
Persa,		Circe.

Without noticing further the characteristic genera of Europe, these will serve to distinguish the continental types of the two Faunas.

Between the subdivisions of these continental types we find climatic analogies, shown by the correspondence of certain generic, or, at least, sub-generictypes, between the Faunas of those parts belonging to the same isothermal zones. Tubularia and Sarsia are the only genera found in both the Northern and Southern Faunas of both the continents, unless further research should show that this is the case with Obelia and Campanularia. But the Sarsia of Boston Harbor is more analagous with those of Northern Europe, while that of Charleston Harbor is strikingly like that of the Mediterranean. The genus Tiaropsis is found on the Northern seas of both continents, but is absent from the southern. We find a similar analogy between the Tubularidæ of the two continents, for there is so strong a resemblance between the Tubularia described by Kölliker from Messina, and the *T. cristata* of this paper, as to render it difficult to separate them from mere written descriptions.

We may, perhaps, take the isothermal of 50° Farh. as an approximate boundary line between the northern and southern Faunas of each of the two continents. This would divide the British Fauna between the two zones, and there is actually a mingling of the characters of the two Faunas in the Fauna of Great Britain. But it is remarkable that of the four Sarsiæ described by Forbes, the three which have more or less long digestive trunks, and are, therefore, members of the same sub-genus as the *S. mirabilis* of Boston Harbor, were like the last species found north of the isothermal of 50°; while *S. prolifera,* the only species agreeing with Gegenbaur's *O. thelostyla* and *S. turricula,* of this harbor, by the presence of a short digestive trunk is found just south of this isothermal at Penzance Bay. On our American side of the Atlantic this difference also exists, the only genus found on both sides of Cape Cod being Clava,* so far as at present known. While from Long Island Sound southward we find the genera Nemopsis, Pennaria and Hydractinia, the two latter appearing to be represented by one species from Point Judith on the coast of New Jersey to Charleston Harbor. The mean annual temperature of Charleston Harbor is about 66°, nearly the same as that of Sicily. Accordingly, leaving out the genera peculiar to each place, we find the following, so far as is at present known, common to the Harbors of Messina and Charleston: Turritopsis, Tubularia, Zanclea, Sarsia (short trunked), Porpita, Diphyes, among Endostomata. Among Exostomata, besides Eucope proper and Eucheilota, which are representative genera, we have Campanularia (proper,) Obelia, Liriope and Cunina, common to the two. To these may be added Saphenia, Pennaria, Eudoxia and Physalia, common to the Mediterranean and to Charleston Harbor. Some of the species which represent these genera between the two regions are very similar to each other. This is the case between *Pennaria tiarella* and *P. Cavolini*, *Sarsia turricula* and *Oceania thelostyla*, *Tubularia*——— and *Tubularia cristata*, *Campanularia noliformis*, and *Eucope campanuliformis*. There appears to be, therefore, a natural analogy between the Faunas of the Mediterranean and of our South Atlantic coast. And taking the zone whose approximate boundaries are the isothermals of 50° and 66°, we find that in America it includes the coast from Long Island Sound to Charleston, while in Europe it stretches from the southern coasts of Ireland and England, including its northward prolongation, up the Irish channel, to the coast of Africa, the mean annual temperature of Alexandria in Egypt being nearly that of Charleston. In Europe the following genera appear to be common to the northern and sourthern parts of this zone: Oceania, Turritopsis, Cladonema, Sarsia, Lizzia, Diphyes, (?) Agalmopsis, Eucope, Thaumantias, Liriope, Aequorea, (?) Obelia, Campanularia, Physalia; Velella and Porpita, probably have their northernmost limit rather southward of the isothermal of 50°.

In comparison, then, the Faunæ of these zones, in the two continents, saving their continental peculiarities, may be con-

* As to Laomedea and even Campanularia, as ordinarily circumscribed, we cannot speak with an approach to certainty; there is every probability that in each of these, not yet sufficiently investigated groups, two or more genera will be ultimately distinguished, so soon as their medusæ become sufficiently known.

sidered as analogues the one of the other; and whilst the analogies of Charleston Harbor appear to be greatest with the Fauna of the Mediterranean, it has, nevertheless, strong relations with the Fauna of the English and Irish channels, which merit attention. On the other hand, Pennaria, which, so far as I am acquainted with the subject, is on the European side, known only from the Mediterranean, is in America found as far north as the isothermal 50°, and as far south as the isothermal of 66°, thus establishing a sort of relation between the Mediterranean and the northern part of this zone in America. Again, between the southern waters of Great Britain and Charleston Harbor, there are not only strong analogies, but it is doubtful whether some of the species are not identical. The genus Willsia has but two known representatives, and these are natives, one of the south coast of England and the other of Charleston Harbor. The three representatives of the genus Turritopsis are found, one in the Mediterranean, (*T. flavidula*) one on the coast of Devon, (*T. pusilla*) and one in Charleston Harbor, (*T. nutricula.*) Of Saphenia, two species are found in the Mediterranean, two in the British channel, and one in Charleston Harbor. The last, *T. apicata*, is so like the *T. Titania*, from the coast of Devon, that it may be doubted whether subsequent research will not prove them identical, and at least they are representative species. It is likewise doubtful whether the *Eudendrium ramosum* of the English and Scottish coast does not extend to Charleston Harbor. I have not been able to distinguish between the *Aglaophenia cristata* of the coast of Great Britain and that of Charleston Harbor. The genus Epenthesis has probably representatives on both coasts and, Liriope is like Turritopsis, represented in the Mediterranean as well as in the British seas, and in Charleston Harbor. The conclusion naturally arises from this comparison that the Fauna of Charleston Harbor, so far as the Hydroid Medusæ are concerned, has more analogies with that of the southern waters of Great Britain, whose latitude is nearly that of Labrador, than with the Fauna of Boston Harbor, whose latitude is nearly that of Rome, and which, moreover, belongs to the same continent. This analogy can, it appears to me, find its only explanation in the Gulf Stream, which passes by our doors to encircle the coasts of Great Britain.

In conclusion, the Fauna of Charleston Harbor appears to me to present the three following geographical relations:

First. In its continental type it is identical with those of Grand Manan, Boston, and Long Island Sound.

Second. Its natural climatic analogies are with the Fauna of the Mediterranean.

Third. It has strong analogy, if not partial identity, with the Fauna of the southern coast of Great Britain, which must be attributed to the Gulf Stream.

EXPLANATION OF PLATES, 8, 9, 10, 11, 12.

PLATE 8.

Fig. 1.—*Turritopsis nutricula*—(young.)
 l, the four incipient labial tentacula, three of which are seen in this profile view.
 t, the mass of large transparent cells, above the digestive cavity.

NOTE.—Ocelli are present at this stage, but have not been distinctly given in the engraving.

Fig. 2, 3.—*Saphenia apicata.*
Fig. 3—contracted digestive trunk—*a*, cavity formed by the contraction of the elongate transparent portion of the digestive trunk.
 o, ovaries surrounding the true digestive cavity.
Fig. 4 *to* 5.—*Zanclea gemmosa.*—(young.)
Fig. 4.—*p*, clavate appendages of the tentacula.
 x, one of the characteristic groups of thread-cells, seen in profile.
Fig. 5.—Magnified view of one of the clavate appendages, *p*, fig. 4.
 a, corpuscles contained in the enlarged extremity.
Fig. 6 *to* 8.—*Sarsia turricula.*—(young.)
Fig. 6.—Oldest stage observed.
Fig. 8.—Younger stage, in a somewhat contracted condition. The slight prominences, which enrich the surface, are not represented in fig. 6.
Fig. 7.—Tentaculum of fig. 7 enlarged, showing the arrangement of the tufts of thread-cells.
Fig. 9 *to* 10.—*Eudoxia alata.*
Fig. 9.—Basal medusa.
 a, air chamber.
Fig. 10.—Sexual medusa.
 c, the elevated crests from which the specific name has been derived.
 o, ovary and ova.

PLATE 9.

Fig. 1 *to* 2.—*Dipurena strangulata.*
Fig. 1.—*l*, lower cavity of the digestive trunk.
 u, upper cavity of the same.
Fig. 2.—Tentaculum magnified.
 c, cavity of the terminal bulb.

Fig. 3 *to* 8.—*Corynitis Agassizii.*

Fig. 3.—Adult—*c*, terminal bulb of the tentaculum.
k, pad of thread-cells.

Fig. 4.—View of another quadri-tentaculate specimen from above; *c*, as in fig. 3

Fig. 5.—Bi-tentaculate, free stage.
* natural size; letters as in fig. 3.

Fig. 6.—Bi-tentaculate bud before separation from the larva, much magnified.
a, single large cavity of the tentaculum.
c, radiate tube.
d, digestive trunk.

Fig. 7 *to* 8.—Two positions of a still younger bud, in which the two large tentacula are just beginning to sprout; *a*, *c* and *d*, as in fig. 6.
b, sinus of the radiate and circular tubes, at one of the points whence the two additional tentacula are to spring.

Fig. 9 *to* 11.—*Willsia ornata.*

Fig. 9.—Magnified view.
* natural size.

Fig. 10.—Chain of thread-cells which rises from the margin along the outer sur face.
a, terminal group of a chain.
b, group which has resulted from the union of two or more smaller groups by contraction.

Fig. 11.—Small portion of the border of the labial circle magnified.
a, one of the larger thread-cells.

PLATE 10.

Fig. 1 *to* 7.—*Nemopsis Gibbesii.*

Fig. 1.—Adult magnified, with (*s*) fully developed sexual organs. Magnified Drawn from nature, by H. Bosse.
c, one of the pair of clavate tentacula.

Fig. 2.—Somewhat younger specimen with (*s*) less developed sexual organ. Drawn from nature, by H. Bosse.

Fig. *a*.—1, enlarged view of the compound tentacular bulb, showing the ocelli at the bases of the clavate tentacula.

Fig. 3.—Still younger specimen with (*s*) sexual organs confined to the neighborhood of the digestive trunk. Drawn by H. Bosse from nature.

Fig. 4.—Young medusa just after separation from the larva. *s*, mass representing the digestive trunk, and future sexual organs.

Fig. 5.—Bud just before separation. *a* one of the four compound tentacular bulbs with tentacula.

Fig. 6.—Still younger bud; *a* as in fig. 5. No tentacula have yet appeared.

Fig. 7.—Free floating larva with buds *b*, *b*.
s, slight depression in the rudimentary stem, giving it the appearance of a sucker.
u, tentacula of the upper circle.
l, tentacula of the lower circle.
m, the mouth.

Fig. 8 *to* 10.—*Hippocrene Carolinensis.*

Fig. 8.—Adult much enlarged.

a, knobs representing contracted tentacula.

Fig. 9.—Young free medusa, with but from one to three tentacula, to each bulb.

Fig. 10.—Very young Cytæis-like free stage, with but four tentacula, and *a*, three unbranched oral cirrhi.

PLATE 11.

Fig. 1 *to* 3.—*Eucheilota ventricularis.*

Fig. 1.—Full grown specimen, natural size; representing the carriage of the tentacula, while the animal is sinking in the water.

Fig. 2.—Specimen enlarged several diameters. The sexual organs are in an abnormal condition, being represented by a plexus on one side, and by two very slight fusiform swellings in those tubes which are on the right and left side of the digestive cavity.

Fig. 3.—A magnified view of an oval, sexual gland, with its large sinus of the same form.

Fig. 4.—*Campanularia noliformis,* from beneath; showing the tentacular circle, and the arrangement of the eight sense-capsules, *a*, with regard to the radiate tubes.

Fig. 5 *to* 7.—*Obelia commissuralis.*

Fig. 5.—Young medusa viewed from above, and enlarged several diameters.

Fig. 6.—Ovary of an adult medusa. The usually circular outline is modified by the tension of the large ova, of some of which the germinative vesicles only are seen.

Fig. 7.—Small arc of the tentacular circle, exhibiting three tentacula, with their reëntrant radices. With the middle one is connected a sense-capsule, *a*, containing a single corpuscle.

Fig. 8 *to* 9.—*Eutima mira.*

Fig. 8.—Nearly of the natural size.

Fig. 9.—Portion of the marginal cord—showing the form of one of the sense-capsules, *a*, containing four corpuscles.

PLATE 12.

Fig. 1 *to* 2.—*Eucheilota ventricularis.*

Fig. 1.—Portion of the tentacular circle, much magnified.

a, great ganglion of the tentaculum.

b, smaller ganglion of the greater tubercles bearing thread-cells.

c, lesser ganglion for the small tubercles. The dark line connecting these ganglia, *a*, *b*, and *c*, is the nervous cord, which accompanies the marginal canal, *e*, through its whole circuit.

e, *e*, marginal and radiate tubes.

d, tentacular bulb.

f, *f*, the two small lateral tentacula, one of which is stretched out, and the other twisted together.

f' the enlarged and roughened termination of the smaller tentaculum.

Fig. 2.—Another portion of the tentacular circle, exhibiting *d*, a tentacular bulb, without a lash, in course of development. *a* and *f* as in fig. 1; *k*, sense-capsule of the same type as in Eutima, containing five corpuscles; *h*, its ganglion; *m*, marginal cord.

Fig. 3.—*Persa incolorata.*—The sexual organ at the right of the digestive trunk was abnormal in form. Only three of the labial tentacula are represented.
Fig. 4 *to* 5.—*Cunina octonaria*—full grown; much magnified.
Fig. 4.—Viewed from above. On the outer edge of each muscular lobe, are seen the three sense-capsules *a*. Within and above them, are the three corresponding fleshy tubercles, *b*.
Fig. 5.—Viewed in profile.

MAY 1st, 1857.

President Lewis R. Gibbes in the chair.

Prof. Gibbes exhibited a specimen of *Epidendron conopseum*, from the neighborhood of Georgetown, So. Ca., the most northern locality in which it has been found. It was there noticed by Dr. A. M. Forster. Prof. Gibbes also exhibited a specimen of *Ophisaurus ventralis*, and a copy of the Musci Exsiccati of Sullivant and Lesquereux recently issued, and just received by him.

Contributions to the Library.

M. L. A. Huguet Latour presented Reports of the Superintendent of Education for Lower Canada, 1850–1855.

An Act to provide for the better organization of Agricultural Societies in Lower Canada.

Dr. Isaac Lea, Philadelphia, presented

Rectification of Mr. T. A. Conrad's Synopsis of the family Naiades of North America.

On the new Red Sandstone formation of Pennsylvania.

Description of a new sub-genus of Naiades.

Description of a new species of Triquetra.

Description of new fresh water shells from California.

Description of twenty-five new species of Exotic Uniones.

Lieut. Maury presented Astronomical Observations United States Naval Observatory, Washington, D. C.

Academy of Natural Sciences, Philadelphia. Proceedings September, 1856, to January, 1857.

Essex Institute, Salem, Mass. Proceedings, vol. i. 1848, 1856.

Boston Society of Natural History. Proceedings, February, 1857, pp. 81 to 96.

American Philosophical Society, vol. vi. No. 56, 1856.

Correspondents Elected.

Prof. Karl Theodore Von Siebold, Munich.
Prof. Albrecht Kölliker, Würtzburg.
Dr. Franz Leydig, Würtzburg.
Dr. Heinrich Mëller, Würtzburg.
Maj. T. C. Downie, St. Simon's Island, Ga.
J. P. Postell, Esq., St. Simon's Island, Ga.
Dr. Geo. Smith, Philadelphia.
Hon. T. L. Clingman, Asheville, S. C.
Dr. Edward Hallowell, Philadelphia.

Members Elected.

Charles D. Carr, Esq.
Henry W. Carr, Esq.
Robert Chapman, Jr. Esq.

MAY 15th, 1857.

President L. R. Gibbes in the chair.

Prof. McCrady said that the common opinion among naturalists with regard to the history of specific form, appeared to be, that they remained absolutely unchanged, from the time of their first creation, through all the ages of their existence. Mr. McCrady believed that no researches which could satisfactorily test the truth of this opinion had ever been made known to the world. He, himself, believed that in one sense a species always remained the same in form, viz.: that it never could, by any kind of transformation, become another species distinct from that which it had first been created. But he raised the question whether it was consistent with the analogy of nature to suppose that each specific form did not exhibit, in the course of its history, a cycle of changes belonging to itself, and included in its original conception. The idea of the class was, in the course of its history, modified according to the laws of the development of special from synthetic types. So was that of the order, and even that of the family. The individual of any species was not the same in form at all periods of its existence, but exhibited form-changes, which, as in the case of fission, even sometimes encroached upon the notion of individuality as we entertain it. Why, then, should the ideas of the genus and the species be the sole stationary ideas? Why should they alone be excepted from the law of development? If each of these groups had a beginning and an end, why should it not have a history? a progressive morphology? Mr. McCrady thought that the question considered *a priori* resolved itself to this: whether there was anything at rest in nature? Whether, among all the ideas of the Great Morphologist, expressed in the organic world, there was one which was stationary, like a crystal, and not rather living, growing, teeming, like the germ of a plant or animal?

Member Elected.

James Johnson, Esq.

JUNE 1st, 1857.

President L. R. Gibbes in the chair.

Prof. McCrady remarked that he had recently had the opportunity of making some incomplete observations on the embryology of a species of Bolina found in Charleston Harbor. From these observations it appeared that Bolina had not at first the singularly graceful bi-lobular form which afterwards distinguished it, but that it first exhibits the form of a Cydippe with very short ambulacra, which were confined to the upper third of the body, around the sense-capsule, which was very large. The remaining two thirds of the body were, as yet, unfurnished with circulatory tubes, and the circulatory system seemed to be represented mainly by two large quadrangular sinuses—one on each side of the apex of the digestive cavity. On a level with these sinuses, and connected with them, were the rudimentary tentacular chambers as in Cydippe.

The President stated to the Society some of the results of his investigations now in progress into the optical properties of the Turpentines from the the various species of Pine found at the South.

JUNE 15th, 1857.

President L. R. Gibbes in the chair.

The President continued his remarks on the progress of his researches upon the Turpentines of our native Pines. These remarks, at his request, are not reported, his intention being to present them in the form of a written communication at a later day.

JULY 1st, 1857.

President L. R. Gibbes in the chair.

The President exhibited to the Society a specimen of *Xylostroma gigantea,* growing in a cleft of the wood of *Pinus australis* Michaux.

The first part of a paper entitled "*Flora of the Low Country of South Carolina*" was read by its author, W. Wragg Smith, Esq.*

A paper on the "*Ozonicity of the Atmosphere,*" by Dr. William H. Ford. The publication of this paper is postponed for the present, at the request of the author, in order that it may be presented at a later date, under another form.

William Jervey, Esq. elected an honorary member.

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* The whole of this paper will be published by the Society, more connectedly, at a later date.

JULY 15th, 1857.

President L. R. Gibbes in the chair.

The President read the following paper:

Description of Ranilia muricata Milne Edwards. By Lewis R. Gibbes.

Plate 13.

In the *Histoire Naturelle des Crustacés*, M. Edwards gave (tom. ii. p. 195,) the characters of this genus and a description of the only known species. His description was drawn from a single specimen, and that an imperfect one, having lost the terminal segments of the abdomen, and of the four last pairs of feet. Its country was also unknown to him.

In the third volume of the Proceedings of the American Association for the Advancement of Science, (meeting at Charleston, March, 1850,) I announced that this animal inhabited the waters of Key West, and the Atlantic shores of the United States. Having had the opportunity of examining four or five specimens, two of them perfect, with the exception of the terminal (multiarticulate?) and, probably, short segment of the antennæ, I am induced to give the following description, including points omitted by M. Edwards. A few other points, requiring examination, must be considered at another time, as I am unwilling to mutilate the few existing specimens for the sake of close inspection.

RANILIA.

General form much resembling that of *Ranina*, but the carapax is more convex in transverse section, and its anterior border is not straight as in *Ranina*, but is much curved. The anterior border is armed with distant spines, of which the middle one forms the *rostrum*, and is separated from each of the two adjacent ones by a deep incurvation of the edge of the carapax. The *orbits* are directed downwards and slightly backwards, so as to form an inverted V with rather wide spreading branches. *Eyes* with peduncles nearly half the length of the anterior border of the carapax, folding downwards in the orbits, the articulation of the last segment appearing in the space between the rostrum and the first supra-orbital spine. *External antennæ* with three peduncular segments and a terminal filament, basal segment without the auriculiform appendage of *Ranina*. *External maxillipeds* of nearly the same form as in *Ranina*, the third segment of nearly the same breath as the second, and about equal to it in length, (M. Edwards, by mistake, says that is longer,) and gives insertion near its extremity to the fourth segment, which is folded in a groove at the inner edge of the third segment. The *sternal plate* resembles that of *Ranina*, is broad, widening anteriorly and stretching out into two branches, which unite with the pterygostomian regions of the carapax, separating completely the bases of the external maxillipeds from those of the first pair of feet; between the bases of the second pair of feet the sternal plate becomes linear, as in *Ranina*, but it differs from that of *Ranina*, by widening again between the bases of the third pair of feet, to become again linear between those of the fourth, so that an area somewhat hexagonal is presented between the bases of the second, third and fourth pairs of feet. In general structure, and in the forms of the tarsi, *the feet* closely resemble those of *Ranina*, and the fifth pair are inserted in that genus above the four preceding pair, and a little in advance of those of the fourth pair. *Abdomen* small, linear, when curved under the body, barely reaching to the bases of the third pair of feet, cemposed in both sexes of seven distinct segments, successively diminishing in dimensions.

RANILIA MURICATA.

Pl. 13, Fig. 1 and 2, natural size.

Syn. *Ranilia muricata*. M. Edwards. *Hist. Nat. des Crust.*, tom. ii. p. 196, 1837.
Ranilia muricata. L. R. Gibbes. *Proc. Amer. Assoc.*, vol. iii. p. 187, 1850.

Description.—*Carapax* posteriorly smooth, polished and punctate, anteriorly marked with numerous dispersed piliferous ridges, which are short and denticulate, with two to four obtuse teeth, and pairs, as it were, oppressed, pointing forwards; the lateral edges of carapax terminating anteriorly in a prominent sharp spine. *Rostrum* short. *Eyes* with straight terminal peduncle folding downward and outwards in repose; supra-orbital ridge, with three distant sharp spines, the outermost of these spines being situated a little short of the outer angle of the orbit, and midway between the first of these spine and the one forming anterior termination of lateral edge of carapax; between the spines are more minute spinulose denticulations, which are continued along the outer angle and lower edge of the orbit; this lower edge is incomplete, and terminates at the base of the outer antennæ in a spine, adjacent to which is another somewhat smaller, forming the anterior termination of the outer border of the buccal frame. Basal segment of the *exterior antennæ* somewhat flattened, outer edge terminating anteriorly in an acute prolongation at the articulation with the second segment.

First pair of feet, of moderate length, third segment stout, with numerous piliferous denticulate ridges; carpus compressed, surface with granulations and denticulate ridges, upper border terminating with an acute spine above the articulation with the hand; the line of this articulation appears to lie in the prolongation of the lower border of the carpus even more decidedly than in *Ranina dentata; hand* much compressed, almost flat, lower edge subtrenchant, nearly straight, ornamented with a raised border without denticulation, even the slightest, and terminating in a stout, moderately curved tooth, which is opposed to the tip of the terminal segment, or moveable finger; upper edge of the hand much arched, granulate, and furnished with a spine a little in advance of its middle; both surfaces of the hand are, like the carapax, polished, and covered with piliferous denticulate ridges. The last segment or *moveable finger* polished, moderately curved, outer edge with a double line of granules near the articulation, trenchant edge without vestige of teeth, the opposing edge of the hand is furnished about the middle with a single large lamellar tooth.

Feet of four last pair resemble very much those of *Ranina dentata,* but, in general, the segments are less cylindrical, in some pairs quite flat. The forms of the tarsi are nearly the same as in *Ranina,* those of the third pair are not flat, but rather triangularly prismatic, with the under or anterior surface nearly plane, and the outer edge of the prism forming a prolongation beyond the articulation with the fifth segment, for nearly one-third the length of that segment; the tarsi of the fifth pair are not more than half the breadth of the tarsi of the fourth pair; the fourth segment of the fourth pair has a tooth-like prolongation of the posterior edge, which reaches beyond the middle of the fifth segment; the anterior and posterior edges of most of the segments of the four last pair of feet are fringed with long hairs, the hairs of the piliferous ridges of the sternal plate, pterygostomian regions and external maxillipeds, are long also, giving a hirsute appearance to the under surface of the animal.

The *buccal frame* is longer than broad, open anteriorly, as in *Calappa*, *Ilia*, &c. the opening being between the bases of the antennæ; the *external maxillipeds* close it exactly, the second and third segments about equal in length, and rather narrow, the third diminishing in breadth to its anterior extremity, and giving insertion to the terminal portion of the organ at the extremity of its inner border; this terminal portion, (the three last segments,) is very slender, almost filiform, and generally concealed in a groove on the inner border of the third segment; the second segment of the external maxillipeds is traversed obliquely by a piliferous ridge, which causes this segment to appear as two; this circumstance has misled M. Edwards into the belief that the third segment is longer than the second.

Abdomen narrow, about two-thirds the length of carapax, of seven distinct segments in both sexes, the last three segments curved under the others, but not extensive enough to conceal the abdominal appendages.

Color prevailing in the dry specimen, is purplish, mixed with yellow and orange in places, particularly about the articulations and spines; the latter are generally purple at the base, orange in the middle, and white at the tip; and the moveable finger of the first pair of feet is colored much in the same manner; the upper surface of the first pair of feet is purple, purple tracings ornament the outer surface of the remaining pairs of feet, particularly the fourth and fifth, and the outer surface of the abdominal segments is marked with two longitudinal lines of purple. The plate is printed in a color approximating to the general coloration of the specimen from which the drawing was made.

Dimensions of largest specimen, a male figured in plate xiii. length of carapax 1.55 inch, breadth 1.20 inch.

Geographical Distribution. Inhabits coast of southern Atlantic States; the first specimens I saw were brought from Key West; a specimen in the Museum of the Medical College of Charleston, is from Charleston harbor, or the ocean immediately adjacent; and in 1846, on a voyage from Charleston to New York, I obtained from the stomach of a fish taken at sea, off the coast of North Carolina or Virginia, a single specimen of what I take to be the young of this species. It was, of course, not fully developed; the rostrum large in proportion to carapax, orbits almost wanting, no supra-orbital ridges or spines, eyes large on short peduncles, but the forms of the hands and of the tarsi quite characteristic; length less than a quarter of an inch. Accompanying it were the specimens, four in number, of *Monolepis inermis* of Say, mentioned in Proc. Amer. Assoc., vol. iii. p. 192.

EXPLANATION OF PLATE 13.

Fig. 1—View of upper surface. Fig. 2—View of under surface.

The President read a letter from Prof. F. S. Holmes, tendering his resignation as a member of the Society.

On motion of Prof. S. H. Dickson, this resignation was accepted, and the President requested to fill, by appointment *pro tempore*, until the next meeting of the Standing Committee, the office of Corresponding Secretary, thus left vacant.

Prof. McCrady made the following remarks, suggesting a new view as to the Zoological affinities of Graptoliteis:

Prof. McCrady said, that he would avail himself of the means afforded by this Society for making public a suggestion which he had some time before made in a private letter to Prof. James Hall, of Albany, the distinguished Geologist, now connected with the Geological Survey of Canada. This suggestion concerned the nature of those singular fossils denominated Graptolites, which were found only in the Palæozoic Rocks, though in certain of these they appeared in great numbers. These fossils had been first referred by Naturalists to Halcynoid Polypi in the neighborhood of Virgularia, whence recently they had been, by some authors, transferred to the group of Bryozoa or Molluscan Polyps, and this latter view had been countenanced by some of the most distinguished Naturalists in this country.

Mr. McCrady suggested that it was quite possible here, as in numerous other instances, that to a certain extent heterogeneous elements had been combined in the group to which the name Graptolitidæ had been given. It was *possible* that a few of the specimens so called might be Hydroid Polypi, which we now class with the Medusae, or even Bryozoa. But he thought that there were a few considerations which made it very *improbable* that these singular fossils belonged, in the first place, to any group of animals now actually existing, and in the second, especially improbable that they should belong to communities of animals such as the dendritic Bryozoa and Hydroids. In the first place both the Halcynoidea, the Hydroidea and the Bryozoa, were all abundantly represented at the present day. If, therefore, the Graptolites are their fossil representatives, why are they coufined to the Palæozoic period. Were the slates of the Palæozoic period more peculiarly adapted to their preservation than the Lithographic Rock of Solenhofen, belonging to the Secondary period, or than the Chalk, or than the Marls of the tertiary period. In fact it appears from our present knowledge of the Geological ages, that the Graptolites did not outlive the period in which their fragmentary skeletons are found; that to that period they belonged, and that they have never had representatives among mature animals since.

In the second place the Graptolites, though consisting of serrate stems, like many Hydroidea and Bryozoa, yet have their stems of a different form, i. e. oftenest entirely unbranched, and without root-like processes, and when the former are present, as in Didymograpsus, they are simple divarications of the extremity of a main stem, and when the roots appeared they were very short and opposite, and belonging to a form of Graptolite which was more easily explicable on the hypothesis about to be presented. In short, all the cases of branches and roots which had been figured, with, perhaps, one or two exceptions, such as Hall's fig. 6*a*, 6*c*, pl. 74, (*Palæontology of New York,* Vol. 1,) were he thought more explicable on the supposition, he would present than by a comparison with Hydroids or Bryozoa, or polypidomata of any sort.

There was one structure also which imparted a peculiar appearance to the outline of some Graptolites which had so far as was known to Prof. McCrady, no parallel among polypidomata; it was the large, smooth, sharp, thorn-like process which sometimes singly issued from one side of a Graptolite, and which had no analogy with a root. Such a process was common in Didymograpsus on the outer side of the point of union of the two branches. It was also present in cases where the branches formed an angle with each other almost equalling 180° and therefore lying nearly in the same straight line. Such an instance was represented by Hall, pl. 74, fig. 5*a*, 5*b*, vol. 1. Also in *Pictet's Paléontologei,* Atlas, pl. cviii. fig. 22, 23.

In structure also, the Graptolites differed from the Bryozoa and Hydroidea, in as much as they consisted of an *internal* calcareous skeleton, composed sometimes of two and probably more parallel bars, at times connected together by transverse bars, and of an external sheath, composed of modified organic tissue, of a horny appearance. On the other hand the bifurcate form of many Graptolites and the processes before mentioned, resembling roots, are points of dissimilarity with Pennatulidæ.

Again, what have been called cells may be explained upon another hypothesis.

And lastly, while no impressions of the soft bodies of the supposititious polyps which have been imagined to fill these cells, have been found, an impression of a soft fleshy structure of a different kind *has* been found in connection with Graptolitic stems.

Prof. McCrady then stated that, in his opinon, a much greater similarity existed between the fragmentary and disjointed forms, which we call Graptolites and the parts of the skeletons of Echinoderm Larvæ, as they had been recently made known to the world, by the wonderful researches of Joh. Muller, than could be found for them in any other group of known animals.

In the first place, the thorn-like processes, the lyriform Didymograpsus, the peculiar root-like processes of some specimens (*Graptolithus bicornis*, Palæontology of New York, Vol. I. Pl. 73, fig. 2*a*, 2*c*, 2*f*,) the oval and spindle-shaped expansions of the stems in others, all received an immediate explanation by this comparison, while the disjointed and fragmentary condition of the specimens was no argument against it. The serrature of the stem, also, was at least as explicable in this way as in any other, by a comparison with the toothed rods of the skeleton in the Echinoderm larvæ.

The structure of the internal calcareous skeleton, which is either solid, or consisting of parallel rods, which often do not unite even at their very extremities, and are frequently held together by transverse bars, has its exact counterpart among the Echinoderm larvæ. Prof. McCrady requested a comparison of the fig. 2*a*, Pl. 74, Vol. I. of Hall's Palæontology, of New York, with the peculiar structure figured by Muller, "*Ueber die Gattungen der Seeigel-larven Siebente Abhandl.*" Pl. 6, ff. 5 and 11, separately, and in ff. 4,8,9,10, in connection with other parts. Also, with ff.

12 and 13, as well as 10 and 11 of Pl. 8, of the "Vierte Abhandl," of the same series. The resemblance of general outline is so remarkable between them, that Mr. McCrady thought it could not fail to strike any one, who had the two structures presented to his eye at the same time. The form of the shaft, broadest above, and tapering below; the two opposite root-like processes, diverging from this slender portion in each; the serrated edge of the shaft is the Echinoderm larva, corresponding to the serrated edge in the Graptolite, the dissepiments in the Graptolite, (fig. 4*a*, Pl. 74,) corresponding to the spaces between the bars in the Echinoderm larva.

Again, the arcuate Graptolites, which had been associated in the genus Didymograpsus, most of them found their analogies in nature, as at present known, only in the lyriform, calcareous structure, which overarched the gullet in the larvæ of Echini proper. To see this resemblance, it was only necessary to compare Muller's Sieb. Abh. Pl. 1, fig. 5, Pl. 2, fig. 10, Pl. 8, ff, 3 and 8, and Vierte. Abh. Pl. 7, fig. 1, 2, 5, 6, E. E., with Murchison's Siluria, Pl. 12, ff. 1 and 1*a* and Hisinger's *Didymograpsus geminus*, Lyell Elements Geol. p. 446, fig. 600. They both possessed the singular spine or thorn-like process from the vertex of the curve formed by the branches. Also this structure in the Echinoderm larva is not as yet known ever to possess dissepiments like several of the other parts; the same is true of Didymograpsus.

The thorn-like process, present in other longer-shafted specimens among Graptolites (Hall's Pal. Vol. I. Pl. 74, ff. 5*a*, 5*b*) had also its analogy in the parts of Echinoderm larvæ, and (so far as was known to Mr. McCrady) in no other animal structure. *Gattungen der Seeigellarven* pl. 1–8, *passim.*

In addition to all these analogies, there was a specimen, the property of the Geological Survey of Canada, which Mr. McCrady believed had been exhibited by Prof. Hall, at the meeting of the American Association for the advancement of Science, held at Providence, R. I., in 1855, and which Mr. McCrady had been shown by Prof. Hall, at his study in Albany, at a later date, which still preserved the Graptolitic shafts, nearly in their original normal connection with each other, and with the impression of the soft membrane which stretched between them, and held them together. The view of the nature of Graptolites given in these remarks, suggested itself to Mr. McCrady immediately on the examination of this specimen, which unfortunately, he had only seen this once, and then for scarcely ten minutes. It consisted of an even number of rods diverging from a central space, about which they were not disposed at equal distances asunder, but symmetrically, and bilaterally, so that there were two sides to the specimen. Between these rods was the impression of the soft parts curving inwards. The only illustrations of a similar object known to Mr. McCrady, were the figures of Mûller, of the upper view of the larvæ of some Echinoderms. (See Ophiurenlarven Pl. 1, fig. 4.) And it immediately occurred to him that this specimen was the upper view of a Pluteus-like animal, which had been subjected to pressure from above, while resting in a vertical position. It appeared to Mr. McCrady that no other explanation of this specimen, so far as his opportunities had extended, could be made.

During the same year, Mr. McCrady had been shown by Prof. Hall, while in Boston, some Graptolites from the west These had the stem very much expanded, and were immediately explicable, by comparison with the expanded portion of the shafts in Müller's Pl. 7, fig. 4, 4, Siebente Abhandlung. With regard to the long Graptolites, they are usually solid, and sometimes serrated on one side only, sometimes on two; they are, also, though rarely, yet sometimes divaricate. All these characteristics would be explained by a comparison with the long shafts of the tent-frame in Pluteus. They, also, usually terminate abruptly, and are generally presented in fragments, and this is consistent with the case of Pluteus and the larvœ of Echini, in both which, also, the rods are very fragile and easily broken.

The dissepimental fragments were also explicable by comparison with the longer rods of the larvæ of Echini proper. If Mr. McCrady's suggestion was correct, it was also probable that smooth unserrate Graptolites would be found corresponding to the smooth rods in the larvæ of Echinoderms.

There were certain apparent difficulties which might be urged in opposition to this, which Mr. McCrady desired to notice. Such was the external cortical horny sheath, which in Graptolites, usually surrounded the calcareous rods. This might have been the modified remains of the external soft tissues of the Pluteus-like animals surrounding the rods and shrinking upon them at the death of the

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animal. That such soft tissues could leave their mark, was shown by the specimen belonging to the Canada Survey mentioned above, and that they should have been very much modified, in the course of fossilization, was to be expected.

There were also certain pretty constant differences between the Graptolites and the parts of Echinoderm larvæ, as at present known to us, even in those cases where in the main they resembled each other closely. Thus, the serratures of the edges, were nearly always more numerous in the Graptolite, than in its nearest analogues among the larvæ of Echini. They also differed vastly in size—the Graptolite being absolutely gigantic in proportion to the Echinoderm larva, barely a line in diameter. To this, it was to be replied, that in such a view as the suggested one, we are comparing perfect fossil animals not with perfect ones of the present age, as when, for instance, the scales and bones of a fossil Lepidosteus are compared with those that now swim in our rivers, but we are comparing *perfect* fossil animals, with the *imperfect immature* representations of them which occur in the embryological history of another very different group, which now, countless ages after they have vanished from the scene of life, is still, if this supposition be correct, yearly recording their former existence, and sketching the details of their structure in a wonderful, if not in a minute manner. If no fishes now existed in the seas, and we were compelled to trace the relations of the parts in the fossil fishes by a comparison with the larvæ of frogs, we should find the task still more difficult. If Pteropods existed only in the fossil state, and we were to attempt to find their analogues, it would be a long time before the larvæ of Gasteropoda, would suggest themselves. The resemblance, as it stands between the Graptolites and the Echinoderm larvæ, is very great indeed, on the supposition that the latter are embryonic representatives of the former, and their great difference in size is certainly to be expected, on the ground, that the present suggestion is the true one; for nearly all embryonic forms are smaller than the perfect animals, whose types they represent.

There was, however, another argument which strengthened this view, which Mr. McCrady thought proper to notice. Wherever the young of an animal in its first stages has been found to differ greatly from the adult in structure, as is the case of these larvæ when compared with adult Echinoderms, it has been found that these apparently idiosyncratic larvæ represent the structure of some other lower group of animals. But hitherto the larvæ of Echinoderms have excited the wonder of naturalists, by the fact, that they appeared absolutely without representatives among perfect animals, either fossil or recent. Yet, in truth, according to analogy, we must look back to some distant geological period for their representatives. Where, then, could we more naturally expect to find them than in the Palæozoic Rocks, at a stage just anterior to the epoch in which the first undoubted Echini proper appear? And in this very position, the Graptolites, with their remarkable resemblances to the skeletons of Echinoderm larvæ, present themselves like the disjointed letters, and words, and phrases, of a fragmentary inscription, which, however, continued labor may enable us to put together, and rightly to decipher.

In short, so striking have these resemblances appeared to Mr. McCrady, that before communicating his views, he would have gone to work to reconstruct the animals, had he ever had a series of Graptolites sufficient ; but there were so few good collections of these fossils, that seeing no prospect of possessing a sufficient suite of specimens himself, he had made the suggestion public at once, in order that it might be tested by those who had the means of doing so thoroughly.

Another fruitful cause of difference between the appearances of Graptolites and Echinoderm larvæ, was, that the former had all been pressed flat, into very thin laminæ, in the course of their fossilization. This made them appear, probably, broader than they would have done otherwise, and might account, in many cases, for the great number of teeth which appeared on the serrate edge, by the suggestion that two edges were brought together by the pressure, so as to appear as one, while their serratures were in such a position, that a tooth on one edge should invariably correspond to the interval between two teeth on the other. It, also, would account for the more conical and suddenly tapering form of the thorn-like process in the Graptolites, when compared with its more cylindrical representative in the skeletons of Echinoderm larvæ ; for the inequality between the diameter of the base of the process and that of its free extremity, would, of course, be much magnified, if the structure were pressed flat.

But Prof. Hall had fortunately found and figured (Pal. of New York, vol. 1st, pl. 73, ff. 2n) specimens which had, at least, not been subjected to pressure to so great a degree as completely to alter their form. These are transverse sections of Graptolitic stems, and are trilobate, like the transverse section of a rod in an Echinocidaris larva, figured by Müller, *Siebente Abhandlung,* Pl. 4, fig. 8. This trilobate section showed that the stems in some Graptolites, at least, were like the complex rods (*gitterstäben* Müll.) in Echinoderm Larvæ, composed of three parallel rods, bound together; and Mr. McCrady thought that the delicate black line, often traceable along the axis of a Graptolite of the genus Diprion, was not a central stem, but merely the edge of the third rod, of which no other part could be seen. See Pictet's Paliontologie, Pl. cviii. fig. 19, *a* and *b*. The fact that the three lobes of the section in the Graptolites were not grouped together in the same manner as in the rods of Echinocidaris, might be due to compression; or, if this arrangement were normal, it would not, in his opinion, impair the analogy.

With regard to Gladiolites, which was composed principally of a net-work structure, it was just as explicable on this supposition as on any other, and did not fall without the range of variation which might be conceived as possible for the type of structure exhibited in the Echinoderm larvæ. For net-work expansions of parts of main stems, are by no means uncommon among the latter; as, for instance, in the upper parts of the great rods in the larva of *Echinocidaris aequituberculata*, Müller's *Siebente Abhandlung* Pl. 4 fig. 2. It was quite possible that such expansions might have played a more important part in the organization of mature animals of similar type.

Mr. McCrady, in conclusion, remarked that this suggestion, if proven true, would have important results. In the first place, it would explain the analogies of the hitherto scarcely explicable embryology of Echinoderms; and in the second, it would add a new sub-order, *Graptolitidæ,* to the class of Echinodermata. If a mistaken supposition, it ought, therefore, to be disproved as soon as possible. If founded in truth, a satisfactory proof of it would enlarge our views of a remarkable class in the animal kingdom.

AUGUST 1st, 1857.

President L. R. Gibbes in the chair.

W. Wragg Smith, Esq., presented a specimen of the wood of *Pinus taeda,* colored red transversley to the concentric layers of annual growth. Also a Longicorn Beetle.

Wm. Sharswood, Esq., of Philadelphia, presented the second edition of Liebig's Agricultural Chemistry.

The President appointed Dr. J. F. M. Geddings, corresponding Secretary *pro tempore.* Dr. Geddings signified his acceptance of the appointment.

A letter of resignation from the Society, was received from Dr. Geo. S. Pelzer, which on motion of Dr. Geddings was accepted.

W. Wragg Smith, Esq., read a second part of his paper, entitled "*Flora of the Low Country of South Carolina.*" (See the note on foot of p. 224.)

Prof. McCrady communicated verbally to the Society the results of some observations recently made with regard to certain asymmetrical ciliated germs of Bolina. (See the paper on the reproduction of two species of Ctenophora published under date of Dec. 15th.)

The President stated that a memorial praying that the Museum of the College of Charleston be opened to the members of the Elliott Society had been presented by him, on behalf of the Society to the Trustees of the College; and he understood that it had been laid before the Board of Trustees.

The President also exhibited a plant, a Portulacca, on whose powers of generating Ozone he had been experimenting. Two Ozonometers one under the influence of light, the other not, during four days had suffered no perceptible change of colour.

AUGUST 15th, 1357.

Robert Hume, Esq. in the chair.

Dr. L. A. Frampton mentioned that in a recent visit to Minnesota, he had seen a specimen of an Orthoceras four feet in length and had been assured by what he had every reason to believe was reliable authority, that they had been found there twenty feet in length; not entire, it is true, but in fragments which evidently had once, together, formed an individual specimen. It was previously known to Palæontologists that specimens of certain species of Orthoceras indicated a probable length of ten or eleven feet. Dr. Frampton had been promised specimens of this Orthoceras for the Society's collection.

SEPTEMBER 1st, 1857.

President L. R. Gibbes in the chair.

H. W. Ravenel, Esq. presented, through the President, two specimens of *Brachyorros amoenus*, found near Aiken.

Dr. J. F. M. Geddings a *Scarabeus tityus*, from Bennett's Mill wharf, Charleston.

The President exhibited a variety of *Cactus* from Eding's Bay, S. C.

Lieut. Maury presented Maury's Wind and Current Charts and Gales on the Atlantic. The thanks of the Society were tendered to Lieut. Maury.

The President stated that he had procured the variety of *Cactus* which he had placed upon the table, upon the sea-coast of this State, at Edingsville. It differs from the common species, *Cactus opuntia*, in possessing joints not *ovate* in form, but *sub-cylindric;* the longest joint being about six inches long. No fruit was observed. The plant, which was prostrate, appeared to be propagated by the joints taking root where they touched the ground. Prof. Gibbes had had no opportunity of making a further examination of the plant, but called the attention of the Society to it.

He also exhibited to the Society a specimen of the *Lyonia maritima* of Elliott, brought from the same locality, Eding's Bay.

From this locality the President had also brought some specimens of rock, consisting of recent shells and sand cemented together. These were found on the front beach of Edingsville.

Prof. McCrady stated that he had recently spent a short time at Bay Point Island, at the mouth of Port Royal Harbor, S. C. During this time he had found the following Medusae:

Among Ctenophora found *Bolina littoralis*, the same species before mentioned to the Society as common in Charleston Harbor.

Also a Cydippe larger than the greater number of the Cydippe-like young of Bolina. This large Cydippe is also occasionally found in our own harbor, and may be a mature animal.

Among Discophora Mr. McCrady had seen a much injured specimen picked up on the beach, which appeared to belong to the family of Medusidae proper. It had a four cleft cross-shaped mouth, and the four lobes of the large digestive cavity in the disk were large, elongate and shaped like the broad, rounded ambulacra of Clypeaster. Round the margins of these cavities were the sexual organs. So much of the periphery of the disk as was left was occupied by numerous radiate tubes. But the whole margin of the disk appeared to have been cut off, since there were no marginal sense-bodies to be found.

Among the Hydroidea had found *Turritopsis nutricula, Dipurena strangulata, Hippocrene Carolinensis*, and a species of Eudendrium which he proposed to call *E. repens*. It was found growing upon an oyster shell brought up by a fishing line from the bottom of Moss Island creek. The main stem appeared to be creeping, giving off at intervals single branchlets, each of which bore at its extremity a rather large polyp with a single whorl of numerous tentacula. This species was quite different from the Corydendrium of Van Beneden, since it wanted the enlargement beneath the tentacula.

In the Exostome Sub-order, Mr. McCrady found *Eucheilota ventricularis* (variety with small oval sexual organs.) *Eutima mira*, and a specimen probably of *Liriope scutigera*. Also on the shell with *Eudendriun repens*, described above, was the Larva of *Campanularia noliformis*. A free swimming larva of *Cunina octonaria* through it had but a single sense-capsule to each peripheral lobe, yet had the projections of the digestive cavity towards the tentacula less pointed and the outline of this cavity more sinuous than the specimens described in his first paper on this subject; thus constituting an intermediate stage between them and the adult Cunina.

SEPTEMBER 15th, 1857.

W. Wragg Smith, Esq. in the chair.

Prof. McCrady presented a specimen of *Aglaophenia cristata*, found on Sullivan's Island Beach.

The following gentlemen nominated at a previous meeting were elected Correspondents:

Dr. JOSEPH HYRTL, of Vienna.

Dr. WILLIAM PETERS, of Berlin.

Dr. D. G. FLUEGEL, of Leipsig.

OCTOBER 1st, 1857.

Robert Hume, Esq., in the chair.

The proceedings of the Boston Society of Natural History vol. vi. pp. 209, 240, were received.

Wm. Sharswood, Esq., presented Electrical Experiments by G. W. Francis, London. Laws of the Royal Scottish Society of Arts.

A communication from Wm. Sharswood, Esq., of Philadelphia was read by the correspondtng Secretary, *On the Thermo-electric properties of Aluminum.* This paper was subsequently withdrawn by the author, in order to its being presented under a new form.

Samuel Morgan, Esq., nominated at previous meeting, was elected a correspondent of the Society.

OCTOBER 15th, 1857

Prof. H. R. Frost, presented the Dictionnaire des Sciences Naturelles, 42 tomes 8vo. Paris et Strasbourg.

Commander Thos. J. Page three charts of the survey of the river Paraguay, South America.

The President read the following paper entitled—

BOTANY OF EDINGS' BAY.

Through the politeness of one of the residents of Edingsville, I enjoyed, in August last, an opportunity I have long desired of examining the botanical and other features of the island on which stands that village. My examination was rapid, from the small portion of time at my command to bestow upon it; but the result may yet be of sufficient interest to communicate to the Society.

Edings' Bay, one of the series of islands that form the coast line of the southern Atlantic States, is not more than a mile and a quarter in length, and scarcely a quarter of a mile in breadth, lying between Botany Bay Island, on the north or north-east, and Edings' Island on the south-west, separated from each by inlets; the southern inlet being so shallow, that, at low water, it is easily passable on horseback, in vehicles, or even on foot for those who may choose that mode of travel; these three islands form the coast line between the north and south entrances to Edisto river. This island has been for many years the summer resort of the inhabitants of Edisto and the neighboring inland islands, which lie just behind the coast line; and on it are about fifty dwellings, as nearly as I could estimate or learn, occupied by probably some six hundred inhabitants. Access from it to Edisto Island is made easy by a substantial causeway, with bridges across the marshes and creek, which separate it (as is the case with the coast range generally) from the adjacent inland islands. The sandy shore surface, on the side of the ocean, has a very gentle declivity, and in consequence forms, at low water, a very wide sand beach of nearly uniform surface, and offering but few *living* shells to the zoologist; though strewed with numerous remains of dead shells, and of shells scarcely to be distinguished from the recent ones of the coast, but which, I have no doubt, are fossil washed out of the under lying post-pleiocene beds. Only after violent storms do living shells appear to be found in any abundance, thrown up by the waves. Sullivan's Island, and other of our islands, present the same broad, sandy beaches, nearly barren of *living* shells. Scattered on the beach, are found fragments of a shell rock, composed of the remains of shells and particles of sand, pretty firmly cemented together; in many cases, only the casts of the shells remain, and the shells appear to be of the same species as those recent on our coast. The siliceous, sandy particles constitute about forty per cent. of the rock, the remaining being entirely soluble in acids. These rocky fragments appear to be thrown, by the action of the waves on the beach, from deeper water, but I found no one who could give me any information with regard to the rock in situ, such as might be obtained by fragments drawn up on anchors or fishing lines; rocky bottoms, or anchorages, appeared to be well known, but the character of the rock had attracted no attention. In cavities in the rock, and also in cavities of shells attached to the rock, are found small crystals of carbonate of lime, of the form known as dog-tooth spar. I have never seen this rock on the beach of Sullivan's Island; and on the Waccamaw beaches have only found fragments of shells, containing crystals of carbonate of lime in their cavities. On the beach, near high water mark, are seen at different points, stumps of palmettos, remains of roots of cassena bushes, (*Ilex cassine*,) which once formed thickets; also barrels, indicating the site of old wells formerly used by the inhabitants. All these remains indicate the encroachments of the ocean, particularly the effects of the gale of 8th Sept. 1854, which were very severe. That gale is said to have destroyed a line of low hills, or bluff, with its covering of thickets of cassena, spanish-bayonet, palmettos, &c. which skirted the ocean, and served as a defence for the dwellings situated behind it; several dwellings are now left in a very exposed situation. The south-western extremity of the island is chiefly a sandy flat, whose appearance seems to indicate a gradual increase at this end of the island; of this point, however, the residents are more competent to judge. North-easterly of this flat, sand hills appear, but of moderate height only; the chief accumulation of sand, in the form of hills, some twenty or twenty-five feet high, being near the north-eastern end. Between these points are the greater number of the dwellings situated, near the inner or land side of the island, or back beach, along which runs a road forming a general means of communication between the different parts of the village. Adjacent to this road and to the lanes leading from it to the various groups of dwellings, is the chief portion of the verdure of the island to be found; the sand hills being tenanted by a small number of species only. An examination of the Flora of the island, made at such opportunities as a short stay of one week, and the intense heat of the last days of August would allow, furnishes the following catalogue.

CATALOGUE OF PLANTS.

Cruciferæ.
1. Cakile americana.

Hypericaceæ.
2. Ascyrum crux-andreæ.

Rutaceœ.
3. Xanthoxylum carolinianum.

Vitaceæ.
4. Vitis cordifolia.
5. " bipinnata.
6. Ampelopsis quinquefolia.

Leguminosœ.
7. Galactia pilosa.
8. Clitoria mariana.
9. Gleditschia triacanthus.

Rosaceæ.
10. Prunus caroliniana.
11. Rubus villosa.
12. Rosa levigata.

Onagraceæ.
13. Œnothera.

Cactaceæ.
14. Cactus opuntia.
15. " (new species?)

Passifloraceæ.
16. Passiflora lutea.

Umbelliferæ.
17. Daucus carota.

Caprifoliaceœ.
18. Lonicera sempervirens.

Compositæ.
19. Eupatorium fœniculaceum.
20. Erigeron canadense.
21. Baccharis halimifolia.
22. " glomeruliflora.
23. Iva frutescens.
24. " imbricata.
25. Borrichia frutescens.
26. Cnicus altissima.
27. Pyrrhopappus carolinianus,
28. Sonchus oleraceus.

Aquifoliaceæ.
29. Ilex cassine.

Sapotaceæ.
30. Bumelia tenax.

Schrophulariaceæ.
31. Herpestis cuneifolia.

Verbenaceæ.
32. Verbena urticifolia.
33. Zapania nodiflora.
34. Callicarpa americana.

Labiatæ.
35. Monarda punctata.

Convolvulaceæ.
36. Convolvulus sagittifolia.

Solanaceæ.
37. Physalis viscosa.
38. Datura stramonium.

Gentianaceæ.
39. Sabbatia gracilis.

Asclepiadaceæ.

40. Lyonia maritima.

Phytolaccaceæ.

41. Phytolacca decandra.

Chenopodiaceæ.

42. Salicornia ambigua,
43. " herbacea.
44. Salsola kali.

Polygonaceæ.

45. Polygonum aviculare.

Euphorbiaceæ.

46. Euphorbia polygonifolia.
47. " maculata..
48. Croton maritimum.

Cupuliferæ.

49. Quercus virens.

Myricaceæ.

50. Myrica cerifera.

Coniferæ.

51. Pinus Tæda.
52. " rigida.
53. Juniperus virginiana.

Smilaceæ.

54. Smilax tamnifolia.
55. " ovata

Liliaceæ.

56. Yucca draconis.
57. " gloriosa.
58. " filamentosa.

Palmæ.

59. Chamærops palmetto.

Juncaceæ.

60. Juncus maritimus.
61. " acutus.

Cyperaceæ.

62. Cyperus flavescens.
63. " ovularis.
64. Fimbristylis spadiceus.

Gramineæ.

65. Spartina glabra.
66. Cynodon dactylum.
67. Uniola paniculata.
68. Rottboellia dimidiata.
69. Setaria glauca.

Filices.

70. Pteris aquilina.

It cannot be expected that the above list represents completely the Flora of the island; but it will make a tolerable approximation to it, especially in certain families. That which is most largely represented in species, is, as might be expected, the Compositæ, which in our region is the most abundant in species. Ten species were found; *Iva imbricata* being the only one found on the sand hills. Next in number of species come the Gramineæ; of which we observed five species, to which a closer search would add a few more. *Spartina glabra,* the "salt water marsh," was, of course, found only on the back beach. The only grass on the sand hills was *Uniola paniculata,* the "sand hill grass," or "sea-side oats;" it was confined to the few sand hills near the southern end of the island, and it will probably be exterminated, in course of time, by the cattle on the island, which are very fond of it. It is diminishing in abundance on Sullivan's Island, from the same cause. Of the Cyperaceæ were obtained but three species; and it is very probable that in the search after other plants as many more species, at least, were overlooked; *Cyperus tetragonus*, found here by Elliott, did not occur to me.

Coniferæ, Liliaceæ, Rosaceæ, Leguminosæ, Vitaceæ, Verbenaceæ, Euphorbiaceæ, and Chenopodiaceæ, furnished three species each. The three species of Liliaceæ were the three species of *Yucca*, indigenous to our State. *Yucca draconis* is well known as the "Spanish bayonet," or as it is sometimes called, the "Palmetto royal;" rather absurdly, as it is not even a Palm, much less a "royal" one; it abounds on the island, and a flourishing thicket of it exists at the summit of the highest sand hill, some individuals rising eight or nine feet above the sand. *Yucca gloriosa* is not generally distinguished from the last by the residents, although it is easy to do so; the leaves of the first are more rigid and sharp pointed than those of the second, and have an edge like a fine saw, while the leaves of the second are smooth edged and of a paler green. *Yucca filamentosa* is well known as the "Silk grass," or "Bear grass," in domestic use, on account of the strength of the fibre of its leaves. One of the Leguminosæ, *Gleditschia triacanthos*, the Honey locust, was found as seedlings, apparently, in one of the lanes, and was probably introduced.

Solanaceæ, Smilaceæ, Cactaceæ, and Juncaceæ, furnished two species each, and the other families indicated, but one each. The only Fern found was *Pteris aquilina*, not rare here, nor on Sullivan's Island, in Charleston Harbor, and widely spread through our State from the coast to the mountains.

The trees of the island were only the seven following:

1. *Prunus caroliniana*,	Wild Orange.
2. *Bumelia tenax*,	Ironwood.
3. *Quercus virens*,	Live Oak.
4. *Pinus tæda*,	Loblolly Pine.
5. *Pinus rigida*,	Pond Pine.
6. *Juniperus virginiana*,	Cedar.
7. *Chamærops palmetto*,	Palmetto Tree.

Prunus caroliniana, a well known evergreen, is not rare on our sea coast range of islands, and attains great size. *Bumelia tenax* is still more common on Edings' Bay and on the other islands, and forms good sized trees. *Quercus virens* is abundant, but no very large trees were seen. Of *Pinus tæda*, and *P. rigida*, each, a single individual only was seen; the former dying, or actually dead, the last of its race on the island, as I was informed that at one time they were numerous. The remaining two aborescent species, the Cedar and the Palmetto, are the only ones that can be said to constitute the forest of the island; and the Palmettos are abundant, some rising to a height estimated at twenty-five feet.

The shrubs of the island are, also, seven in number:

1. *Xanthoxylum carolinianum*,	Tooth-ache bush.
2. *Baccharis halimifolia*,	Salt water myrtle.
3. *Ilex cassine*,	Cassena.
4. *Callicarpa americana*.	
5. *Myrica cerifera*,	Sweet myrtle.
6. *Yucca draconis*,	Spanish bayonet.
7. *Yucca gloriosa*.	

Xanthoxylum americanum, which might be reckoned a small tree, is common, and is found even on the sand hills; it is surprising that all the authors we have consulted, Elliott, Torrey and Gray, Pursh, Michaux, Nuttall, &c. except Sir J. E. Smith, and Loudon, (in the Arb. Britt.) spell *Xanthoxylum* with a Z, instead of an X, as required by the Greek orthography; a similar error, or variation, is found in *Xanthorhiza*, but in *Xanthoxylum* it is more remarkable, as ξανθος and ξυλον, the two components of the word, begin with the same letter, for which different English or Latin equivalents are used. *Baccharis halimifolia* is occasionally a large shrub, ten or twelve feet high, the largest of our Compositæ. *Ilex cassine*, with *Myrica cerifera*, constitute the thickets of the more fertile portion of the island near the "back beach," and flourish in this soil, but do not appear on the sand hills. *Callicarpa americana*, ornamented with its rich clusters of purple colored fruit, (whence the name *Callicarpa*, signifying beautiful fruit,) in whorls around the stems, was common among the thickets; this plant ranges from the sea-coast to our mountains. *Yucca draconis* is found in the thickets on the more level portion of the island, but more abundantly upon the front beach, and also in groups over the sand hills; the other species is found in similar situations, but much less abundantly.

The following climbers run over the shrubs and smaller plants, and, to a certain extent, contribute to the formation of the thickets in which they are found:

1.	*Vitis cordifolia,*	Winter grape.
2.	*Vitis bipinnata,*	
3.	*Ampelopsis quinquefolia,*	Wild Ivy.
4.	*Galactia pilosa,*	
5.	*Clitoria mariana,*	
6.	*Rosa levigata,*	Cherokee Rose.
7.	*Passiflora lutea,*	Yellow Passionflower.
8.	*Lonicera sempervirens,*	Wild Honeysuckle.
9.	*Convolvulus sagittifolia,*	Red Morningglory.
10.	*Lyonia maritima,*	
12.	*Smilax tamnifolia,*	} China Briar.
11.	*Smilax ovata,*	

Ampelopsis quinquefolia, sometimes called Wild Ivy, is regarded by some persons as a poisonous plant; it is quite innocuous, and is probably mistaken for *Rhus radicans,* the Poison Vine, from which it is easily distinguished, the Poison Vine having the leaves *trifoliate,* or by threes, while in this plant the leaves are *quinquefoliate,* or by fives together. The Poison Vine was not seen. *Clitoria mariana* was conspicuous, with its large lilac papilionaceous flowers, the largest papilionaceous flower we have. *Rosa levigata* is certainly not a native of the island, but completely naturalized. *Passiflora lutea* appeared to flourish here, contributing, with *Lonicera sempervirens* and the *Smilaces,* to form the drapery which clothed the trunks of the Palmettos which grew among the thickets; its leaves three inches wide. *Convolvulus sagittifolia* and *Lyonia maritima* were found in moister places, running over low bushes of *Myrica cerifera, Iva frutescens,* &c. the former quite ornamental with its large rose-colored, funnel-shaped flowers.

Besides *Rosa levigata,* two other introduced plants attracted attention, on account of their flourishing condition, *Nerium Oleander* well known as the Oleander, and *Tamarix gallica,* the Tamarisk; neither appeared to be naturalized. *Nerium Oleander* was found in full flower at the foot of one of the sand-hills, and partly enveloped by it about the roots; it doubtless formerly belonged to some garden, though not now within any inclosure. Its dry and sterile soil would never suggest the origin of the generic name, (from νηρος, damp,) nor enable one to comprehend Ritter's conjecture, that this was the tree alluded to in the first psalm, as "planted by the *streams of water,* which bringeth forth his fruit in due season, whose leaf shall not wither." But around the Mediterranean, its native region, the Oleander is found along the banks of streams, and in Palestine along the Jordan from the Sea of Gennesaret to the sources of the river, and further north, along the rivers of Cœle Syria. *Tamarix gallica* grew in great luxuriance, flowering abundantly, within the enclosures surrounding some of the dwellings along the back beach, apparently planted along the fences adjoining the road, by the residents, to screen their dwellings from the view of passers on the road. In its native country, Spain, the South of France, and other regions about the Mediterranean, a similar use is made of it, as a hedge plant near the sea-shore, but we have seen no tree with us at all rivalling in height those of Europe, which attain fifteen, twenty, or even thirty feet in height. It requires a sandy soil, abundantly supplied with moisture, to bring it to perfection.

Among the sand hills towards the northern end of the island, and near the front beach, is a mound of shells, chiefly the common oyster, most probably accumulated by the aborigines around their huts.

There are two wells on the island, denominated "public wells," much used by those who have no cistern. The only one visited was but three or four feet deep, excavated in a depression among the sand-hills north of the middle of the island. The water proved to be excellent, having not the slightest resemblance in taste to its briny neighbor, whose waves were rolling within a hundred yards. A pint brought with me to the city, and examined in my laboratory, yielded only a little more than two grains of saline matter to the pint, or one part in three thousand five hundred of the water, a degree of purity exceeding that of many of our city wells. It was, in fact, a nearly pure rain water, filtered through the sand.

The island called Botany Bay Island, on Johnson & Walker's map of the State, is called, on Mills' district map, Clark's Island, and on Wilson's map of the State, Tucker's Island. The most southern of the three appears to be uniformly called Eding's Island, and the intermediate one, on which is Edingsville, is called by the inhabitants Eding's Bay, "The Island" being Edisto Island. In familiar conversation, such phrases as "going to the bay," "the inhabitants of the bay," are of frequent occurrence, and from long habit such a phrase as this, "*the sea destroyed half the bay* in 1854," would not produce the least surprise.

Prof. McCrady communicated certain facts with regard to the development of a Beroe of Charleston Harbor.

These remarks have since been incorporated by Mr. McCrady in the paper published further on under date of Dec. 15th, 1857.

Members Elected.

THOMAS L. WRAGG, Esq., H. W. DESAUSSURE.
HENRY YOUNG, Esq.

NOVEMBER 2d, 1857.

W. Wragg Smith, Esq., in the chair.

A letter was read from the President, Prof. L. R. Gibbes, declining a reëlection, in consequence of his numerous avocations.

Prof. McCrady after a few remarks upon the loss the Society had sustained by this resignation, introduced the following resolutions which were unanimously adopted.

Resolved, That the members of the Elliott Society of Natural History, in unwillingly accepting the resignation of Prof. Lewis R. Gibbes, their President, regret extremely the combination of employments which has led him to decline reelection.

Resolved, That it is the sense of this Society that the manner in which Prof. Gibbes has discharged the duties of this, the highest office in their gift, is in every respect worthy of the name and character he has already established for himself among men of science.

Resolved, That, as a mark of honor, Prof. Gibbes be unanimously elected a permanent Vice President of this Society.

Resolved, That the Recording Secretary be instructed to enclose a copy of these resolutions to Prof. Gibbes, as a testimony of the gratitude of this Society for the faithfulness, as well as the ability with which he has discharged his duties and the assurance of their highest respect and consideration

Officers Elected.

President.

Dr. James Moultrie.

Vice Presidents.

Prof. Lewis R. Gibbes,
Prof. Sam'l H. Dickson,
Prof. Wm. Hume,
Dr. Edmund Ravenel,
W. Wragg Smith, Esq.

Secretaries.

Corresponding.
Dr. J. F. M. Geddings,

Recording.
W. Henry Wright, Esq.

Treasurer.

Dr. Francis T. Miles.

Curators.

Prof. John McCrady,
Dr. S. W. Barker,
Dr. J. P. Chazal,
Dr. W. Myddleton Michel,
Dr. St. Julien Ravenel,
Dr. H. W. De Saussure,
Henry W. Ravenel, Esq.,
W. Wragg Smith, Esq.,
Dr. F. Peyre Porcher,
Robert Hume, Esq.,
Dr. Gabriel E. Manigault,
Dr. L. A. Frampton.

Contributions to the Collection.

Dr. Chazal presented, from the Editors of the Mercury, a specimen of Bituminous Coal from Kansas Territory, near Atchison.

Dr. F. P. Porcher: *Squilla empusa.*

Prof. John McCrady: A Collection of Palæozoic Fossils, from New York.

Members Elected.

Dr. C. Happoldt,
Col. Allan McFarland,
J. R. Mordecai, Esq.,
Dr. D. J. Cain,
J. Barrett Cohen, Esq.,
Dr. Geo. E. Trescot.

Correspondents Elected.

Dr. Joseph Carson, Philadelphia.

NOVEMBER 18th, 1857.

President Dr. James Moultrie in the chair.

Dr. Edmund Ravenel presented, through Prof. Gibbes, a box of Shells, recent and fossil.

Contributions to Library.

Boston Soc. Nat. History: Proceedings, Vols. V. and VI., July to October, 1854 to 1857.

Wm. Sharswood, Esq., Philadelphia: Tricks in Trade, pamphlet; British Poisonous Plants.

Wunderlich's Handbuch der Pathologie and Therapie.

Dr. J. F. M. Geddings presented Godman's Natural History.

The following paper, by Wm. Sharswood, Esq., of Philadelphia, was read, entitled—

On the Preparation of Metallic Cobalt. By WILLIAM SHARSWOOD.

In researching on Physics, the investigator is frequently, at the outset, encompassed by obstacles which can only be surmounted by an investigation pertaining to a congeneric science, and consequently the progress of the one science is, in a manner reflected in the advancement of the other.

Although the present paper is to be considered as a contribution to Chemistry, it was owing to a necessity of obtaining the element for the purpose of making researches in Thermo-Electricity that the attention of the author was attracted to the subject.

The source from which I recommend the metal to be obtained is the Chloride of Purpureocobalt,* from the fact of its presenting the means by which a pure Chloride of Cobalt can be obtained with comparatively most ease and certainty.

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* *Vide.*—"Researches on the Ammonia-Cobalt Bases, by Wolcott Gibbs and Fred. Aug. Genth; Smithsonian Contributions, Vol. IX.," in which will be found that the substance which is described by M. Fremy under the name of Chlorid of Roseocobaltiaque really consists of the compounds of two distinct bases. The name Roseocobalt was retained for the radical of our salt, while the name Purpureocobalt was devised for the other. The respective formnlas are:

Chlorid Roseocobalt.......................................$5NH_3.Co_2.Cl_3 + 2HO$

Chlorid Purpureocobalt....................................$5NH_3.Co_2Cl.Cl_2$.

The formation of the Chlorid of Purpureocobalt is effected by simply oxydising the Chlorid of Cobalt with Ammonia by exposure to the air.

It is not necessary to use a pure Chlorid of Cobalt in forming the Chlorid of Purpureocobalt; any commercial oxide answering. even in the presence of arsenic, nickel, iron, and other impurities.

A perfectly pure Chlorid of Cobalt is easily prepared from this salt by heating it in a porcelain crucible until vapors of Ammonia and Chlorid of Ammonium cease to be driven off. The pure anhydrous Chlorid of Cobalt thus obtained is characterised by beauty of color, forming pale blue talcose scales.

To obtain the metal in a state of sponge, it is merely necessary to reduce the chloride by means of Hydrogen.* In order to fuse the metal, it is an indispensable precaution, to preserve its purity, that it be effected by means of the *lime crucibles* as employed by M. Sainte Claire Deville.† In connection with these crucibles, he uses a lamp of peculiar construction, in which the vapor of any liquid hydrocarbon, as oil of turpentine, is completely consumed, by means of an artificial blast of air. I am unable, on the present occasion, to reproduce the description, as it could not be rendered with sufficient intelligence without the aid of a figure. By means of this instrument the fusion of feldspar can be accomplished with facility. It has been found that the platinum metals fused in *these crucibles*, present properties very different from those heretofore attributed to them, the lime serving to deprive them of osmium and silicon.‡

As much carbon becomes mixed with Cobalt in the ordinary method of fusion, one of its characters, that of ductility, becomes entirely destroyed; and a piece of the metal thus prepared, when placed before the Oxyhydrogen Blowpipe, upon a brick, in which a groove had been cut for the purpose of obtaining it in the form of a bar, merely assumed an intumescent state, without exhibiting any tendency to enter the incision.

Since this, M. Debray has found that pure Molybdenum completely withstands the temperature, at which platinum, etc., become liquid; and that its melting point, in a crucible of Carbon before the Oxyhydrogen Blowpipe, is at a temperature at which

*The preparation from the Oxalate will be treated of hereafter.

†Annales de Chimie et de Physique, XLVI. p. 182, 1856.

‡"De quelques méthodes générales de preparation pour les corps simples." Comptes Rendus de l'Acadamie des Sciences, XLIV. pp. 672–677.

Rhodium fuses. He further states, however, that the fused mass was contaminated with from four to five p. c. of Carbon.*

With the expectation of presenting, in future, a memoir containing the results of my researches on the Physical and Chemical Properties of this element, with an enlargement of the present paper, the author has refrained from making this any other than an introductory notice.

DECEMBER 1st, 1857.

Vice President, W. Wragg Smith, in the chair.

Henry W. Carr, Esq., presented a collection of Minerals from Georgia.

Dr. J. F. M. Geddings: Ores and Minerals from Lake Superior, from the Crater of Vesuvius, and from other localities unknown; a specimen of the shell of *Nautilus Pompilius*, and one of *Tripneustes ventricosus.*

W. Wragg Smith, Esq.: *Hydnum erinaceum.*

Dr. Edmund Ravenel: European Coins.

The Corresponding Secretary read a letter from the Geological Society of Dublin, expressing a willingness to exchange publications.

An Appendix to Part First of the Flora of the Low Country of South Carolina, by W. Wragg Smith, Esq., was read. See note, p. 224.

Members Elected.

Dr. J. Julian Chisolm.
Dr. Alexius M. Forster.
Dr. William L. Moultrie.
Rev. James H. Elliott.
Richard Yeadon, Esq.
Dr. Eli Geddings.

Dr. Miles resigned the office of Treasurer.

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*Comptes Rendus de l'Academie des Sciences, XLVI. p. 1098.

Resolved, That Dr. Miles' resignation, as Treasurer, be accepted, and that he be requested to retain his position as a Curator.

Dr. Miles signified his acceptance.

DECEMBER 15th, 1857.

Vice President, W. Wragg Smith, in the chair.

Dr. Edmund Ravenel, presented Cranium of *Chelonia mydas*, from Key West.

The Corresponding Secretary read a letter from the Geological Society of London, acknowledging the receipt of the Proceedings of this Society, from November, 1856, to April, 1857. No. 3.

On the development of two species of Ctenophora found in Charleston Harbor. By John McCrady.

Plate 14.

So little has hitherto been ascertained with regard to the embryology of the Ctenophorous Medusæ, that I suppose the following observations, though not complete, will not be deemed without value:

From time to time, since the commencement of my researches in Charleston Harbor, I had observed the three following forms of Beroidea:—First, a Beroe, (much resembling the *B. punctata* of Eschscholtz, found north of the Azores,) measuring in large specimens more than two inches in length; second, a Cydippe, generally very small, but of various sizes, the largest, however, I think, never exceeding the quarter of an inch in diamater; third, a Bolina, belonging to the same type as that so elegantly figured and described by Prof. Agassiz, from Boston Harbor. The first of these, for lack of proof to the contrary, I shall consider, for the present, identical with the Eschscholtzian species *B. punctata.* To the second, I shall give no name, for reasons presently to appear; and, the third, I propose to call *Bolina littoralis*, my first acquaintance with it having been derived from the numerous specimens thrown up at some seasons upon the beach of Sullivan's Island.

In form, this species appears to me to differ from *B. alata*, Agassiz, by its greater height in proportion to its width, and, consequently, by the less expanse of its wing-like lobes. In generic type, it seems identical with that species.

In the month of May, I had several full-grown specimens of this species in my jars, and a few small Cydippe-like Medusæ, taken at the same time. After the lapse of a few days, the Medusæ remaining still very active and lively, I found the number of these Cydippe-like individuals decidedly increased; at the same time, appeared in the jar, a number of minute, ciliated animals, barely visible to the naked eye. These were submitted to the microscope, and appeared as represented in ff. 1, 2 and 3, Pl. 14, young and very small, Cydippe-like Medusæ, still smaller than those easily observed ones, also like Cydippe, which were taken with the full-grown Bolinas. One of these measured about .06 inch. in length, by about .45 inch. in greatest breadth. The profile outline was somewhat pyriform. The mouth occupy ing the less rounded extremity was proportionately large, and opened into a digestive cavity of elongated funnel-shape, tapering as it receded from the mouth. Above at its apex this cavity communicated with a rudimentary circulatory system, consisting of two broad sinuses, one on each side of the narrow transverse middle portion into which the digestive cavity opened. Each of these sinuses corresponds with the main trunk and its four horizontal branches in adult forms. Each of them, even at this stage, had on its outer side, four short pointed projections, corresponding to the four horizontal branches in the adult, and distributed like them to each of the four rudimentary ambulacra, as represented in fig. 3, 4. There were, as in the adult Medusæ, eight ambulacra, but these were very short, as represented in ff. 1, 2, containing each only from five to seven transversely arranged ciliary combs. These short ambulacra are very narrow, and are arranged in pairs two and two, and have not the equi-distant aspect presented by the same structures in the adult. The short pointed representatives of the radiate tubes, which pass off from the great lateral sinuses to the ambulacra, meet the latter rather low down, the greater portion of the ambulacrum apparently lying above them. The ambulacral or superficial vessels appeared to exist at this stage, but not to descend below the short ambulacrum; in the whole space between the lower extremities of the short ambulacra and the mouth, there was not the smallest trace of a vessel of any sort. From the upper extremities on the other hand, passed upward to the sense-capsule, (which presented no peculiarity but that of being proportionately large,) from each of the ambulacra, a whitish line corresponding exactly in position with the delicate tubes traced by Agassiz between the same points in Pleurobrachia.

To return to the large lateral sinuses, it will be noticed in the drawings (ff. 3 and 4,) that they were each somewhat quadrangular in form, one of the angles being turned towards the apex of the digestive cavity, one to each pair of ambulacra, and one to a structure not yet mentioned—the chamber of the tentaculum. In fig. 4, however, there is, as yet, no angular projection corresponding to the tentaculum, which is sessile upon one side of the triangular sinus. Each of the angles belonging to the ambulacra, gave off two very short projections, already mentioned: one of which was distributed to each ambulacrum. The fourth, which is situate between the ambulacral angles, on reaching the periphery, meets, and is partially embraced by the external depression which forms the tentacular chamber. This chamber increases in diameter as we trace it outwardly, and encloses a short tentaculum, with three or four nodose threads. The tentaculum was thus on a level, that is, in the same horizontal plane with the lateral sinuses, as is more or less the case in the species of Cydippe and Pleurobrachia.

Immediately above the apex of the digestive cavity, and at the point of junction of the two lateral sinuses, arose the ascending diverticulum of the circulatory system, which, as in adult Beroids, embraced the base of the sense capsule. The size of this structure rendered it very conspicuous. The dark nucleus within, consisted of an aggregation of spherical corpuscles of a blackish hue, which appeared to me explicable, on the supposition of high refractive power, and not as necessarily indicating pigmentary deposit. These corpuscles appeared to be not more than twelve or thirteen in number. The nucleus thus formed was covered by a very thick transparent cap, of an oblong form, having its greatest diameter in the vertical diameter of the body.

In this young stage the animal was quite lively, the cilia being in constant motion, though on account of their small number, its progress through the water was not rapid. The unvascular portion of the pyriform body, between the plane of the circulatory system and the mouth, was quite flexible, and was turned about in various directions, at the will of the animal, like the protruberant mouths of Corynidian polyps.

About the same time, and in the same jar, I found another young Beroid, larger in size and more advanced in structure, but with such a resemblance to the foregoing, that I at once associated them together, as different stages in the growth of the same species.

The body, now grown larger, was still, in the main, pyriform, but like the *Cydippe brevicostata* of Will; it had two very distinct labia, or lappets, on the oral extremity of the body, and in the cleft between them was the oral orifice. The line of this cleft is in the same plane with a line which we may suppose to connect the two tentacular chambers above, making the position of the lappets correspond to that of the wing-like expansions in full-grown Bolinas. Changes had also occurred in other parts of the body. The space between the sense-capsule and the apex of the digestive cavity had notably increased, and with it the proportionate length of the ascending diverticulum of the circulatory system. The ambulacra had progressed further downward than in the first specimens described, and with them the superficial tubes. They had, in fact, reached half way down between the position of their extremities in the first specimens and the mouth. The tentacular chambers, also, *were, relatively, lower down.*

At a later date, June 3d, I was so fortunate as to find a stage intermediate between these two. This specimen was not actually measured, but its size was, judging by the eye, about the tenth of an inch. Its general outline was still pyriform, but the mouth, though not actually bilabial, was situate at the bottom of an elongate depression, whose axis corresponded with that of the cleft between the labia in the older of the two former specimens. The tentacular chambers are still directed *outwards, not downwards*, having not, as yet, sensibly departed from the level of the lateral sinuses. The ambulacral tubes which (as will be also seen to be the case in Beroe,) in their progress downward, precede the ambulacra themselves, had not, as yet, descended below them. On the other hand, the two gastric tubes which, in the adult, descended from the centre of the circulatory system, down along the sides of the digestive cavity, to anastomose with the tortuous prolongations of the ambulacral tubes in the lobes, had, at this stage of growth, already reached the borders of the mouth. The large lateral sinuses, which were the principal portion of the circulatory system in the smaller embryo, were reduced to nothing more than the tubular junction of the circulatory canals. The ambulacral tubes, as in the case just mentioned, appeared to be continued upward to the sense-capsule at the superior pole of the animal, and here the singular oblong, asymmetrically placed area, figured by Agassiz in adult Beroids, and which was present, also, in the still younger stage, figured pl. **11**, fig. **4**, *o*, of this volume, was very distinct, and was bounded by two sets of double outlines, parallel to each other, which would be the appearance of a canal, or vessel, lined internally by a distinct membrane.

The tentacula of these specimens were all capable of being more or less stretched out after the little animal in the manner of Pleurobrachia, as figured by Agassiz. Indeed, they have, about this stage, the same form of tentaculum as in that genus, that is, a main lash, very extensile, from which depend more or less numerous lateral threads. Their motion in the water was lively, but, nevertheless, slow, on account of the small number of ciliary blades in proportion to the size of the embryo; nevertheless, they trail their tentacula more or less after them, even in these very young stages.

After these dates I took numbers of these embryos in various stages, and with the ambulacral tubes, exhibiting various degrees of descent towards the mouth. They were usually pyriform, but in one instance an almost spherical shape was exhibited, possessing, however, like the pyriform specimens, the two labial appendages, representing the lobes of the adult. The tubes which, in the adult, are prolonged to border the lobes, had, in this specimen, anastomosed, already forming thus two loops, one on each side of the mouth. The gastric tubes, also, which are the first to reach the mouth, had here begun giving off at right angles, one on each side of their inferior extremities a short ramus, which, no doubt, was designed to form the circular tube around the mouth, and eventually to connect themselves with the prolongations of the superficial tubes. The details of the development, so far as the remaining tubes are concerned, which distribute themselves in a tortuous manner, two on each of the lobes, have not been, as yet, made out on account of the pressure of other observations. In these specimens, however, the tentacular chambers had made a very decided progress towards the mouth.

Since these observations were taken, I have succeeded in raising genuine Bolina, with its large, graceful lobes, from bi-labiate embryos, like those described, and though my observations are not yet sufficiently detailed to enable me to give a full history of the growth of each part, I am yet assured that the following general statements are true:

First. That Bolina, in the course of its development, passes through a stage wherein it has the form and the tentacula of Cydippe, as distinguished from Pleurobrachia.

Second. That at first the four-branched transverse tubes, one on each side of the central chamber about the digestive cavity, have the form of two large quadrangutar sinuses.

Third. That the peripheral, or ambulacral tubes, or their representatives, ascend to the sense-capsules before they begin to develop themselves downward towards the mouth.

Fourth. That the gastric tubes reach the mouth before the superficial tubes.

Fifth. That the tentacular chambers are at first on a level with the apex of the digestive cavity, and that they afterwards gradually descend, as the animal grows, until they reach their ultimate position one on each side of the mouth.

Sixth. That the tentacula are at first capable of extending themselves several times the length of the body, behind the animal, as in Pleurobrachia, but that as they grow they lose this power, by degrees, until, in the fully developed adult, it entirely disappears. However, that it continues, to some extent, even after the large lateral lobes have reached a high degree of development.

Seventh. That the four narrow ciliated ribbons which hang near the mouth, between the great lobes, two on each side, in the adult, are the last external appendages developed, and do not appear until some time after the great lobes are recognizable as such.

I may add here, that it is probable that but a short time only elapses between the discharge of the ovum and its assumption of the form of figure 1, Pl. 14. What changes intervene I have not been able, so far, to discover.

In a later month, (October 3d) I found in my jars two embryo Ctenophores of a quite different appearance from the young of Bolina. They were more elongate, and broader at the mouth than the latter. Their ambulacra, confined as in the Bolina embryos, to the upper portion of the body, were continued almost to the sense-capsule, around which a few of the dendritic yellowish appendages of the superior pole of the body, known in adult Be roes, were already sprouting. Scattered over the outer surface also but thickest upon the upper portion of the body, were the brown pustules, which are so conspicuous in that species of our harbor, identified for the present with the *Beroe punctata* of Eschscholtz. The chief distinction between these and the Bolina embryos, however, was the *complete absence* of any trace of tentacula, or tentacular chambers.

The bi-labial mouth of these specimens was like that of Beroe, and the labia were broader in proportion to the breadth of the animal than in the Bolina embryos. Their motion, also, in swimming was much more rapid.

The condition of the circulatory system was quite different from its condition, either in the adult Beroe or the embryo Bolina. Above the digestive cavity was a single large octagonal cavity like the digestive cavity of the young Cunina larva. The eight points of this were distributed, one to each of the ambulacra. This cavity, of course, corresponded to the two sinuses of the Bolina embryo, and to the symmetrical apparatus of branched tubes in the adult Beroe. The gastric tubes had already descended to the margin of the mouth, where already existed a marginal tube, but this latter was confined to the labium to which it belonged, and did not anastomose with the corresponding tube of the opposite side. On the other hand the marginal tube on each side anastomosed at each of its two extremities with one of the two superficial tubes which approached the angles of the mouth on that side. The two tubes intermediate between these, had not progressed more than half way down the length of the animal's body, and as in Bolina, all the superficial tubes outstripped the ambulacra in the rapidity of their growth downward. In these embryos, which were unmistakeably the young, either of *Beroe punctata,* or of some nearly allied Beroid, the tubes were all very much broader than in the Bolina embryos, and instead of being grouped in pairs were equi-distant from each other. Unfortunately these specimens perished before further information was obtained from them. I will, however, notice a few peculiarities which may lead to their recognition at some future date. The labia were bordered each by a very distinct rather broad yellowish band. On each side of the sense-capsule, at the superior pole, were two dark pigment spots. The ambulacra were capable of being entirely retracted and covered by the inter-ambulacras areas which would meet over them. The motion in swimming was very brisk and lively. The digestive cavity, as in Beroe, was very broad at the mouth, narrowing as it proceeded inwardly, and not very far from the oral extremity appeared to form another circular aperture, narrower than the external mouth.

Though these specimens did not complete their growth, and thereby demonstrate their specific relations, yet I think that the main facts of their condition at this stage, with the exception of the absence of tentacula, are in accordance with the facts recorded of the development of Bolina. They are these. That the embryo very early assumes the Beroid form. That the central portion of the circulatory system above the digestive cavity is, at first, lacunar in form. That the zone wherein this central portion encounters the extreme surface of the animal, is the zone whence the development of the external surface and the structures connected with it begins. That this development is first directed upwards towards the sense-capsule at the superior pole of the body, and that it is not until later that it begins to direct itself to the lower pole. That the gastric tubes precede the superficial tubes in development—that all the latter precede the ambulacra more or less in their progress downward—and that of the four superficial tubes belonging to each side of the body, the two which approach the angle of the oral cleft, precede in their downward progress the other two which are interposed between them.

These facts agree with those obtained by Joh. Muller, at Trieste, and by Kolliker, at Messina. In fact, the latter author (Wissenchaftliche Zoologie, vol. iv. p. 318,) has described a younger Beroid than any which I have seen; for he says, that while it possessed a mouth, digestive cavity, sense-capsule, and eight (paired) rows of ciliary blades, it was entirely without any trace of the circulatory system, with the exception of the single ascending tube, which proceeds from the summit of the digestive cavity to the sense-capsule, at the superior pole. That it wanted tentacula, does not show necessarily that it was extremely young, for it is probable, from my observations, that Beroe never has any trace of tentacula.

It is also probable, that these observations will considerably reduce the number of species and genera of Ctenophora, where these have been created for minute specimens. It is, I think, probable, that both the species of Eschscholtzia, described by Kölliker, as well as his genus Owenia, are only young stages of perhaps known adult Ctenophora. The *Cydippe quadricodstata* of Sars, is not improbably, the young of his *Mnemia Norvegica*, and is characterised by the unusual proximity of its paired ambulacra, giving the appearance of four, instead of eight. The *Cydippe brevicostata* of Will, is, perhaps, the young of *Eucharis multicornuta.**

Another class of facts connected with the multiplication of individuals among Ctenophorous Medusæ, has been presented to my attention from time to time in a somewhat disconnected manner. These facts appear to indicate a peculiar kind of fissiparition, and are principally as follows:

I had repeatedly observed, that in tolerably active full grown Bolinas, there occurred, under conditions which I do not profess to understand, a sort of shedding of the ambulacra—a tendency of the outer surface to break up into small fragments, which certainly did not at once lose their vitality. During the exhibition of this phenomenon, also, the original animal did not appear to lose its own vitality for some time, and its subsequent death, which, so far as my observations went, always took place, has appeared to me to be rather due to the adverse circumstances by which specimens in captivity removed from the sea, are always rendered more exposed to the chances of dissolution, than to the dismemberment to which by this process they were subjected. The fragments thus liberated, were usually portions of the ambulacra, varying in size, but which immediately assumed a spontaneous motion of their own, the blades remaining in full activity.

A fragment of the ambulacrum thus separated, contracts, upon the side opposite that which bears the ciliary blades, and revolves with an excentric motion. They vary greatly in size, according to the length of ambulacrum separated in each case, and also according to the size of the original medusa from which they came. Some have been so large as to be very conspicuous objects, while others have been barely visible to the naked eye. The large examples I have never seen to pass through any changes in my jars—but I think it will he apparent, in the course of what I will relate, that this is probably attributable to the contracted sphere to which they were confined, from which death speedily ensued both to the original medusa and its dismembered parts.

On one of the dates mentioned above, however, when I was

*With deference to the memory of Will, I suggest that the position of the cleft between the labia, in his drawing Plate 1, fig. 16, is an error, since it is not in the same plane with the line of the tentacula, but at right angles to it. Such an error may have resulted from the appearance of a specimen under compression.

searching my jars for Bolina embryos, I encountered some very minute fragments of this sort, which, from a combination of favorable circumstances, underwent a portion of their changes under my observation. Among the smallest and least developed of these, was the specimen figured Pl. 14, fig. 8. It was at first little larger than the largest ova seen in the tubes of Bolina, and of an avoidal or irregularly spherical form. On one side was a portion *a* of the parenchyma of the original animal, which bore two parallel rows of cilia, four in each, *c*. These cilia appeared to be as long as those of the smallest embryos described above.

The opposite side *t*, and the mass of the organism, were at first perfectly transparent, but soon began to assume a granular appearance. This side *t* began to assume a somewhat conical form. Next on each side of this cone indistinct points and projections appeared, four or five on each side.* Under this form the animal revolves very freely, stopping now and then for a few moments, as if to rest. Soon the conical sides began to be separated from the ciliated side by a constriction, which gave it a bi-lobular appearance. The points and projections *t* have shortly after this been replaced by two more or less long tentacula, and the organism has the form represented in fig. 13. These tentacula were extremely like those of the embryos of Bolina, and were composed throughout their length of nodes which may have represented contracted lateral threads. The organism swam freely, extending or contracting its tentacula at will, sometimes carrying one of them extended, and the other contracted. After this the size increased, but so great was the transparency of the organism, and the difficulty of defining its outlines, that great doubt remained on my mind of the accuracy of the following details. Apparently, that portion which supported the tentacula (fig. 13, *e*,) became greatly enlarged, and began to protrude beyond them as in fig. 14, *e*, thus causing the tentacula to appear relatively closer to the constriction which first appeared, separating them from the ciliated lobe of the embryo. Next this lobe *e*, fig. 14, enlarged and appeared to become divided into two other lobes, (*d* and *e*, fig. 10,) by a constriction *p*, in which appeared to be situated the tentacula. And these tentacula now appeared to be composed of two threads instead of one, as at first. The lobe *d*, next appeared to be divided into two lesser lobes by a constriction, whose plane was at right angels to the plane of the

*Compare this with Will's figure Pl. 1st, fig. 7.

constriction *p*. As will be seen from the figures, the lobe *e* was greater than the double lobe *d*, and in neither of them could I make out any indication of the formation of internal organs. But it is possible that such were in course of formation, for I was unwilling to use any means for reducing the organism to quiescence, which might have resulted in their death since, with ciliary blades and tentacula of the type of young Bolinas, they were yet very far from the Ctenophorous form, and I wished, if possible, to trace their further changes. All of these described occurred within the space of three hours about midnight, and the next morning these interesting specimens were dead. While under examination, their great restlessness and transparency rendered it impossible to make out any thing with certainty, in regard to their internal structure. The only appearance which seemed to have connection with this, was the appearance of a cavity immediately under the ciliary arc, (ff. 8, 11 and 12 (?) *s*.) This, perhaps, was a portion of the ambulacral tube of the original animal.

Since these observations were made, however, I have frequently found small asymmetrical Bolinas, usually with one side tolerably well developed, while the other had its parts just sketched out. These would gradually develope themselves in my jars to perfect symmetrical Bolinas. And I think that they, likewise, are individuals developed from previously existing Bolinas by fission, and that they constitute a stage subsequent to those figured Pl. **14**.

From the observations hitherto made it appears that the development of the Ctenophorous medusae is an homogony, and that the embryo early assumes the form of the youngest stages of hydroïd larvae, passing directly from this into the form of a Ctenophore Does this embryological history then skip over the types of Hydroid and Discophorous Medusae? Certainly, to all appearance, the campanulate, or umbrella, or watch-glass shape of these lower medusae is never presented, and the homology of parts has been so difficult to trace between the two groups of Ctenophora and Discophora, that a very able European Naturalist, Vogt, was led to consider them altogether distinct, and removed the Ctenophora to the under-kingdom of Mollusea. It appears to me, however, that the embryology of these medusae confirms a suspicion which I had before entertained of their homologies, viz: that they hold to the Discophores a relation as to homology, very similar to that which Echini proper and Holothuridae hold to Star-Fishes. This homology between Echini and Asteridae has been very ably shown by Prof. Agassiz.

To understand this homology we have only to imagine a Discophore with a very short digestive trunk or none at all, that is with the digestive cavity in the disk. If now we suppose the outer or upper surface of the disk to be very much contracted, in fact reduced to a mere oblong area on the top of the body of the animal, while at the same time the inner or under surface of the disk or bell is very much developed, and instead of remaining concave becomes convex, and covers nearly the whole external surface of the animal; it is obvious that by such a change the margin of the disk would be carried upwards, and being contracted at the same time, would at last appear as a small circle, surrounding the superior pole of the body; with the margin, would be carried upwards all the marginal appendages, such as the sense-capsules and the tentacula or their representatives. Now such appears to be actually the case in Beroe. For its sense-capsule at the superior pole is so little different in appearance from the marginal capsules in the Discophora that the resemblance must have struck every one conversant with the three orders, and it is by no means impossible to suppose that the short more or less branched appendages of the oblong area in that genus, are the homologues of structures in the lower Medusae. For in several genera among Discophora, besides the tentacula proper, the margin of the disk is fringed all round with short appendages. In *Cyanea ferruginea,* Eschscholtz has represented them (pl. 5, fig. 1a. Acaleph,) as more or less arborescent, which seems to be their tendency morphologically. But Huxley has described particularly the peculiar heart-shaped area, situate just above each of the sense-capsules in Rhizostoma, (Phil. Trans. 1851 and Annales des. Sci. Nat. 3me. Ser. vol. xv. p. 337.) Of this structure he remarks that "La surface proémine sous forme de plis arborescents, et tres abondamment ciliés.' The same expressions might be made use of to describe the elongate area in Beroe, with the exception that the arborescent appendages there are confined to the margin of the area. But we should also expect that the direction of the tubes which radiate from the centre towards the periphery in the lower medusae, should follow the tentacular margin upwards, and hence their direction changed from a more or less horizontal to a vertical one. And accordingly we find in the embryo described by Kölliker, that the first tube developed in the young Beroid is the vertical one passing upward from the central chamber of the circulatory system to the sense-capsule at the superior pole.

Here we are met by a seeming difficulty in the great reduction in the number of parts which are numerously represented in the lower groups. There is but a single sense-capsule in the Ctenophora to correspond to the eight or more of the Discophores. There is, likewise, but a single vertical tube to correspond to the typical four in the lower groups. While among Beroidae, the appendages which we have spoken of as representatives of tentacula, disappear altogether. But it should be remembered that such reduction of the numbers of similar parts is common in passing from a lower group to a higher one in the animal kingdom. Solaster has numerous ambulacra, and Crinoids have divaricate ones, yet they are all homologous with the five ambulacra of Spatangus, or Echinus. It must be acknowledged, however, that if this homology be the correct one, the reduction of numbers in the case of the sense-capsule and the vertical tube, is remarkably great.

In regard to the remaining parts, with the exception of the digestive cavity, this view of the homologies of medusae would lead us to suspect that they have no immediate homologues among the medusae of the lower orders. Such are the two main lateral divaricate horizontal trunks of the circulatory system, the gastric tubes, the ambulacral tubes and the ambulacra themselves, besides the tentacula of Cydippidae. With the exception of a portion of the ambulacra and the tentacula of Cydippidae, whose time of development is uncertain, it is known that these parts are developed after those which I have attempted to homologise with the parts of the lower medusae. It is possible, therefore, that they are peculiar altogether to the Ctenophora and belong to a different order of things from that which is exhibited in the Discophores and Hydroids; that they are special structures, whose appearance is connected with the vast development and bulging out of the lower portion of the disk. The tubes, therefore, of this part of the body and the tentacula of Cydippidae, would, in this view, be only *serially* homologous with the radiate tubes and tentacula of Discophora and Hydroids, while the ambulacra of ciliary blades*

*Kölliker's notion that they are homologous with the cilia of the planule, appears to me inadmissible, since, according to my view, they belong to the homologue of the inner surface of the bell.

may, perhaps, be altogether without representatives in the lower orders. Two circumstances connected with these parts, however, deserve special notice. One is that the ambulacral tubes, or their representatives, and the ambulacra find a connection with the area of the sense-capsule before they stretch downward toward the mouth. This shows that the area in question at the superior pole of the body is the point towards which even the serial homologues of the radiate tubes tend, a fact which strengthens the notion that the periphery of this area is the homologue of the disk margin in the lower medusae. The second is that this explanation of the homologies leaves no longer any discrepancy between the position of the sexual organs among Discophores and Hydroids, and its position among Ctenophora. For in both they are situate beneath the external tissues of the same surface, which is within the bell or disk-cavity, among the Hydroids and Discophores, and therefore concave, but which is convex and external among Ctenophora.

At the same time if we carefully scrutinize the morphological tendencies of the Discophora proper, it will be seen that the circular tube exhibits a constant tendency to be lost in a labyrinth of interlacing tubes around the digestive cavity. And that, in this order, the marginal capsules and tentacula are no longer sessile upon the circular tube, but are provided with special radiate canals, which stretch between the circular canal, or its homologous plexus and the margin of the disk, where each of these canals divides into two more or less short blind branches which embrace the base either of a sense-capsule or a tentaculum, or of a fasciculus of tentacula. Again—we observe that the tentacula continually tend to shift their position to the under side of the disk. It is, therefore, possible that the large central sinuses in the young Ctenophores represent the whole circulatory system of Hydroidea, including the circular marginal tube, and that all their radiate tubes (not their superficial tubes,) are homologous with that portion only of the radiate tubes in Discophora, which stretches externally to the circular tube, from the latter to the margin. The peculiar forked termination of these tubes is the same in both Discophora and Ctenophora, so far as those of the sense-capsules and tentacula are concerned. And it should be remembered that those of the ambulacra, which in the young are paired, do at this stage present the same bifurcate tendency as those of the tentacula. Their branches, however, afterwards separate so far as to appear as independent tubes. I have not mentioned that the anal pores of the Discophora belong to this same system of tubes, which may be thus homologised with the two anal pores, one on each side of the sense-capsule in Ctenophora.

How does it then happen that these tubes which, among Discophora, belong, as it were, to the same horizontal plane, are among Ctenophora so variously directed, one ascending perpendicularly towards the sense-capsule, two descending towards the mouth, (where, like the rest, they bifurcate,) and four or six directing themselves horizontally, at least, at first? How does it occur that, of all of them, only a single one ascends towards the homologue of the margin of the disk in the lower orders? This would be a great difficulty in this explanation, were it not that we have an evident tendency among Discophora to the distribution of the marginal capsules, and the tentacula upon distinct though concentric circles. And, also, it should be remembered that the anus, which among Asteridæ is dorsal, appears among Echini proper frequently in the inter-ambulacra, belonging to the lower surface, and sometimes even is extremely near the mouth. This shows that the arrangement of internal systems of organs is not wholly dependent upon the arrangement of the external surface. And because the upper surface of the Medusa, among Ctenophora, is reduced almost to nullity, and confined to the upper pole of the body, is no reason why some of the radiate tubes should not preserve their old horizontal position.

In the Order of Ctenophora there appear to be two sub-orders, distinguished by the presence or absence of tentacula.* Thus tentacula which are so conspicuous in Cydippidae, and are found also in a large number of allied genera as Pleurobrachia, Mnemia, Bolina, Eucharis and Cestum, appear to be entirely absent in Beroe and Medea, if the latter be not the young of Beroe. This distinction appears, as I have related above, at a very early age; for I have not yet seen any stage of Bolina so young as not to possess tentacula, yet embryos of Beroe, not much older than the younger stages of my Bolina embryos, possessed no vestige of them. It is probable, therefore, that this is a fundamental embryological distinction between the two groups. It is worthy of note, also, that it is the Beroidae which possess the appendages of the area around the sense-capsule, and that these, so far as I am

*Had Eschscholtz been aware of the fact that *Mnemidae* possess tentacula, he would probably have united them with his Cydippidae; for it is only on this ground that he separates them.

acquainted with the writings of authors on the Ctenophora, are entirely absent among Cydippidae. If the development of all the Beroid genera be like that of *Beroe punctata*, as I have partially observed it, there is also another distinction between the two groups in the earlier forms of the centres of the circulatory system. For in the embryo of Beroe I found this to be a single large octagonal cavity, above the digestive funnel; whereas, in Bolina, it consisted of three inter-communicating sinuses, a central one marked *m*, in fig. 5, pl. 14, and two lateral sinuses, marked *a*, in fig. 4, of the same plate. In the adult Beroe, also, there is an apparatus of many tortuous horizontal tubes inter-communicating between the vertical ambulacral tubes. Now no such apparatus has been traced, so far as I am aware, in any Cydippidae, and indeed I am led to think, by my own observations, that they appear very late in the growth, even of Beroe. It would be interesting to know whether this difference is also constant for the two groups.

What I may call the morphological tendencies also of the groups is different. Among Beroidae there is a tendency to an elongation of the vertical axis, while the reverse is the case among Cydippidae, where lateral dilatation is the manifest tendency, as in Bolina and Cestum.* It is the superior pole of the body also in Beroe which exhibits complexity in its structure, while among Cydippidae this pole is comparatively simple and the sides of the body, on the contrary, have a marked disposition to assume complex forms. A further knowledge of these differences will probably result in the establishment of two sub-orders in the group of Ctenophora, viz: the Cydippidae and the Beroidae proper.

If the view of homologies herein suggested be correct, the Beroidae would constitute the higher group. For in them the tentacula have disappeared, the area of the sense-capsule become more complicated and the superficial system of tubes has taken on a much larger development. The tentaculum appears in fact to be a badge of inferiority. It exhibits a great numerical development among the members of the lower orders, and it is most developed in Cydippe and Pleurobrachia, the lowest genera among Ctenophora. It gradually dwindles away among the higher genera of the group of Cydippidae, and at last entirely disappears among Beroidae. The more complicated condition of the sense-capsule

* This difference may be, to some extent, analogised with that which obtains between the tendency to *dilatation* among Echini and the tendency to *elongation* among Holothuridæ.

among Beroidae, also would constitute an analogy with its complexity among Rhizostomidae. While the development of intercommunicating tubes between the vertical ones, would be a further development of a peculiarly Ctenophoran system. Also, if we reason from analogy with Echinoderms, the tendency to dilatation among Cydippidae is a sign of lower type than the tendency to elongation among Beroidae. Thus both type and structural complexity would combine to make the Beroidae a higher group than the Cydippidae.

EXPLANATION OF PLATE 14.

Fig. 1 *to* 5.—Very young embryos of *Bolina littoralis.*

Fig. 1—View with the tentacula in profile.

c, the ambulacra.

d, the digestive cavity.

m, the mouth.

s, the sense-capsule.

t, the tentacula.

Fig. 2—View with the tentaculum turned towards the observer. Letters the same as in Fig 1.

Fig. 3—View from above.

a, one of the lateral sinuses of the circulatory system. The other letters as above.

Fig. 4—View from above more magnified than the last.

b, tentacular bulb; the lash is not figured.

h, the external depression or chamber in which the tentaculum is situated.

o, the elongate area, connected with the sense capsule.

p, the pointed projections of the wall of the lateral sinus *a*, which go to meet the ambulacra. These projections did not appear to be yet tubular at this stage. The other letters as in fig. 1 to 3.

Fig. 4—View from the side: the tentacula, if figured, would have been seen in profile as in Fig. 1. The letters *d* and *s* as in the preceding figures.

g, g, incipient gastric tubes, just beginning to bulge downwards from the central sinus of the circulatory system *m*.

l, point where the lateral sinus approaches the surface to meet the ambulacra which are not figured.

m, part of the lateral sinus.

Fig. 6—Magnified view of a portion of an ovary of *Bolina littoralis.*

a, external membrane or cuticle which supports,

c, ciliary blades.

m, muscular (?) masses.

o, ovary in which the ova are seen crowded together.

t, ambulacral circulatory tube.

r, subjacent tissues.

Fig. 7 *to* 14—Illustrating the fissiparition of *Bolina littoralis.*

Fig. 7—Very young product of fission, without cilia.

a, portion of the cuticle. See fig. 6, *a*.

t, tentacular knobs beginning to sprout.

Fig. 7, *a*—Another smaller fragment, in which no further changes were observed.
Fig. 76—A ciliated fragment in repose, with its cilia at rest.
Fig. 8—Another specimen, scarcely older than fig. 7, but possessed of eight ciliary rows in four pairs.

c, *a* and *t*, as above.

s, appeared to be a small cavity beneath the cuticle, *a*.

Fig. 9–14—Further advanced embryos, for which the following are the letters:

a, the cuticle.

b, the constriction, in which are situated the tentacula.

c, the ciliary blades.

d, the smaller lobes.

e, the greater lobe, which is developed before *d*.

f, the constriction, which separates the lobe, *d*, from the ciliary prominence.

g, the outline of the lobes, *d* and *e*, as seen in one of the specimens, when the tentacula were in profile.

h, constriction, in which were placed the tentacula; perhaps identical with *b*, ff. 9 and 10,

r, root, or point of attachment of

t, the tentaculum.

s, appearances which may have been produced by a cavity within.

The figures, 9 to 14, are not numbered in the order of their age. Ff. 11, 13, and 14, are younger than 9, 10, and 12. Fig. 11 is a view from above; the cilia being turned towards the observer. Ff. 13 and 14, are views from the side of specimens, whose lobes, *d* and *e*, are not yet developed. In fig. 13, the tentacula were composed of single threads; they are double in all the other figures. Fig. 12 is a side view, in which the tentacula are seen in profile. Ff. 9 and 10, are views from the side, (with the tentaculum turned towards the observer,) in which the lobe, *d*, is developed.

Members Elected.

Hon. EDWARD FROST.
ROBERT H. LUCAS, Esq.

JANUARY 1ST, 1858.

Robert Hume, Esq. in the chair.

J. Randolph Mordecai, Esq. presented some specimens of rock, obtained as ballast, from Palma, containing impressions of shells.

Prof. John McCrady presented a small collection of Pleiocene Fossils from Wilmington, N. C. containing some specimens of Acephala, Gasteropoda, and a species of Oculina, *Oculina palmata?*

J. R. Mordecai, Esq. a number of Fossils from the Pennsylvania Coal Measures.

Contributions to the Library.

Mercury Office: Patent Office Report, (Agricultural,) for 1856.

Boston Society of Natural History: Proceedings, Nos. 16, 17. Vol. VI.

Commander Thos. J. Page: Tract Survey of River Paraguay; three charts.

Members Elected.

Rev. R. S. Baker, Henry L. Johnson, Esq.
Geo. A. Gordon, Esq. Plowden C. J. Weston, Esq.

JANUARY 15, 1858.

Vice President, W. Wragg Smith, in the chair.

Editors of Charleston Mercury, presented, through the Elliott Society, to the Museum of the College of Charleston, specimens of Lead Ore, from Cameron's Mine, Spartanburg District.

Prof. McCrady made some remarks on the spontaneous fission of the young of *Actinia cavernosa*. See p. 275.

Prof. L. R. Gibbes made the following remarks, "On the representatives of the genus Cactus in this State."

Elliott, in his Sketch of the Botany of South Carolina, says, under *Cactus opuntia*, that, it is probable, there are now three distinct species on the sea-coast covered under this name, but but neither he, nor any other botanist, appears to have paid any close attention to them. In excursions during the past year, I have had the genus in view, and have endeavored to collect its representatives; and now lay on the table four, if not five, distinct forms, obtained within a few miles of Charleston—possibly four distinct species.

1. The first, which we will call *Opuntia tunoidea,* falls under Engelman's sub-genus Platopuntia, section Grandes, is erect, or sub-erect, with large ovate joints, armed with yellowish spines, tipped with brown, about three-quarters of an inch long. The flowers and fruit we have not yet procured. The plant is

infested with a cochineal insect, covered with a white tomentum. 2. The second, which we will call *Opuntia macrartha*, falls under the same section with the preceding, and seems to be near *Opuntia angustata*, of Engelman, from the west of the Rio Grande; a prostrate species, joints from ten to fifteen inches long and three inches wide, one-third of an inch thick; no spines, fruit two and a half inches long, slender, clavate. 3. The third species is *Opuntia vulgaris*, the *Cactus opuntia* of Elliott, and others, common throughout the State. 4. The fourth, which we will call *Opuntia frustulenta*, probably falls under Engelman's section, Xerocarpeæ, of the same sub-genus; plant prostrate, joints subcylindric, two to six inches long, armed with spines, white, three-fourths of an inch long, large for the size of the plant, joints separating readily. This species seems to be near *Opuntia fragilis*, Haworth, *Cactus fragilis*, Nuttall, from Upper Missouri. It has been found so far only on the sea islands, and is well known to their inhabitants, who call them *Dildoes*, and say that they have never seen them flower. This is the form exhibited to the Society on the 1st September last.

Correspondents Elected.

Oscar M. Lieber, Esq. R. W. Habersham, Esq.

Members Elected.

A. H. Boykin, Esq. J. F. Bussell, Esq.

FEBRUARY 1st, 1858.

Vice President, W. W. Smith, in the chair.

Dr. H. W. DeSaussure presented from John M. DeSaussure, Esq. of Camden, a nodule of iron ore found in clay, 30 feet below the surface; similar nodules found on the surface; a specimen of fossilized wood, fossilized by iron; and a specimen of pine-wood, discolored by an iron nail, which had been driven into it years since.

Prof. L. R. Gibbes mentioned that he had deposited in the Society's collection ten species of corals from our southern coast, and twenty-four species of Echinoderms, chiefly from our southern coast. The Professor laid on the table living specimens of *Tillandsia recurvata,* from Florida, an air plant, growing there on trees like its congener *Tillandsia usneoides,* the long moss of our own region. Also, specimens of the fruit of the *Bertholletia excelsa* of South America, enclosing the seeds — the well known Brazil nuts of the shops.

Prof. McCrady exhibited specimens of Actinia, from Lynn, Mass.

He also presented the following Hydroids *Pennaria tiarella,* (Globiceps tiarella, Ayres;) Charleston Harbor.

Dynamena cornicina, Charleston Harbor.

Aglaophenia cristata, Charleston Harbor.

Eudendrium ramosum, Charleston Harbor.

Contributions to Library.

Wm. Sharswood, Esq. presented Lehrbuch der Chemie D. Benjamin Scholz.

Natural Curiosities in the Environs of Malham, in Craven, Yorkshire. Thomas Hurtley.

Syllabus of Chemistry. Prof. E. Solly.

Address before the Geological Society of London, Feb. 19th, 1857. Leonard Horner.

Catalogue of Library of Pennsylvania Horticultural Society. 1856.

Address before the Alumni of the University of Pennsylvania. 1856. Hon. Geo. Sharswood.

Cryptogamia. Harland Coultas. 1853.

A letter was read from the Boston Society of Natural History, acknowledging the receipt of the last number of the Proceedings.

FEBRUARY 15th, 1858.

Vice President W. W. Smith in the chair.

Prof. John McCrady deposited in the Society's collection a specimen of *Aglaophenia pelasgica,* which had been lent him by Dr. Ed. Ravenel.

Instance of incomplete longitudinal Fission in Actinia cavernosa *Bosc.* By John McCrady.

I will present what I have to say on this subject by extracts from my private journal as follows:

Jan. 13th, 1858—Saturday last, (9th ult.) I collected, on Sullivan's Island, some young specimens of *Actinia cavernosa* Bosc; I think them not more than six months old. They are of a rich green, lighter than that of the adult, with amber-colored tentacula, smooth exterior, and semi-transparent parieties; in the smaller specimens, the tentacula are sprinkled with white. Yesterday, I observed that the base of one of these smaller specimens, which had climbed near the top of the jar, had assumed a dumb-bell like outline, and to-day I find that spontaneous fission has proceeded so far longitudinally that two distinct individuals are nearly formed; the cavities of their bodies being still in communication, by means of extensions of the walls of the body, which though very much strained, have not yet parted; thus forming a kind of tube, which, however, appears to be open below by a slit extending from centre to centre of the two partial bases thus formed. The tentacular circle, and its area, were, also, divided into two tufts, one of which was larger than the other. I could not discover whether the smaller of these had, or did not have, a mouth. But the bases of the two separating individuals already begun to assume the circumscribed circular outline. The separation of the parts of the base appears almost complete, while that of the parts of the tentacular crown is only indicated. This shows that the fission, in all probability, begins at the base.

Jan 14th.

BASE.

BASE. Jan. 13th. PROFILE.

Jan. 14th.—To-day, the parts of the base were less strained apart the connecting bands had disappeared, but the two partial bases were less circular in outline than on the day before. However, their centres of radiation, though more eccentric, were more entirely disconnected with each other than yesterday; and the bodies of the two incipient individuals appeared to be connected only near their upper parts. In fact, the process of fission seems to begin below, and gradually to progress upward; it is the bases which are first separated, and the process there begins by the Actinia's stretching out its base in an oblong form, if I am to judge by the condition of some specimens, wherein I think fission is about to begin. In one such instance, I remarked, to-day, that the centre of radiation was much elongated, while the tentacular crown was still undivided. Sometimes, however, in such cases, the tentacula on one side of the circle are unusually crowded together, while those occupying the remainder of the circle are expanded nearly as they ordinarily are. In consequence of this habit of the tentacula in the specimens exhibiting these phenomena, I have been uniformly foiled in endeavoring to ascertain whether two mouths were formed simultaneously with the two bases. In one unusually large specimen, however, I observed that what must have been the original mouth of the polyp, was unusually elongated in the same direction as the base. Even in specimens where the process had proceeded to the separation of the bases, I was unable to decide this point. I am inclined to think, however, from what I have detailed above, that the plane of fission does not pass through the central longitudinal axis of the cylindrical body, but a little on one side of it, and by this means a corner only of the mouth, and only a small portion of the stomach, ovarian cavity and circulatory chamber, may be cut off by it; that is, the new individual may be less than one-half of the original polyp.

Jan. 16th.—Observed, yesterday, (15th ult.) that in one specimen (the most advanced), fission had proceeded no further than to divide the tentacular crown into two more nearly equal, but still incomplete circles. Another specimen exhibited the condition described under former dates. Others exhibited gradual elongation of the base, one of them to an extraordinary degree; but the specimen being attached to the nearly opaque frond of *Ulva latissima,* I could not see from beneath how far the fission had proceeded.

A specimen, which, to the best of my recollection, was nearly round at base yesterday, to-night (16th inst.) exhibited a longitudinal constriction which did not pass through the axis of the cylindrical body, and which tended to separate a new individual very small in proportion to the original polyp. I have never seen the plane of constriction or fission pass through the axis of the body, but always on one side of it. Yesterday, (15th ult.) observed that, as I had surmised, the central or ovarian chamber, has its transverse axis elongated in the same direction as the base before division.

It must be borne in mind however, that in no instance have I seen two individuals actually formed by separation. Though the process has been going on ever since the 13th ult., having begun, indeed, on the 12th, in the specimen first noticed, it is not yet complete. Nevertheless, in that specimen, the two parts of the base have become very distinctly separated, and the appearance of separation into two parts is very distinctly exhibited in the tentacular crown.

Jan. 18th.—In the oldest case of fission observed, the formation of two perfect bases had so far progressed that the centres of radiation for each of them, which had hitherto been excentric, in relation to the circular outline, had now become central for each of the partial bases. At my last observation, these two centres of radiation were decidedly out of the centres of their respective circular bases, being the result of the division into two of the centre of radiation of the base of the original polyp.

Jan. 30.—My young *Actinia cavernosa,* first mentioned as undergoing spontaneous fission, has apparently occupied all this time in forming two new bases. The centres of radiation are now, also, the centres of the circular bases; still the process of fission does not seem to be complete—two scar-like seams still stretching from base to base.

Not long after the dates of these extracts, the young Actinias died—*without* completing the process of division into two. From time to time I occasionally saw two small specimens near each other, as if they had but lately broken apart, but I never had the good fortune to observe the actual separation of two individuals.

Actinias have been known to multiply themselves by buds, but I am not aware that spontaneous fission has ever been observed among them. Though these observations are incomplete, they tend to show that Actinia does not represent a stage of Polypi younger than that in which fissiparition begins—but since this incomplete fission is exhibited only in the younger stages of this Actinia, it appears more probable that the Actinidæ are the highest form of the order of Actinioidea, viz: the form in which the embryonic character of fissiparition disappears.

Member Elected.

James L. Petigru, Esq.

MARCH 1st, 1858.

Vice President W. W. Smith in the chair.

Prof. L. R. Gibbes deposited forty-nine specimens of woods most of which were contributed by Dr. Alexius M. Forster.

A letter was read from Oscar M. Lieber, Esq., acknowledging the reception of the notice of his election as Correspondent.

Cavendisham—Philadelphia.

J. F. M. Geddings, M. D. *Corresponding Secretary of "The Elliott Society of Natural History."*

I would ask the indulgence of the Society's attention to a fact that seems not heretofore to have been duly recognised. In a research on Titanium I made use of some *Rutile* that was represented to me as occurring *in quartz* at Lynchburg, in Virginia, *a locality not mentioned by Professor Dana, in "The Manual of Mineralogy."*

With the highest esteem, I remain,

WILLIAM SHARSWOOD.

February 9th, 1858.

A letter was read from R. W. Habersham, Esq. acknowledging the reception of the notice of his election as Correspondent, and making the following communication:

February 9th, 1858.

Enclosed I send flowers of the apple tree, just gathered. The trees in front of my house are in *full* bloom, and have been since the frost in November. The jessamines are out, and it is not a week since a retiring spring tide left several silver fish in a ditch on my land. This is all very unusual for Port Royal Island, and may be deemed note-worthy in the annals of the Society.

Vice President W. W. Smith, read "Notes and Additions to the Flora of the low country of South Carolina."*

MARCH 15th, 1858.

Vice President W. W. Smith, in the chair.

Contributions to Collection.

J. R. Mordecai, Esq. presented a specimen of *Tripneustes ventricosus*, (locality ?) and specimens of Iron Pyrites, in quartz from California.

W. W. Smith, Esq. forty-one different kinds of native woods.

Prof. L. R. Gibbes deposited a collection of Fossils from Palestine.

Correspondent Elected.

Dr. J. F. E. Hardee.

APRIL 1st, 1858.

Dr. J. F. M. Geddings in the chair.

Prof. John McCrady exhibited specimens of a new species of Actinia, belonging to a genus new to our harbor.

J. R. Mordecai presented specimens of fossils from the Pennsylvania coal bed.

Contributions to Library.

W. Sharswood, Esq. Linnæa Entomologica, vol. 2.

A letter was read from Prof. Hyrtl, of Vienna, acknowledging the reception of the notice of his election.

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*See note page 224.

Prof. McCrady made some remarks on the Actinia which he had exhibited, *Anthea flavidula.*

Correspondents Elected.

M. (le Docteur) E. Brown-Sequard, Paris.
W. Stimpson, Esq. Washington.

MAY 1st, 1858.

Prof. L. R. Gibbes, Vice-President, in the chair.

Contributions to Library.

L'Academie des Sciences, Arts, et Belles Lettres de Dijon. Les Memoires de l'Academie. Tomes 1, 2, 3, 4 du 5 me, series.

Nouveau Genre d'Edenté fossile, Nodot. Atlas With.

Academy of Natural Sciences, Philadelphia, Proceedings and circular.

Boston Society of Natural History. Proceedings.

North American Helicidæ. Thos. Bland.

Crustacea and Echinodermata of the Pacific shores. Wm. Stimpson, Esq.

Prof. L. R. Gibbes presented Leidy's Fossil Sloth and Invertebrata of New Jersey, and Bailey's Microscopic Organisms.

A letter was read from Wm. Stimpson, Esq., accepting his election as correspondent.

Dr. E. Ravenel introduced the following paper on three new species of univalves, recent and fossil.

Description of three new species of Univalves, recent and fossil, by E. Ravenel, M. D.

CHEMNITZIA SPEIRA.

Fossil. Post pleiocene ——, Wando River, So. Ca.

Shell turreted, very slender and pointed, glossy white, whorls ten, nearly flat, reticulated with numerous ribs and interrupted revolving lines. Suture well defined, with a distinct impressed revolving line a little below it, leaving a raised space like a crimped fillet, wrapped around the shell. Aperture about a sixth the length of the shell, ovate with the posterior angle sharp.

This shell is about one-fourth of an inch in length, and very slender. It is found with the *Chemnitzia interrupta,* in the Post Pleiocene, on the Wando River, but rare.

It is readily distinguished from the *C. interrupta* by its more delicate form, and the band upon the whorls.

I have not seen it recent.

COLUMBELLA ORNATA.

Fossil. Post pleiocene ——, Wando River, So. Ca.

Shell small, dirty white, ovate-conic; whorls, six or seven; in mature specimens seven can be distinguished; nearly flat, with longitudinal ribs extending almost to the apex, revolving lines interrupted at the ribs, except near the base, where the ribs become obsolete, and the revolving lines are uninterrupted and more decided than elsewhere. Suture distinct, with the revolving line next below it more deeply impressed than the others. Aperture nearly half the length of the shell, narrow, with a rather deep sinus at its posterior angle, ending in a short canal in front. Outer lip thickened and smooth on the outside, being free from the ribs and lines of the whorls; within, strongly toothed; pillar covered with smooth callus, the outer edge of which is elevated and sharp. Length one-fifth inch.

I have seen this species only as a Post Pleiocene fossil.

COLUMBELLA SPIRANTHA.

Recent. Wando River, So. Ca.

Shell small, ovate conic; smooth, except at the base, where there are a few revolving lines; whorls seven, in mature specimens; nearly flat, with the suture distinct; color brown, with a series of irregular triangular spots, of a dull yellow. There is considerable variation in the coloring, sometimes the general color is of the dull yellow, with brown, waving lines, marking off the whorls with the irregular spots. Aperture oval, about one-third the length of the shell, with a slight recess at the posterior angle, and a short canal in front; brown, with a few teeth within the outer lip, and a smooth slight callus on the pillar. Length about one-sixth inch.

Animal white; proboscis half the length of the shell; foot a little longer than the shell, narrow, wider in front; posterior end quite narrow, but not pointed; operculum small, on posterior end of foot; head projecting from the foot, with tentacles one-third the length of the shell, very delicate, almost hair-like, with small black eyes at the base. Animal active, keeping the proboscis in constant motion, while the tentacles are little used.

This shell is like the *Nassa lunata*, Say, but it is narrower in proportion to its length; the aperture is shorter and differently shaped, the pillar being straighter, and the denticulations of the outer lip stronger than in the *N. lunata*.

The animals differ; the tentacles of the *C. spirantha* are delicate and hair-like, while in the *N. lunata* they are rather thick for the size of the animal.

I have only found this shell in Wando River, near the village of Cainhoy—on oyster shells about low-water mark—not common.

Prof. L. R. Gibbes made an oral communication on some plants from the neighborhood of Bluffton, S. C., also on half-formed sandstone, lying on pluff mud.

Prof. J. McCrady made some remarks on the Eocene formation in the neighborhood of Alligator, Florida.

Mr. McCrady said that in a recent visit to Alligator, Florida, he had collected the fossil echinoderms which he presented at this meeting. The soil in this region was chiefly sandy, and under it was a calcareous marly rock, which being continually worn by percolation of water, frequently sunk in, forming usually more or less circular depressions in the sandy soil, which are known both in this State and in Florida as *sinks*. These appeared usually to arrange themselves in tolerably continuous lines, thus suggesting the idea that they follow the course of subterranean streams. He was told that instances of streams disappearing suddenly underground after running a portion of their course on the surface, were known. And it was affirmed of one of the smaller tributaries of the Suwannee, that it disappeared in this manner, emerging again at the distance of a mile or more from its point of disappearance. An instance of a stream disappearing in this manner for a short distance underground, was known in our own State, at Eutaw Springs, the scene of one of our Revolutionary battles. The sinks before mentioned were frequently filled with water, and there were quite a number of lakes stocked with fresh water fish, which frequently had no outlet or inter-communication on the surface, and were probably only sinks on a large scale, communicating with each other by underground channels. On the inclined sides of these sinks frequently cropped out the calcareous rock which formed the underlying stratum. Sometimes imbedded in it were large masses of silicious rock resembling the buhrstone of Aiken, S. C. Both the marl and the buhrstone were fossiliferous. The remains of Mollusca were generally in bad preservation, but there were large numbers of casts of the species of Echinoderm presented to the collection. This species Mr. McCrady believed to be the same as that described by Bouvé, as *Pygorhynchus Gouldii* and was a congener of *Pygorhynchus crucifer* and *P. rugosus* of Dr. Ed. Ravenel, "Catalogue of the Echini Fossil and Recent of South Carolina."

Mr McCrady stated, however, that the genus was quite distinct from Pygorhynchus, which was almost exclusively an European genus. He would characterize it as follows:

RAVENELIA, *nov. gen.*

Form rather depressed—no anal facet, hinder end of shell horizontally trenchant, anus supramarginal, generally surmounted by a transverse labium. Mouth in advance of the centre, surrounded by prominent bosses, and a distinct oral roset. Nether surface, which is slightly concave, more or less beset with irregular tortuous rugosities, which are the elevated spaces between the deep-set knops, which must have borne larger spines than any other portion of the shell. The ambulacra are transversely ribbed, and have the pores of the outer row of a lenghtened slit-like form.

Three species viz: Ravenelia crucifer. Eocene, S. C.
" rugosa. " "
" Gouldii. " Ga. and Fla.

The two species from South Carolina are characteristic of the Eocene period, and the genus has not been found above the Eocene. And it is probable that R. Gouldii is not an exception.

I have given to the genus the name of Dr. Edmund Ravenel, the discoverer of two of the three species which belong to it, and an observer to whose zeal our State is almost entirely indebted for the knowledge of its Echinoderms.

MAY 15, 1858.

Vice President W. W. Smith in the chair.

W. W. Smith, Esq., presented specimens of different kinds of native woods, showing their planed surfaces.

Contribution to Library.

Linnæan Society, of London, presented Proceedings, Vol. i. four Nos. on Botany, and four Nos. on Zoology; Vol. ii. Nos. 5 and 6 on Botany, and Nos. 5 and 6 on Zoology; also, the list of the Linnæan Society.

Dr. W. Hutson Ford exhibited specimens of Alcohol, obtained from hepatic and lung tissue, and blood of animals, upon which he had experimented. Dr. Ford read a monograph on the presence of Alcohol in the blood of Mammals.*

JUNE 1st, 1858.

Vice President W. W. Smith in the chair.

Dr. A. M. Forster: Specimens of Fish.

Dr. Robert R. Gibbes: Specimens of Fish.

Prof. L. R. Gibbes exhibited specimens of the chrysalides of an insect allied to the genus Psyche, obtained on Sullivan's Island, chiefly on the cedar.

Mr. W. W. Smith exhibited the Hygrometer plant, from Arabia, submitted to his inspection by Prof. Holmes.

Prof. Gibbes made some remarks upon the fishes and insects presented.

Member Elected.

Charles F. Panknin, Esq.

*To be published at a later date.

JUNE 15th, 1858.

Vice President W. W. Smith in the chair.

I. R. Mordecai, Esq..: Stuffed specimens of European Weasel and Fox.

Contributions to Library.

Geological Society of Dublin, presented Proceedings; first seven volumes, excepting vol. 1, part ii., and vol. 2, part iv.

Felix Flügel, Leipzig, le Bulletin de la Societé Imperiale des Naturalistes de Moscou.

Sitzungs berichte der Wiener Akademie, Band ix.

Echinomyia Dumene, &c.

Dr. Held's Life and Writings; Literarische Sympathien Philology in America, by F. Flügel.

A letter was read from La Société Royale de Zoologie, of Amsterdam, soliciting exchange, and inquiring into the mode of effecting it.

JULY 1st, 1858.

Vice President W. W. Smith in the chair.

James Johnson, Esq., deposited: Shells, chiefly from the Southern coast of United States.

Dr. E. Ravenel: Fossil Echinoderms, from his place, on Cooper River.

W. W. Smith, Esq.: Wheat, infested with *Puccinia graminis*, the ears of which had not filled.

Contributions to Library.

Academy of Natural Science, Philadelphia: Proceedings, April and May, 1858.

Academy of Science of St. Louis, Mo.: Transactions, vol i. No. 2, with plates.

Legislative Library: Report on the Geological Survey of South Carolina, 2 copies, Oscar M. Lieber.

Prof. Gibbes mentioned his recent verification of a suspicion he had entertained respecting the existence of a new species of Fir in the Saluda Mountains, resembling *Pinus Canadensis;* but clearly distinct by well marked characteristics. He also noticed the *Azalea arborescens* of Pursh, on the confines of North Carolina.

JULY 15th, 1858.

Vice President W. W. Smith in the chair.

Dr. J. P. Chazal presented two specimens of a species of Haliotis, from Lower California.

Prof. Gibbes exhibited fossils among which were fragments of Pleiocene Echinoderms, brought from H. M. Manigault's place, within nine miles of Charleston. His attention had been directed to them by Mr. Manigault.

Prof. J. McCrady stated that he had made a partial examination of the Echinoderms among these fossils, and they appeared to him to be fragments belonging to the same genera, perhaps to the same species as those he had described in Holmes and Tuomey's Fossils of South Carolina, several of which were first described by Dr. Edmund Ravenel.

AUGUST 2d, 1858.

Vice President W. W. Smith in the chair.

Dr. J. P. Chazal presented jaws of a species of Carcharias of our harbor.

Contributions to Library.

W. Stimpson, Esq., presented Prodromus Descriptionis Animalium Evertebratum, &c. Pars v.

Boston Society Natural History: Proceedings, vol. vi. No. 23, May 1858.

A letter was read from Dr. E. Brown-Séquard, accepting his election as Corresponding Member.

A communication was read from W. Sharswood, Esq., describing an expeditious method of preparing an antidote for Arsenious Acid.

Dr. J. F. M. Geddings.

Dear Sir—Since I have an occasion for addressing you, it may not be out of place to preface my remarks by an account of the new Antidote for Arsenious Acid, the original paper on which is sent to Europe.

The only antidote for Arsenious Acid heretofore known, (excepting the less important one, Caustic Magnesia,) is the hydrated sesquioxide of iron, the ferrugo of the Edinburgh Pharmacopæa. To prepare this it is recommended to precipitate protosulphate of iron, by an alkaline carbonate, the precipitated protocarbonate, during the process of washing and drying, loses its carbonic acid, and attracts oxygen, becoming hydrated sesquioxide of iron.

It is well known that to administer the above antidote, considerable time is required for its preparation, and, with the exception of large towns where the substance is kept ready prepared on the apothecary's shelves, the life of a patient must be often sacrificed to the time necessary for its formation; and aside from even its being ready prepared, it is well known that it is only in its recently precipitated condition that it is most active.

The antidote to which I refer while depending upon the same principles, is characterized by facility and speed of preparation, and at the same time possessing within itself a cathartic principle.

To prepare this we have merely to take a solution of the *protosulphate of iron*, and after having *oxydized the iron with a few drops of nitric acid*, precipitate the oxide with *caustic magnesia*, when the result is a precipitate of hydrated sesquioxide of iron, combined with sulphate of magnesia or epsom salts.

In this way we have immediately the sesquioxide of iron together with sulphate magnesia.

It will also be seen that the rapidity with which this is formed, renders it unnecessary to be made before the time of use, which is a great disadvantage with the ordinary antidote, from the fact of its being kept for months, if not years, whereas it has been shown that it is only in its recent condition that it is most active.

I shall take an early opportunity for giving you the required information concerning the paper on Thermo-Electricity. I would also state that the fourth part of the proceedings has not been received, if published.

With sentiments of the highest esteem, I remain,

WILLIAM SHARSWOOD.

July 24th, 1858.

Prof. J. McCrady made some remarks on a genus of free floating Sertularian, without radicles, found by him in Charleston Harbor.

SEPTEMBER 1st, 1858.

Vice President W. W. Smith in the chair.

Prof. L. R. Gibbes presented an undescribed species of Aplysia.

Dr. E. Ravenel: Coleopterous Insect, undetermined.

Dr. E. Ravenel: Scorpion, Key West.

Contributions to Library.

Proceedings of the Essex Institute, Vol. II. Part 1, 1856–57

Prof. Gibbes read a paper entitled "Notice of the Phenomena attending the Shock of the Earthquake of Dec. 19, 1857."

I desire to put on record in our proceedings the phenomena attending the earthquake of 19th of December last, as observed by myself in this city, or communicated by others.

No distinct shock or blow was perceived by me, but the motion consisted of a series of horizontal oscillations, increasing gradually in distinctness, and then subsiding somewhat more rapidly. The agitation lasted about six or eight seconds, as well as could be estimated, at the rate of about four or five oscillations (or double vibrations,) per second, and was distinctly manifested by the motion of the floor of the room, (five or six feet from the ground,) by the motion of the chair in which I sat, and by the rattling of an adjacent door. The agitation was perceived by all the adults in the room, and by several of the children, and by myself and my wife was immediately recognized as an earthquake. A bunch of keys, hanging from the one in the lock, was observed to be in motion some minutes after, and on going to the college, at least ten minutes afterwards, the weights hanging on Atwood's machine, locked up in the cases enclosing the philosophical apparatus, were found still in motion.

As soon as the motion subsided, I referred to a chronometer which stood near at hand for the time, and after making due allowance for the lapse of a few seconds in so doing, for the duration of the agitation, and for the error of the chronometer, I estimated the instant of greatest agitation to have been at 9h. 3m. 40s., A. M., mean time at Charleston, and think this estimate cannot be ten seconds from the truth.

The direction of the agitation appeared to be in a line N. W. and S. E., but whether from the latter point to the former, or the contrary, could not be determined. No vertical motion was perceived, and of the extent of the horizontal motion I could form no reliable estimate. I heard a rumbling accompanying the motion, but the street noises render it doubtful whether the two had the same origin. I learned that in other parts of the city, the motion attracted but little attention, while the noise accompanying the agitation was so great as to excite alarm, and arouse fears that some accident had happened in the house. In the country, where circumstances permit greater quiet, this rumbling noise was perceived in its approach, and recognized as a coming earthquake before the agitation was felt.

The earthquake which proved so destructive in Naples occurred on the 17th, two days before ours, but it is doubtful whether the two were connected; the disturbance of the 19th appears to have been of limited extent. It was perceived in Savannah, and in Georgetown, South Carolina, and near the Santee river, on the road to Georgetown, from this city, but does not seem to have been felt at Columbia or at Augusta.

NOVEMBER 1st, 1858.

Vice President W. W. Smith in the chair.

Contributions to Library.

W. Sharswood, Esq.: Agricultural Chemistry. H. Davy.

Inorganic Chemistry: Dugald Campbell.

Fresh Water Aquaria: James Bishop and others.

Organic Chemistry: Henderson's Raspail.

Chemical Experiments: Francis.

Reports of Accidents in Coal Mines.

Academy Natural Science, Philadelphia: Proceedings, Nos. 10–12, pp. 129–176, 1858.

Boston Society Natural History: Proceedings, vol. vi., No. 24, pp. 369–384.

American Philosophical Society: Transactions, vol. vi., No. 39, pp. 281–320.

Navy Department, Washington, Commander T. J. Page: Map of the Basin of the La Plata.

W. Stimpson, Esq.: Prodromus Animalium Evertebratum, &c. Pars. VI.

A letter was read from the British Museum, acknowledging the receipt of the Proceedings of the Society.

A letter was read from the "Secretaire Archiviste de la Societé de Museum d' Histoire Naturelle de Strasbourg," tendering an exchange of publications.

A letter was also read from Mr. Sharswood, Philadelphia, reporting the progress of his paper on the "Thermo-Electric Properties of the Metals."

NOVEMBER 15, 1858.

Vice President W. W. Smith in the chair.

Contributions to Cabinet.

Dr. E. Ravenel: Native Leech in Alcohol.

Contributions to Library.

W. Sharswood, Esq., New Experiments and Observations; Thibaut's Art of Chemistry; Phœdro's Physical and Chemical Works; Berzelius' Traité de Chimie, Esslinger's Translation. 5 vols.

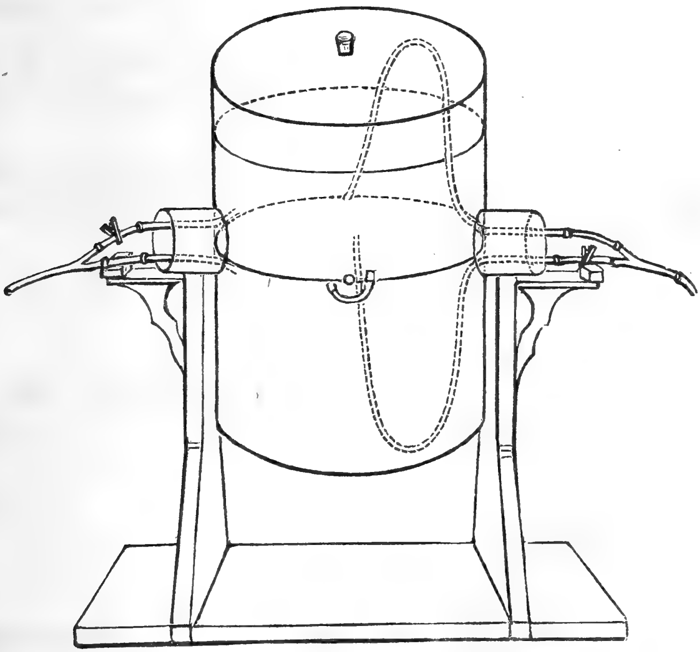
Kirby & Spence's Entomology, London, 1856; Granville's Art of Embalming Mummies, from the Philosophical Transactions, 1825.

Report of the Superintendant of Education for Lower Canada. Legislative Document.

Prof. L. R. Gibbes read a paper "On a convenient form of Aspirator."

On a convenient form of Aspirator, by Prof. L. R. Gibbes.

The Aspirator is a well known and valuable instrument in pneumatic researches, and several forms of it have already been proposed, or are in actual use. The principles involved in its construction are familiar to all. I cannot venture, therefore, to bring forward any points in the construction of the present instrument as actually new, but its form is so convenient and its construction so easy, that I do not hesitate to make it known.



This Aspirator (figured in the above wood cut) consists of a tin* cylinder, 20 inches in height, and 15 inches in diameter, divided

* By tin, I mean throughout, tinned sheet-iron.

by a central partition of the same material, parallel to the two bases of the cylinder, into two air tight compartments, an upper and a lower. Two hollow cylindrical projections, of tin, 2 inches long, and 3 inches in diameter, are soldered on opposite sides of the Aspirator, with their axes in the same line, and in a plane equidistant from the bases of the Aspirator. These projections serve as trunnions or pivots, by which the Aspirator can be rotated on proper supports, so as to bring either compartment uppermost. Within the area inclosed by each of these projections or pivots, are two apertures, one communicating with the upper, and the other with the lower compartment, and in each of these apertures there is soldered a leaden tube. On one side (left side of figure) these tubes are short, projecting within only an inch, and without, only an inch or two beyond the extremity of the pivot. These tubes are made to communicate with a common outlet, by means of a two-branched tin tube, in the form of the letter Y, each branch being connected with one of these tubes by an India-rubber flexible tube, 6 inches in length, and the stem of the Y forming the common outlet, from which the air issues when the Aspirator is in action. On the other side, the leaden tubes also project outwardly an inch or two beyond the end of the pivot, but within they are long and curved, in the form of the letter U, with two long branches, the bend of the U being, for each tube, near the base of the Aspirator, and the aperture of the inner branch not far from the partition separating the two compartments; these tubes are also so bent towards one side of the Aspirator, that this aperture of the inner branch shall be as far as possible from the two pivots, and on the other side of the Aspirator, there is, in the partition, an aperture one-fifth of an inch in diameter, forming a communication between the two compartments of the Aspirator. The two ends of these tubes projecting externally, are furnished, by means of another two-branched Y tube and India-rubber connectors, with a common inlet, through which air enters when the Aspirator is at work. If the India-rubber tubes be firmly compressed, the ingress or egress of air, or other fluids, may be entirely prevented at any, or all of these four points of communication, with the interior of the Aspirator. For compressing the India-rubber tubes, I employ the wooden pincers closed with brass springs, which are used in this country by laundresses for fastening clothes to the lines, while hanging out to dry, and which can be had for a few cents in the shops.

Two uprights secured to a convenient stand, sustain the pivots and permit rotation. At the upper part of each upright is attached a shelf to support the Y tubes, which are firmly fixed, so that the stem of the Y is in the prolongation of the axis of the cylindrical pivots, and the branches of the Y in a horizontal plane. To avoid confusion, the mode of attaching the Y tube is not represented in the wood cut. The Aspirator being rotated about its pivots until it lies horizontally with the partition in a vertical plane, the ends of the two projecting portions of each pair of lead tubes will be found in a horizontal plane opposite the corresponding branches of the adjacent Y tube, and the India-rubber connectors are attached in this position. When the Aspirator is brought into a vertical position with either base uppermost, these flexible connectors will be slightly crossed, but free passage through them in no degree impaired. If the other base is to be brought uppermost, the Aspirator must be rotated back to the original horizontal position, and then that base brought uppermost, in order to avoid entwining the flexible tubes. An aperture, in the center of each base, permits either compartment to be filled with water, the aperture being closed air-tight by a cork.

Now, suppose the Aspirator to be brought into a vertical position with the compartment containing water uppermost, the *lower* flexible tube of *ingress*, (on right side of figure,) and the *upper* one of *egress*, (on left side,) each *closed* by a compressor; then will the water in the upper compartment flow into the lower, through the aperture in the partition, escape of water by the upper tube of egress being prevented by the compressor, and through the upper tube of ingress by its curved form; air will enter by this tube of ingress into the upper compartment, to supply the place of the water, and air will issue from the lower compartment by the lower tube of egress, being prevented from escaping through the lower tube of ingress by the compressor. If, now, any chemical apparatus be connected with the main tube of ingress, a current may be established through the apparatus by aspiration, until all the water flow from the upper to the lower compartment, and then by shifting each compressor to the adjacent flexible tube, and inverting the Aspirator, the current will be established again in the same direction, and may thus be made nearly continuous, but a few seconds being occupied in each inversion of the Aspirator. The velocity of the flow of the water depends, as is well known, on the difference of level between the aperture from which the water flows, and that by which the air enters, and as these are on opposite sides of the Aspirator, by inclining it, this difference of level may be increased or diminshed, or rendered null, and the velocity of the current of air through the apparatus controlled at will. To provide for a still more rapid flow, if desired, there are two apertures in the side of the Aspirator, near the aperture in the partition, one forming a communication with the upper compartment—the other with the lower; short tin tubes soldered to these apertures externally permit connection to be established between them by a short flexible tube, as exhibited in the wood cut, through which the water can flow from the upper to the lower compartment, and by compressing more or less this flexible tube, the velocity of flow may be regulated. Proper means must be used to restrain the tendency of the Aspirator to turn over, the water being uppermost. The same means may be used to regulate the inclination of the Aspirator.

DECEMBER 1st, 1858.

Vice-President W. W. Smith in the chair.

Contributions to Library.

Boston Society of Natural History presented Proceedings. Vol. vi., Oct. 1858, pp. 385–400.

DECEMBER 15th, 1858.

Vice-President W. Wragg Smith, Esq., in the chair.

Contributions to Library.

Die Oberhessichen Gesellschaft für Natur- und Heilkunde presented Proceedings, 5th and 6th Nos., Oct. 1855 and June 1857, accompanied by a letter from the Society's Secretary, soliciting exchange.

W. Wragg Smith, Esq., read "Notes and Additions to the Flora of the Low Country of South Carolina." *

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*See Note p. 224.

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The names of quoted species or groups are printed in italics. An asterisk is prefixed to the names of deceased members or correspondents. Those who have resigned are distinguished by a †.

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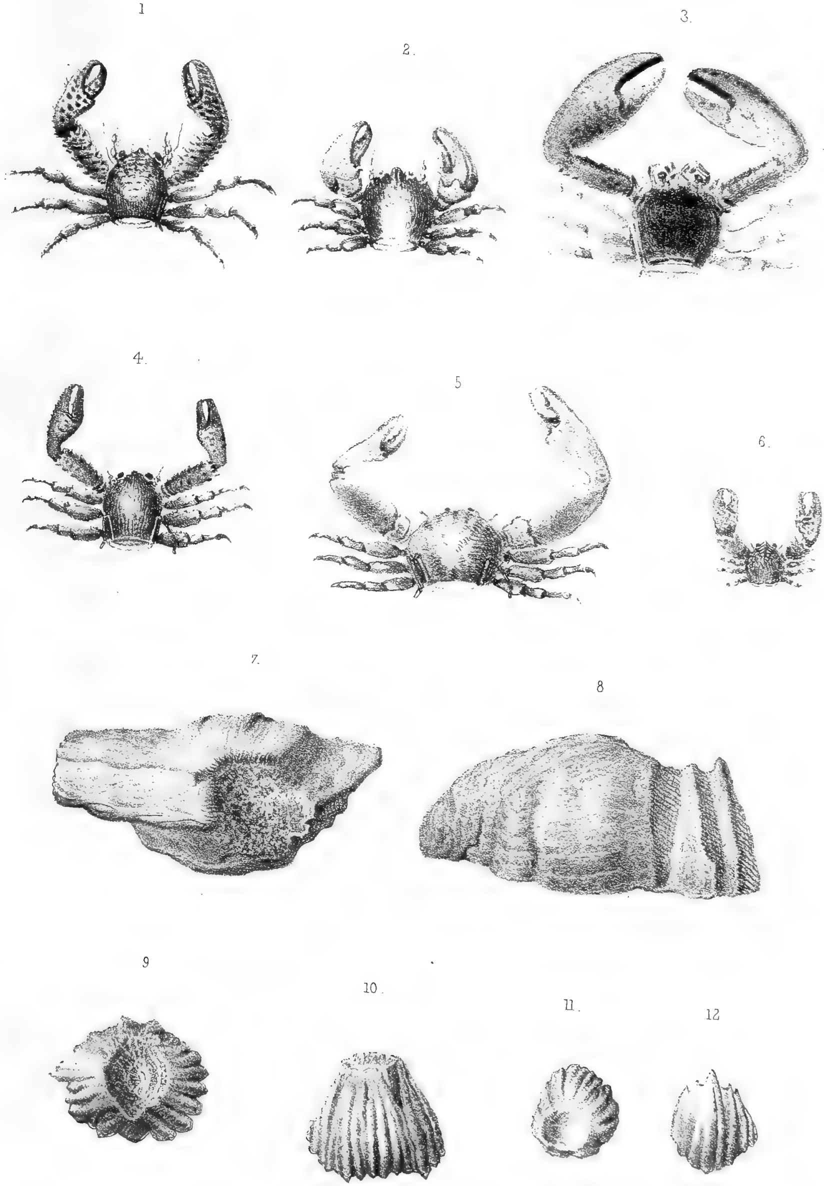


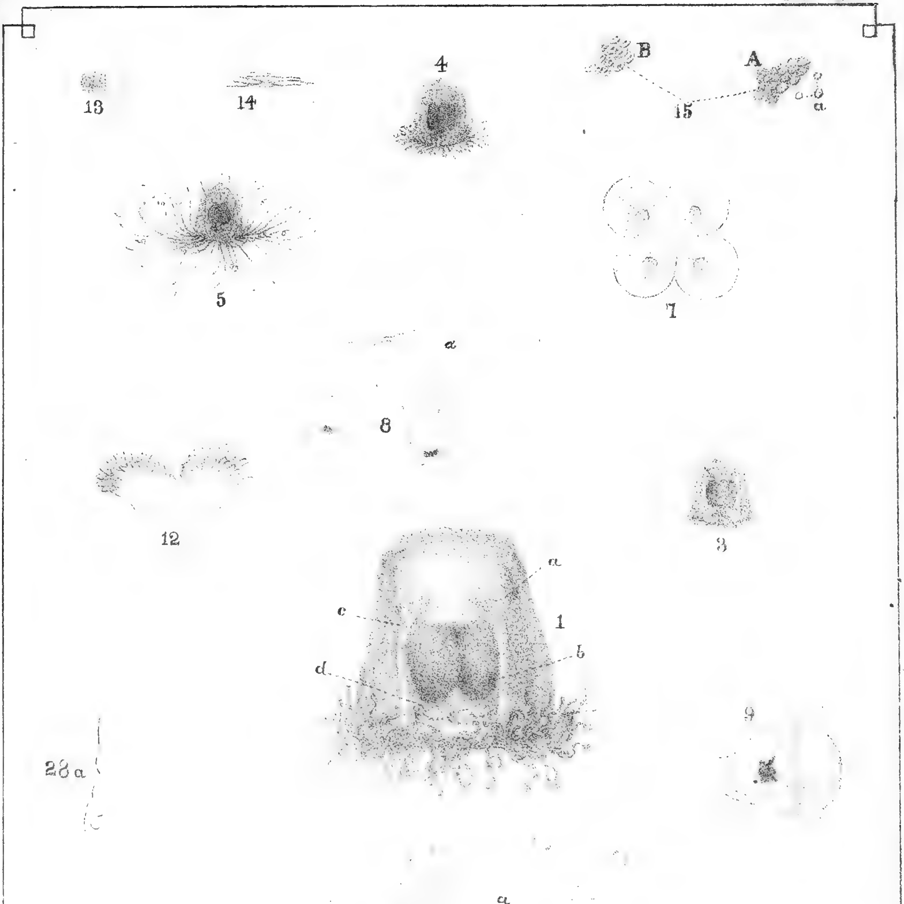
Baptisia stipulacea

DIABOLICTHYS ELLIOTTI.—HOLMES.

FIG. 1. *Knob and base of tail, natural size.*

" 2. *Bone with the small spine as extracted from the knob.*

" 3. *Upper view of the same.*



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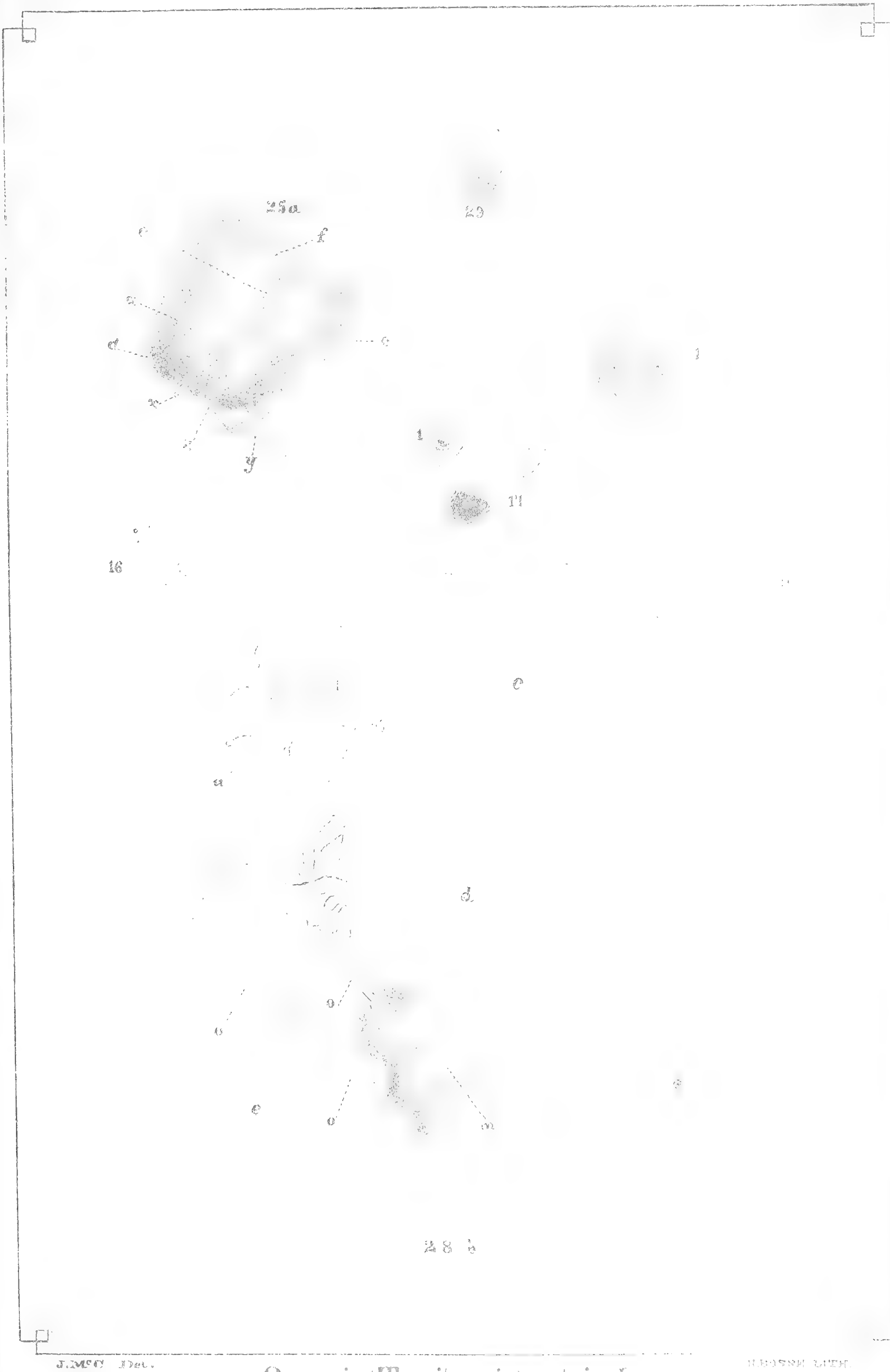

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Oceania (Turritopsis) nutricula.

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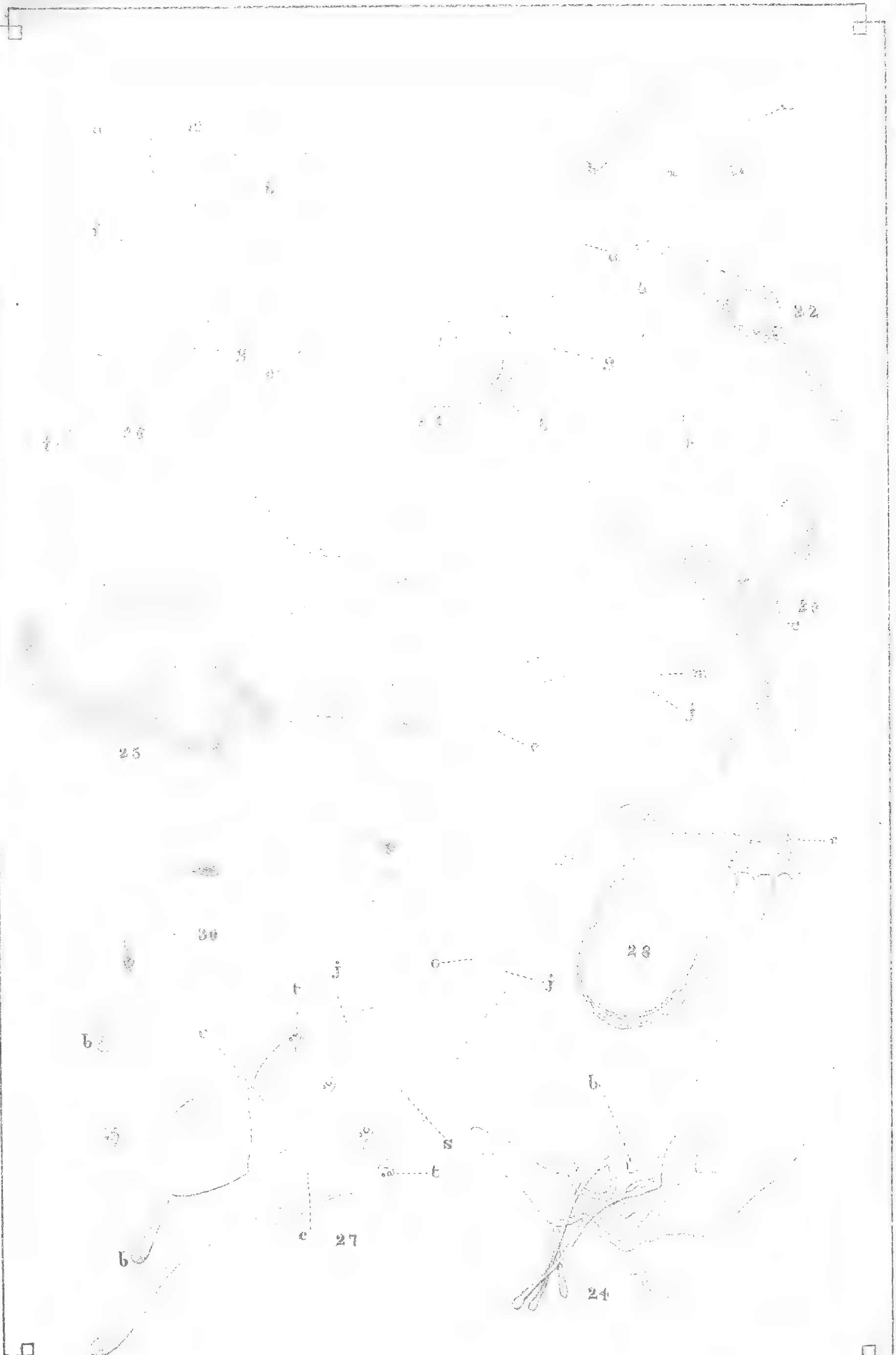
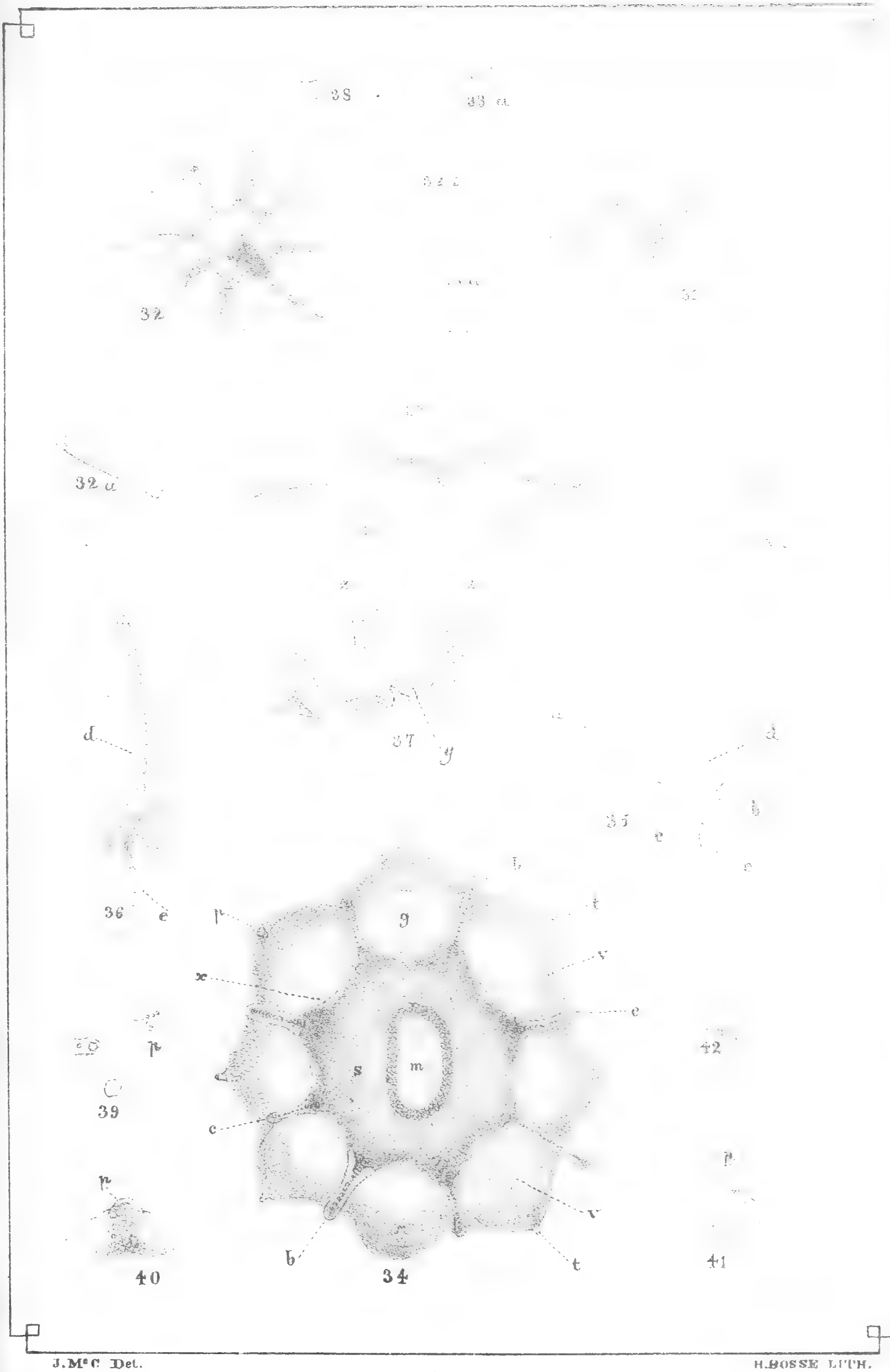


J.McC Del. H. BOSSE LITH.

Oceania (Turritopsis) nutricula.



J. M^c C. Del. H. BOSSE LITH.

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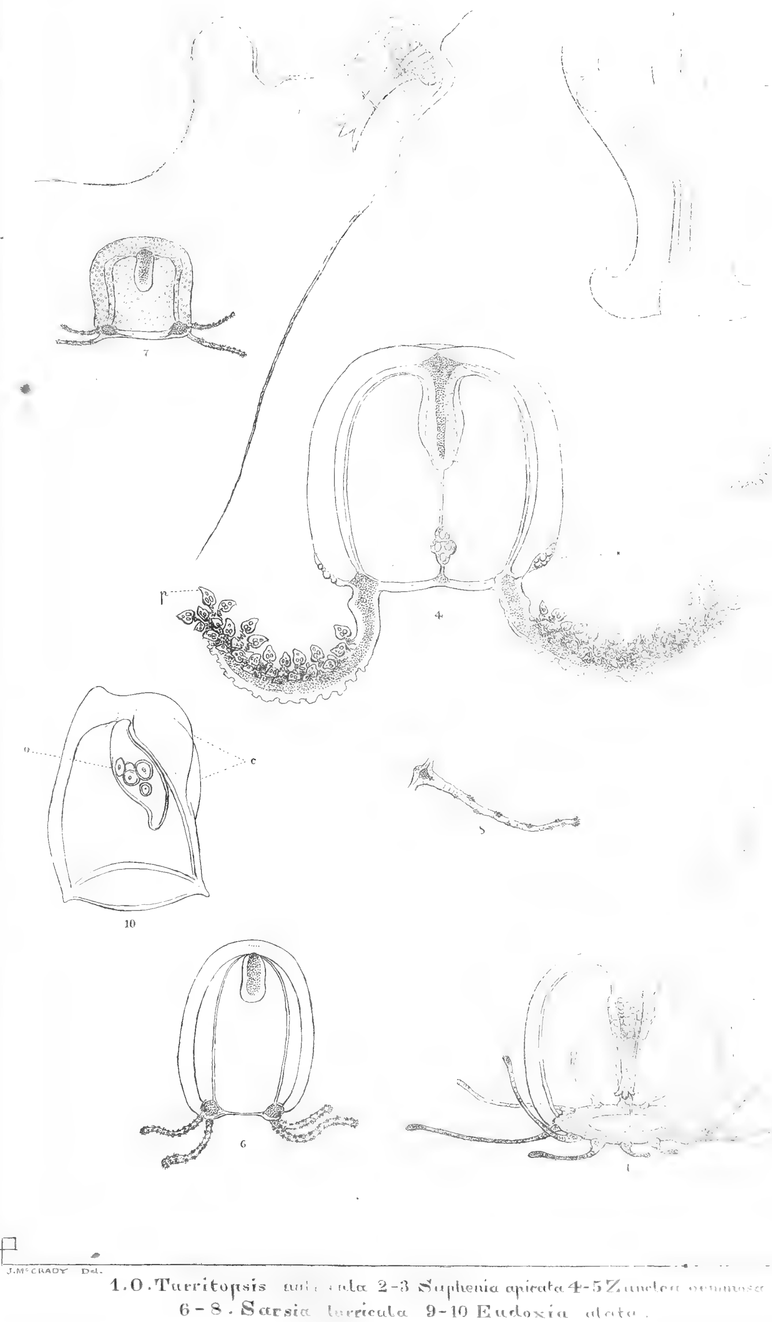
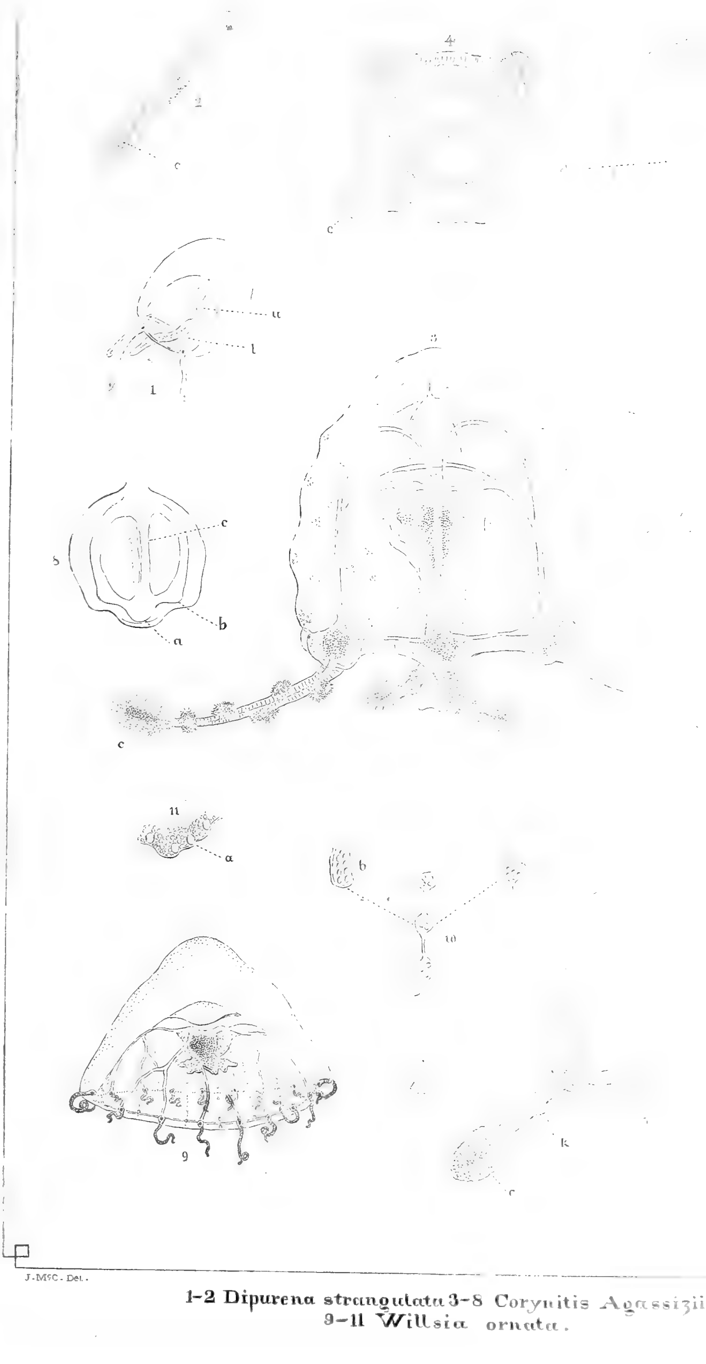


J.McCRADY Del.

1.0. Turritopsis nutricula 2-3 Syphenia apicata 4-5 Zanclea gemmosa
6-8. Sarsia turricula 9-10 Eudoxia alata.



J. McC. Del.

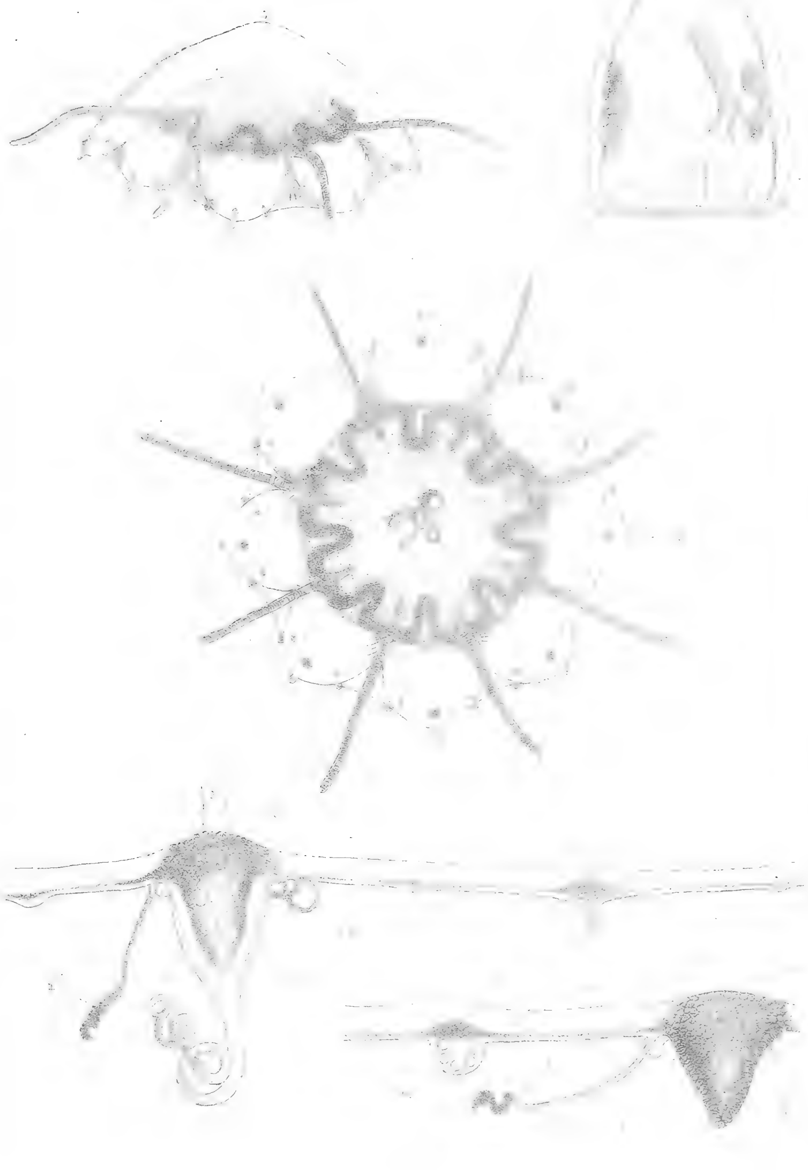
1-2 Dipurena strangulata 3-8 Corynitis Agassizii
9-11 Willsia ornata.

H. Rosse sc.

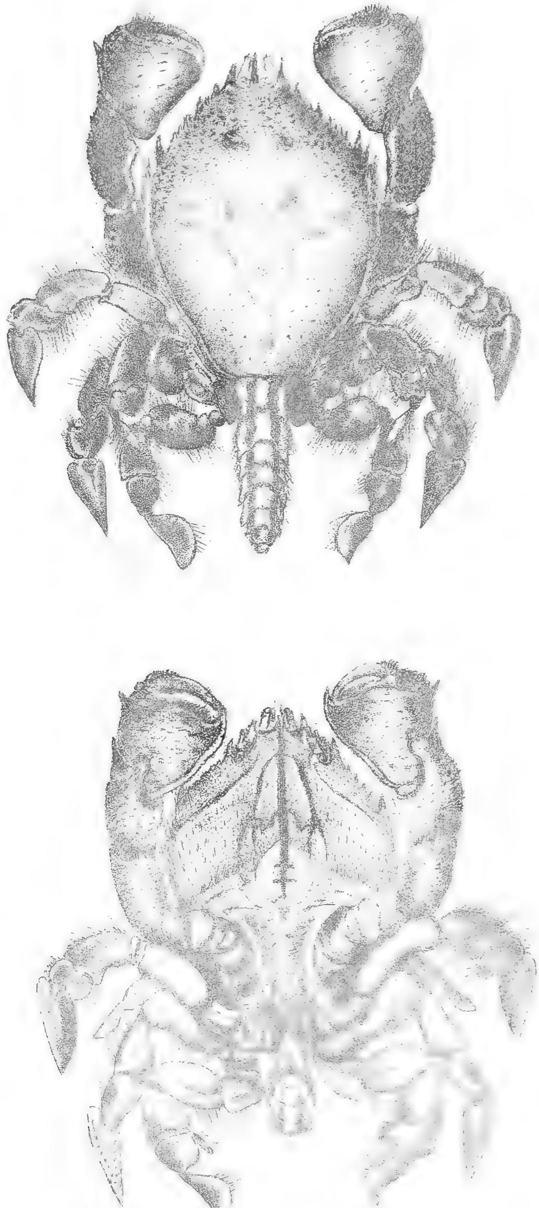
1–7 Nemopsis Gibbesii 8–10 Hippocrene Carolinensis

J.McC. delt.

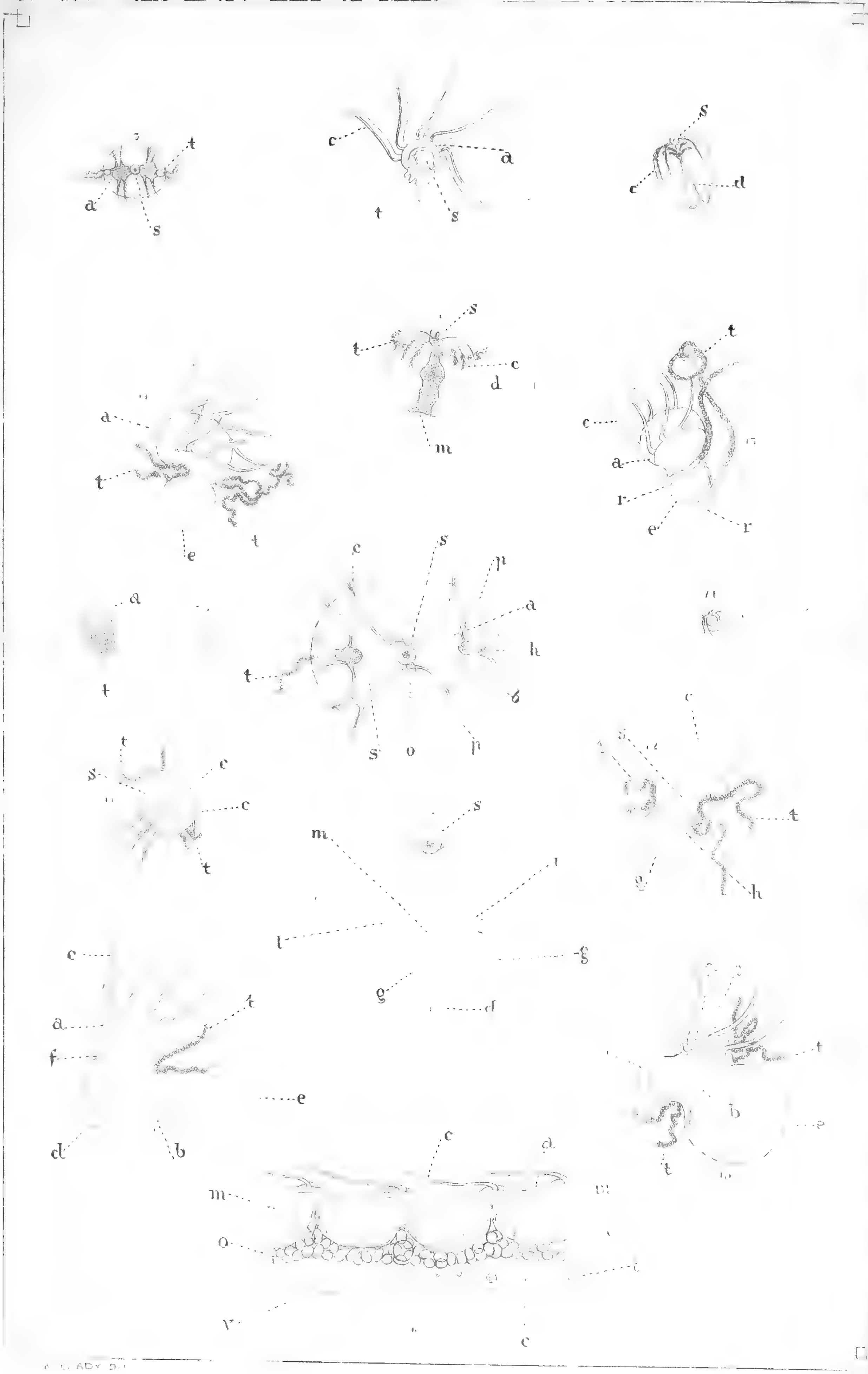
1 to 3 Eucheilota ventricularis. 4 Campanularia nodiformis. 5 to 7 Obelia comissuralis. 8 & 9 Eutima mir...



1-2 Eucheilota (bell-rim) 3, Persa incolorata 4-5, Cunina octonaria.



Ranilia muricata. M.Edw.



Bolina littoralis (young)

BY-LAWS

OF THE

ELLIOTT SOCIETY OF NATURAL HISTORY,

CHARLESTON, S. C.

1853.

CHARLESTON:
PRINTED BY A. J. BURKE, 40 BROAD-STREET,
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1853.

" True it is, Nature hides
Her treasurers less and less. Man now presides
In power where once he trembled in his weakness;
Science advances with gigantic strides."—Wordsworth.

The advancement of useful knowledge is undoubtedly the leading spirit of the age; and as the principle of association is one of power, success, and utility, Societies have been formed in most of the large cities of the civilized world for this object, and their efforts have been crowned with the most flattering success.

"The genuine lovers of science, every where, have one faith, one hope, one aim, and the truest friendship and sympathy with each other. The love of nature and nature's laws, the laws of the great First Cause, sinks the selfish passions, elevates the mind, and cements the friends of knowledge and truth in every land. They are like the tallest monuments in a country, the first to receive and reflect the light on the masses below."*

Among the pioneers for the advancement of science and literature, and especially of Natural History in North America, the most prominent were Charlestonians; the names of Garden, Elliott, Ramsay, Grimké, and others have thereby become the common property of the world.

Influenced by these considerations, and with a view not only to the improvement of ourselves, but also to unite our feeble individual efforts, more effectually to extend the knowledge we may acquire thereby, We, whose signatures are hereunto annexed, do pledge ourselves individually to observe the following Rules and Regulations for the government of an Association hereby formed, for developing the Natural History of our Country, and especially of our own State, and for cultivating and promoting the study of this science.

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* Dr. B. Dowler.

BY-LAWS.

CHAPTER I.

Art. 1. In compliment to a distinguished Naturalist and Scholar, the late Stephen Elliott, of Charleston, this Society shall be called the Elliott Society of Natural History.

Art. 2. The Society shall consist of *Members*, *Correspondents*, and *Honorary Members*.

Art. 3. The right of voting, of holding offices, and of transacting business, shall lie solely with the members.

Art. 4. The common seal of the Society shall be the title of the Association surrounding the bust of the late Stephen Elliott of South Carolina.

Art. 5. The Society shall grant to each Member, Correspondent, and Honorary Member, a certificate of membership, as follows:

The Elliott Society of Natural History, have elected ———— a ———— of their Association, this ———— day of ————.

[SEAL.]

President.
Vice President.
Secretary.
Treasurer.

Art. 6. This certificate shall be signed by the first Vice President only, or in his absence, by the next in order; the signature of one Vice President shall be sufficient.

Art. 7. The Officers of the Society shall be elected annually, at the Anniversary Meeting in November.

Art. 8. They shall consist of a President; one or more Vice Presidents, as may be determined at the Anniversary Meetings; a Secretary; a Treasurer; and a Committee of Curators, to consist of such a number, as the Society may from time to time determine.

Art. 9. The Officers, and the Committee of Curators, together, shall constitute a Standing Committee.

CHAPTER II.

Election of Members and Correspondents.

Art. 1. All candidates for admission into the Society, whether as members or correspondents, must be proposed in writing by two members at any meeting, and be ballotted for at the business meeting next succeeding; the affirmative votes of three-fourths of the members present shall be necessary to elect a candidate.

Art. 2. No person residing in Charleston, can be chosen a Correspondent; nor shall any Correspondent continue such, after he shall have removed permanently into the city. In such case a re-election is not necessary, but the correspondent becomes liable for the annual contributions, and is entitled to all the privileges of a member.

Art. 3. No person (except in cases of correspondents removing into the city) shall be entitled to the privileges of membership, until he shall have paid the fee of initiation, and signed the following obligation:

> *In becoming a member of the* Elliott Society of Natural History, *I promise to conform myself to its constitution, laws, and regulations, and in testimony thereof, I do hereunto subscribe my name.* ——— ———.

Art. 4. If any member elect shall not sign the above declaration, and pay the fee of initiation within six months from the date of his election into the Society, the said election may be declared null and void, by a majority of the members present, at any business meeting.

Art. 5. If any member shall be balloted for and rejected, or his name withdrawn previous to the ballot, no note of said rejection or withdrawal shall be made on the minutes of the Society.

Art. 6. No person thus rejected shall again be proposed before the expiration of one year; nor shall any one whose name has been withdrawn previous to the ballot, be again proposed before the expiration of six months from said withdrawal.

CHAPTER III.

Contributions and Payments.

Art. 1. Every member elect shall pay into the treasury an initiation fee of Five Dollars.

Art. 2. Every member shall be subject to an annual contribution of Five Dollars, payable at the anniversary meeting in November.

Art. 3. But any member who shall pay into the hands of the Treasurer the sum of $50, shall be exempt from all future annual contributions.

Art. 4. The Society may, as a mark of distinction, exempt any member from his contributions, provided it is proposed at one business meeting, and lie on the table to another; and all the members present at the subsequent business meeting agree thereto.

Art. 5. No member shall be entitled to vote at the annual election of Officers, unless he can exhibit to the tellers a receipt in full for all his arrearages to the Society.

Art. 6. No pecuniary contributions shall be required from Correspondents, nor from the Secretary and Treasurer of the Society; and should there be an assistant Secretary, he also shall be exempt from such contributions, during his term of office.

CHAPTER IV.

Resignation and Expulsion of Members.

Art. 1. Any member shall have leave to resign, upon application made therefor, in writing, provided he can produce a certificate from the Treasurer, that all arrears due by him to the Society have been discharged.

Art. 2. Members may be expelled from the Society for any flagrant act of disrespect to the Officers or Members of the Society, or wilful disregard of the Constitution and By-Laws.

Art. 3. No member shall be expelled from the Society, unless three-fourths of the members present agree thereto: at least twelve members being present, and then not without having an opportunity of being heard in his own defence.

Art. 4. No person thus expelled, shall, under any circumstances, be received as a candidate for re-election.

CHAPTER V.

Of Officers and their Duties.

Art. 1. The duties of the President shall be, to occupy the chair at the meetings of the Society, to preserve order and decorum, to regulate the debates; to nominate the Chairman of all Committees, and to call special meetings of the Society at such times as he shall deem necessary, or at the request of five members.

Art. 2. The duties of the Vice President shall be the same as those of the President, during his absence.

Art. 3. The Secretary is to take and preserve correct minutes of the proceedings of the Society, to notify all members of their election, and all committees of their appointment; to keep a correct list of the members of the Society, with the date of their election, resignation, or death; to have charge of the common seal of the Society, and to lay before the Society, at its anniversary meeting in November, a written report of its transactions during the preceding year. He is to maintain and conduct the correspondence of the Society; and to acknowledge all donations made by those who are not members of the Society. He is to notify all correspondents of their election, and to keep a correct list of such elections, as well as of any deaths, resignations, &c., that may occur, noting the time; he is also to keep correct copies of all letters written on the business of the Society, to have the care of the certificates of membership, and to have them filled up, signed, sealed, and forwarded to correspondents, or delivered to members, provided that they are not in arrears to the Society.

Art. 4. He shall be Chairman of the Committee of Curators.

Art. 5. Should the Secretary deem it necessary, he may appoint an Assistant Secretary.

Art. 6. The Assistant Secretary shall keep the rough minutes of the meetings of the Society, of the Standing Committee, and Committee of Curators, and otherwise assist the Secretary when required by him to do so.

Art. 7. The Treasurer shall take charge of the funds of the Association, and attend to the receipt and payment of moneys, but no moneys are to be paid by him except by order of the Secretary. He shall keep a clear and detailed statement of all expenditures and receipts, and lay it before the Society at every business meeting.

Art. 8. The Curators shall take special interest in the department to which they may be appointed, and shall report everything worthy of note that may transpire. They shall exert themselves in obtaining specimens in their departments of Natural History, and shall report to the Society the names of such works relating to the same, as may from time to time be issued from the press, either of this country or Europe.

They shall receive all papers and other written communications intended for publication, refer them to sub-committees from among their own number for examination, and they shall report upon the same to the Society.

They shall superintend the publications ordered by the

Society; and when required, read and correct the proof-sheets.

ART. 9. The Standing Committee shall have the general supervision of the financial and other concerns of the Association. They shall meet at such times as they themselves shall determine upon. The first Vice-President shall be Chairman, and in his absence, the other officers of the Association in the order named.

CHAPTER VI.

Publications of the Society.

ART. 1. All papers shall be published as far as practicable in the order in which they have been reported upon.

ART. 2. Drawings shall be considered the property of the individual who furnishes them; and shall be returned when called for, unless originally understood to be presented to the Society.

ART. 3. Every author shall be entitled to twenty extra copies of his paper at the expense of the Society, on timely notice being given to the Secretary.

ART. 4. All communications read before the Society shall be considered its property.

ART. 5. But all written communications which shall not be deemed fit for publication may be returned to their authors, if duly requested.

CHAPTER VII.

Specimens of Natural History and Books.

ART. 1. As the Museum of the College of Charleston is, through the liberality of its Trustees, opened every Saturday for the free admission of its citizens; and, as students may at all times have free access to the collection of the specimens of Natural History in that Cabinet for the purpose of study; and furthermore, as it is desirable to concentrate all our resources and exertions for the advancement of our favorite science, the specimens which may be presented to this Society, or may come into its possession by purchase, shall be immediately transferred to the Cabinet of that institution as a free gift; and all books, drawings, charts, etc., shall be deposited in its Library, subject to the claim of the Society.

CHAPTER VIII.

Meetings.

ART. 1. The stated meetings of the Society shall be held on the first Tuesday evening of each month; the hour to be fixed from time to time by the Society. No change, however, can be made but after one month's notice given at a business meeting, and laid on the table to be acted upon at the next business meeting.

Art. 2. The meeting in November shall be called a business meeting, and also, every third meeting thereafter, and shall be devoted to the enacting and altering of laws, the financial concerns of the Society, receiving reports from the Standing Committee and the Committee of Curators, and in general to all such business as does not appertain to the scientific transactions of the Society.

Art. 3. All other stated meetings shall be called ordinary meetings, and shall be devoted to scientific pursuits. No other business shall be brought forward except in cases of urgency, and on a vote of two-thirds of the members present.

Art. 4. Special meetings may be convened by resolution of the Society, or by public notice from the President, or by the joint request of five members.

Art. 5. Five members shall constitute a quorum. Strangers may be introduced at ordinary meetings of the Society.

Art. 7. The order of business at ordinary meetings shall be—

1st. Reading of the minutes of the last ordinary meeting.
2nd. Reception of specimens of Natural History.
3rd. Reception of Books, drawings, etc.
4th. Written communications.
5th. Verbal communications.
6th. Business called up by special resolution.
7th. Reading of the rough minutes.
8th. Adjournment.

Art. 8. The order of business at business meetings shall be—

1st. Reading of the minutes of the last business meeting.
2nd. Reports of the Standing Committee.
3rd. Report of the Committee of Curators.
4th. Report of the Secretary.
5th. Report of the Treasurer.
6th. New business.
7th. Elections.
8th. Reading of the rough minutes.
9th. Adjournment.

CHAPTER IX.

Art. 1. In all such points of order as are not noticed in these By-Laws, the Society shall be governed by the established usages of similar institutions.

Art. 2. No alterations shall be made in these By-Laws, unless they be proposed in writing at one business meeting, lie on the table until the next, and be sanctioned by the affirmative vote of two-thirds of the subsequent business meeting, at least nine members being present.

The following is a list of the officers elected, 1853.

President.
REV. DR. BACHMAN.

Vice-Presidents.
PROF. L. R. GIBBES,
PROF. E. GEDDINGS,
PROF. S. H. DICKSON,
PROF. JAMES MOULTRIE,
PROF. WM. HUME,
DR. EDMUND RAVENEL,

Secretary,
PROFESSOR F. S. HOLMES.

Treasurer,
DR. FRANCIS T. MILES.

Curators.
DR. S. W. BARKER,
DR. THOS. L. BURDEN,
DR. J. P. CHAZAL,
DR. L. A. FRAMPTON,
DR. P. C. GAILLARD,
DR. J. F. M. GEDDINGS,
JNO. McCRADY, ESQ.,
DR. M. MICHEL,
DR. F. T. MILES,
DR. F. PEYRE PORCHER,
DR. ST. J. RAVENEL,
HENRY W. RAVENEL, ESQ.,
W. WRAGG SMITH, ESQ.