PROCEEDINGS

OF THE

ESSEX INSTITUTE.

VOL. IV.

1864–5.

[Issued Quarterly.]

SALEM:
PUBLISHED BY THE INSTITUTE.

1866.
ERRATA.

Page vii, line 21, for John H. Bettis read John B. Bettis.
" x, " 13, for convential read conventional.
" 9, " 14, for Phalsenidæ read Phalenidæ.
" 11, " 12, after Agarista see insert a comma.
" 12, " 6, for lignivorous read lignivorous.
" 12, " 30, for strangely read strangely.
" 13, " 36, for Tortriidæ read Tortricidæ.
" 15, heading, for Zygænidæ read Zygænidae.
" 15, line 24, for Zygænidæ read Zygænidæ.
" 16, " 8, for maxillary read labial.
" 22, " 11, for gives read give.

Plate I.
The figure of the Imago should be fig. 1, not 1b.
MONDAY, JANUARY 11. Evening meeting.
The President, A. Huntington, in the chair.
Donations to the Library and Cabinets were announced.
Rev. G. W. Briggs occupied the evening in reading a portion of a Memoir of the late President of the Institute, Hon. D. A. White.
Adjourned to Thursday evening next, for the continuation of the reading of the Memoir.

WEDNESDAY, JANUARY 13. Ordinary meeting.
J. G. Waters, in the chair.
E. K. Roberts was appointed Secretary pro tempore.
Arthur Kemble, and William Neilson of Salem, were elected Resident Members; Benjamin Peirce of Cambridge, James B. Endicott now in England, and William Endicott now in China, Corresponding Members.

THURSDAY, JANUARY 14. Adjourned evening meeting.
The President in the chair.
H. M. Brooks was elected Secretary pro tempore.
Rev. Dr. Briggs finished the reading of his Memoir of the late Judge White.
The thanks of the Institute were voted to Rev. Dr. Briggs, for his valuable and interesting Memoir of our late President, and a copy was requested for publication. (See Historical Collections, VI, No. I.)

Monday, January 25. Evening meeting.

The President in the chair.

Donations were announced to the Library and Cabinets.

Letters were read, from G. A. Ward accepting membership; from Corporation of Yale College; Trustees of the Newburyport Public Library; and New Haven Colony Historical Society, acknowledging the receipt of Publications: from R. S. Rantoul, in relation to the naming of Forts in Marblehead and Gloucester.

George A. Ward read a communication, giving an account of the formation of the Essex Historical Society, forty-two years ago last June.

Allusions having been made in Mr. Ward's communication, to the existence of the frame of the original "First Church," in Salem, on the land of David Nichols, rear of Boston street, considerable discussion ensued, as to the proof of the above mentioned frame being that of the "First Church." The President, Francis Peabody, G. A. Ward, A. C. Goodell Jr., and Rev. G. D. Wildes participated in the discussion; the arguments adduced seemed to favor the affirmative of the question.

The thanks of the Institute were voted to Mr. Ward, for his valuable communication and a copy was requested for publication. (See Historical Collections, VI, No. I.)

Monday, February 8. Evening meeting.

The President in the chair.

Donations to the Library and Cabinets were announced.

Letters were read, from Wm. Neilson accepting membership:
from the Smithsonian Institution, Washington, acknowledging the receipt of Publications: from Jonathan Pearson of Schenectady, in relation to the publications.

The Secretary read a communication from D. M. Balch, "On the Sodalite at Salem." Referred to the committee on publications.

F. W. Putnam read a communication from George H. Emerson of Cambridge, "On Magnetite, and an Unknown Mineral at Nahant." Referred to the publication committee.

Rev. G. D. Wildes spoke of the thoroughly English aspects of several of our olden towns in the County of Essex, noting particularly those of Ipswich, as illustrating to the untravelled eye, the marked features of the English rural town. Probably no County in the State in its local names and physical character is more suggestive of associations connected with the mother land.

A. C. Goodell Jr., in presenting to the meeting, one of the parts, (viz: the deed to the grantees, Edward Winslow and Robert Cushman,) of the original indenture or patent from Lord Sheffield, of the territory of Cape Ann, which indenture was deposited in the archives of the Institute by J. Wingate Thornton Esq., of Boston, gave a brief account of the dates of the several voyages of discovery, charters and settlements by Englishmen in America; and specially referred to the earlier grants and charters of the planters at New Plymouth and Massachusetts Bay.

The instrument deposited by Mr. Thornton, bearing date Jan. 1, 1623-4, he declared to be the grant under which the New Plymouth people first laid claim to Cape Ann, and began that series of settlements by fishermen and planters which laid the foundation of this flourishing Commonwealth.

Mr. Wildes followed Mr. Goodell in some remarks as to the great value of such documents, and alluded to the care taken of similar articles in the British Museum, mentioning several very valuable historical relics which he had seen in that collection.
The thanks of the Institute were voted to Mr. Thornton for this valuable contribution.

Wednesday, February 10. Ordinary meeting.
H. J. Cross in the chair.
Charles Creesey and Joshua Safford, of Salem, were elected Resident Members.

Monday, February 22. Evening meeting.
Vice President, A. C. Goodell Jr., in the chair.
Donations to the Library and Cabinets were announced. F. W. Putnam presented a communication by A. S. Packard Jr., of Brunswick, Maine, entitled "Notes on the Family Zyganidae." Referred to the Committee on Publications.
R. S. Rantoul read the following communications which he had recently received from the War Department, at Washington, accompanying the same with a brief account of his visit to Washington and his interview with Mr. Whiting, the Solicitor for the Department, in relation to the subject of naming the Forts in Gloucester and Marblehead:

War Department, Washington City, Feb. 8th, 1864.

Robert S. Rantoul Esq.,
Dear Sir,
I have the pleasure of enclosing the order of the Secretary of War made at my request in accordance with the wishes of the Essex Institute, naming Fort Glover and Fort Conant.
Respectfully, your obedient servant,
William Whiting,
Solicitor of the War Department.

War Department, Washington City, Feb. 7th, 1864.

Sir,
The Secretary of War directs me to acknowledge the
receipt of Mr. Robert S. Rantoul’s communication dated January 22d, addressed to you and enclosing copy of a resolution passed by the “Essex Institute” of Salem, Massachusetts, recommending that the fortifications now erecting in Marblehead be named “Fort Glover,” and the works designated for the “Stage” in Gloucester “Fort Conant.”

In reply, I am instructed to inform you, that the Secretary regards the names proposed as suitable designations of these defences, and that he has ordered that they be named accordingly.

Very respectfully, your obedient servant,

Ed. M. CAMBY,
Brigadier General, A. A. G.

Hon. Wm. WHITING,
Solicitor of the War Department.

The chair remarked as follows: soon after the publication of Mr. W. P. Upham’s Memoir of Gen. John Glover of Marblehead, S. H. Phillips Esq., suggested the propriety of having one of the Forts about to be constructed in Marblehead named “Fort Glover.”

At a meeting of the Essex Institute, held on Wednesday, Sept. 2, 1863, on motion of Mr. W. P. Upham, a committee, consisting of Messrs. W. P. Upham and A. C. Goodell Jr., was appointed to cooperate with the town authorities and citizens of Marblehead in such a manner as may be deemed appropriate to accomplish this object.

At a meeting held on Monday evening, Dec. 14, 1863, the subject of naming the fortifications designed for the “Stage” in Gloucester, “Fort Conant,” suggested in a letter to Mr. Goodell by J. Wingate Thornton Esq., of Boston, in honor of Roger Conant, the founder of the first plantation in Massachusetts Bay, was brought to the notice of the Institute and referred to the same Committee who had under consideration the naming of the Fort at Marblehead.

Mr. Goodell moreover stated that as the business for which the Committee was appointed had been so fully accomplished by Mr. Rantoul, he desired to be excused from further duty.
This was voted, and also a resolution of thanks to Mr. Rantoul.

Adjoined to meet on Monday of next week, Feb. 29th, and voted that meetings be held on every Monday until otherwise ordered.

**Wednesday, February 24.** Ordinary meeting.

H. P. King in the chair.

Henry R. Stone of Salem, was elected a Resident Member. Charles E. Hamlin of Waterville, Me., and S. I. Smith of Norway, Me., were elected Corresponding Members.

**Monday, February 29.** Evening meeting.

Vice President, A. C. Goodell Jr., in the chair.

Donations were announced to the Library and Cabinets.

Letters were read, from Henry R. Stone, accepting membership: from B. F. Mudge, of Quindaro, Wyandote Co., Kansas, in relation to the Geological survey of that State: from Trustees of the New York State Library; Historical Society of Pennsylvania; Henry A. Smith of Cleveland, Ohio; J. Henry Stickney of Baltimore, Md.; and N. Paine of Worcester, relating to the publications.

F. W. Putnam made some remarks on Orthopterous Insects, suggested by specimens presented to the Institute by Miss Edmunds.

Mr. Putnam presented a communication from A. E. Verrill of Cambridge, entitled "Synopsis of the Polyps collected during the years 1853-6, by Dr. Wm. Stimpson, Naturalist to the North Pacific Expedition, commanded by Captains Ringgold and Rogers." Referred to the publication committee.

The Secretary read the following communication from Geo. A. Ward, in regard to the naming of "Fort Lee."

"While at work in reconstructing the fort on Salem Neck in 1812 as a member of the Salem Light Infantry, my grandfather informed me that it was originally planned by General Charles Lee, and that he gave instructions regarding it, and that his name was given to it. My said Grandfather was of the Com-
mittee of Safety and had considerable to do as to the fortifications in the neighborhood of Salem, and I think he could not be mistaken as to Fort Lee."

Extracts from the Town records were read in relation to this subject, and remarks were offered by the chair, H. Wheatland, W. P. Upham and others. Some suggesting that the Fort was named for Colonel W. R. Lee, formerly collector of Salem and an active officer in the Revolution.

The chair presented in behalf of J. V. Browne, a copper plate, on which was engraved the likeness of Rev. Joseph Sewall of Boston, and gave a brief sketch of the life of Mr. Sewall.

T. Ropes made some enquiries relative to the old Friends Meeting House, on the South side of Essex street, between Monroe and Dean streets, which were replied to by the chair.

John M. Ives spoke of the new silk worms that feed on the Ailanthus, and remarks were offered by F. W. Putnam and others on silk producing worms.

The remainder of the evening was occupied by F. W. Putnam, who gave a general view of the geological succession of animals, and their geographical distribution at the present time.

John H. Bettis and Robert Brookhouse 3d, of Salem, were elected Resident Members.

MONDAY, MARCH 7. Evening meeting.

Vice President, A. C. Goodell Jr., in the chair.

Donations to the Library and Cabinets were announced.

Letters were read, from C. E. Hamlin and S. I. Smith, accepting membership: from S. Jillson respecting some Birds.

H. Wheatland read extracts from the Records of the Superior Court of Judicature and the Inferior Court of Common Pleas (1766) relative to one Jenny Slew of Ipswich, Spinster, (colored woman) vs. John Whipple Jr. of Ipswich, claiming damages for his detention of her as a slave. The judgment of the Inferior Court was reversed by the Higher Court and the plaintiff recovered her liberty and damages.

Rev. G. D. Wildes spoke of Domestic Servitude as it existed
in this country prior to the Revolution, and instanced the case of a Norwegian girl in his Grandfather's family, whose services were purchased for a term of years.

The chair alluded to a similar case in Manchester.

Mr. Wildes spoke of Marblehead as presenting a near and most interesting field of Antiquarian research for the younger members of the Institute, whose minds might be directed to that department. St. Michael's Church, with its ancient Church yard; the old mansions of that formerly flourishing seaport; the history of several families identified with Colonial and Revolutionary history, would be found to present most interesting points of enquiry.

Mr. Wildes also spoke of Christ Church, Cambridge as perhaps the best specimen, in this country, of the English Village Church of the last Century. It was a question whether the frame of this Church was brought from England or not. Mr. W. gave an interesting account of the Vassal family, in connection with this Church, and of the several old mansions, still marking the social life of Cambridge in the Ante-revolutionary history of the town. A visit to Cambridge, in connection with researches into the history of some of these, even now elegant residences of a later generation, would be found to be full of interest and instruction.

Remarks of a conversational character from Messrs. Wildes, Beaman, the chair and others, relating to Boston and its vicinity in Revolutionary times occupied the rest of the evening.

A Committee consisting of Messrs. F. W. Putnam, J. A. Gillis, R. S. Rantoul, W. P. Upham and H. Wheatland were appointed to revise the Constitution and By-Laws.

**MONDAY, MARCH 14.** Evening meeting.

Vice President, A. C. Goodell Jr., in the chair.

Donations to the Library and Cabinets were announced.

Letters were read from Joseph A. Goldthwait of New Berne, N. C., relating to specimens sent to the Institute: from Wm. A.

The Secretary read some extracts from the Records of two Aqueduct Corporations, which, though limited in their operations, are interesting as relating to the history of the introduction of water into this city. (See Historical Collections, VI, No. I.)

F. W. Putnam exhibited the Pea Hen recently presented by F. Peabody and mounted by S. Jillson. This Hen had been kept on the grounds of Col. Peabody for seventeen years; about two years since she commenced to assume the plumage characteristic of the male, and had so far accomplished this object that at the time of her death she had attained the "train" and the brilliant colors of the male. Mr. Putnam stated that Latham, in his Synopsis of Birds, mentioned two such instances that had come under his observation. He also said that similar cases had been noticed among other birds, and was quite common in the English Pheasant. Similar changes in the external appearance were known to take place in some species of fishes.

A. C. Goodell Jr. read a portion of an account, presented by George B. Loring, of the houses on Essex street in 1793, written by Col. Pickman who died in 1819.

Thomas Morong of Gloucester, was elected a Resident Member. Jeremiah L. Hanaford of Watertown, and Benj. F. Mudge of Quindaro, Kansas, were elected Corresponding Members.

Vice President, A. C. Goodell Jr., in the chair.

Donations to the Library were announced.

Letters were read, from the Trustees of the New York State Library, giving notice of the transmission of books: from Trustees of the Boston Public Library, acknowledging the receipt of publications: from Wm. A. Smith of Worcester, in relation to publications.

Mr. Goodell concluded the reading of Mr. Pickman's account
of the old houses on Essex street. Referred to the publication committee to be printed in the Historical Collections.

Some discussion followed relative to the old houses in Salem, participated in by Messrs. Ropes, Goodell and others.

MONDAY, MARCH 28. Evening meeting.

Vice President, A. C. Goodell Jr., in the chair.

Donations to the Library and Cabinet were announced.

F. W. Putnam made some remarks upon the Trilobites from the Braintree quarry, presented by A. S. Packard Jr.

The Rev. Mr. Wildes, presented to the Institute, several articles which he had procured in a visit to Newburyport this afternoon. One of these was a framed engraving of the body of Marshal Ney, as it appeared after being taken to a conventual house in Paris, immediately after his execution. The engraving, suppressed by the Allied Commander in the fear that it might tend to popular tumult, is supposed to be the only one in this country. It presents a most faithful portrait of the Marshal, and is not the least interesting among the historical objects in the collection of the Institute.

Mr. W. also presented to the Institute, on deposit, the bullet by which Capt. Greenleaf was wounded in the fight with the Indians near Newbury, in 1695. It is hoped, that the buff coat, worn on the occasion by Capt. G., and still in the possession of his descendants, may eventually be obtained for the Institute.

A third article presented by Mr. W., on behalf of the Misses Tracey of Newburyport, was the snuff box of the eminent merchant Jeremiah Lee of Marblehead, the subject of the exquisite painting by Copley, now, with that of Madame Lee, in the possession of the Misses Tracey.

Another article presented by Mr. W., in behalf of E. W. Rand Esq. of Newburyport, was a pair of very ancient tongs, used for the purpose of lighting a pipe, and with various pecu-
liar contrivances for securing reasonable comfort in smoking. Mr. W. accompanied the presentation with various interesting details as to these and other objects of interest, which might eventually be procured from the same sources for the collections of the Institute.

F. W. Putnam called the attention of the meeting to a singular monstrosity that had been presented by Mr. James Buffington of Salem. This was a young duck that had, apparently, an extra leg developed from its back. Upon dissection this leg proved to be made up in some parts, of two legs closely united. The portion joining the pelvis (the femur,) being single, but the second segment of the leg (tibia and fibula) was shortened and spread out, so as to allow the articulation of two tarso-metatarsal bones, and from this point the foot was nearly double, having six toes, the two small hind toes being wanting.

Mr. William Mansfield presented to the Institute a wooden model, used before the city government to illustrate the grade and direction of the proposed route of the Eastern Railroad, in 1837-8, through Washington Street, in Salem. This model contains, in miniature, all the buildings then standing on the land included in the present Washington Street South of Essex Street, except the "Marston building." The chair gave an historical sketch of these several buildings, and of earlier structures in the same locality.

Additions to the Museum and Library during January, February and March, 1864.

TO THE NATURAL HISTORY DEPARTMENT.

Bertram, John. Specimen of Malachite.

Buffington, James. Malformed Young Duck.

Edmands, Miss A. M. Collection of 24 species of North American Orthoptera, named by Mr. Scudder. 250 specimens of New England Spiders.

Felt, S. Q. Lime incrustation from Brazil.
Goldthwait, Capt. J. A., New Berne, N.C. Fossil wood, a portion of a large tree, from Neuse River, near Kingston, N.C.

Hamlin, Prof. C. E., Waterville, Me. 3 Salamanders, 2 species from Waterville.

Harrington, Capt. Geo. Fossil Shells from Gibraltar.


Hartt, J. W., St. John, N. B. Two specimens of Fossil Fish from the Albert Coal Mine, N. B.

King, Capt. H. F. Wood of the Sophora Japonica.

Lyceum of Natural History of Williams College (In exchange.) 19 species of Corals from Florida, named by Mr. Verrill.


Neal, Jos. Body of a Fox, for Skeleton.

Ordway, H. L., Ipswich. 34 specimens, 5 species of Spiders from Ipswich.

Packard Jr., A. S., Brunswick, Me. Trilobites from the Braintree Quarry. 40 species, 200 specimens of Lepidoptera Maryland. 3 species, 8 specimens of Lepidoptera from England.

Peabody, Francis. A female Pea fowl which had assumed the characteristic plumage of the male.

Putnam, F. W. Iron Ore from Port Henry Mines, N. Y. Clay stones from Lake Champlain.


Robinson, John. 40 specimens, 12 species of Insects from Salem.

Sanborn, F. G., Boston. 117 specimens, 28 species of Spiders from Essex County.

Smith, Lawrence P. Insects from the Southern States.

Smith, S. I., Norway, Me. Young Salamanders from Norway.

Stevens, C. B. Skin of a Phatagin Manis tetradactyla from Madagascar.

Stone, W. H., Agent Port Henry Mines, N. Y. Specimen of the Cheever Iron Ore from four hundred feet depth.

TO THE HISTORICAL DEPARTMENT.

Barton, Wm. C. Model of a Chinese Vessel.


Brown Jr., Benj. Two United States Buttons.

Brown, Horace. Feather Cape from India.

Cole, Mrs. N. D. Bust of Alex. Hamilton, (in plaster, bronzed.)

Cloutman, William R. 3 China, 3 Japanese and 3 Russia Coins. Japanese Inkstand. Brick from Captain Kid's Fort, and a Stone from the grave of "Paul and Virginia."

Greenough, W. An old Musket, taken from a Blockade Runner.

Kimball, Capt. Thomas. Model of a Catamaran used on the coast of Brazil.

Mansfield, Wm. Model used to illustrate the route of the Salem Tunnel.

Nichols, Mrs. Andrew. Tile from the old Gov. Winslow house, Plymouth.

Nichols, C. F. Stone from the Hoosac Tunnel, half a mile from the entrance.


taken at the Battle of Roanoke Island. Portion of Rebel Flag-
staff at Washington; N. C.

Rand, E. W., Newburyport. Ancient Tongs used for light-
ing a pipe.

Playing Cards.

Rogers, Ewd. S. Old Tiles for Fireplace ornaments.

Russell, A. B. Cane made with a jackknife.

Smith, Lawrence P. Rebel Sword.

Ward, G. A. The Waistcoat worn by Capt. Jonathan Har-
aden during the Revolutionary war.

cannon, made at Falls Village, Conn.

Wiggin, J. K., Boston. Sword blade, from the cargo of
the Anglo-Rebel Blockade Runner "Minna."

Wildes, Rev. G. D. (On deposit.) An engraving of the
body of Marshal Ney, from a drawing made soon after his exec-
ution. The bullet taken from the body of Capt. Greenleaf,
wounded in a fight with the Indians near Newbury in 1695.
The Snuff Box of the eminent merchant Jeremiah Lee of Mar-
blehead.

TO THE LIBRARY.

Chase, George C. Friend's Review, 20 numbers.

Cole, Mrs. N. D. Salem Gazette, 1863, 1 vol. folio; Boston Daily Evening Traveller 1863, 2 vols. folio.

Davis, Charles of Beverly. Files of Beverly Citizen, vols.
1 and 2, folio, 1850 to 1853.

Decosta, B. F. of Charlestown. Footprints of Miles Stan-

Dodge, Allen W. of Hamilton. Cushing's Newburyport,
12mo, 1826; Report on Hoosac Tunnel, Feb. 1863, 8vo,
pamph.

Foote. C. Files of several County Papers, for September,
October, November, and December, 1863.
Gillis, James A. Massachusetts State Registers for 1856 and 1858, 2 vols. 8vo. 25 Pamphlets.

Hanaford, Mrs. P. A. of Beverly. Several numbers of the New Jerusalem Messenger.


Johnson, A. B. of Utica, N. Y. Our Monetary Condition, by A. B. Johnson, 8vo, pamph. Utica, 1864.


Johnson, Mrs. Lucy P. Independent for 1863, fol. New York.


Loring, George B. Two manuscript volumes containing the Expenses of Salem from 1788 to 1802, kept by Benjamin Pickman.

Massachusetts Secretary of State. Mass. Public Documents 1862, 3 vols. 8vo; Census of Mass., 1 vol. 8vo, 1863; 19th and 20th Registration Reports, 2 vols. 8vo; Acts and Resolves for 1863.


Nichols, Charles F. Collection of Handbills, &c.

Nichols, Henry P. Several pamphlets.

Oliver, H. K. 27 pamphlets, including Legislative Documents and Town Reports.


Putnam, Capt. George D. Regulations of the Army of the Confederate States, 12mo. Richmond, 1863.

Rantoul, R. S. Several pamphlets.

Short, Joseph. Shepard’s Sound Believer, 12mo. Boston, 1762.


Stevens, C. B. Pilot from July to Dec. 1807 and part of 1809, 3 vols. folio. London.


Upton, James. Scientific American, several numbers.


Waters, J. Linton of Chicago, Ill. 15th Annual Rep. of Trade and Commerce of Chicago, for 1863, 8vo, pamph.

Wheatland, Mrs. B. Boston Daily Transcript, July to Dec., 1863, 1 vol., folio.

Wheatland, Stephen G. 45 Pamphlets.

Wyman, T. B. of Charlestown. Genealogy of the Hunt Family, 4to, Boston, 1862-3.

BY EXCHANGE.


Canadian Institute at Toronto. The Canadian Journal for Jan. 1864.


Monday, April 4. Evening meeting.

The President in the chair.

Donations were announced to the Library and Cabinets.
XIX

Letters were read, from J. L. Hanaford of Watertown, accepting membership; and from Wm. Graves of Newburyport, on business matters.

Rev. G. D. Wildes gave an account of Queen Elizabeth's yacht, and showed, by a drawing on the black board, that in model and rigging it very nearly resembled the North River Sloops of the present day.

He suggested that an account of the different kind of vessels used from the early settlement of the country to the present day would be a valuable contribution to our commercial history.

A. C. Goodell Jr. called attention to the late discovery of a sunken vessel near Yarmouth on Cape Cod, supposed to have foundered there in 1623, which illustrated the manner of building at that period.

F. W. Putnam, in reply to questions, described the characteristic form of the breast bone of swimming birds and the different modes of progression among fishes. Mr. Putnam alluded to the erroneous views in regard to moths, as recently given in the newspapers and gave an account of the various species which are so destructive to furs, carpets, cloths, &c.

Voted; that the committee, appointed on the 7th of March, on the Constitution and By-Laws, be requested to nominate a list of officers for election at the annual meeting.

MONDAY, APRIL 11. Evening meeting.
Vice President, A. C. Goodell Jr., in the chair.
Adjourned to Monday Evening the 18th inst.

MONDAY, APRIL 18. Evening meeting.
Vice President, A. C. Goodell Jr., in the chair.
Donations to the Library and Cabinets announced.
Letters were read, from Thomas Morong of Lanesville and B. F. Mudge of Quindaro, Kansas, accepting membership; from Long Island Historical Society, Smithsonian Institution, and George A. Ward relating to books transmitted to the Library;
Messrs. Ticknor and Fields on business matters; from David Choate in reply to queries proposed; from Miss M. B. Derby accompanying a donation of a Burmese Idol sent from India in 1825, by her brother the late Capt. Alfred F. Derby; from James T. Tucker, of the staff of General Banks, relating to a donation to the Historical Department, of the envelope, franked by President Lincoln which enclosed his recognition of the election of Governor Hahn of Louisiana.

Rev. G. D. Wildes exhibited a piece of stone taken from a window sill in Kenilworth Castle, and made some interesting remarks about that celebrated place. Mr. W. also exhibited several views of the house in which Shakespeare was born and of other interesting localities in the vicinity of Stratford upon Avon, and gave a description of the same.

The remarks of Mr. Wildes called forth a general discussion upon the life and writings of Shakespeare.

F. W. Putnam mentioned that Mr. James H. Emerton had found a female Lump Fish *Cyclopterus lumpus*, having matured eggs, just on the point of being laid, and had made an estimate of their number, which amounted to 258,372. Five hundred eggs weighed 43 grains.

Col. J. H. Wildes, Asst. Surveyor General of California was elected a Corresponding Member.

Voted to adjourn to Monday evening, the 25th inst.

**MONDAY, APRIL 25.** Evening meeting.

The President in the chair.

Donations were announced to the Library and Cabinets. Letters were read, from Newburyport Public Library and Pennsylvania Historical Society, acknowledging the receipt of publications; from Messrs. Crosby & Nichols of Boston, and Henry A. Smith of Cleveland, Ohio, on business matters; from Mrs. P. A. Hanaford in relation to holding a Field Meeting in Reading.

F. W. Putnam, from the Committee on the Constitution and
By-Laws, submitted the first reading of the amendments to the Constitution to be acted upon at the annual meeting.

Mr. Putnam read a communication from A. S. Packard Jr. of Brunswick, Me., entitled "The Humble Bees of New England, and their parasites, with notices of a new species of Anthophorabia, and a new genus of Proctotrupidae." Referred to the Publication Committee.

The subject which occupied a portion of the last meeting, and which had engrossed the attention of the Literary and Historical Societies during the past week, the ter-centenary birth day of Shakespeare, was resumed, remarks being made by the chair, Messrs. Wildes, Beaman and others.

John Kilburn of Salem was elected a Resident Member.

**Monday May 2. Evening Meeting.**

Vice President, A. C. Goodell Jr., in the chair.

Donations to the Cabinets and Library were announced.

Letters were read, from Henry Saltonstall of Boston, Justin Rideout of Boston, L. Saltonstall of Newton, and the Postmaster of Boston, on business matters; from the Misses Derby, relating to a donation of books to the Library; from the Mass. Historical Society, acknowledging the receipt of publications; from John Kilburn, accepting membership.

A variety of May-flowers having been placed upon the table, and the subject of May-day festivals having been alluded to, the Chair remarked that the return of another May-day, with its accompanying festivities, invites us to consider the pleasant change now working in the public mind of New England with regard to the observance of this ancient holiday of our Motherland.

The very name of May, not less than the practices used to usher in the month, runs back into the obscurity of antiquity. The poet Ovid, whose surmise has been generally adopted, derives it from the names of several Roman deities, among whom is the fair Maia, the mother of Mercury. But there are, on
the other hand, some reasons to support the conjecture that the name is of Teutonic origin; and, as this conjecture neither wounds our vanity nor conflicts with history, we may safely assume it to be the true one, and so unbridle fancy to carry back our May-day festivals beyond the time of the Heptarchy, into the woods of Germany, and among those hilarious wild-men, the primitive ancestors of our Saxon stock.

Whatever gave rise to the ceremonies of May-day—whether they are a relic of the early "mythology of the Teutonic peoples," or a continuation of the *Floralia* of the Romans, or a Christian festival in honor of the Blessed Virgin, as has been variously supposed by different investigators of the subject—all are agreed that, in England; at least, they are of so ancient observance that "the memory of man runneth not to the contrary;" and that, universally, they symbolize the joy of mankind at the triumph of the Sun over the frosts and barrenness of Winter.

The celebration of the May-games was extremely distasteful to the Puritans and other early reformers in the English Church; and, doubtless, the many excesses of the revellers—the wantonness and debauchery inseparable from these festivals—were sufficiently scandalous to all pious and moral men. Latimer, who suffered martyrdom in the reign of Mary, discloses another objection to these pastimes in a sermon preached before the young King Edward against the popular observance of Robin Hood's day, which, he complains, sometimes drew all the parish away from church. "I thought," he mournfully says, concerning an instance of this kind within his own experience, "my rochet would have been regarded; but it would not serve, it was faine to give place to Robin Hood's men."

The Puritans were certainly not steeled against all the sweet influences of nature, nor backward in their enjoyment and praise of the beauties of Spring; and it was the chief of Puritan poets whose "Song on May Morning," remains to this day unapproachable in its excellence.
But the Puritans were not blind to the evils already alluded to, and, moreover, it is clear that they considered the May-pole to be a relic of those heathen rites performed by the ancients in their worship of the goddess Flora: it was for this reason that Philip Stubbs arraigned the May-games in 1595, in his "Anatomy of Abuses;" and for this reason sixty years later, Thomas Hall made them the subject of his "Funebria Floræ; or, Downfall of May-games," &c. Here, in New England, our good old Governor Bradford, of Plymouth, also condemned them for the same reason.

Not long after the landing of the Pilgrims at Plymouth some events occurred in their neighborhood, which called forth an official denunciation of May-day festivities, by the colonial authorities; and the rebuke was administered in so emphatic a manner that, if it has not effectually prevented a repetition of these ceremonies for all time, in New England, it has, at least, brought upon them a stigma which the lapse of two centuries has not wholly removed.

The Chair then proceeded to give an account of "Thomas Morton, of Clifford's Inn, Gent."—as he styles himself in his "New English Canaan"—and of the famous May-day revels at "Ma-re Mount," now Mount Wollaston, in Quincy, which were celebrated under his direction in 1626.

After detailing the particulars of the action of the colonial authorities against Morton, the dispersion of his followers and the destruction of his plantation, the Chair narrated the principal known facts of his subsequent career down to the time of his death at York in Maine, in 1646, and stated that this first May-day jubilee continued to be, for generations, the last. There had been May-day festivities in Maine before the affair at Mt. Wollaston, and there is some reason to suppose that Morton was a participant in those revelries; but, after his expulsion, and the destruction of his plantation at "Mount Dagon" no Puritan father was ever offended by the sight of the scandalous altar of Flora enticingly set up before the innocent eyes
of his children. But the times are greatly changed since the dark and troubled days of the Pilgrims. There is now, happily, no need of ceaseless vigilance and the most sensitive jealousy in guarding a tender faith from the two-fold danger of relapsing into error or being contaminated by new and specious fallacies. Around our morals, our faith, our liberties, as their great bulwark of safety, modern science has thrown a network of invulnerable truths till old besetting evils have lost their power of harm forever.

No prejudices, then, based on the experience of an age remote and quite unlike the present, should be suffered to interfere with the celebration of the pleasant and pure festivities which of late years are beginning to be observed on May-day, in some parts of New England. It is to be hoped, rather, that we shall add some day in May to the list of legal holidays, and that, from the St. Croix to where "Mine Host of Ma-re Mount" sleeps under the brow of Agamenticus, and thence to Mount Wollaston, where he held his revels, and so along the entire boundary of our Union, May morning will evermore be held sacred to the celebration of the sun's return, the bursting of green buds and the birth of the flowers.

The wild flowers exhibited at the meeting, by those who went a-maying, were described by G. D. Phippen in the following manner:

_Hepatica triloba_, which differs but slightly from an anemone, is one of the earliest plants that has any pretensions to beauty, and is found in oaken woods, peeping up among the dried leaves, in close proximity with drifts of snow. It was mentioned by Higginson in 1629, and described by Josselyn in his New England Rarities printed in 1672, as "Noble Liverwort, one sort with white flowers and the other with blew." The Rev. Dr. Cutler mentions it in 1784, and Collinson writes to Bartram of Philadelphia in 1739, that "out of some mould sent with other plants has come up your Hepatica."

_Anemone nemorosa_, or Wind Flower. This little flower or
a co-species was described centuries ago by Pliny, and long before Gerard wrote "That this floure doth neuer open itself but when the wind doth blow." Darwin says—the wind "gives its ivory petals to expand." It certainly is shy of opening and only occasionally when warmed by the sun, not forced by the wind,

"It "looks up with meek, confiding eye,  
Upon the clouded smile of April face,"—
are words beautifully expressed by a poet much nearer home.

_Epigaea repens_, called Mayflower, and Forefather's-flower, is fast becoming well known and much used of late as a souvenir present at this season of the year, and is associated historically with the ship Mayflower of Pilgrim fame, which however we believe to be of recent application. This flower commends itself both for its delicious, spicy fragrance, as well as its beauty, and is destined to find a place in literature as well as science.

_Caltha palustris_, Marsh Marygold, grows on the border of brooks, has a brilliant golden cup, and first flowers about the 22d of April.

"In that soft season when descending showers  
Call forth the greens and wake the rising flowers."

It is called also May-blouts, or May-blobs, and all the poetry of so fine a posy often subsides into a mess of greens, as it is a favorite dish with many.

Old Parkinson says "It joyeth in watery places and flowereth somewhat early." All the old botanists describe it, such as Clusius, Bauhin, Tournefort, Clayton and some with figures. Cutler imputes the yellowness of butter to the cows feeding upon it.

_Aquilegia canadensis_, or Columbine, was noticed by the early travelers to America, and is well described and figured by Cornuti soon after the settlement of Canada,
and through him obtained its specific name; it has been from that day highly prized by the botanists and florists of Europe. Parkinson says, “it was brought out of Virginia by Master John Tradescant, and flowereth somewhat earlier than any of the garden kinds, usually by a month.” There is a remarkable locality of this showy flower on the hills of the Great Pasture on the east side of the road, which is much frequented by the young during the vacation of this month, who, returning with bunches of them in their hands, remind us—

“That spring is here, the delicate footed May,
With its slight figures full of leaves and flowers.”

*Sanguinaria canadensis*, Blood-root, appropriately named, as may be seen by breaking the root, which is rarely avoided in digging them up. This fine flower, as large as the Ox-eye daisy, has a deserved place in many gardens, where it gradually increases and elevates its numerous and paper-white flowers in a flat surface over the plant about four inches above the ground. Its singular root is used extensively in medicine, and probably worthily so, and the plant is often figured in medical books. Its large and deeply lobed leaves give to the plant, throughout the summer, a tropical appearance. It was carried to England and cultivated as early as 1680. Linnaeus wrote to John Ellis from Upsal in 1765, “If you see Mr. Lee, ask him for the Sanguinaria, which I know is to be had in England, though I have not received it from any of my correspondents.”

*Violets*. Two or three species of this well known genus can now be obtained from the fields. They are celebrated both by the exact botanists and the idealist. Pliny says, “There be some wild and of the field; others domestical and growing in our gardens. Garlands made of violets and set upon the head resist the heaviness of the head
and withstand the overturning of the brain, upon over-drinking; yea, the very smell thereof will disperse such fumes and vapors, as would trouble and disquiet the head."

Gerard, alluding perhaps to the Pansy, then called Herb Trinitie, says they "have a prerogative above others, not only because the mind conceiveth a certain pleasure and recreation by smelling and handling them, but they bring to a liberal and gentle minde the remembrance of honestie, comelinesse and all kind of virtues." An eastern poet has said of this flower,

"It is not a flower; it is an
Emerald bearing a purple gem."

*Houstonia caerulea*, one of the most common of the spring flowers, and a universal favorite, often called Viollets,—a most delicate little biennial plant, its erect and very slender stem topped off with starry white or pale blue flowers with a yellow eye, and in masses often appearing like a thin sprinkling of snow over the fields.

It does not appear to have been introduced into the Kew gardens till 1785. It is figured in Curtis's Magazine and elsewhere.

*Saxifraga virginica*. One of Parkinson's seventeen tribes of plants are the "Saxifrages, or Break-stone Plants," so called from their habit of growing in the seams or crevices of rocks, not inaptly described by Josselyn as "The New England Dayzie or Primrose, the second kind of Navelwort in Johnson upon Gerard; it flowers in May and grows amongst moss upon hilly grounds and rocks that are shady." It is an Alpine plant, this and a co-species, the *S. nivalis*, were among the very last flowers that greeted the eyes of Kane and his weary voyagers as they pressed onward toward the pole, beyond all vegetable life.
Erythronium americanum, most improperly and unhappily called "Dog’s Tooth Violet," a fine locality of which can be seen in the low land among bushes near Legg’s Hill and the Forest River road. It belongs to the Lily tribe, and it has been suggested that it be called May Lily. It has elegant glossy leaves, blotched with purple. Josselyn, in 1672, calls it "Yellow Bastard Daffodil; it flowereth in May; the green leaves are spotted with black spots." It was cultivated in England in 1665, and is mentioned in Rea’s Flora.

Feathery Catkins, from the branches of Alders, Willows, Poplars and Maples, are now for a brief period shaking their pollen to the winds, and in their graceful beauty are well worthy of study. They are occasionally mentioned with much effect in the poems of Bryant, some of whose sweetest inspirations were caught under the swaying branches of his native woods.

Rev. G. D. Wildes gave an account of a recent celebration of May-day in England.

F. W. Putnam gave a summary of a paper, presented for publication by J. A. Allen of Springfield, entitled a "Catalogue of Birds found at Springfield, Mass., with Notes on their Migrations, Habits, &c., together with a List of those Birds found in the State not yet observed at Springfield." Referred to the Publication Committee.

The proposed amendments to the Constitution were read for the second time.

Charles D. McDuffie, of Salem, was elected a resident member.

Vice President, A. C. Goodell Jr., in the chair.
Donations to the Library and Cabinets were announced. Letters were read, from S. F. Baird, William Stimp-

The reports of the Secretary, Treasurer, Cabinet Keeper and Curators were read and accepted.

The Secretary stated that the Society was never in a more flourishing condition than at present. The receipts from the assessments of resident members had been greater than in any preceding year, which was also the case in regard to the sales of publications. During the year thirty-seven resident, and twelve corresponding members have been elected. Six members have died, leaving the number of resident members three hundred and sixty-one. Biographical notices of the deceased members will be printed in the June number of the Historical Collections. The Secretary alluded in particular to the late venerable botanist, Dr. George Osgood of South Danvers, who had always taken an active part in the Field Meetings of the Institute, and who was extensively known as one of the Linnaean school of botanists.

Five field meetings were held during the past summer, in Swampscott, Amesbury, Salem, Newburyport, and Rockport, which were all fully attended, and acknowledged successful in the attainment of their objects. Throughout the winter months meetings were held at the Society's rooms on Monday evenings, alternating with lectures on Zoology from Mr. F. W. Putnam.

A course of twelve lectures was given under the auspices of the Institute, at Lyceum Hall during the last winter, as follows:—two from Prof. C. T. Jackson, on Min-
ing; one each, from Mr. C. W. Tuttle, on Cometary Astronomy; Mr. Cleveland Abbe, on Astronomical Instruments; Capt. N. E. Atwood, on the Habits of our Native Fishes; Prof. Benjamin Pierce, on Cosmogony; Mr. Alpheus Hyatt, on the Mollusca; Mr. C. M. Tracy, on Berries; President Hill, on the Geometrical Curve; and Mr. A. E. Verrill, on Corals and Coral Reefs.

The publication of the Proceedings and Historical Collections has been continued during the year. Of the former, the first quarterly number of the fourth volume, under its new form, is ready for distribution to subscribers. The Historical Collections have now reached to number one of volume six.

The annual Horticultural Exhibition took place on the 23d, 24th and 25th of September, but owing to the great scarcity of fruit, of all kinds, the tables were not loaded as in former years, though many fine specimens were contributed, particularly of grapes, which included not only those varieties grown in the hot-house, but many choice seedlings raised by the industry and care of Edward S. Rogers, of Salem. The show of vegetables was unusually good and in great variety. Heretofore very little attention has been devoted in our exhibitions, to this class of horticultural products.

To the Library valuable additions have been made, during the year, consisting of 1603 volumes and pamphlets, received from one hundred and nineteen individuals and thirty-two societies, editors of journals, and the various departments of the State and General Government. The most valuable of the donations were, one from George A. Ward, consisting of 160 volumes in the various departments of History, and general reading; and another from the retiring Vice President of the Institute, James Upton, comprising 51 valuable volumes, principally relating to horticultural subjects.
The Treasurer presented the following statement of the financial condition, for the year ending May, 1864.

**GENERAL ACCOUNT.**

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**NATURAL HISTORY AND HORTICULTURE.**

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**HISTORICAL ACCOUNT.**

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The Cabinet Keeper reported that the specimens in the Museum were in as safe a condition, as the crowded cases of some of the departments would allow. During the year, Mr. T. M. Pond has arranged, catalogued, and labelled the North American birds, and their nests and eggs. Mr. Horace Brown has done the same with the collection of Mammalia, and had commenced to catalogue the Osteological collection when other occupations prevented his completing the work. Mr. Charles H. Higbee has arranged the Mineralogical collection, and by his efforts much has been done to increase its value. The Reptiles have been partially catalogued and named. The snakes which were sent to Professor Jan of Milan have been returned in good condition, with his identifications. Among the specimens Prof. Jan found several unknown species, descriptions of which will appear in his great work on Ophidians, in which he will give full credit to the Institute for its assistance.

During the year, an Essex County Collection has been commenced with the intention to soon have the Natural History of our county fully represented and separately arranged.

The total number of donations to the various sections of the Department of Natural History, since the last annual meeting, amounts to one hundred and twenty-six, received from eighty-six persons; besides which, several exchanges have been made with the Museum of Comp. Zoology at Cambridge, and the Lyceum of Nat. History of Williams' College.

Mr. James H. Emerton, curator of Articulata, reported that the Insects had been looked over, the worthless ones discarded and the others carefully protected from injury. The large collection of Brazilian Insects had been arranged, according to their orders, in a case by themselves. The
other pinned specimens have been arranged in tight boxes
and drawers. The alcoholic specimens of Insects, Crusta-
ceans, and Worms have been arranged in the central cases
of the large Hall. The pinned specimens of Coleoptera,
Orthoptera, and Hemiptera have been catalogued and as
far as possible named. Of the Coleoptera there are 1212
species, and over 3000 specimens. Of Orthoptera, 155
species; Hemiptera, 169 species; Neuroptera, 40 species.
Several hundred species of Diptera and over 2000 speci-
mens of Lepidoptera, one-half of which are from South
America. The Lepidoptera have been partially named by
Mr. S. H. Scudder while in the Museum of Comp. Zoölogy.
The small collection of Bees has been named by Dr. A. S.
Packard Jr. Several exchanges have been made with
Messrs. Scudder and Packard. The collection of Spiders
has been largely increased during the year, and the curator,
who is specially engaged in studying this order of insects,
requests contributions of specimens from all parts of the
country for his work.

Mr. John Robinson, Curator of the Ethnological De-
partment, reported that the collection under his charge
had been rearranged during the year. There had been
many valuable donations received from fifty-five persons.
Several sub-departments have recently been commenced,
and good progress thus far made in rendering them avail-
able for purposes of study and examination; the Curators
request the cooperation of the members and friends of
the Institution in aid of these objects, trusting that their
appeal will meet with a hearty response, and that many
specimens will be contributed, especially such as are
evanescent in their character, and if not preserved at the
time, soon disappear, and afterwards are very difficult if
not impossible to obtain.

The Constitution and By-Laws as revised by the Com-
mittee were unanimously adopted.
The following officers were elected for the ensuing year:

**PRESIDENT.**
ASAHEL HUNTINGTON.

**VICE PRESIDENTS.**

*Of Natural History*—SAMUEL P. FOWLER.  *Of History*—A. C. GOODELL JR.  
*Of Horticulture*—J. F. ALLEN.

**SECRETARY AND TREASURER.**

HENRY WHEATLAND.

**LIBRARIAN.**

NATHANIEL J. HOLDEN.

**SUPERINTENDENT OF THE MUSEUM.**

F. W. PUTNAM.

**FINANCE COMMITTEE.**


**LIBRARY COMMITTEE.**


**PUBLICATION COMMITTEE.**


**LECTURE COMMITTEE.**


**FIELD-MEETING COMMITTEE.**


**CURATORS OF NATURAL HISTORY.**

*Geology*—H. F. Shepard;  
*Mineralogy*—C. H. Higbee;  
*Paleontology*—H. F. King;  
*Botany*—C. M. Tracy;  
*Comparative Anatomy*—Henry Wheatland;  
*Vertebrate*—F. W. Putnam;  
*Articulata*—J. H. Emerton;  
*Mollusca*—H. F. King;  
*Radiata*—Caleb Cooke.

**CURATORS OF HISTORY.**

*Ethnology.*
William S. Messery, M. A. Stickney, John Robinson, J. A. Gillis.

*Manuscripts.*

*Fine Arts.*

**CURATORS OF HORTICULTURE.**

*Fruits and Vegetables.*

*Flowers.*
On motion of Mr. G. A. Ward, a committee, consisting of Messrs. G. A. Ward, R. S. Rantoul, George Perkins, E. N. Walton, T. M. Stimpson, Charles Davis, G. D. Wildes, S. P. Fowler, and W. P. Upham, was appointed to present the claims of the Institute upon the public for a more liberal patronage, so that it may be better enabled to accomplish the objects of its organization.

On motion of Mr. S. P. Fowler a committee was appointed to make a collection of card photographs of the members of the Institute. Messrs. S. P. Fowler, John Robinson, and D. W. Bowdoin were placed on this committee.

Mr. S. P. Fowler was requested to prepare a paper on the Ornithologists of America, for publication in the Proceedings.

Thursday, June 9th. Ordinary Meeting.

J. G. Waters in the chair.


Additions to the Museum and Library during April, May and June, 1864.

TO THE NATURAL HISTORY DEPARTMENT.

Brookhouse Jr., Robert. Specimens of Glyptemys insculpta from Salem.
Burt, D. W. Male and female Attacus cecropia.
Chamberlain, James. Eggs of a Mollusk and an Echinus from Beverly Bar.
Chipman, R. M. Attacus luna from Salem.
Cloutman, Capt. W. R. Snake from Yangtse River, Japan.

Concord, Mrs. H. M., of South Danvers. A Red-winged Black-bird from Danvers.

Conway, Capt. Mounted specimen of White Owl.

Cook, C. Dried Plants, Shells and Echinii from Zanzibar, Africa.

Cross, H. J. Sponge from Marblehead Beach.

Davis, Charles, of Beverly. Young Eagle taken from the nest in Beverly, June 2d.

Emerton, J. H. Insects, Helix, and 2 Salamanders from an Island off Manchester. 129 specimens, 91 species of Insects from Essex Co. 147 specimens, 32 species of Insects from Salem. A collection of Ants from Salem. 6 species of Insects and a Tree Toad from Danvers. Cyclopterus lumpus and Raia sp. from Nahant.

Glover, Geo. D. Attacus cecropia from Salem.

Hunt, Y. Attacus cecropia from Salem.


Lindsay, Ed. E., of Manchester. Coral found on Glasshead flats, Manchester.

Lyceum of Natural History of William's College. (In exchange) Skin of a Seal and several Bird's Skins from Greenland. Bird's eggs from Florida and Greenland.

Marks, Capt. T. 2 Saurians from Landana, S. W. C. Africa.


Mason, Mrs. G. R., of Lynn. 43 specimens of dried Seaweeds and 3 of Hydroids. Native.

Nichols, H. P. 117 specimens, 40 species of Insects, and a Snake from Salem.

Northend, Miss L. H. 2 specimens Attacus cecropia from Salem.

Peabody, Alfred S., of Cape Town. Copper Ore from Cape of Good Hope. Set of pressed Ferns, Bulb of a plant, Seeds of the Blue Gum Tree, Hydroids and Barnacles from Cape Town, Africa.

Pond, T. M. A Java Sparrow.

Porter, Edw. 3 Salamanders from Salem.


Rantoul, R. S. Portion of an Indian’s jaw from West's Beach, Beverly.

Rowe, Joseph. Specimens of Storeria DeKayi from Salem.


Stone, Frank. A Bird and 2 Reptiles from Essex Co.

Unknown Donor. 2 Loons from?
Verrill, A. E., of Cambridge. 42 species of plants from Anticosti and
Grand Menan.

Watson, F. P. Larvae of Wasps from Salem.


West, G. W. A collection of Ants and others Insects from Salem. 929
specimens, 80 species of Insects from Salem.


Fishes and Salamanders from River Clarion, Elk Co., Pa.

Wheatland, Simeon J. Attacus cecropia from Salem.

White, G. W. 85 specimens of Insects from Salem.

TO THE HISTORICAL DEPARTMENT.


Brown Jr., Benj. Rebel war relics.

Cloutman, W. R. Chop Sticks and Japanese Smoking apparatus.

Brick from the Porcelain Tower of Nankin.


Farrington Jr., G. P. Rebel Equipments.


Goodell Jr., A. C. Coins from Half-way Rock.

Higbee, C. H. Rebel War Relics from Port Hudson.

Kilby, Wm. H., of Eastport, Me. Postage Stamps.

King, Capt. Jas. B. Silver Ornaments from the ruins of the Inca city
Kuamachuco.

Mansfield, Wm. Grape and Canister Shot, Bomb, and Bullet, revolu-
tionary relics.

Marks, Capt. Thos. A Ring of Native Copper, wrought by the Natives
of the W. C. Africa.

Putnam, F. W. Calcutta Hookah.

Putnam, G. D. Breastplate of the 38th Staffordshire Reg't.

Richardson, Fred. Buttons of the Bombay Artillery.


Vanvleck, H. J., of Nazareth, Pa. 7 Bills of New Jersey Continental
Money, and a number of Ancient Relics relating to the early history of
Nazareth, Pennsylvania.

Ventry, James. Indian Arrowheads.

Williams, Israel, (Estate of) Native War Implements of the Fejee
Islanders. New Zealand Chief's Blanket and Native Basket. Sword taken
from the Pirates on the coast of South America.

Williams, Capt. Old Shot from Fort Sewell. Coins, Military Buttons
and other Revolutionary Relics found at Ft. Pickering.

Wheatland, H. Relics from the Field of Gettysburg. 5 Catholic
Medals.
XXXVIII

TO THE LIBRARY.

Alley, John B. (M. C.) Message and Documents, 1862—3, 4 vols 8vo; Message and Doc. Navy Department, 1862—3, 1 vol. 8vo; Message and Doc. Dept. of State, 1863—4, 2 vols. 8vo; do. Dept. of Interior, 1863—4, 1 vol. 8vo; do. P. O. Dept., 1862—4, 1 vol. 8vo; U. S. Coast Survey, 1861, 1 vol. 4to; Patent Office, Mechanical, 1860, 2 vols. 8vo; do. Agricultural, 1861, 1 vol. 8vo; Report of Commissioners of Agriculture, 1862, 1 vol. 8vo; Reports on the Finances 1862—3, 2 vols. 8vo; McClellan on the Army of the Potomac, 1 vol. 8vo; Report on Armored Vessels, 2 vols. 8vo.

Barnard, James M., of Boston. Scilla de corporibus Marinis Lapidessentibus, 1 vol., 4to, Rome, 1752; Griffith's Icones Plantarum Asiaticum, part iv, 1 vol. 4to, Calcutta, 1854. Griffith's Palms of British India, 1 vol. fol., Calcutta, 1850.

Boston, City of. Boston City Documents for 1863, 2 vols. 8vo.


Cleveland, Miss M. S. Turner's North Carolina Almanac for 1864. 8vo, pamph. Also several Newspapers from Newbern, N. C.

Colburn, Jeremiah, of Boston. 'Lewis's Address N. E. Hist. Soc'y, Jan., 1864, 8vo, pamph. Albany, 1864.


Gleman, Daniel C., of Yale College. Several pamphlets relating to Yale College.

Goldthwaite, Joseph A. Carpenter on the Microscope, edited by Smith 1 vol., 8vo, Phila. 1856.


Hanaford, Mrs. P. A., of Beverly. Various Pamphlets and Newspapers.

JOHNSON, MRS. LUCY P. United States Commercial and Statistical Register—several numbers.


KIMBALL, MISS ELIZABETH. Liberator for 1863, 1 vol., folio.


LORD, N. J. Boston Post for Feb., March, April, and May, 1864.


MITCHALL, HIRAM, of Boston. The Metropolitan Catholic Almanacs, for 1851, 1853, 1854, 1855, and 1856, 5 vols., 12mo.

MOULTON, HENRY W. Specimens of the Blank Forms used in the Provost Marshal's office, 5th District, Mass.

MONTAGUE, WM. L., of Amherst College. Annual and Triennial Catalogues for several years.

PACKARD, A. S., of Brunswick, Me. Catalogue of Bowdoin College, Spring term, 1864, 8vo, pamph.


RHODE ISLAND, SONS OF. BY HENRY T. BROWNE. Oration and Poems before the Sons of Rhode Island in New York, May 29th, 1863, 8vo, pamph.


SLOCUM, EBBN. Boston Patriot for 1812, 1 vol., folio.


UNITED STATES TREASURY DEPARTMENT. Report on the Finances for year ending June, 1863, 1 vol., 8vo.


Washington's Farewell Address, (Hist of) 1 vol., 12mo. Dr. N. L. Frothingham's Metrical Pieces, 1 vol., 12mo. Stockdale's Brit. Peerage, 1 vol., 12mo.


John Adams' Cunningham Correspondence, 1 vol., 12mo. Brazer's Holyoke's Ethical Essays, 1 vol., 12mo. Combe on the Constitution of Man, 1 vol., 16mo. Jefferson's Notes on Virginia, 1 vol., 12mo.

Newhall's Letters to John Pickering on the Letters of Junius, 1 vol., 12mo. Letters to and from John Wilkes, 1762, 1 vol., 12mo. Dealings with the Dead, L. M. Sargent, 1 vol., 12mo. Emerson's Hist. of the First Church Boston, 1 vol., 12mo.

Willis's Idlewild, 1 vol., 12mo. The Landing on Cape Ann by Conant, 1 vol., 8vo. Travels in Holland, 1 vol., 12mo. Map of Holland, 1 map.

Linda, (Slave) 1 vol., 12mo. Salads for the Solitary, 1 vol., 12mo. Notices on Duels by Shibine, 1 vol., 12mo. Memoirs of Lucien Bonaparte, 1 vol., 12mo.

Furness' Discourses, 1 vol., 12mo. Bible News, 1 vol., 16mo. Notte's 50 Years in both Hemispheres, 1 vol., 12mo. Memoir of John W. Foster of Portsmouth formerly of Salem, 1 vol., 12mo. Life Thoughts of Henry Ward Beecher, 1 vol., 12mo.


Gasparin on the American Rebellion, 1 vol., 12mo.—Volumes, 161.


4to, London, 1800. Ware’s European Pilot, 1 vol., Whitehaven, 1774.

BY EXCHANGE.

Editors. Historical Magazine, for April and May, 1864.
Editors. Round Table, Nos., 24 to 32.
Iowa State Historical Society. Annals, No. 6 for April, 1864.
Rhode Island Historical Society. Rhode Island Colonial Records vols. 1 to 7, 7 vols., 8vo. 87 Pamphlets.
Smithsonian Institution. Smithsonian Miscellaneous Collections, vol. IV. Smithsonian Contributions to Knowledge vol. XIII. Annual Report, for 1862.
Zoologischen Gesellschaft, Frankfort, a. M. Der Zoologischen Garten, Nos. 7, 8, 9, 10, 11, 12 (1863,) and No. 1 (1864,)

Wednesday, July 6. Ordinary meeting.
Francis Peabody in the chair.

The following persons having been nominated at a previous meeting by Messrs. G A. Ward, H. Wheatland and W. P. Upham, were elected Resident Members; Daniel

Wednesday, July 13. Field meeting at East Saugus.

This meeting was attended by a company who arrived by the 10 A. M. train from Salem, Lynn, and other towns, and made their rendezvous at “Waverley Hall.” From thence, dividing into parties, one pursued the route leading to “Round Hill” and the “Center,” while another took a path on the easterly side of the river and visited “Pirates Glen” and other interesting spots adjacent. Others pushed their travels as far as “Dungeon Rock” in Lynn. At 3 P. M. the meeting was called to order, and Rev. S. Barden of Rockport was invited to preside during the absence of the constituted officers.
The records of the preceding meeting were read, and letters were announced from the following:

A. Agassiz, of Cambridge; John H. Klippart, Sec'y Ohio State Bd. of Agriculture; J. Mayer & Co., of Boston; S. F. Baird of the Smithsonian Institution; Edward L. Graeff, of Brooklyn, N. Y.; E. T. Cresson, of Philadelphia; J. A. Allen, of Springfield; L. Trouvelot, of Medford; Henry White, of New Haven, Conn.; C. B. Richardson, of New York, relative to the publications. From the Maine Historical Society; Massachusetts Historical Society; Literary and Historical Society, of Quebec; Lyceum of Natural History, of New York; Corporation of Harvard College; Trustees of Newburyport Public Library; Trustees of Boston Public Library, severally acknowledging receipt of publications. From Jere. Page; Willard Goldthwaite; Charles Bowker; Francis Boardman; Geo. P. Daniels; W. J. Stickney; H. K. Oliver; M. Fenollosa; G. B. Jewett, accepting membership. From C. M. Tracy, of Lynn; Mrs. P. A. Hanaford, of Reading; S. H. Scudder, of Boston, relating to Field meetings. From Long Island Historical Society; A. S. Packard, of Me. Hist. Soc.; Henry W. Moulton; Smithsonian Institution, relating to exchanges and transmission of books and specimens. From J. Porter, of Wenham; Henry A. Smith of Cleveland, Ohio; Mrs. Hannah B. Russell; Morris Phillips, of New York; C. B. Preston, of Danvers; R. M. Piper, of Nahant; Lowell Bleachery; Geo. A. Ward, on business matters.

Donations to the Library and Cabinets, were announced. The chair proceeded to give an account of the geology of the place, as observed by him. He spoke of the "Jasper Ledge" of "Round Hill" and its amygdaloid, and of the fine porphyries of this region. At this point Vice President A. C. Goodell Jr. arrived and took the chair.

C. M. Tracy, of Lynn, described a variety of plants and flowers gathered during the day. A fine cluster of rhododendrons being sent to the table he gave some account of the family to which it belonged and of its peculiarly fine development among the Alps and Himalayas. Also of the other splendid members of this family, the azaleas, the kalmias, the heaths, &c.

Wilbur F. Newhall, of Saugus, gave somewhat extended remarks on the more prominent points in the history of the town. He remembered the old Newhall Tavern formerly kept here by an ancestor of his, and famous in its
time, and he recollected being carried, when a little boy, to see the old building torn down. At this tavern, as he had heard the story from an ancient dame, Washington once stopped during his journey, rested awhile, and only allowed himself a cup of cold water. Mr. X. also spoke of a series of articles on the history of the town, prepared by his late father Benj. F. Newhall, and printed in the Lynn Reporter, a reprint of which is under consideration.

Joseph Dampney, of Lynn, gave some further statements in the same direction, particularly as to the first church built in Saugus, which was at the “Center.”

The chair said that Saugus was a place very interesting to the antiquary, and historian. Some of the ramblers of the day had probably seen the heaps of scoria at the “Center” called the “Cinder Bank.” At that spot was established the first iron foundery in the country, the scene of the labors of Joseph Jenks, one of the pioneers of American inventors. It was he who first contrived and introduced the long stiff scythe now used by mowers; and we also find record to show that he invented an “engine for the more spedye cutting of grasse,” for which he sought legislative encouragement. What this “engine” was does not well appear. The foundery was a success, it would seem, and a choice relic from it is yet preserved in the family of the late Alonzo Lewis, of Lynn, to wit, the first article cast, being a small quaintly shaped iron pot.

Rev. C. C. Beaman, of Salem, gave a brief account of the delightful scenery at and about “Pirate’s Glen” and also adverted to the tribe of Indians who formerly dwelt hereabout. It was said that their camps might still be traced by the imbedded clam-shells in the soil; and there were some who could recollect the last of these easy, indolent, fish-eating people, as they lingered awhile among their civilized and more powerful successors.
Rev. A. W. Bruce, of Marblehead, expressed his satisfaction at the proceedings of the day, and spoke further of the importance of preserving items of local history.

James H. Emerton, of Salem, made some statements as to the large collection of insects received by the Institute in the past year, and gave some suggestions on the preservation of specimens in this class.

P. L. Cox, of Lynn, testified to the pleasantness of the day's affairs, and paid a just and warm tribute to the memory of Benj. F. Newhall, the historian of Saugus.

Prof. John C. Holmes, of Michigan, gave some description of the tulip tree as found in that State (allusion having been made to the tree by Mr. Tracy.) He then spoke of the development of the agricultural resources of the West, the transportation eastward of their products, and the necessity of increased facilities for this purpose.

W. P. Upham, made some remarks on the jasper and porphyry of this region.

Rev. C. C. Beaman, of Salem, called attention to the character and worth of the late Joshua Coffin Esq., the historian of Newbury, and on his motion, the Vice President of History was requested to prepare a memoir of that venerable author to be read at a future meeting.

On motion of Mr. Upham the thanks of the Institute were tendered to Messrs. Wilbur F. and Alston Newhall for their services as guides and otherwise, to the Proprietors of Waverley Hall and all our friends in Saugus for their kindness this day. Several persons were nominated for membership and the Institute then adjourned.

THURSDAY, JULY 14. Ordinary meeting.

G. A. Ward in the chair.

The following persons nominated at the Saugus meeting by Messrs. G. A. Ward, R. S. Rantoul and H. Wheat-

Wednesday, July 27. Field meeting at North Beverly.

A small company of those most actively interested repaired to the neighborhood of Wenham Pond in the morning, taking the early train as far as the little village of North Beverly. These spent the forenoon in various rambles in the vicinity and being joined by a large additional force from Lynn, Salem, and other places, at about 3 P. M. the regular meeting was organized on the westerly margin of the pond under a clump of venerable pines on the grounds of Richard P. Waters Esq. Vice President, A. C. Goodell Jr., took the chair and made a few remarks, explanatory of the objects of the Institute.

After the reading of the records of the last Field meeting, and the announcement of donations to the Library and Cabinets, letters were read from the following:

Trustees of Boston Public Library, acknowledging receipt of publications; W. F. Newhall, of East Saugus; A. W. Bruce, of Marblehead; D. C. Haskell, J. F. Walden and Mrs. J. H. Silsbee, of Salem, accepting membership; R. M. Piper, of Nahant; S. Barden, of Rockport, and Wm. Lafavor, of Salem, on business matters.

Robert S. Rantoul, of Salem, read an extended essay on the History and Uses of Wenham Pond. In his remarks he spoke of the remarkable purity of its water; its permanency of level; the enormous crops of ice taken from it
and the esteem in which this product is held abroad; the many notable characters associated with it in history, particularly Rev. Hugh Peters; and the singular amount of litigation that had marked the adjoining territory in the course of years.

A short but very pleasing poem by Mrs. J. H. Hanaford, late of Beverly, but now of Reading, was read by Rev. Geo. D. Wildes of Salem who prefaced it with a few remarks. The Poem was descriptive of the emotion felt by an American in Europe on meeting with a specimen of the famous ice from these waters.

Stephen H. Phillips, of Salem, adverted to the very interesting fact that this was one of those "greate pondes," of more than ten acres in extent, whose entire freedom to all our people for fishing and fowling is guaranteed forever, first, by the "Bodye of Libertyes," drawn and promulgated by Rev. Nathaniel Ward of Ipswich in 1643, then by later enactments of the General Court, and now finally made a fixed fact by decision of the Supreme Court lately rendered. He read extracts from the manuscript opinion of the Court in the case of Inhabitants of W. Roxbury vs. Stoddard, bearing on this point. Thus, said Mr. P. we are in full possession of these lovely waters, for all legitimate public uses, free of cost and beyond hinderance by designing men; and this more than by all else, by the early foresight of Nathaniel Ward of Ipswich, known as the "Simple Cobbler of Agawam."

James Slade, late City Engineer of Boston, gave some interesting facts on the subject of furnishing water to cities, and said that when a tolerable source was selected, it was always found that the quantity provided by nature could be much increased by art, by the use of means to prevent loss and waste.

Rev. G. W. Skinner, of Gloucester, made some statements upon the remarkable ridge, or moraine, which runs
along the shore of the lake, from near this spot to almost the northern end. He discussed its structure very fully and concluded that it was formed, during the period of drift, by the deposit of stones and gravel brought by ice-floes or field-ice, which here, restrained by the highlands, was forced to move for sometime in a kind of eddy.

C. M. Tracy, of Lynn, made some observations on the peculiar structure of the *Sarracenia* or Huntsman’s Cup. He favored the idea that its pitchers, which are usually partly full of pure water, are reservoirs for the collection of dew, which may, by some natural means, be formed upon them more readily than upon other objects. The specimen before the meeting was from Cape Ann, and, despite the severe drought, had been found with its usual supply of water.

Prof. B. O. Pierce, of Beverly, had also examined the moraine spoken of by Mr. Skinner, and gave some considerations thereon, as also on the mollusca found in Wenham Pond.

Richard P. Waters, of Beverly, said this moraine had attracted the notice of Hitchcock who had pronounced it a wonderful formation; but he seemed not to have alluded to it in his writings.

Rev. C. C. Beaman, of Salem, gave some notice of the earlier proprietors of this region, and particularly of Rev. Mr. Fiske, one of the first clergymen in Wenham; also of the church records of that old parish which are still preserved.

Charles S. Osgood, of Salem, alluded to the kind entertainment given us this day, and moved the thanks of the Institute to the friends who had furnished it. The same were voted unanimously. After the nomination of several persons for membership the Institute adjourned.
THURSDAY, JULY 28. Ordinary meeting

Vice President, A. C. Goodell Jr., in the chair

The following persons nominated at the North Beverly meeting by A. C. Goodell Jr., and H. Wheatland, were elected Resident Members; Isaac Appleton, of Beverly; Geo. P. Russell, of Haverhill; Shadrach M. Cate, Ephraim Miller, James C. Stimpson and George Newcomb, of Salem. The thanks of the Institute were voted to Mr. Rantoul for the reading of his paper, on the “History of Wenham Pond” at the meeting of yesterday, and a copy was requested for publication in the Historical Collections.

WEDNESDAY, AUGUST 10. Field meeting at Gloucester.

About three hundred persons arrived in the first train from Salem, and were escorted to the Town Hall where a few remarks of welcome were made by Rev. Mr. Skinner, of Gloucester, and the divine blessing was invoked by Rev. Mr. Banvard of Worcester. The party was then dismissed for rambles and observations. Some visited the “Stage Rocks” and “Rafe’s Chasm”; others rambled along the beach or in the woods in search of plants and animals.

At one o’clock the party had mostly reassembled at the Town Hall, where after appeasing the good appetites caused by the morning walks, the meeting was called to order by Rev. S. Barden, of Rockport, who made a few opening remarks.

The records of the last Field meeting were read, and donations to the Cabinets and Library announced. Letters were announced from:

New Jersey Historical Society, acknowledging the receipt of publications; J. F. Tuckerman, of Salem, accepting membership; C. M. Tracy, of Lynn; A. P. Peabody, of Cambridge, and G. W. Skinner, of Gloucester, respecting Field meetings.

G. D. Phippen, of Salem, gave a brief account of the early history of Gloucester, and then spoke of the trans-
mutation of species among plants, holding that, while under cultivation, plants were by the hand of man, changed, so as to produce well marked varieties, yet, if left to nature's own laws, every species would remain true to the characteristics stamped upon it by the Creator, at its first appearance upon earth.

Rev. E. C. Bolles, of the Portland Nat. Hist. Society, upon being introduced, made a most eloquent, and appropriate speech, advising all to study the works of God in the field, and open their eyes to the beautiful gems at their feet. Mr. Bolles stated that he had come from Portland with his fellow member of the Nat. Hist. Society, Mr. Morse, to see how a field meeting was conducted, and hoped that his own Society would be able to follow the example of the Essex Institute.

Rev. G. W Skinner, of Gloucester, exhibited, under a microscope, some infusorial earth found on the Cape, and explained the probable origin of the deposit.

Prof. Wm. Hinks, of University College, Toronto, C. W. was introduced to the meeting, and gave an interesting, general account of the lower animals and plants, during which he stated that he was inclined, with others, to admit a fifth branch to the animal kingdom, in which the sponges and allied organisms should be placed.

Rev. Joseph Banvard, of Worcester, gave an account of the Worcester Society which had similar objects with those of the Essex Institute, and had commenced to hold field meetings. In the Worcester Society, ladies are not only admitted as members, but are elected assistant curators, and take an active part in all the meetings of the Society, reading papers, and discussing the various subjects presented. Mr. Banvard stated that he had recently seen the ants feeding upon the juices secreted by the aphides, or plant lice, and that he had noticed three distinct species
of ants, each of which lived upon the secretions of a peculiar species of aphis.

Ed. S. Morse, of Portland, whose especial study is the land snails, gave an account of the collection made by himself and Mr. Bolles during the morning, stating that he had found several specimens of two very rare species of minute snails. The structure of these little snails, furnished, like most of the larger species, with a shell, which is secreted by, and is a part of the animal itself, and not a house which it can leave at will, as is commonly supposed, was explained by drawings. He also showed the position and shape of the hundreds of microscopic teeth with which the snail’s tongue is furnished for the purpose of rasping its food.

Mr. Morse read the following list of Terrestrial Mollusca collected at Gloucester during the morning.

Tebennophorus dorsalis Binney.  Helix ferrea Morse.  
Limax campestris Binney.  " Binneyana Morse.  
Helix striatella Anthony.  " exigua Stimpson.  
" labyrinthica Say.  Vertigo ovata Say.  
" arborea Say.  Pupa pentodon Say.  
" chersina Say.  Succinea Totteniana Lea.  
" lineata Say.  " avara Say.  
" milium Morse.  Melampus bidentatus Say.  

A. C. Goodell Jr., called the attention of the meeting to the little neglected barnacle on the rocks, and after giving an interesting description of its structure, which he illustrated by a drawing of that portion of the animal under the shell, he favored the meeting by reading a few stanzas, found in his pocket, relating to the little crustacea.

F. W. Putnam, of Salem, being called upon to explain the structure of the lobster and other animals that had been collected during the day, gave a brief account of the various animals, and by a comparison of the lobster with the young barnacle, which for a short period of its life, is a free swimming animal, showed how closely related were the two, and how erroneous was the common opinion,
that the barnacle was a mollusk, on account of its limy shell.

Prof. A. Crosby, of Salem, gave an account of the walk taken by his party to the rocks, where many interesting things were discovered, and several kinds of minerals collected.

Rev. S. Barden, of Rockport, exhibited a number of the minerals that had been collected, and described the structure of each.

George F. H. Markoe, of Boston, explained the various properties of the medicinal plants which he had collected, and furnished the following list of plants seen during the day.

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<tr>
<th>binomial name</th>
<th>binomial name</th>
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<tbody>
<tr>
<td>Drosera longifolia</td>
<td>Epilobium lineare</td>
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<tr>
<td>Drosera rotundifolia</td>
<td>Cornus canadensis, in fruit</td>
</tr>
<tr>
<td>Leucanthemum vulgare</td>
<td>Scutellaria laterifolia</td>
</tr>
<tr>
<td>Marula cotula</td>
<td>Spirea tomentosa</td>
</tr>
<tr>
<td>Nymphaea odorata</td>
<td>Spirea salicifolia</td>
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<tr>
<td>Nuphar advena</td>
<td>Oenothera biennis</td>
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<tr>
<td>Gaultheria procumbens</td>
<td>Oenothera pumila</td>
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<tr>
<td>Athilea millefolium</td>
<td>Antennaria margaritaceae</td>
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<tr>
<td>Asclepias incarnata var. pulchra</td>
<td>Eupatorium purpureum</td>
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<tr>
<td>Platanthera blephariglottis</td>
<td>Impatiens fulva</td>
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<tr>
<td>Sambucus canadensis</td>
<td>Lobelia cardinalis</td>
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<tr>
<td>Mitchella repens</td>
<td>Lobelia inflata</td>
</tr>
<tr>
<td>Leontodon autunnale</td>
<td>Lobelia spicata</td>
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<tr>
<td>Arctostaphylos uva-ursi, in fruit</td>
<td>Pontederia cordata</td>
</tr>
<tr>
<td>Hypericum perforatum</td>
<td>Sagittaria variabilis var. sagittifolia</td>
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<tr>
<td>Hypericum sarothra</td>
<td>Vaccinium oxyoceus</td>
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<tr>
<td>Elodea virginica</td>
<td>Lythrum salicaria</td>
</tr>
<tr>
<td>Silene inflata</td>
<td>Xyris bulbosa</td>
</tr>
<tr>
<td>Statice limonium</td>
<td>Solanum dulcamara</td>
</tr>
<tr>
<td>Clethra alnifolia</td>
<td>Oxalis stricta</td>
</tr>
<tr>
<td>Cuscuta Gronovii</td>
<td>Trifolium repens</td>
</tr>
<tr>
<td>Eupatorium perfoliatum</td>
<td>Trifolium pratense</td>
</tr>
<tr>
<td>Epilobium angustifolium</td>
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James H. Emerton, of Salem, exhibited a collection of about an hundred species of insects, including many species of spiders, the object of his special study, that had been collected by him during the day.

Rev. E. B. Willson, of Salem, made a few general remarks upon the usefulness of these meetings in promoting the study of Nature.
Henry W. Peabody, of Salem, was nominated for Resident Membership by A. C. Goodell Jr. and H. Wheatland. On motion of Mr. Goodell the thanks of the Institute were voted to the Selectmen of Gloucester, for the use of the Town Hall during the day, and to Rev. G. W. Skinner and other friends in Gloucester, for kind attentions. Adjourned.

THURSDAY, AUGUST 25. Field meeting at Rockville, South Danvers.

A company of pleasant size and character gathered this day at the little chapel at "Rockville" for a series of refreshing rambles in the neighborhood of our old familiar "Ship Rock." Some of the party started for Bartholomew's Pond; others proposed to find "Wildcat Ledge" on the declivity of Prospect Hill near the line of Lynn; and some went to Spring Pond and the Aqueduct Fountains. The largest portion, probably, as generally happens, took the shortest walk, and ended their jaunt at "Ship Rock." The iron ladder and steps, provided by the Institute, are still in good order; and the shady woods around were very refreshing for a hot and dusty day.

The afternoon meeting was organized in the chapel; Rev. S. Barden, of Rockport, taking the chair. On so doing, he remarked that we had brought stones, plants and animals, and displayed them on and about the sacred desk. It might seem as if this apparent desecration needed some apology, but to him, at least, it was evident, that no antagonism existed between these elements, but most beautiful harmony. True, we seldom see it exemplified in this way. The works of God are never opposed to his word; and Nature teaches nothing in support of irreligion or vice.

The records of the last meeting were read and dona-
tions to the Library and Museum announced. Letters were announced as received from the following persons and Societies, since the last meeting:

Julian A. Fogg; John P. Browning; George P. Russell, of Haverhill; J. H. Wildes of San Francisco, accepting membership; James D. Dana, of New Haven, respecting Ordway’s “Tree Protector”: B. Westermann & Co. of New York; J. A. Allen, of Springfield; Raynal Dodge, of Newburyport, relating to the publications; J. D. Dana, of New Haven; James Hubbert, of Toronto; S. F. Baird, of the Smithsonian Institution; James Hall, of New Haven; Vincent Barnard, of Chester Co., Pa.; Charles H. Pitman, of North Barnstead, N. H.; Wm. Dawson, of Spiceland, Ind.; Amory L. Babcock, of Haverhill; Geo. C. Huntington, of Kelley’s Island, Ohio; James Lewis, of Mohawk, N. Y.; John Johnston, of Middleton, Conn.; John Haywood, of Kingston, Ohio; W. M. Beauchamp, Skaneateles, N. Y.; Wm. Muir, of Fox Creek, Mo., relating to the Naturalists’ Directory: S. Jillson, of Feltonville; E. S. L. Richardson, of Chicago, Ill.; P. A. Hanaford, of Reading, on business matters.

The chair then spoke of the geology of this region; and said that he had been able to-day to verify the observation made by Messrs. Alger and Jackson in 1848, of scratches and groovings on the ledge under the eastern base of Ship Rock. These clearly proved it a bowlder; since there must have been a time when it stood elsewhere, and other materials were doing this grinding work in the place it now occupies. Under the well known rock in Gloucester called the "Whale’s Jaw," similar markings are to be seen, proving the same thing. If any one doubted that such rocks had ever been transported, or that ice was an adequate agent for such work, he had only to visit Cape Cod in the winter, when in one of its harbors it might be seen at play, as it were, with a great stone, carrying it rods away and back, this way and that, with every tide.

F. W. Putnam exhibited the various animals which had been collected and explained the characters of the bream, perch and shiner, showing in what way the shiner differed from the other two, and how the perch and bream
belonged to two closely allied families. He stated that the three species under consideration had a wide geographical range, only equalled by one or two other North American fishes, being found in almost all the ponds and lakes east of the Rocky mountains and south of the Arctic regions. He also made some brief statements as to the nature and habits of the several kinds of batrachians such as frogs, toads, and salamanders.

C. M. Tracy, of Lynn, made some explanation of the plants collected by the explorers, particularly of the composite family, which make ten per cent. of the world’s vegetation, and were well represented to-day, by a prodigious thistle, some six feet high. A few moments were spent in considering a variety of plants reputed to cure the bite of snakes and other venomous animals. Some of them, it was stated, probably possessed a degree of virtue, while others would be but idly employed for such a purpose.

Rev. Joseph Banvard, of Worcester, said that he had seen to-day, fresh evidences of that grand principle of Nature, that all life is nourished by decay. Death and dissolution are everywhere before us. The animal dies, the plant perishes, and both are turned to mould. The rock weathers and disintegrates. Ship Rock itself is crumbling. From the dust of all decaying structures, a new order and generation of things, sentient and otherwise, springs constantly up, to fill a place and enjoy a time in the universal history. So in all things. In a sense wholly legitimate, we have lived for years on the blood and bones of our Revolutionary Fathers. To-day we are called to fertilize the soil anew with sacrificial blood, that life and enjoyment may arise for future generations. These things are often more literal than we think. When, some time ago, there was opened the grave of good old Roger Williams, the root of an apple tree was found to have travelled to
the head of the coffin and penetrated all along the spine, and thence branched down the legs to the feet, being thus nourished by the material of the bones. And therefore those who ate of that tree had been unwittingly partaking of the very substance of the old Reformer. Nor in all this is there anything abhorrent to a fine and merciful sense. Nature destroys with sudden stroke, mostly, all things that can feel. She saves pain, she shows no malevolence, but only kindly transfers the life from one form to another.

Prof. A. Crosby, of Salem, gave some account of the operations of the Portland Natural History Society. This institution has excellent accommodations, and is about commencing a system of Field Meetings, much on the plan of our own. A curious feature at their rooms, is the grand table, eleven feet long by six wide, made of a single plank from the "Big Tree" of California. Prof. C. also spoke of the facilities afforded by these meetings for educational purposes, and for acquaintance with things around us which are too rarely seen in schools.

E. N. Walton, of Salem, spoke in continuation of the same subject.

The Secretary read a letter from Rev. Charles Babbage, chaplain in the army, in relation to Wenham Pond, giving some curious anecdotes of that locality, and the former residents thereabout.

On motion of C. M. Tracy of Lynn, the thanks of the Institute were voted to the Proprietors of the Rockville Chapel for the use of their premises to-day; also to the friends in the village who have favored us with their assistance and encouragement.

Henry W. Peabody of Salem, nominated at a previous meeting, was elected a resident member.

The Institute then adjourned.
LVIII

Friday, September, 16. Field meeting at Newburyport.

This meeting had been appointed for the previous Wednesday, but postponed on account of dull weather. The company from the lower towns of the county, arriving by the morning train was quite large.

Under the efficient guidance of the Rev. G. D. Wildes, the large company were at once placed upon the route for visiting the most interesting objects in Newburyport and its neighborhood. A small party of the members whose interest was more immediately connected with the botanical and mineralogical departments, left the cars at the "Serpentine Quarry," returning thence in time for the collation and public meeting. After a general gathering at the City Hall, some of the party went on a delightful trip to Plum Island; others chose to stroll over the bridge, and enjoy the fine walk and views on the Salisbury side, and the remainder proceeded to visit the Church and Memorial Chapel of St. Paul's. The latter structure attracted special attention, from the connection with the memory of a deceased clergyman and his daughter, held in affectionate remembrance by many friends in Salem. The exquisite memorial windows of the Chapel placed as monuments to their dead, by several families of St. Paul's parish, may certainly be regarded as among the finest specimens of the stained glass to be found in this country.

From the Chapel, the party were next conducted to the beautiful grounds of the Dexter mansion, which were thrown open to them through the kindness of the proprietor, Dr. E. G. Kelley. In other particulars than this, the Institute, as on previous occasions, found themselves greatly indebted to the courtesy of Dr. Kelley. After spending some time in these grounds, the party proceeded to the Mall, the Putnam School, and thence to the beautiful Oak Hill Cemetery. None could fail to admire the
new gateway, just erected through the generous gift of Mr. Tappan of New York, a native of Newburyport. None could fail to be struck with the beautiful inscription wrought in the granite entablature. We understand that the inscription was furnished by Mrs. Tappan, the daughter of the late C. W. Story Esq., of Newburyport, and we record it, as itself a testimony to a tasteful and pious culture long known to her friends:

"Until The Day Break,
And The Shadows Flee Away."

From the elevated portions of the cemetery, beautiful and extensive views of the surrounding country were obtained, embracing on the south and west the hills of West Newbury, Rowley, Ipswich, and Old Town; on the east and north the headlands of Cape Ann, the sandy shores of Plum Island, Salisbury, and Hampton; the distant Isles of Shoals, and the woods and hamlets of Salisbury, Seabrook, with the towns of Amesbury and West Newbury. After leaving the Cemetery, the Copley paintings were visited at the house of the Misses Tracy, who very kindly threw open their mansion to the large party, and furnished much valuable information as to the history of the portraits of Colonel and Mrs. Lee. Another fine portrait by Trumbull of Col. Jackson, the ancestor of the distinguished Jackson family of Boston, was seen at the same place. From this point, the route was taken to the old South Church, passing by the way the old colonial jail house in Federal street. Many of the party visited the tomb of Whitfield, where the remains of the great preacher, together with those of Prince and Parsons, were seen. After testing the quality of the whispering gallery in the church, the party proceeded to the old Tracy Mansion, once honored by the presence of Washington, Talleyrand, Chateaubriand, Louis Philippe, LaFayette and others.
This venerable mansion, now occupied, in part by the Rev. Mr. Fletcher, the distinguished traveller in Brazil, is soon to be used for the purposes of the Public Library; alterations to that effect being now made. We hope to see in connection with the valuable Public Library of Newburyport, a flourishing branch of the Essex Institute.

After viewing other localities of interest as connected with the literary, professional and commercial history of the city, the party returned to the City Hall, where the large hospitality of their friends in Newburyport had made excellent provisions for a noonday repast.

The afternoon meeting was called to order in the City Hall, about 2 1-2 o'clock, and Rev. George D. Wildes, of Salem, was invited to occupy the Chair. On assuming that place he made some remarks in explanation of the plan and practice of the Institute and the influence exerted by its meetings on the community around.

Donations since the last meeting were announced and letters were read from the following:

A. S. Packard Jr., of Brunswick, Me.; G. C. Huntington, of Kelley's Island, Ohio; J. D Dana, of New Haven; J. A. Allen, of Springfield; Thomas Barlow, of Canastota, N. Y., in relation to the publications; Smithsonian Institution, acknowledging the receipt of publications; Lyceum of Natural History of New York; S. Barden, of Rockport; W. H. Prince, of Northampton; John L. Russell; Mrs. E. H. Derby, of Auburndale, on general business; A. L. Babcock, of Sherborn; Thos. Gile, of Washington; Hiram A. Cutting, of Lunenburg, Vt., on exchanges of books and specimens.

F. W. Putnam, explained the structure of the galls found on the leaves and stems of plants, and the habits of the gall flies. He also spoke of the habits of the Aphids, Coccus and other insects injurious to vegetation.

Rev. S. Barden, of Rockport, had been to the "Devil's Den." But there was nothing there infernal; it was a place of unmixed beauty. He was glad to see the clergymen of this place interested in the pursuits of this day:
they have saved Newburyport to the cause of science. While laboring with his hammer at the ledge he had been cheered by the presence of some of them, and encouraged to open more fully the wealth of that spot. There were beautiful specimens of serpentine, as well as asbestos, or amianthus of a fine description. He exhibited an elegant vase made from the serpentine by Mr. Osgood, of Newburyport, and pronounced it equal to anything of the kind to be seen elsewhere.

Dr. H. C. Perkins, of Newburyport, said that every boy in the place had at some time been to the "Devil's Den," which few here know as a serpentine quarry. It was opened for lime exclusively and worked for some time. It furnished besides serpentine and asbestos, some very good steatite and dolomite. The celebrated Jacob Perkins, once of Newburyport, made paper from this asbestos and printed some bank-notes on it which were incom bustible and served to surprise his friends.

Rev. Artemas D. Mussey, of Newburyport, expressed his deep satisfaction in the meeting and its purposes. He could not doubt its effect on those who attended, especially on the young; and he hoped a branch society, or something like it might be formed and sustained in this place.

Rev. J. S. Spalding, of Newburyport, had fortunately met the party at the "Den" and highly enjoyed the enthusiastic activity of those who composed it. If all the members of the Institute were equally engaged and successful, the best results must follow. There are young men in Newburyport engaged in science and natural history. They have made fine collections of birds' eggs including many rare kinds and if directed and encouraged by some systematic society, they would do much for themselves and the cause of knowledge.
Rev. C. C. Beaman, of Salem, thought the Essex Institute could not fail to be greatly cheered by such language as that of the Newburyport people to-day. The historical side of our society well deserves encouragement. We are at work to preserve a worthy past by gathering and securing every relic of historic value.

Rev. Mr. Spalding, said that Essex North was rich in archeological wealth. Its history was both valuable and available. Felt, in his annals, had made some statements as to John Barnard, a celebrated teacher of the early times; but recent researches have corrected him in this matter and identified parties very differently.

Rev. John N. Sykes, of Newburyport, was glad to see the activity of the young men who took part in the operations of the Institute. The benefit of such employment in youth must be great. They would form habits of observation, which in after life would be of the greatest advantage.

C. M. Tracy, of Lynn, gave some explanation of the plants gathered by the explorers, alluding in particular to the asters, goldenrods and other autumnal flowers, and discussing somewhat the relations of the oaks and hickories. He also spoke of his visit to the garden of Dr. E. G. Kelley, in which were noticed, among the many interesting objects there found, the beautiful and finely grown hedges of hemlock, spruce and other evergreens also one of weigelia, this last in the time of flowering must have presented a splendid appearance.

Dr. Perkins said every one ought to study Natural History. It was the greatest source of comfort amid pain, sorrow and affliction, that he had ever known. When the botanical specimens were just now brought forward, they seemed to him like old friends. He remembered that forty years ago, he left Cambridge with a classmate and botanized from thence to Newburyport, losing the way in the ardor of the pursuit.
The Chair added some further thoughts on the Institute as a means of education. Such an institution forms the best of safeguards for the young and developing minds. The love of science will live everywhere. He had seen, in the icy fastnesses of the Alps, the little band of German students, on their vacation from the Universities, camping in the mountain valleys and enjoying their explorations with a zest that made him almost envious. Yet this enjoyment is not all, for modern science is not pleasurable only; it is eminently practical and therefore eminently useful. Encourage its growth among the people and you give them at once both happiness and power.

Stephen B. Ives, of Salem, offered the following resolutions, which were unanimously adopted.

Resolved, That the sincere thanks of the Essex Institute be presented to the City Council, of Newburyport, for the use of the City Hall, for its meeting here this day.

Resolved, That the most grateful acknowledgements of the Institute be presented to those kind friends in Newburyport, whose attentions in making the most ample, and tasteful arrangements for the field meeting, and, in providing bountiful and elegant refreshments, have rendered the present meeting among the foremost in interest and encouragement in the history of the Society.

Resolved, That the thanks of the Institute are especially offered to Mrs. D. T. Granger, Mrs. Pearson, Mrs. Nourse, Mrs. W. Horton, the Misses Tracy, of the ladies; and to the Messrs. G. J. F. Colby, E. S. Moseley, E. G. Kelley, D. T. Granger, Charles Wills, C. H. Bailey, J. H. Frothingham, J. Bogardus, J. Horton, and others who have so largely contributed to the gratification of the Institute in its present meeting.

After the nomination of members the meeting adjourned.

Wednesday, September 21. Ordinary meeting
Joseph G. Waters, in the chair.
William Whitaker, Thomas L. Perkins and William H.
Emmerton, of Salem, and John S. Allanson, of Marblehead, nominated at a previous meeting were duly elected Resident Members.

Friday, September 30. Special meeting.
The President, A. Huntington, in the chair.

The president stated that the object of our assembling this evening was to take some suitable notice of the recent sudden decease of our late associate member George Atkinson Ward, of Salem. Mr Ward was one of the original members and very active in the organization of the Essex Historical Society. He removed to New York in 1823 to engage in business in that metropolis. He returned to Salem, in November last to spend the remainder of his life among the scenes and friends of his youth; since that time he has renewed his interest in the doings of the Institute and by his zeal and industry has largely contributed to its success.

Rev. George W. Briggs moved that a committee be appointed to prepare resolutions and a memoir to be presented at some future meetings, accompanying the same with appropriate remarks.

Francis Peabody, in seconding the motion, alluded principally to Mr. Ward's previous residence in Salem, his interest in the Institute and in all measures conducive to the intellectual and moral culture of his native place.

Rev. George D. Wildes stated that his acquaintance with Mr Ward was recent, but during that time he had seen much of him both in his walks and in visits to his home, and bore testimony to his worth and character as a citizen and a friend.

A. C. Goodell Jr. followed in remarks of a similar import and suggested that the committee consider the propriety of providing a portrait of Mr. Ward to be placed in the rooms of the Institute.
The motion of Mr. Briggs, seconded by Mr. Peabody and amended by the suggestion of Mr. Goodell, was unanimously adopted, and Messrs. C. W. Upham, A. Huntington, A. C. Goodell Jr., G. W. Briggs and Francis Peabody were appointed on said committee.

On motion of Mr. F. Peabody, Mr. C. W. Upham was appointed, in place of Mr. G. A. Ward deceased, on the committee to which was referred the “consideration of the authenticity of the tradition that the frame of the old Building in rear of Boston street is that of the first meeting house in Salem.”

The committee on resolutions was authorized to call meetings whenever it may be prepared to report.

Adjourned.

Additions to the Museum and Library during July, August and September, 1864.

TO THE NATURAL HISTORY DEPARTMENT.

Allen, J. A., of Springfield. 32 specimens, 9 species Reptiles from Springfield. 1 specimen Trout, young.


Barden, Rev. Stillman, of Rockport. Specimens of Pyrheclose, Smoky Quartz, Pyrites, Fluorspar, &c., from Rockport.

Bolles, Rev. Edwin C., of Portland, Me. 8 Specimens Helix hortensis from Broom Corn Island, Casco Bay. 3 valves of Pecten icelandicus, 4 do. of Mytilus edulis, 3 do. of Saxicava distorta Say, 3 do. of Astarte laurentiana Lyell, from the Post Pliocene, Canal St., Portland, Me. 3 Specimens of Macoma fusca, 4 do. Muscula antiqua Mighels, 11 do. Leda portlandica Hitchcock, from the Post Pliocene, Land Slide, Westbrook, Me.

Bowditch, Mrs. Rebecca. Specimen of Limax from Salem.

Briggs, Mrs. Adaline, of S. Danvers. 2 Specimens Attacus cecropia.

Brown, Benj. Fossil coral.

Brown, Horace. Specimen A. cecropia.

Byrnes, Clifford C. 2 specimens Slag. Iron found among coal.

Chipman, R. Manning. Flowers of Linnaea borealis from Westford, Mass. 

Crammer, Mrs. F. M. Cones and twigs from the "Great Pine of California," also a string giving the exact circumference of the tree from which they were taken.


Emerton, James H. 112 specimens, 44 species Insects, collected at the field meeting in East Saugus, June 13. 28 specimens Insects, 23 specimens 2 species Ants, 1 larva of Cicindela from Salem. 58 specimens, 34 species Insects collected in Beverly. 132 specimens, 74 species Insects collected at the Gloucester field meeting.

Emerton, W. H. Specimen of Walking-stick, Bacunculus femoratus, from Salem.

Farrington, Miss A. W. B. Specimen of Attacus cecropia from Salem.

Flint, G. F. Specimens of Eudryas grata.

Frost, Mrs. L. A. Clay from Talahama, Tenn.

Goodell Jr., A. C. Nest of Wasps from Ipswich.

Grant, Henry. Fossil Mollusks from Lake Champlain.

Hall, Capt. W. H. 6 Starfishes and Embryo Whale from West Coast of Africa.


Hanaford, Mrs. P. A. Specimen of Chauliodes pectinicornis.

Haskell, Joshua, of Marblehead. 5 specimens of Insects collected at the field meeting at Wenham Lake.

Higbee, Charles H. 3 specimens of Solitary Bees and specimen of Attacus Prometheus from Salem.

Kimball, Mrs. Enoch F., of Wenham. Nest of Chimney Swallow.

King, H. F. 4 specimens, 2 species Coleoptera from Gorham, N. H.

Lake, Charles H., U. S. V. Specimens of Galena, Blende, Pyrites, Mica, Limestone, Tourmaline, Hematite and Fossils from the vicinity of Little Rock, Arkansas.

Leavitt, Mrs. Larva of Cerura borealis from Lexington.

Lee, John C. Humming Bird from "Worcester.

Lefavor, Joseph. Specimen of Cicada pruinosa.

Lewis, I. P. Large Pearl from a Quahaug.

Lord, George R. Specimen of Monohamnus sp.

Lowd, Mark. Nest and specimens of Hornets.

Merchant, Addison, of Gloucester. Barnacles and Shells from Banks of Newfoundland.

Nichols, H. P. 297 specimens, 148 species Insects, 2 malformed Hen's eggs, 40 specimens 3 species Salamanders, 20 specimens Fish, collected in Bethel, Vt. 73 specimens, 40 species Insects from Salem.

Osgood, J. C. Nest and eggs of a Wren from Salem.
Parker, Chas. Specimen of Walking-stick, living female.
Pease, W. H., of Honolulu, Sandwich Isls. 20 species of Land Shells from Tahiti. 71 species of Marine Shells from the Pacific Islands. Several specimens of each species, all named and several types of new species.
Perkins, Henry W. Full grown larvae of Attacus cecropia.
Putnam, F. W. 2 specimens of a large Aphis, with eggs and cast off skin from Salem. Quartz, Pyrites with gold, from Rangely, Me. 49 specimens of Spiders from the northern parts of Maine.
Putnam, Capt. W. H. A. Collection of over 500 specimens of Coral and several Shells from Singapore, E. I. 2 specimens Forficula. Several hundred Crustacea and several Fishes from soundings off the coast.
Robinson, Asa P., Specimen of Nepa from Grafton Lake, Me.
Robinson, John. 73 specimens, 50 species Insects from Salem.
Russell, John W. Full grown larvae of Attacus cecropia.
Safford, Joshua. Coal with vein of Sulphuret of Iron.
Savage, Miss. Specimen of Walking-stick, female with eggs, from Salem.
Sillsbee, William. Nest of Hornets with about 1000 specimens in different states of growth.
Smith, Henry. Specimen of Prionus laticollis.
Smith, Lawrence P. Specimen of Attacus cecropia.
Stickney, M. A. Specimens of Pterogorgia and Plexura from the Cape Verd Islands.
Stone, Frank. 85 specimens, 34 species Insects from Salem. Specimen of young Turtle from North Reading.
Stone, Dr. Lincoln R., U. S. A., Gallipolis, Ohio. Specimen of Sphinx quinquemaculata from Gallipolis.
Symonds, S. S. Specimens of Pelecinus sp. and Philampelus satellitia from Salem.
Tracy, C. M., of Lynn. Specimen of Scolopendra sp.
True, Joseph. 13 specimens, 4 species Hymenoptera from Salem.
Watson, Frank. Specimen of Monohammus sp. from Salem.
White, Geo. M. 60 specimens of a Beetle from Milkweed, Salem.
Wilson, Miss Alice. Specimen of Cicada pruinosa from Salem.

TO THE HISTORICAL DEPARTMENT.

Chamberlain, James. 2 Postage stamps, Cape of Good Hope and Victoria.
Chipman, R. M. Grains of Corn from the grave of an Indian supposed to have been buried 400 years.
Creame, Geo. G. Piece of the Stone steps down which Gen. Putnam rode when pursued by the British during the Revolution, Greenwich, Conn.
Felt, S. Q. Piece of Palmeto wood from the Rebel ram Merrimac.
Putnam, Perley, (Estate of) 3 Weapons from the Feejee Islands.
LXVIII

PUTNAM W. H. A.  10 cent Postage stamp of Netherlands India.
RANTOULE, R. S. Netherland Copper Coins.
WILLIAMS, 4 shot, 2 fragments of shot and 1 fragment of Cannon from the old Ft. Pickering, Salem.

TO THE LIBRARY.


DROWNE, CHARLES, of Troy, N. Y.  Annual Register of the Rensselaer Institute, 1864, 8vo, pamph.  

FOOTE, CALEB.  Files of the County Papers for several months.


HANAFORD, P. A., of Reading.  Bible Society Record, nine numbers.  Dwight's Open Converts, 1 vol. 16mo, New York, 1836.  Stone, W. L., Matthias and his impostures, 1 vol. 16mo, New York, 1855.  22 Pamphlets, also several Newspapers.


Kippart, J. H., Cor. Sect'y Ohio State Bd. of Agric.  Ohio Agricultural Reports for 1853, 1856, 1857, 1858, 1859, 1860, 1861, 1862, 8 vols. 8vo.

MANN, MISS ELIZABETH N.  Andover Advertiser, from 1857 to 1863 incl. 7 vols. folio.

MANNING, R. C.  Cooper's Surgical Dictionary, 2 vols. 8vo, New York,
1832. Ballou’s Candid Review, 1 vol. 12mo. Orton’s Discourses, 1 vol. 12mo, Boston, 1816. 14 Pamphlets.

Morse, Edward S., of Garham, Me. Observations on the Terrestrial Pulmonifera of Maine, by E. S Morse, 8vo, pamph., Portland, 1864.

Muddie, B. F., of Quindaro, Kansas. 1st Cat. of Officers and Students of Kansas State Aigr. College 8vo, pamph. 3d Ann. Rep. of Sup’t. of Public Instruction of Kansas, 8vo, pamph. Cat. of Baker’s University. The Rocks of Kansas, by Swallow and Haven, 8vo, pamph., St. Louis, 1858.


Packard, A. S., of Brunswick, Me. Catalogus Collegii Bowdoinensis, MDCCCLXIV, 8vo, pamph.


Parsons, G. W. “The Cartridge Box,” printed at U. S. Army Hospital, York, Pa., 1864, several numbers.


Putnam, Elbridge. The old Franklin Almanac for 1860—64 inclusive, 8vo, pamph.

Putnam, Mrs. Eben. Several Pamphlets.


Symonds, Edward. Several Almanacs.
TITTLE, Miss S. J., of Beverly. 12 Pamphlets.


Tucker, Jonathan. Opening Address by the President at Illinois State Agric. Soc. Fair at Decatur, 1864, 8vo pamph.


Tuckee, William P., of Portland, Me. Catalogus Collegii Bowdoinensis, MDCCCLXIV, 8vo, pamph.

United States, Department of State. Diplomatic Correspondence, 1863, 2 vols. 8vo, pamph. Washington, 1864.

Wade, Misses, of Ipswich. Frisbie's Oration on Restoration of Peace, in 1788, 8vo, pamph. Dana's Eulogy on Washington, 1800, 8vo, pamph.


Ward, George A. The Giles Memorial by John A. Vinton, 1 vol. 8vo, Boston, 1864.


Wightman, W. J., of Reading. 11 School and other Reports of Reading.

BY EXCHANGE

American Antiquarian Society. Lincoln's Address on C. C Baldwin, 8vo, pamph. Jenks' Address Oct. 23, 1812, 8vo, pamph. Proceedings at Meeting April 1, 1864, 8vo, pamph.


New Jersey Historical Society. Proceedings vol. IX, No. 6, 8vo, pamph.


Philadelphia Academy of Natural Science. Proceedings for May, June, July and August, 1864.
LXXI

PORTLAND SOCIETY OF NATURAL HISTORY. Proceedings, vol. 1, pages 97 to 128 incl.


QUEBEC LITERARY AND PHILOSOPHICAL SOCIETY. Transactions, New Series, vol. 1, Nos. 1 and 2.

WILMINGTON (DEL.) INSTITUTE. Annual Report April, 1864, 8vo, pamph.

MONDAY, OCTOBER 10. Evening meeting.

The President, A. Huntington, in the chair.

Records of previous meeting read and donations to the Museum and Library were announced.

Letters were read from the following:

Chas. H. Lake, of Little Rock, Arkansas; J. A. Allen, of Springfield; W. H. Dall, of Marquette Co. Mich., relating to donations of specimens: J. H. Hickcox, of the New York State Library, Albany; S. J. Young, Librarian of Bowdoin College; Secretary of the American Philosophical Society, Philadelphia, relating to exchanges of publications: Prof. S. F. Baird; J. H. Thompson, of New Bedford; Sam'l Clarke, of Milwaukee, Wis., relating to the Naturalists' Directory: Miss Lucy Treadwell, of Salem; Miss A. L Coffin, of Newbury; J. E. Oliver, of Lynn; J. W. Young, of Worcester; S. Tenney, of Cambridge; James Lewis, of Mohawk, N. Y.; Rev. E. C. Bolles, of Portland, on business matters: A. L. Babcock, of Sherborn; Dr. A. S. Packard Jr., of Brunswick, Me.; Theo. Gill, of Washington; W. Hoxie, of Newburyport, relating to exchange of specimens.

Albert B. Russell, and Miss Lucy Treadwell, of Salem, and Theodore Attwill, of Lynn, having been nominated at a previous meeting were elected Resident Members.

Mr. Putnam communicated a paper from Mr. Alpheus Hyatt Jr., entitled "Remarks on the Polyzoa of New England". In this paper, which was referred to the committee on publication, Mr. Hyatt describes and figures several new species of Cristatella and Plumatella from Cambridge, Mass., and Norway, Me. For these species he proposes the names of C. ophidioidea, P. hyalina and P. pennissetusseeensis. Mr. Hyatt also describes the anatomy of the genera Cristatella and Pectinatella and discusses their relations, as naked Polyzoa, to the remaining genera of the sub-order Lophopea.
It was voted that meetings be held on the second and fourth Monday evenings of each month until otherwise ordered, and that all persons interested be invited to attend.

The President, from a committee appointed at the last meeting, reported that the Hon. C. W. Upham had consented to prepare a memoir of Mr. Ward, and was desirous of receiving any contribution that would aid in its preparation. After a few additional remarks, in which he stated that Mr. Ward was born at Salem, March 29, 1793, and died at Salem on Thursday evening, September 22, 1864, he submitted the following resolutions:

Resolved, that the members of this Institute received with deep and unaffected sorrow intelligence of the recent and very sudden death of our friend and associate, George Atkinson Ward; and desire, by these proceedings, to express our high appreciation of his character and worth as a man and citizen, and our very great respect for his memory. As one of the original and prominent founders of the Essex Historical Society, in whose behalf he early enlisted with all his accustomed energy and enthusiasm, and to whose interests he was strongly committed, and as the last survivor of the founders of that institution, since merged in our body, it is especially fit and becoming, that we who have thus entered into these his early labors, should mark, with suitable testimonials of regard and respect, the event of his death, so sudden and startling to his friends and to this community, and so much deplored by us all. Descended from one of the most ancient and honored families of Salem, he was always ready and prepared, by his accurate and full knowledge of her annals from the earliest days of the Colony, to vindicate her character and good name; and whether at home or abroad, he was ever steadfast to the traditions, memories, and principles of the place of his birth. Endowed with the most genial qualities, with high executive ability, and with large practical and business capacities, he early sought a fitting sphere for their exercise and development in the commercial metropolis of the country; and after walking in the high places of commercial life for more than
thirty years, with varying fortunes and success, but always with honor and integrity, never too busy to foster and cultivate the studies and tastes of his earlier life, or to engage in those works, which in all communities are required and expected at the hands of men of public spirit, and enlarged views, he came back here, but little less than one year ago, to a new generation—to die in his native and beloved town, and to be here gathered to his kindred and fathers. Although suffering from disease and infirmity he was still the same genial companionable and enthusiastic man as ever, in all good words and works, and betook himself at once, with all the zeal of his youth, to the care, culture and growth of this child of his earlier days, as one of the departments and functions of the Institute. How he labored to extend its means and usefulness, and to enlarge its boundaries; and how he commended it to the regards, support and encouragement of our people we are all this day his witnesses. He had performed the same work on a larger scale, many years ago, for the Historical Society of New York, by presenting with great attractiveness, and in his fervent and glowing manner, its objects and labors to the culture and wealth of that city, thus greatly augmenting its means, and largely aiding it in entering on that career of usefulness and renown for which it has since been so much distinguished. The hand of our friend and associate was strongly in that earlier work of revival and reconstruction; and it was only in renewal of similar labors, years before, in the formation of the Essex Historical Society. It is an affecting incident, that his very last days and thoughts were employed in preparing illustrative memorials of the first meeting house of the First Church in Salem (and the first Congregational Church founded on the Western Continent,) the frame of which is now being reërected and covered for preservation on the grounds of the Salem Athenæum, in the rear of Plummer Hall, under the direction of a committee of the Institute, a work which he had undertaken, as a labor of love, and in which he was engaged at the very moment of the fatal attack.

Resolved, That a man of a character so strongly marked as that of our deceased friend, and who has so impressed
himself in various ways and degrees of usefulness on his day and generation, deserves to be held in honored remembrance; and we are happy to have it reported to us this evening, that the work of preparing a fitting and just memorial of his life, and character, is entrusted to entirely competent hands, and that in due time, it will be ready for publication in our Historical Collections.

Resolved, That these Resolutions be entered at length on our records, in perpetual remembrance of the respect we bear for the memory of our deceased associate and friend, and of our grief at his death; and that an attested copy thereof be transmitted by the Secretary to the nearest relatives of Mr. Ward.

The acceptance of the resolutions was moved by Rev. G. D. Wildes and seconded by Prof. A. Crosby, and they were unanimously adopted.

Monday, October 24. Evening meeting.

Vice President, A. C. Goodell Jr., in the chair.

Donations to the Library and Museum were announced.

Letters were read from—

Maine Historical Society, acknowledging the receipt of publications: Prof. S. F. Baird, of Washington, relating to the "Naturalist's Directory": H. L. Ordway, of Ipswich, on the habits of the Canker worm: Albert B. Russell and Theodore Atwill, of Lynn, accepting membership: Department of the Interior, Washington, giving notice of the transmission of books: A. L. Babcock, of Sherborn, relating to exchange of specimens: Dr. A. S. Packard Jr., of Brunswick, Me; John W. Young, of Worcester; Miss Mary H. Coffin, of Newburyport; S. Lincoln, of Boston; S. J. Young, Librarian of Bowdoin College; Joseph Willard, of Boston; Wm. A. Smith, of Worcester, on business matters: James C. Ward, of Northampton, in reply to a communication containing the resolutions in memory of his father, the late G. A. Ward, Esq.

F. W. Putnam exhibited a skeleton of a Green Turtle, which had been prepared from a specimen lately presented by Francis Peabody, Esq., and explained the various parts of the skeleton, comparing it with that of a bird. He also spoke of the different sub-orders and families of Turtles as
characterized by the skeleton, and exhibited a skeleton of the Chelys Matamata from the Amazon, which had been in the possession of the Institute for nearly thirty years, but had only recently been prepared for exhibition.

The Secretary presented, in the name of the Heirs of the late Perley Putnam, an autograph letter of General Lafayette, accepting the invitation to visit Salem in 1824, and made some remarks on the visit of Lafayette to this country in 1824—25.

The request of the "Picture Committee" of the National Sailor's Fair, for the loan of the portraits of John Rogers, Andrew LeMercier, Samuel Sewall, William Pinchon, Samuel Cooper, Benjamin Colman, Thomas Prince and Edward Holyoke, was referred to the Board of Directors.

**Wednesday, November 9. Stated meeting.**

Vice President, A. C. Goodell Jr., in the chair.

F. W. Putnam proposed several amendments to the By-laws, which were adopted.

Solomon Lincoln Jr., of Salem, was elected a Resident Member. Edward S. Morse of Gorham, Me., and Edwin C. Bolles of Portland, Me., having been nominated by the Directors, were elected Corresponding members.

**Monday, November 14. Evening meeting.**

Vice President, A. C. Goodell Jr., in the chair.

Letters were read from the following:

Minnesota Historical Society, acknowledging the receipt of publications: Major Albert Ordway, 24th Mass. Infantry; Lt. John S. Allanson, 1st New York Engineers; Alex. Agassiz, of the Museum of Comp. Zoology; Alpheus Hyatt, of Cambridge, relating to the transmission of specimens: James C. Ward, of Northampton; E. M. Stone, of Providence, R. I., relating to the transmission of books: Prof. A. S. Packard, of Brunswick, Me.; J. S. Lewis, of Batavia, N. Y.; E. S. Morse, of Gorham, Me.; S. I. Smith, of Norway, Me., in relation to the publications.

F. W. Putnam read a communication from J. A. Allen of
Springfield, entitled "Notes on the habits and distribution of the Duck Hawk, or American Peregrine Falcon, in its breeding season, and description of its eggs," which was referred to the Committee on Publications.

Mr. Putnam presented, in the name of Rev. E. C. Bolles, of Portland, a collection of land and fresh water shells from Maine and New York.

Mr Bolles, who was present by invitation, being called upon, remarked that he felt like little more than a beginner in this department of conchology. He had been attracted to the study by the examination of the lingual ribbons of the land mollusks, organs remarkable for their beauty and regular structure, and exhibiting under the microscope fine specific characters. As yet there are but a few American students of these shells. In general, people are ignorant of the riches scattered about them in every forest and on every hill side. A snail is only a snail to almost everybody, and the common belief is that there is only one species and that unworthy of a serious man's attention. In Maine from which most of these specimens were brought, there are fifty species of land and fifty-four of fresh water mollusks. Most of these are forms peculiar to N. America. One, the Achatina lubrica is a cosmopolite, the same in both hemispheres, on islands and on continents. Some are analogues of foreign shells,—not facsimiles, but built on the same general plan. A few were evidently imported—carried by the accidents of commerce, as vermin and weeds have been, to make the grand tour of the globe. The islands of the Maine coast were early colonized. Sometimes old coins and carved stones are discovered there. There is another proof of European visits. The common snails of England still retain their rights of squatter sovereignty upon the soil. These shells have never been found far inland. They testify like the weeds which follow the pioneer to the great tide of nature's migration.
These specimens show us another great law of nature. Dissimilar as they are, all their differences lay in simple modifications of a simple type or plan. Beginning with Vitrina there is a loose transparent whorl of organized lime to protect the viscera of the mollusk. Through the flattened Helices to the turretted Achatina this whorl is twisted more or less closely, sculptured or plain, tinted or blanched, elevated or depressed, but in all cases reproducing the original plan in its structure. The animal exhibited the same fact. Animal and shell must be studied together. Here we begin to realize with what economy the Divine Wisdom worked. Out of a few simple substances and by touches of change almost microscopic in their minuteness the living vesture of the globe is made so various in its beauty and exhaustless in its forms.

The study of the anatomy of these mollusks is rendered somewhat difficult by the softness of their bodies. The most wonderful organ is the tongue or lingual membrane,—a rasp by which the creature secures its food. Each tooth of this rasp seems formed of the clearest glass. In some species there are over two thousand of these teeth upon the lingual organs. Under the microscope and especially by polarized light they form beautiful objects for examination. Mr. E. S. Morse, to whom the Natural History of Maine owes so much, has studied this matter scientifically and with fine results.

In short—Nature at our side everywhere offers us the choicest encouragement, whatever our particular tastes. The land repeats the wonders of the sea, and any association, like the Essex Institute, to study the lessons of both, is an association for mutual enjoyment, education and refinement in the knowledge of the great Creator.

The donations to the Library and Museum, received since the last meeting, were announced.

Charles Babbridge, of Salem, was elected a Resident Member.
Monday, November 24. Evening meeting.

The President in the chair.

Letters were read from the following:


F. W. Putnam read letters from George C. Huntington, of Kelly's Island, Ohio, giving an account of the "Red bug" of that Island, specimens of which were presented to the Institute by Mr. Huntington. Mr. H. stated that the insect was, as far as he could learn, found only on Kelly's Island. It is called the "Red bug" on account of its bright crimson color when living. It is so minute as to be hardly visible to the naked eye, and from its habit of penetrating beneath the skin, at the elbow joint, under the arms and other tender places, is very annoying to persons of delicate skin, especially to women and children; of late years however, it has been discovered that alcohol applied to the part affected will kill the insect and allay the eruption caused by it. Whence this insect comes, or where it goes, is still a mystery. They do not propagate while under the skin. In many of its habits it is similar to the "Jigger" of the Southern States, and it is thought by most persons to be the same insect, but by its size and structure this is at once disproved. Mr. Putnam thought that the insect was allied to the Louse (Pediculus) and, as far as he could ascertain, it was as yet undescribed.

William P. Upham presented in behalf of Mrs. Martha Lee late of Manchester, an old Journal kept by Benjamin Craft during the siege of Louisburg in 1745, with letters
written by him at that time; also a Journal kept by Eleazer Craft in the Revolutionary war, at the period of the surrender of Burgoyne, which was presented by Mrs. A. H. Trask of Manchester.

After some remarks upon the subject by A. C. Goodell Jr., and Rev. G. D. Wildes, the communication was referred to the Committee for publication in the Historical Collections.

The Secretary presented in the name of S. H. Phillips, a portrait of President William H. Harrison, painted by Abel Nichols Jr., of Danvers, who visited North Bend on the Ohio, for this purpose, during the Presidential campaign of 1840.

The chair made some remarks upon the events connected with this campaign, and mentioned several incidents illustrative of the character of the late President.

Two very handsome and large specimens of sponge collected from the piers of Beverly bridge, in the channel of the river, at about ten feet below low water mark, were presented by Rev. A. B. Rich of Beverly, who stated that these specimens exhibited, in his opinion, the two extremes of the species, as he had other specimens in his collection from the same locality, having intermediate forms.

Mr. Putnam spoke of the structure of sponges and the various opinions of Naturalists as to their proper affinities, some holding them to be plants and others the lowest form of animal life; to the latter opinion he was strongly inclined.

R. S. Rantoul stated that the War Department had caused surveys to be made for one or two new forts, within the limits of our County. One of these is at Beverly and is intended as a part of the defence of Salem Harbor; for this fort the name of "Hale" would be appropriate, in honor of Col. Robert Hale, a distinguished
citizen of Beverly, in the last century; and if the other should be located in Ipswich, it might be designated "Fort Dennison," in respect to the memory of Col. John Dennison, formerly one of the most noted personages in that section of the county. On Mr. Rantoul's motion a committee, consisting of Messrs. Davis, Rich and Tuck, all of Beverly, was appointed to confer with other parties in relation to the naming of the proposed forts, should they be erected.

Mr. Rantoul called attention to the large number of valuable manuscripts that were daily sent to the paper mills, and trusted that all present would endeavor to rescue as many old papers as possible and have them placed on file at the Institute.

A. C. Goodell Jr., followed Mr. Rantoul, and hoped that all the friends of antiquarian research would endeavor to save the old manuscripts, books, papers, &c., especially those of the Ante-Revolutionary period, from the collectors of such articles for the paper manufactories.

G. D. Phippen mentioned that during the past season Mr. C. W. Felt had removed his establishment for the manufacture of the Type-setting and Justifying machine to this city. Much interest having been expressed in this machine, which bids fair to change the present mode of composition in the printing office, Mr. Phippen moved that a committee be appointed to invite Mr. Felt or his associates to give an account of the machine at some future meeting of the Institute; Messrs. Huntington, Phippen, Goodell and Kimball were appointed on said committee.

James Talant of Concord, N. H., and James Hubbert of Toronto, C. W., having been nominated by the Directors, were duly elected Corresponding Members.
Wednesday, December 7. Special meeting.

The President in the chair.

The chair announced that the object of the meeting was to listen to an explanation of the Type-Setting; Justifying and Distributing Machine invented by C. W. Felt of this city, and now in the course of construction at the manufactory on Bridge street. After some general remarks appertaining to the subject, a general explanation of the machine, and of the purpose of its various parts, and their mode of operation was given by Mr. Wm. G. Choate, and a more detailed description of particular parts of the machine by Mr. John B. Richards, and remarks were made in regard to the invention by Mr. A. C. Goodell, Jr., and Mr. James Kimball.

This machine, as its name imports, sets and justifies type, and also distributes. The setting is done by the manipulation of a key board. There are thirty-seven keys for setting the type, one for each letter and character of some one alphabet, or size of type. While other keys touched with the keys of the several letters, turn the letters into any required alphabet, or size of type. Thus there is an italic key, and a capital key, which touched with the key of any letter, turn that letter into a capital or an italic, &c. The mechanism is so arranged as to keep pace with the most rapid compositor. Consequently if the manipulation of a key board is the quickest method of communicating motion intelligently to mechanism, as is believed, then this machine will enable a compositor to set types as fast as in the nature of things it can be done. Some idea may be formed of the rapidity with which the machine may be operated from the example of printing telegraphic machines which are operated by a similar key board. Rapid operators can compose on these at the rate of 7500 ems an hour, which is seven and a half times
as fast as a rapid compositor can set types by the old method. By the use of a certain series of combined letters, cast in single type, which Mr. Felt has invented and which are used in the machine, there will be a further gain of about one-third, thus bringing the capacity of the machine nearly if not quite up to 10,000 ems an hour in the hands of a quick and skillful operator. Besides setting the type, this machine spaces and justifies the line, as well, or even better than can be done by hand and also leads the matter. The operation of justifying which printers have usually pronounced impossible for machinery to accomplish, and which no other type setting machine does or attempts to do, is performed by the machine automatically, all that the operator does, being to touch a key when his line is full, which transfers the line into the justifying apparatus and puts it in motion. Nor does the justification take the time of the operator. It is performed while he is setting the next line.

Attached to the machine is a register as it is called, which makes a complete record of all the operations of the machine by punching holes in a strip of paper. The use of the register is in resetting and distributing the matter. These strips of paper being placed in the machine, and the machine set in motion, it will automatically set and justify the same matter in the same or a different type at any future time. This will obviate the necessity and save the expense of stereotyping books. The distribution is also automatically performed by means of the register, or it may be effected by the key board, or by nicks in the type.

Besides this machine Mr. Felt has invented several very simple and ingenious applications of the principles of the machine to setting type by hand which will be of great value, especially in small offices, where the large machines will not be required.

On motion of James Kimball it was voted—That the
thanks of the Institute be presented to Messrs. Choate and Richards for their interesting and instructive remarks and explanations of the machine.

**Monday, December 12. Evening meeting.**

The President in the chair

Letters were announced from:

New Hampshire Historical Society; Maine Historical Society; Massachusetts Historical Society, acknowledging the receipt of publications: A. L. Babcock, of Sherborn and A. B. Burton, of Bethlehem, N. H., relating to exchange of specimens; Dr. Wm. Wood, President of the Portland Society of Natural History; Lt. J. S. Allanson, 1st New York Engineers; Prof. S. F. Baird, of the Smithsonian Institution, on business; Rev. Joseph Banvard, of the Worcester Society of Natural History; Rev. E. C. Belles, of Portland, Me.; Prof. A. E. Verrill, of Norway, Me.; J. A. Allen, of Cambridge; W. H. Dall, of Chicago, Ill., relating to the publications.

F. W. Putnam read a letter from William Hoxie, of Newburyport, in which Mr. Hoxie stated that he had found the following birds breeding in Byfield Parish during the past season—*Scoleocophagus ferrugineus* Sw. (Rusty Blackbird), *Myiodytes canadensis* Aud. (Canada Fly-catcher) and *Antrostomus vociferus* Bonap. (Whippoor-will).

George D. Wildes read a memoir of the late Captain William Nichols, of Newburyport, a noted Privateersman during the war of 1812 and one of the most enterprising and daring navigators of that period.

On motion of Mr. Goodell the thanks of the Institute were tendered to Mr. Wildes for his interesting communication, and a copy was requested for publication in the Historical Collections.

Mr. Putnam mentioned that in a collection of Reptiles received from J. A. Allen, of Springfield during the past season, there was a specimen of the *Celuta amaena* B. & G. (Worm Snake). Mr. Allen had for several years past been confident that he had seen this species near Spring-
field, but had never been able to secure a specimen before. The only notice of this snake having been found in New England is by Dr. Storer who states, in his "Report on the Reptiles of Massachusetts," that a single specimen was collected by Professor Adams in Amherst, Massachusetts. Several authors having doubted the identification of Storer's specimen, the present one from Mr. Allen places the species beyond doubt in the Massachusetts fauna. Several specimens of *Heterodon platyrhinos* Latr. (Hog-nosed Snake, or Blowing Viper) were also in the collection received from Mr. Allen.

Mr. Putnam made some remarks upon the nest of a mouse found in a barberry bush, near Swampscott, and presented by Edward J. Porter.

A. C. Goodell Jr. mentioned that the course of Lectures on Insects, their habits and structure, by F. W. Putnam, would be delivered under the auspices of the Institute as soon as the necessary number of tickets were subscribed for.

Donations to the museum and library were announced.

W. P. Martin, W. R. Cloutman and E. S. Attwood, of Salem, were duly elected Resident Members.

**Monday, December 24.** Evening meeting.

The President in the chair.

Letters were read from:


F. W. Putnam read a communication from D. M. Balch, "On Native Grapes." In this paper Mr. Balch gives the results of his analyses of the following varieties of grapes grown in this vicinity, viz: the Delaware, Hartford Prolific, Concord, Adirondac, Allen's Hybrid, Union Village, Clinton, Alvey (Hagar), Franklin, Rogers' Hybrids Nos. 1, 3, 4, 9, 15, 19, 22, 30, 33, and 41.

From these analyses, native grapes would seem to be divided into three classes: 1st, those in which the proportion of acid and sugar are well balanced, as the Delaware, Rogers' Nos. 4 and 15, Allen's Hybrid, &c.: these should make good wine. 2d, those in which the acid is deficient, as in the Adirondac, Hartford, &c. 3d, those in which the great excess of acid overpowers all else, and renders the fruit nearly uneatable; such are the Clinton, Franklin, &c. The paper also contained several important practical remarks upon the culture of the grape in our climate. On motion of Mr. Putnam the communication was referred to the Publication Committee.

Mr. Putnam stated that, since the last meeting, he had ascertained that Mr. Samuels, in his report on the Mammals of Mass., mentioned that the White-footed, or Deer Mouse, Hesperomys leucopus, builds its nest in bushes, and he therefore presumes that the nest presented at the last meeting by E. J. Porter, was that of this species of mouse. In reply to a question from the chair, Mr. Putnam gave a brief account of the winter nests of the Musk Rats.

Charles Davis, in behalf of the committee appointed at a previous meeting, submitted a report containing the recommendation of the Selectmen of Beverly, that the Fort which the Government proposed to erect in Beverly, be called Fort Hale, in memory of Col. Robert Hale, formerly of Beverly, which was adopted.
LXXXVI

Mr. Davis exhibited a fragment of the shell fired from the "Alabama" into the "Kearsarge," and which wounded three men on board the latter steamer; also the only piece of the "Alabama" remaining above water, and which was taken from the leg of one of the crew of the "Alabama" by Surgeon's Steward G. A. Tittle of the "Kearsarge," a citizen of Beverly.

Donations to the Library and Museum were announced. James P. Kimball, of New York and Felipe Poey, of Havana, Cuba, having been nominated by the Directors were elected Corresponding Members.

Miss Susan T. Boynton, of Lynn and Henry W. Putnam, of Salem, were elected Resident Members.

Additions to the Museum and Library during October, November, and December, 1864.

TO THE NATURAL HISTORY DEPARTMENT.

BY DONATION.

Allanson, Lieut J. S., 1st. N. Y. Engineers. Lignite from the Dutch Gap Canal.

Barker, George. Skin of a Coot from Lake Cupsuptic, Me.

Barrett, Miss, of South Danvers. Salamander, Hair Worms, and two Insects from South Danvers.

Bolles, Rev. Edwin C., of Portland, Me. 44 specimens, 25 species of Insects and Spiders from Portland, Me., and Mohawk, N. Y. 43 species of New England Land and Fresh water Shells.

Brown Jr., Benj. 12 specimens, 11 species native Insects.

Brown, Daniel. Fresh specimen of Blue Heron, Ardea herodias Linn.

Dall, W. H., of Chicago. 9 specimens of Reptiles from the vicinity of Lake Goodwin, Marquette Co., Mich.

Day, Albert. Specimen of Scorpion.

Emerton, James H. 87 specimens of native Insects.

Emerton, Ephraim. A Lizard enclosed in copal.

Emerton, W. H. Specimen of Sphinx taken in Salem.

Hale, Henry. Specimen of Blue Sulphuret of Iron, from which metallic paint is made.
Harrison, Edwin, of Irondale, Mo. Specimen of the Walking Fern, *Camptosorus rhizophyllus* from Irondale, Mo.

Haskell, Joshua P., of Marblehead. Cases of Worms resembling the shells of *Helix* from Wenham Pond. 46 species of native Shells.


Horton, N. A. A specimen of very thin veneer.

Ives, John M. Fresh specimen of Bittern, *Botaurus lentiginosus*.


Jones, C. H., of Sun Prairie, Dane Co., Wis. A collection of 130 Fishes from Madison 4th Lake, Wis.


Lake, Chas. H., Mass Vols. A "Green Rose" from Little Rock, Ark.

Lander, Miss E. R. Specimen of Lead from West Hampton, Mass.


Lefavor, Joseph. Fresh specimen of a Woodchuck found in Salem.

Maloon, Wm. Hornets' nest.


Nelson, Sylvanus, of Georgetown, Mass. Fossils from Rock river, N. Y.

Norris, Chas. H. Mud Turtle, *Chelydra serpentina*, from Salem.

Oswood, Capt. Charles. Eggs of *Pythula* from Coast of Brazil.

Oswood, John C. Specimen of Crystalized Salt from Atlantic Salt Company's Works, Bay City, Michigan.

Peabody, A. S., of Cape Town, Africa. 2 specimens of *Callorhynchus antarctica* from South Africa.

Peabody, Francis. Green Turtle, *Chelonia mydas*.

Phippen, G. D. 12 specimens, 4 species Insects from Salem.


Putnam, Chas. A. 6 specimens of Frost Fish *Morhua pruinosa*, from North River. 30 specimens of *Unio complanatus* from Spring Pond.

Putnam, F. W. Eggs of the Sheldrake, Merganser, and Black Duck, from Oxford Co., Me.

Rich, Rev. A. B., of Beverly. Two large and handsome specimens of Sponge from the piers of Beverly Bridge.

Safford, Joshua. Ore from the Hecksber Coal Mine.


Sanborn, Francis G., of Boston. 227 specimens, 69 species of Spiders collected in Massachusetts.

Saute, James G., of Woburn. 73 specimens, 14 species of Insects from Newbern, N. C.
Todd, Mrs. John E. A. Native Silver from Copiapo, Chilli.
Tracy, C. M., of Lynn. 2 specimens of Desmocerus palliatus, male and female. Butcher Bird, Collirio borealis, from Lynn.
Wheatland, Henry. Skull of a Musk Deer. Collection of Flower seeds from California.

By exchange.
Packard Jr., Dr. A. S., Brunswick, Me. Skulls of Seal, Esquimaux Dog, Black Bear and Squirrel, 13 specimens, 8 species of Fishes, 1 Frog, 16 species of Crustaceans, 200 specimens, 60 species Fossil Shells from the drift, 15 specimens, 3 species dried Echinoderms, from Labrador.

TO THE HISTORICAL DEPARTMENT.

By donation.
Andrews, Wm. P. A piece of one of the timbers of the oldest house in America, St. Augustine, Fla. Shells from Fort Wagner.
Black, Ensign Nath. W., of the gunboat "Mahaska." Rebel Torpedo from St. John's River, near Jacksonville, Fla.
Bolles, Rev. Edwin C., of Portland, Me. Rebel Envelopes. Several Postage Stamps, Foreign and American.
Damon, ———, of Marshfield, Mass. Piece of Shell from the "Tennessee". Piece of Wood from the stern post of the "Brooklyn."
Davies, Chas., of Beverly. Photographs of the new Chapel of the Baptist Society in Beverly and of the first Pastor of the society.
Emilio, Capt. Louis. Several Fuses of different kinds.
Fry, ———. Two Spindles from the railing on the top of a pew in the old East Church, built in 1718.
Ordway, Major Albert, 24th Mass., Infantry. 245 Foreign and American Coins.
LXXXIX

Perkins, Geo. Spoon made of bone by an American prisoner confined in Dartmoor prison during the war of 1812.


Putnam, Capt. W. H. A. Native Sword from Java.

Ropes, Nath., of Cincinnati, Ohio. 250 specimens, 108 kinds of Western Tokens.

Ropes, Timothy. Image from ancient Thebes.


Stone, Rev. Edwin M., of Providence, R. I. A portion of the Cotton from the bale on which David Crowley of Providence floated and was saved from the burning “Lexington” Jun. 13, 1840.


Wheatland, H. Two antique Powder Horns.

TO THE LIBRARY.

BY DONATION.


Drowne, Charles, of Troy, N. Y. Annual Register of the Rensselaer Polytechnic Institute, 1864-5, 1st term, 8vo, pamph., Troy, 1864.

Farnum, Joseph. The Brunonian, edited by Students of Brown University, 1 vol., 8vo, pamph., Providence, 1831.


Green, Samuel A., of Boston. Radicalism in Religion, Philosophy and Social life, four papers from Boston Courier, 1 vol., 12mo, Boston, 1855. Catalogue of Lawrence Academy, Groton, 8vo, pamph., 1864.
Correspondence between Webster and Hulserman, 8vo, pamph., London, 1851. 71 Pamphlets.

Ives, Henry P. Trial of the Murderers of Mr. White, 8vo, pamph., Salem, 1830.


King, Henry F. Hayden’s Science and Revelation, 1 vol., 12mo, Boston, 1852. Barrett, the Golden Reed, 1 vol., 12mo, New York, 1855. Wilkinson on War, Cholera, and the Ministry of Health, 1 vol., 8vo, Boston, 1855. A Portrait of Swedenborg, &c., 8vo, pamph., Boston, 1854.


Lord, N. J. Files of the Boston Daily Post for June, July, August and September, 1864.


Nichols, John H. Several papers printed at Charleston, S. C., during the year 1864.


Salem, City. 277 Pamphlets, principally Town Reports.


Smith, Mrs. Nath’l., of Pembroke. Perin’s Meditations, 1 vol., 16mo, Boston, 1709.

Sparks, Jared, of Cambridge. Life of John Ledyard, by J. Sparks, 1 vol., 12mo, Boston, 1864.


Story, Augustus. Herald of Freedom, Railway Times and The Independent, files for several years. 24 Pamphlets.

Tucker, Jonathan. A collection of Manuscripts from the estate of the late G. Tucker.

Upton, James. Littell’s Living Age, vols., 24, 25, and 26, 3d series, 8vo, Boston, 1864.
XCI


By Exchange.


Dartmouth College Library. Catalogue of Dartmouth College, 1864-5, 8vo, pamph.


Harvard College Library. 130 Pamphlets, principally relating to the various New England colleges.


Iowa State Historical Society. Annals of Iowa for October, 1864, 8vo, pamph.
XCl


Massachusetts Institute of Technology. Scope and Plan of the School of Industrial Science, 8vo, pamph., Boston, 1864.


Montreal Society of Natural History. The Canadian Naturalist and Geologist for October, 1864.


Rhode Island Historical Society. One hundred and fifty pamphlets.


By Purchase.

MONDAY, JANUARY 9. Regular meeting.
Vice President Goodell in the chair.

Letters were read from:

F. W. Putnam exhibited several colored drawings by Dr. J. Bernard Gilpin of Halifax, N. S.

One of these was a winter scene, representing a moose feeding on the tender twigs of a young tree which it had pushed over for the purpose, by straddling the tree with its fore legs, bearing on it with its chest. Another drawing was probably that of an undescribed species of Trout from Nova Scotia. The remaining were figures of the "Nurse" or "Sleeper Shark," Somniosus brevipinna Le Su., taken from a specimen captured in seventy fathoms of water on Sambro Banks, and brought to Halifax in the winter of 1862-3. The specimen was eleven feet three inches in length. In the manuscript accompanying the drawings, Dr. Gilpin describes the stomach, small and large intestines of this shark as being formed of one large simple gut from the mouth to the anus, with hardly perceptible differences in the various parts. He also mentions that there was a single caecal appendage. This shark is said to inhabit deep water, never appearing on the surface, and its habits are so sluggish as to allow of its being often captured with a cod line. The fishermen speak of it as voracious, and, at some seasons, troublesome about their nets. Dr. Gilpin also remarks upon the inaccuracy of the published figures, of this species, by Le Sueur, DeKay and Yarrell.

Mr. Putnam spoke of the importance and great value of such figures and observations as those made by Dr. Gilpin, and called attention to the articles on the habits of the
Herring by Dr. Gilpin, published in the Transactions of the Nova Scotian Institute of Natural Science.

Rev. G. D. Wildes presented, in the name of Mrs. John Forrester, a Chinese visiting card of the late D. Fletcher Webster Esq., used while Secretary of the American Embassy at China. Also a Hindostance Poem, written on Palm leaves and supposed to be five hundred years old.

Donations to the Library and Museum were announced.

Daniel H. Mansfield, Charles Odell, and Charles B. Fowler, of Salem, were elected Resident Members.

**Monday, January 23. Regular meeting.**

The President in the chair.

Letters were read from:


Rev. G. D. Wildes presented, in the name of Elijah Haskell, an old Spanish spear head and a gun lock, which were found in the Castle of San Juan d' Ulloa, Mexico; also the eggs of Pyrula from the Delaware Breakwater.

Donations to the Library and Museum were announced.

The President, after some appropriate remarks on the life, character and public services of the late Edward Everett, submitted the following resolutions:

Resolved. That we desire to express, and to place upon our records, in perpetual remembrance, our profound admiration and respect for the life and character of the Honorable Edward Everett, a Corresponding Member of the Essex Institute, and to join in the tributes, everywhere so justly and in such large measure paid to his memory, his worth, and his deeds, as the great American Scholar, Orator, Statesman and Patriot, and our most illustrious citizen.
A. letter from the Hon. C. W. Upham, was read by the President as follows:

Salem, Jan. 23, 1865.

Hon. Asahel Huntington,
President of the Essex Institute.

Dear Sir:

It is eminently proper for every literary and scientific association to participate in the honors paid to the memory of Edward Everett. I regret not to be able to be present at the meeting this evening.

An uninterrupted friendship, covering a period of more than forty years, frequent and long continued correspondence, and much personal intimacy, have given me opportunity to judge of his character. I can say, with the strictest truth, that every word of encomium in the various forms in which the universal public sentiment has been expressed on the occasion of his death, finds full support in my impressions and recollections. In the combination of his natural endowments, the circumstances of his education and history, and the uses to which he put his great faculties and advantages, he has always appeared to me without a parallel.

The warmth and tenderness of his heart, his devotion to offices of benevolence, and his calm moral courage, are the traits which ever most arrested my attention. He often encountered vehement hostility, and the tide of popular misunderstanding and misrepresentation sometimes threatened to overwhelm him, but he kept on his way patiently and quietly, never yielded to its power, or veered from the course marked out by his convictions of duty.

He has been the great teacher of his countrymen of two generations, constantly pouring forth from his wonderful resources of knowledge and genius, the most useful information and the noblest sentiments. An elevating influence has pervaded all the productions of his pen, and inspired his eloquence. He has pushed forward the intelligence, and stimulated the progress of society steadily for more than half a century. If his unrecorded acts of courtesy, kindness, and usefulness in the daily routine,
and ordinary course of life should be made known by those who have experienced them, they would equal in amount the extraordinary accumulation of his public labors. No one, however humble, ever addressed him for information without receiving a prompt and considerate reply, no one ever sought his aid without receiving evidence of his kind endeavor to serve him. He was faithful, punctual, and true to every opportunity of usefulness.

The collection of his Orations and Addresses, when completed, will be found to possess the elements of value and interest that will secure for them a permanent place in the highest department of the literature of the language. They embrace a wider circle of knowledge and a greater variety of subjects, in a style of elegance, accuracy, and polish, than any other work, and will stand the test of time.

His career justifies, and his classic grace and dignity of countenance and mien would peculiarly adorn the most costly monument that a grateful people can rear. All coming generations ought to be enabled to behold the features and form of the American, who has wrought out, by a life of industry, duty and virtue, the most finished model of culture and civilization.

If a portion of the contribution, which wealth and patriotism are about to make to this object, could be expended in giving to the public, in a beautiful form, and at a cost within the means of the great body of the people, a full collection of his productions, of all kinds,—from his first academic efforts to his last expiring strains, pleading the cause of country and Christian charity in Faneuil Hall,—it would indeed be the grandest monument, and render his usefulness perpetual.

Yours, very truly,

CHARLES W. UPHAM.

Resolved. That the letter of Mr. Upham be entered at length upon the records, and that we cordially concur in its sentiments and estimation of the life and character of Mr. Everett.

Resolved. That an attested copy of these proceedings
be transmitted by the Secretary, to the family of Mr. Everett.

Rev. G. D. Wildes seconded the resolutions with appropriate remarks, and they were unanimously adopted.

Francis C. Webster of Salem, was elected a Resident Member.

Monday, February 6. Regular meeting.

Vice President Goodell in the chair.

Letters were read from:

Massachusetts Historical Society; Natural History Society of New Brunswick; Nova Scotian Institute of Natural Science; Corporation of Brown University, acknowledging receipt of publications: Prof. A. E. Verrill of New Haven, Ct.; W. H. Dall of Chicago, Ill.; Thomas R. Drowne; James L. Oliver of Lynn; C. W. Felt; J. Colburn of Boston; S. D. Bell of Manchester, N. H., on business: J. A. Allen of Cambridge; Trübner & Co. of London, relating to the publications: W. W. Stuart of the Buffalo Society of Natural Sciences, on the exchange of specimens: Rev. E. C. Bolles of Portland, Me., transmitting specimens: Prof. Theo. Gill. Librarian of the Smithsonian Institution, giving the particulars of the destruction by fire of a portion of the Smithsonian Institution: Franklin B. Hough of Albany, N. Y.; Prof. D. C. Eaton of Yale College, relating to the Naturalists’ Directory: William Endicott of Shanghai, China, accepting Membership: Mrs. Mary H. Nichols, presenting a portrait of her late husband, Dr. Andrew Nichols: William Everett of Boston, in reply to a communication containing the resolutions passed at the last meeting of the Institute in memory of his father.

Dr. H. Wheatland gave a brief account of the life and services of Dr. A. Nichols, who was one of the pioneers in the study of Natural History, in this vicinity: following immediately in the steps of the celebrated Rev. Dr. Cutler of Hamilton. His example and precept have done much for the promotion of those objects which we now possess and enjoy. He was active in the organization of the Essex County Natural History Society, and for the first twelve years its President. It is well, occasionally, to look back upon the days of our infancy, and call to
mind those who have laid the ground work of the operations of the present day.

Messrs. J. M. Ives and F. W. Putnam, alluded to the various discoveries made by Dr. Nichols in local Natural History.

F. W. Putnam announced the donation of one hundred and thirty-five copies of "The Victoria Regia, or the Great Water Lily of America; by John Fisk Allen," from the author. This work was published in 1854. It is a folio, and contains sixteen pages of text, and six plates representing the flower of natural size, in several stages of its growth, the structure of the leaf, and the young plant. The Institute, is, by this donation, in possession of all the remaining copies of the edition, and the only source whence the work can be obtained. On motion of Mr. Putnam, it was Voted. That the copies of the "Victoria Regia," donated by Mr. Allen, be sold at a price not less than ten dollars per copy, or exchanged for works, equal in value, on Natural History and Horticulture, and that all monies received from this source be expended in the purchase of works on Natural History and Horticulture; and that all books received as above be placed in the Library of the Institute as donations from Mr. Allen.

Donations to the Library and Cabinets were announced. Albert J. Lowd, Thomas R. Drowne and Benjamin Pearson, of Salem, were elected Resident Members. Winslow Lewis of Boston, was elected a Corresponding Member.

Monday, February 8. Quarterly meeting.

Vice President Goodell in the chair.

The following amendments to the By-Laws were adopted.

Chapter I. The following to be added: "Provided, however, that any member may, in lieu of the annual assessment, pay the sum of thirty dollars to be added to
the funds of the Institute, the annual interest thereof to be considered as the payment of the annual assessment of said member."

Chapter IV. Lines 4th, 5th, 6th and 7th to be changed so as to read: "No specimen shall be taken from the rooms except by permission of the Committee of the Department to which it belongs, upon a written application made to the Secretary or Superintendent."

Amos Noyes of Newburyport, John Kinsman, Frederick Lamson of Salem, were elected Resident Members. James C. Ward of Northampton, was elected a Corresponding Member.

Monday, February 20. Regular meeting.

Vice President Goodell in the chair.

Letters were read from:


Mr. Putnam read a communication from J. A. Allen, entitled, "Notice of a Foray of a colony of Formica sanguinea Latr, upon a colony of a black species of Formica for the purpose of making slaves of the latter." Referred to the Publication Committee.

F. W. Putnam made a few remarks upon the development of the fins of fishes, and the subsequent absorption of certain fins in some species.
He had lately examined young specimens of *Achirus lineatus* Cuv., and had discovered that they possessed *pectoral* fins, which were situated very near the opercular openings and composed of four well developed rays. In two specimens, which were nearly three inches in length, the pectorals were perfectly developed, except on the left side of one specimen where no fin could be traced. In another specimen, about four inches in length, both pectorals were present. A number of larger specimens were without pectoral fins which has been considered as the normal condition of the species of the genus *Achirus*.

Donations to the Library and Museum were announced.

Voted. That this meeting be adjourned to Tuesday evening next.

**TUESDAY, FEBRUARY 28.** Adjourned meeting.

Vice President Goodell in the chair.

Hon. C. W. Upham read an interesting memoir of our late esteemed member, GEORGE A. WARD.

On motion of Dr. Wheatland, it was

Voted. That the thanks of the Institute be tendered to Mr. Upham for the highly interesting and valuable memoir of the life, character and services of our late member, George A. Ward, and that a copy be placed at the disposal of the Publication Committee for publication in the "Historical Collections."

**MONDAY, MARCH 6.** Regular meeting.

Vice President Goodell in the chair.

Letters were read from:

The Department of the Interior, giving notice of the transmission of twenty-eight volumes of Public Documents: S. P. Fowler of Danversport; N. Brown of Boston, relating to the publications: Natural History Society of New Brunswick, acknowledging the receipt of publications: T. A. Cheney of Havana, N. Y., relating to an exchange of publications: Prof. James Hall of Albany, N. Y., offering to complete the Institute's set of the Reports on the New York State Cabinet: W. W. Burrage of Boston, relating to the printing of Reports of the Classes
of Harvard University; H. W. Putnam, City Point, Va.; William L. Welch, notice of transmission of specimens and photographs: Messrs. Hartman & Laich of Cincinnati, Ohio, on business.

Captain N. E. Atwood of Provincetown, being present, was called upon by the chair and gave an interesting account of several species of native fishes as observed by him—

The Cod fish of the Eastern coast of the United States is not an inhabitant of the waters south of Cape Hatteras; that cape being the southern limit of the species. The northern limit he could not state, though it was certainly far north of the Straits of Belle Isle. In regard to the Cod, on our eastern coast, being of one, two, or three species, he could not, as yet, decide, but judging from their habits alone there might be three species, and it was his greatest desire to devote the rest of his life to the solving of this and similar problems in ichthyology, which can only be done by a person spending a length of time at each of the fishing grounds on the coast; carefully collecting facts, examining and comparing a large number of specimens from each place. At present, all he could say was, that there was a great and constant variation in the habits and size of the Cod from the various fishing grounds on the coast. The Cod taken by troll lines in the Gulf of the St. Lawrence are much larger than those from any other place, while those taken by the hand lines are quite small. The largest Cod he had ever seen weighed one hundred and one-half pounds, and this specimen was taken near Provincetown. He had heard of others that were supposed to have weighed from one hundred and fifty to one hundred and seventy-five pounds, which had been captured in the Gulf of St. Lawrence near the shore. On the coast of Labrador, he had never seen a Cod that would weigh twenty-five pounds; larger specimens, however, were taken on the small banks in the Straits of Belle Isle, five miles and upwards from the shore, and on George’s Bank the fish caught with hand lines average larger than from other localities.

Mackerel come into Provincetown harbor in the spring as early as the 15th of May, all of full size and with spawn,
and are then known as large No. 3's. By the 28th of May the spawn is fully developed, and deposited by the first of June. About the first of July young Mackerel, not more than two and one-half inches in length, are abundant in the Bay. These young Mackerel, in the latter part of October, are about six inches in length, and he has caught and packed and sold them as "No. 4 Mackerel." They leave the coast earlier in Autumn than the older ones. The large Mackerel, which appear first, as before stated, are followed by the arrival of small ones, on our coast north of Cape Cod about the 15th of June. These are known in the market as "Blinks," and are from last year's eggs. "Tinkers," are of two years growth; "Half-Size," are three years old, those older are called "Large ones." When Mackerel arrive on the coast, being lean, they are all designated as "No. 3's," but as they feed and improve in condition they are called "No. 2's," and when fat, are marked "No. 1," provided that they are thirteen inches long; but if less than thirteen and over eleven, then they are "No. 2's" if fat; all under eleven inches are marked as "small No. 3's," whether fat or poor. Adult Mackerel of four years, or more, are the only ones which spawn on our coast, and they will not take the hook until they have deposited their spawn, when they become lean and voracious. Formerly it was supposed that the large Mackerel, which first appear in Provincetown harbor, had passed the winter in the mud, and many persons would not eat them owing to their supposed muddy taste. These large Mackerel go further north than the smaller ones, returning southward long after the others have left the coast, and are even captured in November and December in the vicinity of Provincetown. Capt. A. was convinced that the Scomber greg was the young of the S. vernalis, Mitchill, and not a distinct species.

After giving an interesting account of the various modes of capturing the Mackerel at different times of the year, Capt. A. alluded to the Bluefish and the changes which had taken place in its habits. This fish, which many years ago, was very abundant, and held in high estimation by the Aborigines of our country, wholly disappeared from our coast in 1764, and not a specimen was
seen on the coast, so far as Capt. Atwood knew, for fifty years. In 1847 they returned to the North of Cape Cod in great abundance, and have since been taken in large quantities in weirs and nets, and by the hook, near the shore. Now they avoid the shore, and, during the last year or two have kept in the Bay, where it is difficult to capture them, as they seldom take the hook, though, until recently, they were most voracious and game fish.

The Menhaden, which were formerly so great a pest to the fisherman, and considered only fit for manure, appear in vast numbers on the coast of Massachusetts during the summer, a little later than the Mackerel, and remain until late in the season. They are now a valuable source of income, being caught for the oil, which is pressed from them, and sold for $40 a barrel. The refuse, after the oil is extracted, is used as a fertilizer and commands a high price. The sides of these fish are also salted, packed in barrels, and sold at a good price for Mackerel bait. The Menhaden does not spawn while on our coast, and it is only in the few, which have been driven into the rivers and which do not leave the coast until December or January, that spawn has been found. In the month of August and September a few of the young Menhaden are seen in our harbors; but further south, along the coast of Virginia, the young are seen in countless millions, and in heavy storms are driven on shore and left to die. On the coast of Virginia, small Menhaden appear after the large ones have left for the North. From the fact that the Menhaden which visit us during the summer, are either of a large and uniform size, or quite young, this species is supposed to attain its growth in a single year.

On motion of Rev. Mr. Wildes, the thanks of the Institute were voted to Capt. Atwood, for his interesting remarks.

Donations to the Library and Cabinets were announced.

John Dixey, Joseph B. F. Osgood, and Edward H. Knight, of Salem, were elected Resident Members.
Monday, March 20. Regular meeting.
Vice President Goodell in the chair.

Letters were read from:
Lyceum of Natural History of New York, acknowledging the receipt of publications: Boston Society of Natural History, acknowledging the receipt of a collection of plants, collected in Zanzibar, by Caleb Cooke: Amos Noyes of Newburyport, accepting Membership.

Donations to the Library and Museum were announced.
A. C. Goodell Jr. read a paper entitled the "Cavalier and the Puritan." This will be published in a separate form.

John Daland of Salem, and Eben F. Stone of Newburyport were elected Resident Members.

Additions to the Museum and Library during January, February, and March, 1865.

TO THE NATURAL HISTORY DEPARTMENT.

BY DONATION.


Babidge, Chas. H. Chalcopyrite from Cheticamp, N. S.

Babcock, A. L., Sherborn, Mass. 9 specimens, 7 species, Insects; Skin of Sciurus hudsonius; skeletons and parts of skeletons of 3 species of native Birds; specimen of Anodonta fluviatilis, from Sherborn.

Buttrick, S. B. Portion of the jaw of a Porpoise. Water Beetle, Dytiscus sp., from South Salem.

Bolles, Rev. E. C., Portland, Me. 7 specimens of Anodonta edentula Lea, A. Ferussaciana Lea, Unio iris Lea and U. calceolus Lea from Milwaukee, Wis. 3 specimens Mya arenaria from the Postpleiocene at Gardiner, Me. 3 specimens Coleoptera from Africa.

Cary, Geo. A. 2 specimens of Tellena from Turk's Island.

Chamberlain, James A. 2 Holothurians, dry.

Chicago Academy of Natural Sciences, Chicago, Ill. Skins of 8 species of Mammals and 64 species of Birds from the West and North. 36 species, 51 specimens of Western Bird’s eggs.

Haskell, Elisha. Eggs of Pyrula from Delaware Breakwater.
Hatch, Chas. F. Flying fish, Exocetus sp., from off the mouth of the Amazon. Centipede from near Parahiba River, Brazil.
Heath, John. Larva of Papilio Turnus Linn. from Lynnfield.
Heath, N. 5 Insects from Salem.
Higbee, Chas. H. Malachite from Africa.
Hoffman, Capt. Chas. Lizard from Bissao, W. C. Africa.
Kezar, Walter A. Wood perforated by Teredo, from Pensacola, Fla.
Lovett, Edmonds. 3 species, 5 specimens of Ophidians; 3 species, 3 specimens of Saurians; 1 Bird; 6 species, 21 specimens of Insects; from the South West Coast of Africa.
Lowd, Mark. Fungus.
Mack, Dr. Wm. Larva of Oestrus Boris from a cow.
Nichols, Stephen. Fungus.
Palfray, Chas; W. Specimen of the Mocking Bird, Minus polyglottus Boie, 13 years old.
Patch, W. H. H., Concord, N. H. Living Opossum, Didelphys virginiana Shaw, from Virginia.
Pond, T. M., Framingham. Nest and eggs of the Meadow Lark, Sternella magna Swains, from Illinois.
Purdie, H. A., Boston. Several Spiders from Boston.
Putnam, F. W. Cochineal Insects, Coccus cacti, from Mexico. Specimen of Sapphire. Several species of Fishes from Mass. Bay. Claw of Lobster (malformation.)
Putnam, H. W. Infusorial Earth and Marl from near City Point, Va. Quinny, Dr. E. H. Human embryo.
Saunders, Miss Mary. Living specimen of the Acadian Owl, Nyctala acadica, captured in South Salem on Jan. 19.
White, Geo. M. 226 specimens, 75 species, Insects from Salem.
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TO THE HISTORICAL DEPARTMENT.

BY DONATION.


Bolles, Rev. E. C., Portland, Me. One of the first stamped Envelopes issued in England, May 5, 1840. Designed by G. W. Mulready, R. A.

Buttrick, S. B. The Cockade worn by the late High Sheriff, Joseph E Sprague. Indian Relics from Ware’s Beach, Marblehead, collected by John W. Bartlett.

Chamberlain, James. 4 Foreign Postage Stamps.


Edwards, Chas. W., Serg’t 2d Mass. Inf’t. Piece of the Rebel Flag found flying at Atlanta on the capture of the city.

Fairfield, Capt. James. 3 Coins from Uruguay; 1 Coin from Buenos Ayres.

Felt, S. Q. Native Dress (Sarong) from Java. 5 Photographs of Sikhs and other castes of India.


Goodell Jr., A. C. Bill Head of John Hancock.

Haskell, Elisha. Gun Lock and an ancient Spanish Spear Head from the Castle of San Juan d’Ulloa, Mexico.

Ives, John M. Wooden Images, carved by Alfred Bates, a soldier of the war of 1812.

King, Capt. H. F. Dutch Copper Coin (2 stivers.)

Lovett, Edmonds. Native Mat from the South West Coast of Africa.

Perkins, Ezra, Essex. Indian Pipe.

Phippen, Nath’l. $5 Bank Note of the United States Bank 1828.

Putnam, Mrs. Eben. Cane made from a timber used in the 2d and 3d house of the 1st Church.

Rhodes, Henry W. Rebel Uniform Button.

Steers, James L. Rebel Uniform Button.

Symonds, Geo. W. Piece of a Rebel Gunstock from the “Wilderness.”

Wilkinson, Mrs. Elizabeth, Beverly. Irish Flax; such as was used in the manufacture of linen cambric. Brought from Ireland in 1791.

TO THE LIBRARY.

BY DONATION.


Ballard, David, Brunswick, Me. Bourne’s Address at the Popham Celebration, Aug. 29, 1864, pamph.

Boston Public Library, Trustees of. 12th Annual Report, 1864, 8vo, pamphlet.

Brooks, Charles T., Newport, R. I. Carriers New Year's Addresses, Jan. 1, 1865.

Brooks, Henry M. Gospel of St. Mark, tr. and arranged by L. A. Sawyer, 1 vol., 12mo.


Burrage, Wm. W., Boston. Reports of Secretary of Class 1856 of Harvard for 1860, 1861 and 1865, 8vo, pamphlets.

Chase, George C. Friends' Review, 16 Nos.

Chase, George H. The Boatswain's Whistle, National Sailor's Fair, Boston, Nov. 1864, 1 vol., 4to.


Colman, Benjamin. The act of Tonnage and Poundage and rates of Merchandise, 1 vol., 8vo, London, 1702.

Dawson, Henry B., Morrisania, N. Y. Correspondence between John Jay and H. B. Dawson, etc., concerning the Federalist, 8vo, pamph., New York, 1864.

Eastern Railroad, Directors. 30th Annual Report, 8vo, pamph.

Forrester, Mrs. John. The Overland Friend of India, files for 1858, 59, 60, 61, 62, 63, Serampore. Manuscript of a Hindostance Poem on Palm leaves; supposed to be 500 years old.


Green, Samuel A., Boston. Charleston Directory for 1862, 1 vol., 12mo. 8 Pamphlets.


Hall, James, Albany, N. Y. Account of Fossils of the Niagara Group, by J. Hall, 8vo, pamph.
HANAFORD, MRS. P. A., Reading. The Young Captain, a Memorial of Capt. Richard C. Derby, by Mrs. P. A. Hanaford, 1 vol., 16mo, Boston, 1865.

HOLMES, JOHN C. 25 Pamphlets.


LANGWORTHY, I. P., Boston. 152 Pamphlets, being Reports of various Charitable Societies, Minutes of Congregational Associations, &c.


LORING, GEORGE B. Files of Boston Post for 1863 and 1864, and Jan'y and Feb'y, 1865.


NEW YORK CHAMBER OF COMMERCE. Annual Reports for 1858, 1859, 1860, 1861, 1862, 1863, 1864, 6 vols, 8vo. 30 Pamphlets, publications of the Chamber.


PACKARD Jr., A. S., Brunswick, Me. Synopsis of Bombyxidia of U. S. A., 8vo, pamph.


PEASE, Geo. W. Statement of the Account of Danvers from Feb'y 1864 to Feb'y 1865, 8vo, pamph.

PHILLIPS, W. P. The Savannah Daily Herald and Savannah Republican.

SANBORN, FRANCIS G., Boston. Economical Entomology by F. G. S., 8vo, pamph.


STONE, EDWIN M., Providence. 23d Ann. Rep. of the Ministry at Large in Providence, 8vo, pamph.


WHEATLAND, STEPHEN G. 22 Pamphlets.

BY EXCHANGE.

AMERICAN ANTIQUARIAN SOCIETY. Proceedings of Annual Meeting, Oct. 21, 1864, 8vo, pamph.

AMERICAN PHILOSOPHICAL SOCIETY. Proceedings, vol. IX, No. 72. 8vo, pamph. List of Members, 1865, 8vo, pamph.

CANADIAN INSTITUTE. The Canadian Journal for Jan’y, 1865.


IOWA HISTORICAL SOCIETY. Annals of Iowa, No. 9, Jan., 1865, 8vo, pamphlet.

15
MASSACHUSETTS STATE LIBRARY. Report of the Librarian for the year ending September 30th, 1864, 8vo, pamph.
MINNESOTA HISTORICAL SOCIETY. Collections for the year 1864, 8vo, pamphlet.


NEW YORK STATE LIBRARY, TRUSTEES OF. Instructions on taking Census of New York, 1865, 8vo, pamph.

PHILADELPHIA ACADEMY OF NATURAL SCIENCES. Proceedings for Nov. and Dec., 1864.

PHILADELPHIA MERCANTILE LIBRARY COMPANY. 17, 19, 21, 23, 24, 25, 26, 27, 29, 30, 31, 32, 33, 34, 35, 36, 38, 39, 41, 42 Annual Reports. Historical Sketch, 8vo, pamph. Special Report, April, 1863, 8vo, pamph.

PUBLISHERS. North American Review, Jan’y, 1865.

BY PURCHASE.


Monday, April 3. Regular meeting.

Vice President Goodell in the chair.

Letters were read from:


The Superintendent called the attention of the meeting to the fifty mounted specimens of birds and mammals on the table, stating that all the species were new to the collection and that they were the skins presented by the Chicago Academy of Natural Sciences and the Lyceum of Natural History of William's College.

Gilbert L. Streeter read a communication entitled, "Salem one hundred years ago," suggested by a perusal of a Dudleyan lecture sermon by Rev. Thomas Barnard of Salem, delivered in May 1768, and printed in Salem by Samuel Hall, who about that time opened a printing office in Salem.

Remarks were offered by Messrs. Wildes, T. Ropes, and the chair, and on motion of the Secretary, a copy of the paper read by Mr. Streeter, was requested for publication in the Historical Collections.

Edward S. Thayer, Nathaniel Kinsman, Jonathan Ropes and Charles H. Pepper of Salem, were elected Resident Members.

Monday, April 17. Regular meeting.

Rev. G. D. Wildes in the chair.

Letters were read from:

Prof. J. Henry, Sect. Smithsonian Institution; Isaac Lea, LL.D., Philadelphia, Pa.; Prof. C. A. Joy, Columbia College, New York; Dr. Wm Stimpson, Corr. Sect. Chicago Acad. Natural Sciences; Capt. A
Donations to the Library and Museum were announced. Professor A. E. Verrill made some remarks upon the Iron ores found in the New England States and contiguous part of New York. Two kinds of ore were mentioned, the Hematitic and the Magnetic oxide. The bog ore found in our low lands resembled the Hematitic in its composition but is usually much inferior in quality.

Francis C. Butman, and Francis A. P. Rust, of Salem, were elected Resident Members. Professor Edward D. Cope of Philadelphia, Professor James Hall of Albany, and Baron Osten Sacken, Russian Consul General at New York, were elected Corresponding Members.

The Chair stated that at the last meeting, the news of the evacuation of Richmond had been received, and that on the morning of the Monday following the announcement of the surrender of Lee’s Army was published to the Country. This day startling news of a different character was received: the death of the President of the United States, at Washington, on Saturday, April 15, at 7.20 o’clock in the morning, occasioned by a bullet wound from a pistol in the hands of an assassin on the evening previous. These events deserve a place on our records.

Robert S. Rantoul introduced a series of appropriate resolutions, which were unanimously adopted and ordered to be placed upon the records of the Institute. Dr. George B. Loring, on moving their adoption, paid an eloquent and deserved tribute to the memory of the late President. Professor A. Crosby followed Dr. Loring with suggestive remarks.
Monday, May 1. Regular meeting.

Vice President Goodell in the chair.

Letters were read from:

Chas. Stodder, Boston; Samuel R. Carter, Paris Hill, Me.; Wm. A. Haines, New York; Prof. T. S. Parvin, Iowa City; Asst. Surg. B. G. Wilder, 55th Mass. Vols.; Chas. Wright, Wethersfield, Ct.; Prof. Edw. Hitchcock, Amherst College; Dr. John Gundlach, Habana, Cuba; Tryon Reakirt, Philadelphia; Thomas Meehan, Editor of the Gardener's Monthly; S. I. Smith, Norway, Me.; John Bolton, Portsmouth, Ohio; S. D. Poole, Lynn; J. D. Parker, Steuben, Me.; Prof. Dana, Yale College; Isaac C. Martindale, Byberry, Pa.; Prof. D. S. Sheldon, Griswold College; Wm. S. Sullivan, Columbus, Ohio; Prof. H. A. Thompson, Otterbein University; G. F. Matthew, St. John, N. B.; Prof. A. E. Verrill, Yale College; S. B. Mead, Augusta, Ill.; Dr. J. Aitken Meigs, Philadelphia; W. J. Howard, Central City, Colorado; Dr. S. A. De Morales, Habana, Cuba, relating to the Publications: Wm. Wood & Co., New York; Wm. W. Stewart, Custodian, Buffalo Soc. Nat. Sciences, on business: A. M. Edwards, New York, announcing the formation of the American Microscopical Society in New York.

Donations to the Library and Museum were announced.

A large number of native plants, collected by Nathaniel Hooper and James H. Emerton, were placed on the table and were explained by Geo. D. Phippen, who had a few interesting remarks to make on each of the various species. Mr. Phippen thought that the opening of the flowers this year, was about ten days in advance of many previous years.

Messrs. Hooper and Emerton gave an account of the special locality of several of the rarer species. Mr. Emerton read a few notes relating to the time of flowering of a number of species of plants, the present season, and also as to the first appearance of several species of insects this spring.

F. W. Putnam stated that the Toads commenced spawning on the 16th of April. He then made some remarks, suggested by those of Mr. Phippen, upon the various theories regarding the origin of species.
Messrs. F. W. Putnam, Charles Davis, W. P. Upham and the Secretary were appointed a committee to nominate officers for the ensuing year, and report the same at the annual meeting.

Edward Dean and T. Francis Hunt, of Salem, were elected Resident Members. E. T. Cresson of Philadelphia, was elected a Corresponding Member.

Wednesday, May 10. Annual meeting.

Vice President Goodell in the chair.

The reports of the Secretary, Treasurer, Superintendent, Curators and Committees were read and accepted. From these reports the following particulars may be specified.

The Society is in a good and healthy condition. The receipts from the assessments of the Resident Members have been greater than in any preceding year, which was also the case in regard to the sales of publications. During the year one hundred and fifty seven Resident and twelve Corresponding Members have been elected. Eight Resident Members have removed from the county, and the following have died during the year: Wm. B. Brown, Henry Hubon, Edward L. Perkins, Charles W. Swasey, Lucy Treadwell, George A. Ward, Mary E. Wheatland, Samuel Webb, all of Salem. The sad intelligence of the decease of the following Corresponding Members has been received: Hon. Edward Everett of Boston, Mass., Professor Benjamin Silliman of New Haven, Conn., Carlton A. Shurtleff of Roxbury, Mass., and William B. Fowle of Medfield, Mass. Biographical notices of the deceased Members will be printed in the Historical Collections. The present number of Resident Members is five hundred and two, of Corresponding, one hundred and thirty-six.

Five field meetings have been held during the past season; at East Sangus, Wenham Pond in Beverly, Gloucester, Rockville chapel in South Danvers and Newburyport. These meetings have been largely attended, and a greater interest than at any previous season has been manifested.
Evening meetings have been held on the second and fourth Mondays of each month for the first part of the winter, and the first and third Mondays afterwards, at the rooms of the Institute, commencing in October and closing with the annual meeting in May. The large number attending these meetings calls for a more commodious meeting room at as early a day as practicable.

The Lecture Committee, having adopted the plan of having courses of lectures on special subjects and of an educational character, delivered to appreciative audiences, in lieu of the more extended courses of a miscellaneous character of former years, made arrangements with Messrs. Putnam and Tracy, who have taken the initiative, and the committee trust that this plan will be adopted in other branches.

F. W. Putnam, on the five Thursday evenings in March, delivered a course of lectures on "Insects, their habits and structure," at Lyceum hall, under the auspices of the Institute, which were very instructive and were well attended by highly appreciative and intelligent audiences. At the close of the course the following resolution, moved by Prof. A. Crosby and seconded by Gen. H. K. Oliver, was unanimously adopted:

"Resolved: That we express to Mr. Putnam our high appreciation of the valuable and interesting Course of Lectures he has just completed; and the personal thanks and obligations of our community to him for these labors in the cause of science and public improvement, especially in view of his generous appropriation of the greater part of the proceeds to the benefit of the Museum of the Essex Institute."

Cyrus M. Tracy of Lynn has delivered two of a series of eight lectures on Botany at the rooms of the Institute on the two preceding Saturday afternoons.
The Treasurer presented the following statement of the financial condition, for the year ending May, 1865.

**GENERAL ACCOUNT.**

**Debits.**

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Athenæum Rent, half fuel, &amp;c.</td>
<td>$535.53</td>
</tr>
<tr>
<td>Publications, $1001 25; collecting assessments, $23 10</td>
<td>1024.35</td>
</tr>
<tr>
<td>Postage and Express, $76 90; Gas, $11 90</td>
<td>88.80</td>
</tr>
<tr>
<td>Printing, $26 75; Stationery and Books, $33 03</td>
<td>59.78</td>
</tr>
<tr>
<td>Sundries</td>
<td>41.06</td>
</tr>
<tr>
<td>Historical account</td>
<td>143.50</td>
</tr>
<tr>
<td>Natural History and Horticultural account</td>
<td>59.34</td>
</tr>
<tr>
<td>Balance in Treasury</td>
<td>12.27</td>
</tr>
</tbody>
</table>

**Credits.**

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balance of last year's account</td>
<td>7.04</td>
</tr>
<tr>
<td>Dividends Webster Bank, $60 00; Books sold, $180 19</td>
<td>240.19</td>
</tr>
<tr>
<td>Sale of Publications</td>
<td>809.40</td>
</tr>
<tr>
<td>Assessments</td>
<td>908.00</td>
</tr>
</tbody>
</table>

**NATURAL HISTORY AND HORTICULTURE.**

**Debits.**

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preservatives &amp;c., $65 00; Specimens, $34 00,</td>
<td>99.00</td>
</tr>
<tr>
<td>Cases, $56 75; Bottles, $6 60,</td>
<td>63.35</td>
</tr>
<tr>
<td>Horticultural Exhibition</td>
<td>55.10</td>
</tr>
</tbody>
</table>

**Credits.**

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horticultural Exhibition</td>
<td>104.11</td>
</tr>
<tr>
<td>Dividends Lowell Bleachery</td>
<td>40.00</td>
</tr>
<tr>
<td>&quot; Portland, Saco &amp; Portsmouth Railroad.</td>
<td>12.00</td>
</tr>
<tr>
<td>General Account</td>
<td>59.34</td>
</tr>
</tbody>
</table>

**HISTORICAL ACCOUNT.**

**Debits.**

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binding, $100 00; Books, $98 50,</td>
<td>$198.50</td>
</tr>
</tbody>
</table>

**Credits.**

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dividends Naumkeag Bank</td>
<td>17.00</td>
</tr>
<tr>
<td>Coupons Michigan Central Railroad,</td>
<td>38.00</td>
</tr>
<tr>
<td>General Account</td>
<td>143.50</td>
</tr>
</tbody>
</table>

**TOTAL:** $198.50
The Library is daily in receipt of additions. A large increase is consequent upon the exchanges that have been arranged with different societies, and editors or proprietors of historical and scientific journals, newspapers, &c.

The additions during the year, principally by donation or exchange, are:

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Octavos and lesser fold</td>
<td>500</td>
</tr>
<tr>
<td>Quartos 4, Folios 12</td>
<td>16</td>
</tr>
<tr>
<td>Newspapers, Folios, (files)</td>
<td>88</td>
</tr>
<tr>
<td>Pamphlets and Serials</td>
<td>1,500</td>
</tr>
</tbody>
</table>

2,104

The above have been contributed by one hundred and twenty individuals and fifty-seven Societies, Editors of Journals and the various departments of the State and General Government.

The publication of the Proceedings and Historical Collections has been continued during the year: of the former, vol. III and Nos. 1, 2, 3, and 4 of vol. IV have been printed; of the latter, volume VI.

The annual Exhibition of Fruits, Flowers and Vegetables took place on Wednesday, Thursday and Friday, Sept. 21, 22, 23, and exceeded our expectations after the severe unprecedented drought. There were many plates of fine pears. The leading feature was the display of outdoor grapes, which was judged the finest ever exhibited in the state. The vegetables were particularly fine. The flowers, as usual, were very attractive and contributed essentially to the general appearance of the rooms.

The Historical Department has been increased during the year by the addition of two hundred specimens to the Ethnological section, a large number of valuable manuscripts and several engravings and portraits. The room given to this department is much crowded, rendering a proper display of the collection impossible and obliging the storage of many of the engravings and manuscripts for the want of accommodation.

Two hundred and thirty-seven donations, embracing eight thousand five hundred and three specimens, have been received for the Natural History Department during the year. The work in the various sections of the depart-
ment has been carried on with good results, and several are in a forward state of arrangement. Catalogues have been commenced and in some of the classes the specimens are as far arranged as the limited supply of case room, jars and alcohol will allow for the present. We are under great obligations to Professor Verrill, of Yale College, for the identification and arrangement of the Polyps, and Acalephs. These classes have been largely increased by the valuable addition of several hundred specimens of East Indian corals, collected and presented by Capt. W. H. A. Putnam. By the kindness of Professor Verrill, and Mr. Alexander Agassiz, who had previously identified the collection of Echinoderm, we have the specimens belonging to the branch of Radiata so far identified that it is proposed to publish a catalogue of the collection at an early day. We are also indebted to Rev. E. C. Bolles, of Portland, for the identification of many of our native land and fresh water shells.

It is to be hoped that the work on the collection will not long be impeded by the present insufficient supply of cases and materials for the proper exhibition of the specimens. Much larger accommodations are required for the various departments of the Museum and these cannot be supplied to the extent desired without an addition to the present building by which, at least, three times the present amount of case room can be obtained. Not more than three-fourths of our specimens are now visible to the public, or of use for study, as many are stowed in kegs and cans in the cellar and in drawers and boxes in the hall. A partial supply of case room could be obtained by the construction of a few railing and table cases in the hall for the Insects, Fossils and Birds’ nests and eggs. The cases for the pinned Insects are needed at once, for this valuable collection is being destroyed by its insect enemies, and until more room is given to it this destruction cannot be wholly prevented, even by the constant vigilance of the Curator.

As the arrangement of the various classes is perfected large numbers of duplicate specimens are separated, which will be presented to such institutions and individuals as will use them for the advancement of science, in accordance with the rule adopted by the Institute regarding
the distribution of its duplicates. Though a number of collections are now being packed for transmission to various persons and societies the following, only, have been sent during the past year.

To the Cabinet of Yale College:
40 species, 102 specimens, of Corals.
25 " 41 " " Echinoderms.
7 " 20 " " Sponges.
4 " 5 " " Tunicates.

To A. L. Babcock, of Sherborn, Mass.:
168 specimens of South American and
2 " " African Insects.

To the Chicago Academy of Science:
25 species, 110 specimens, of foreign Helices.

To the Museum of Comparative Zoölogy:
1 specimen of *Goniaster cuspidatus* Gray, from the West Coast of Africa.

To J. G. Shute of Woburn, Mass.:
28 species, 59 specimens of foreign Shells.

To Rev. E. C. Bolles, of Portland, Me.:
73 species, of several specimens each, of foreign and American land and fresh water Shells.

The following estimate of the number of specimens (exclusive of a large number of duplicates) in the various departments of the Museum presents a general view of the character of the collection at the present time.

**Historical Department.**

The section of Ethnology contains about 1400 specimens, illustrating the habits, costumes, war and domestic implements of the various races and nations.

In the section of Manuscripts there are a very large number of Manuscripts relating to our early civil and ecclesiastical history.

In the section of Fine Arts there are several hundred Portraits, Paintings and Engravings, many of which are of great historical value.

**Department of Natural History.**

<table>
<thead>
<tr>
<th>Specimens</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Geological specimens</em>, about 200</td>
</tr>
<tr>
<td><em>Minerals</em>, 1896 specimens, of which 196 are from Essex County, 1896</td>
</tr>
</tbody>
</table>

17
<table>
<thead>
<tr>
<th>Category</th>
<th>Species/Count</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Radiates</strong></td>
<td>186 species, 250 specimens</td>
</tr>
<tr>
<td><strong>Mollusks</strong></td>
<td>1108 &quot; 2000 &quot;</td>
</tr>
<tr>
<td><strong>Articulates</strong></td>
<td>20 &quot; 50 &quot;</td>
</tr>
<tr>
<td><strong>Vertebrates</strong></td>
<td>90 &quot; 120 &quot;</td>
</tr>
<tr>
<td><strong>Plants</strong></td>
<td>135 &quot; 200 &quot; Fossils, 2620</td>
</tr>
<tr>
<td><strong>Fossils</strong></td>
<td>250 specimens, 2000 &quot; 50 &quot;</td>
</tr>
<tr>
<td><strong>Sponges</strong></td>
<td>42 species, 100 specimens</td>
</tr>
<tr>
<td><strong>Acalephs</strong></td>
<td>446 species, 1500 specimens</td>
</tr>
<tr>
<td><strong>Echinoderms</strong></td>
<td>Badiates, 1500</td>
</tr>
<tr>
<td><strong>Mollusks</strong></td>
<td>1108 &quot; 2000 &quot;</td>
</tr>
<tr>
<td><strong>Worms</strong></td>
<td>110 species, 200 specimens</td>
</tr>
<tr>
<td><strong>Crustaceans</strong></td>
<td>150 &quot; dry, 330 species in alcohol, about 1300 specimens</td>
</tr>
<tr>
<td><strong>Insects</strong></td>
<td>21000 specimens pinned, 5000 specimens in alcohol, of these 2000 species of the pinned have been catalogued</td>
</tr>
<tr>
<td><strong>Birds</strong></td>
<td>100 species, 150 specimens in alcohol; 411 species, 500 specimens mounted</td>
</tr>
<tr>
<td><strong>Birds’ nests</strong></td>
<td>50 species, 80 specimens</td>
</tr>
<tr>
<td><strong>Mammals</strong></td>
<td>180 &quot; 425 &quot;</td>
</tr>
<tr>
<td><strong>Fishes</strong></td>
<td>1000 species, 2000 specimens in alcohol, and about 200 specimens dry and mounted</td>
</tr>
<tr>
<td><strong>Reptiles</strong></td>
<td>400 species, 1000 specimens, principally alcoholic</td>
</tr>
<tr>
<td><strong>Vertebrates</strong></td>
<td>4510</td>
</tr>
<tr>
<td><strong>Skulls</strong></td>
<td>of Mammals, 172 species, 230 specimens, of which 39 are human</td>
</tr>
<tr>
<td><strong>Skulls of Birds</strong></td>
<td>150 species, 200 specimens</td>
</tr>
<tr>
<td><strong>Skulls of Reptiles</strong></td>
<td>27 &quot; 10 &quot;</td>
</tr>
<tr>
<td><strong>Skulls of Fishes</strong></td>
<td>10 &quot; 10 &quot;</td>
</tr>
<tr>
<td><strong>Skeletons of Mammals</strong></td>
<td>12 &quot; 12 &quot;</td>
</tr>
<tr>
<td><strong>Skeletons of Birds</strong></td>
<td>4 &quot; 5 &quot;</td>
</tr>
<tr>
<td><strong>Skeletons of Reptiles</strong></td>
<td>6 &quot; 6 &quot;</td>
</tr>
<tr>
<td><strong>Skeletons of Batrachians</strong></td>
<td>10 &quot; 30 &quot;</td>
</tr>
<tr>
<td><strong>Skeletons of Fishes</strong></td>
<td>8 &quot; 8 &quot;</td>
</tr>
<tr>
<td><strong>Parts of Skeletons, of Mammals</strong></td>
<td>8 &quot; 8 &quot;</td>
</tr>
<tr>
<td><strong>Teeth of Mammals</strong></td>
<td>14 &quot; 30 &quot;</td>
</tr>
<tr>
<td><strong>Jaws of Fishes</strong></td>
<td>15 &quot; 20 &quot;</td>
</tr>
<tr>
<td><strong>Horns and Antlers</strong></td>
<td>43 &quot; 43 &quot;</td>
</tr>
</tbody>
</table>

**Osteological collection 639**
May not the Institute hope that its friends and the patrons of science will soon give that aid, which is so essential to promote its objects and to continue with success its usefulness in diffusing a knowledge of the works of the Creator and of the History of Mankind?

If an addition to our present accommodations and means could be obtained and a number of professional Naturalists, having the charge of the various branches of the department of Natural History, and also several assistants in the Library, who, in addition to the ordinary duties could classify and arrange the manuscripts, pamphlets, newspapers and other materials that appertain to the Historical department, be permanently attached to the institution, much good would be done to the cause of education in our community by well arranged collections and libraries, and also by free lectures illustrating the various objects of the Institute. Much could also be accomplished through the medium of our publications in advancing the cause of science, and also of historic research by the continuation of the printing of abstracts of wills, deeds and other documents which are deposited in the offices of the county of Essex, and other materials of an historical nature that may be obtained from various sources.

Letters were read from:

The following officers were elected for the ensuing year:

**President.**

**Francis Peabody.**

**Vice Presidents.**


**Secretary and Treasurer.**

Henry Wheatland.

**Librarian.**

Charles Davis.

**Superintendent of the Museum.**

F. W. Putnam.

**Finance Committee.**


**Library Committee.**


**Publication Committee.**


**Lecture Committee.**


**Field Meeting Committee.**


**Curators of Natural History Department.**

Geology—H. F. Shepard; Mineralogy—C. H. Higbee; Paleontology—H. F. King; Botany—C. M. Tracy; Comparative Anatomy—Henry Wheatland; Vertebrata—F. W. Putnam; Articulata—J. H. Emerton; Mollusca—H. F. King; Radiata—Caleb Cooke.

**Curators of Historical Department.**

Ethnology—William S. Messervy, M. A. Stickney, John Robinson.


**Curators of Horticultural Department.**


Voted: That the meetings on the first and third Mondays of each month be held at 4 o'clock P. M. until otherwise directed.

Voted: That the Curators of Horticulture be authorized to hold exhibitions of Fruits, Flowers, Vegetables &c., at such times and places as may be desirable; also to offer premiums and gratuities for specimens exhibited, under such regulations as they may adopt.

Voted: That Messrs. Goodell, Rantoul and Upham be a committee to prepare suitable resolutions expressive of the thanks of the Institute due to A. Huntington, the retiring President, for his valuable services during the four years which he has presided over the Institute.

On motion of Mr. Putnam, Chapter I, Section VI, lines five and six, of the By Laws were so amended as to read "make such use of the duplicates as may be beneficial to science."

George M. White, James A. Chamberlain, Jonathan Ropes and George Fowler, all of Salem, were elected Resident Members.

Monday, May 15. Regular meeting.

Vice President Goodell in the chair.

R. S. Rantoul, for the committee appointed at the annual meeting, submitted the following report which was adopted and a copy of it ordered to be transmitted to the retiring President:—

Whereas the Honorable Asahel Huntington having declined reelection to the Presidency of the Essex Institute after four years of acceptable service in that capacity, during which the Institute has prospered beyond precedent.

Therefore, Resolved: That we cannot forego this opportunity of putting upon record our appreciation of the virtues of his private character, and of the usefulness of his long professional and public career; together with the hope that he may hereafter look back upon his efforts, while President of this body, in behalf of sound learning, the
diffusion of useful knowledge and the generous culture of letters, science and the arts, as not the least among the honorable services of a well spent life.

John L. Marks, William H. Silsbee, and Henry R. Gardner, of Salem, were elected Resident Members.

TUESDAY, JUNE 6. Adjourned Regular meeting.

Henry F. King in the chair.

On motion of the Superintendent it was Voted: That the thanks of the Institute be tendered to George C. Huntington, Esq., of Kelley's Island, Ohio, for the donation of a valuable collection of Fishes from Lake Erie, and also for his kindness in defraying the necessary expenses attending the same.

WEDNESDAY, JUNE 7. Field meeting at Nahant.

The society opened their series of Field meetings this day by a visit to the ever delightful retreats of Nahant. The number in attendance reaching over two hundred who took the regular conveyances from the Central Station, besides many who took other means and different hours for the passage. Arriving at the Methodist Chapel, which had been selected as the place of meeting, the company deposited their various provisions, and under the guidance of John Q. Hammond, Esq., the greater number set out to examine the curiosities of the place. Some, in search of particular objects, scattered here and there, to fish, or gather plants, or break the rocks for specimens of minerals. But most of the party made a circuit round the shore, passing the summer residences of Gen. Fremont, Prof. Longfellow, and that formerly of Prescott, the historian, as well as many more. The "Swallow's Cave" received due attention, as also those features of the eastern extremity, "Pulpit Rock," "Natural Bridge," "Castle Rock," and the "Spouting
Horn." A brief stay was made about the crumbling ruins of the old Nahant Hotel, whose scorched and shivered stones yet bear up against the elements. Some pursued their walk to the "Maolis Gardens," so fancifully laid out and bedecked by the late Frederick Tudor, and puzzled themselves with his unexplained devices. On returning, and after a plentiful repast, the party assembled in the Chapel for the formal exercises of the afternoon, when the meeting was called to order by A. C. Goodell, Historical Vice President.

Letters were read from:

Rev. E. C. Bolles, Portland, Me.; Trübner & Co., London, Eng.; Mrs. B. F. Mudge, Quindaro, Kansas; E. L. Layard, Director of the South African Museum, Cape Town; Elihu Hall, Athens, Ill.; C. M. Tracy, Lynn; Smithsonian Institution; J. J. Babson, Gloucester; G. B. Loring; A. Lackey, Marblehead; John Howarth, Boston; H. R. Stiles, New York; David Choate, Essex; Dr. Wm. Prescott, Concord, N. H.; Dr. T. M. Brewer, Boston; Chas. M. Wheatley, Phoenixville, Pa.; Prof. Richard Owen, Indiana State University; B. O. Peirce, Beverly; A. S. Peabody, Cape Town, Africa; Geo. C. Huntington, Kelley's Isl., Ohio; Prof. A. E. Verrill, Yale College; Prof. James Hall, Albany, N. Y.; W. W. Denslow, Inwood, N. Y.; W. W. Stewart, Custodian, Buffalo Soc. of Nat. Sciences; Brown, Brothers & Co., Boston, on various business matters: Sidney S. Lyon, Jeffersonville, Ind.; Rev. Samuel Lockwood, Keyport, N. J.; Dr. T. M. Logan, Sacramento, Cal.; Thure Kumlien, Busseville, Wis.; D. G. Tompson, Montpelier, Vt.; Prof. S. F. Baird, Smithsonian Institution; Prof. C. C. Hamlin, Waterville College; H. B. Lord, Ludlowville, N. Y.; Codman & Shurtleff, Boston; W. A. Haines, New York; E. S. Morse, Gorham, Me.; W. J. Beal, Cambridge; Dr. Frederick Briendel, Peoria, Ill.; Prof. S. N. Norwood, Columbia, Mo.; Rev. E. B. Eddy, Waltham; Dr. John G. Thomas, Rivièr du-Loup-en-bas, Canada; Prof. Alex. Winchell, Ann Arbor, Mich.; G. A. Boardman, Milltown, Me.; A. L. Russell, Quebec, Canada; Henry Bannister, Evanston, Ill., relating to the Publications: Maine Historical Society, acknowledging receipt of Publications; Albert G. Browne; J. Vincent Browne; F. Cox; transmission of Specimens: Prof. James Hall, Albany; Henry R. Gardner; accepting Membership: F. Peabody, accepting the office of President: G. B. Loring, accepting the office of Chairman of Field Meeting Committee.
Donations to the Museum and Library were announced. Dr. George B. Loring being called upon said that he had been surprised in several ways to day. He had found evidences of greater antiquity on Nahant than he had supposed were to be seen on the continent. He had found a ruin here, whose worn and tottering stones showed more of the ravages of time than the broken arches of the Forum. He had been through Rome and many places in Europe of the older sort, but nowhere had he seen such worn and plainly antiquated piles as appeared on Nahant to day. Further on, he had found the very rocks carved with inscriptions in forgotten tongues. No one here to day could read them, no one could say what meant the 'epinon ek tes petras' that still endured in the monumental granite of Nahant. Statues were here, but beyond the design of the old masters; frescoes, but wholly pre-Raphaelite in their execution. He was full of wonder at what he had seen. He further spoke of the place as formerly a field for the simple agriculture of the early time, when the unambitious farmers drove their flocks here to graze by day and brought them home at night. He closed by an eloquent allusion to the restoration of peace, under which blessing the Institute could come to such delightful spots as this and continue its Field meetings.

John Q. Hammond, Esq., of Nahant, would speak in behalf of his townsmen and extend their welcome to the Institute in their visit to day. For himself, he felt little of the enthusiasm in the study of nature that some exhibited, but he could appreciate the purposes and the utility of the Society, and was glad to lend what help he might to promote its interests. A good field was surely here for exploration; students were constantly resorting to it, and its rare and curious wealth seemed only partly yet discovered.
C. M. Tracy, of Lynn, gave a brief account of some points in the botany of the peninsula. A remarkable fact appears in the almost total absence of all heath-like plants from this place. It is said there are a few huckleberry bushes here; but not a pyrola, laurel, lambkill, blueberry, swamp-pink, or any such thing could he ever find. On the contrary, the field chickweed, a most lovely plant for the lawn, grows here abundantly, though rare or wanting in all the region round. Formerly, it is said, Nahant had heavy forests; but the settlers destroyed them, and since then a tree can scarcely be made to endure the climate. Persevering care has, however, partly retrieved the error, and the place is growing far greener than for years before.

F. W. Putnam, of Salem, gave some description of the zoological specimens taken during the day.

Wm. J. Beals, of Union Springs, N. Y., said he had been born and brought up in a country where there were no rocks, no ocean, no evergreen trees, and he had heard of these things in his childhood, as the inventions in a pleasant story. A few years ago, he had made a pilgrimage to New England that he might see these things; and he had set himself down by the sea for half a day at a time, full of delight as a child. You who live in the midst of these things have no idea of their true beauty. He gave a description of the curious plant called the sundew, which traps insects by the adhesive drops on its leaves.

Caleb Cooke, late of Zanzibar, East Africa, excused himself from speaking on account of feeble health. He had enjoyed the day and its rambles, and at another time would be glad to speak.

Abner H. Davis and Emery S. Johnson, of Salem, were elected Resident Members. John da Costa Soares, of Mozambique, E. C. A.; George C. Huntington, of Kelley's
Island, Ohio; Professor Richard Owen, of New Harmony, Ind., and Professor Leo Lesquereux, of Columbus, Ohio, were elected Corresponding Members.

On motion of Mr. Tracy the thanks of the Institute were voted to the Proprietors of the Methodist Church for the use of their House for the meeting, and to Messrs John Q. Hammond, Edmund Johnson, George A. Perkins and other friends in Nahant for their favors on this occasion.


The President, Francis Peabody, in the chair.

Letters were read from:


The Secretary submitted the following resolutions which were unanimously adopted.

The Institute having been invited to join in the celebration of the fourth of July in Salem:—

Resolved: That the coming anniversary of American Independence marks an epoch in the progress of civilization and the life of Nations to which no studious observer can be indifferent, and that this Historical Body cordially unite, in spirit, with the people of this community, in such demonstrations as shall impress upon the minds of all the character of the crisis through which the Nation has passed and the honorable place in history which awaits the defenders of their Country.

Resolved: That, whereas, the Members are widely scattered, and many of them will take part in the demon-
stration in connection with other bodies, the Institute, grateful for the polite invitation, deem it unadvisable to take any prominent position; at the same time they will cheerfully render such assistance in their power, consistent with their regulations, as may contribute to the interest of the occasion.

The President, as chairman of the committee on the "First Church," presented a final report of the doings of the committee. The frame of the Church has been removed and placed in the rear of Plummer Hall, encased in an external structure of suitable strength to which it is bolted and is seen projecting from the plastering on the inside of the building. The Committee, in giving the key of the building to the Institute, do so, with the sincere wish, that the Holy House may be preserved to those who come after us, and handed down, from generation to generation, as a valued trust.

Rev. G. D. Wildes, after some appropriate remarks, moved that the report be accepted and that the thanks of the Institute be tendered to the committee, for the faithful and successful performance of their duty, which was unanimously adopted. [The report of the Committee will be published in full in the Historical Collections.]

R. S. Rantoul read a memoir of Major Thompson Maxwell, a soldier in the old French war, the Revolution, and the war of 1812.

On motion of Mr. Putnam, the memoir read by Mr. Rantoul was referred to the publication committee, for publication in the Historical Collections.

The thanks of the Institute were voted to Colonel E. F. Miller for the presentation of the original documents, from which the memoir of Major Maxwell had been compiled.

Mr. Putnam communicated, by title, a paper by E. S. Morse, on the "Classification of the Mollusca on the Princi-
pie of Cephalization," accompanied with a plate. Referred to the Publication Committee.

Donations to the Library and Museum were announced. H. R. Lovett of Beverly was elected a Resident Member.

Thursday, June 24. Field meeting at Standley's Grove in Beverly.

This second Field meeting of the season was attended by a large party from Salem and the adjoining towns, who, after a pleasant forenoon's ramble in the woods and over the Laurel Ground, and a collation in the grove, assembled on the platform, when the meeting was called to order by Dr. G. B. Loring, Chairman of the Field meeting committee, who made a few remarks upon the history of the town, alluding to several of the worthy persons who once lived within its limits, as the Cabots, Nathan Dane, President Willard, of Harvard University, and others.

After the reading of the records of the last meeting, letters were read from the following:


Donations to the Library and Museum were announced.

Rev. G. D. Wildes read a poem written for the occasion by Mrs. P. A. Hanaford.

Dr. Henry C. Perkins, of Newburyport, read a paper of which the following is an abstract.
Attempt to explain the formation, or development, of the cumulus or thunder cloud on the principles laid down by Mr. Espy in his Philosophy of Storms, modified somewhat as to the principle of the ascent of the air in the tornado and water spout.

On the 9th of August, 1852, a large cumulus cloud was observed in process of development, the cloud was soon capped by a dense, white vapor, (as if by a veil), showing that the air above the cloud was being lifted bodily (as it were) by the ascending column of hot air, above the dew point.

The dry bulb thermometer stood at 79° F., wet bulb at 69° F., the dew point being at 65° F.

The rain was soon seen to fall and in a few moments the lightning was observed, followed, at an interval of 45 seconds, by a clap of thunder. A heavy shower from this cloud fell at Hampton Falls.

Reckoning a fall in temperature of 1° for every 100 yards, the base of the cloud was about 1,400 yards above the surface of the Earth, and the top of the cloud about three times as high, or 4,200 yards.

If we suppose with Mr. Espy that the air cools in ascending at the rate of 1.5° for every hundred yards, the thermometer in and outside of the cloud would indicate a fall of 60° in the temperature in ascending 4,000 yards, unless warmed up by the condensation of the vapors in the cloud.

By the above ratio of descent of temperature, when the air has risen 1,700 yards, the temperature will have fallen between 25 and 26°, and in so doing, will, (according to Dalton's tables) after making due allowance for the increased space it occupies in ascending three miles, viz.: one-third, condense forty-four one hundred and fifteenths nearly of its vapor; which would be sufficient to heat up the air in the cloud 35°.

The expansion of the air in the cloud by the giving out of this amount of latent heat, viz.: 35° would equal thirty-five four hundred and eightieths or one-fourteenth nearly, of its bulk, or of the space occupied by the ascending column of hot air.

Supposing now the base of the cloud to be at one mile above the earth, where the barometer may be taken as
standing at 30 inches and the density of the air at unity, or one; at four thousand two hundred yards, its density would be .630, or one third less: or in other words the barometer would stand at 20 inches at or just above the cloud, and at 30 inches at its base: one-fourteenth of this difference would equal .71 of an inch of barometric pressure, which would express the fall of the barometer from expansion by the heat given out by the condensation of the vapors if the expansion was all in an upward direction.

On the supposition that the column of heated air or the cloud ascends to a point where the barometer would stand at 20 inches, the amount of rain which would fall would be about 1.6 inch, supposing all the vapors to be condensed and to fall on an area equal to the base of the cloud; and it would occupy about 30 minutes in falling: for when the dew point is at 65° the air contains about one seventy-seventh of its weight of vapor, and air at 80° dew point ascending on the principle of floating bodies, at the rate of 7 1-2 feet in one second, at 65°, would rise one tenth less rapidly, or at about the rate of 6 feet and 9 inches in a second.

Without doubt the Sun may and does, in the daytime, aid in the development of the cumulus cloud. We learn from Mr. Wise, the Aeronaut, that the air in the base of and on the sunny side of the cloud is much warmer than at other parts, and these clouds are seldom formed in the night; but we apprehend that the electricity given off by the condensation of the vapors is, in many of these clouds, especially those giving rise to the tempest or tornado and the water spout, the great expansive power in their development: indeed, on no other principles but that of the convective discharge of electricity can be explained the uplifting and removal to great distances of heavy bodies, the drying up of ponds, or the phenomena noticed in the subjoined account of the tornado which has so recently occurred in Wisconsin.

"An awful tornado nearly destroyed the village of Viroqua, Wisconsin, Thursday week. One hundred and seventeen persons were killed and wounded. A correspondent of the N. Y. World gives the following particulars:—

The southern part of the village, for a strip near eighty rods in width, was swept away. Where stood handsome white houses, neat barns, and out buildings, nothing now remains but ruins. Gardens, garden fence-
es, orchards, grape vines, floral shubbery, well-curbs, buggier, wagons, cutters, &c., &c., were caught up, whirled, shaken, dashed to fragments, and the pieces taken for miles beyond. Never was work of destruction more rapid or complete. The track of the whirlwind is as if some mighty river had rushed over the course, leaving thousands of odd fragments strewn with liberal yet spiteful power.

Trees were torn up by the roots and thrown rods away. Roofs, sides, doors, floors, chimneys, underpinning, and furniture of houses were pounded together, broken into fragments and fairly sown over the land. Log chains were twisted apart, stoves and plow castings broken, ready for the smelter’s furnace. Tree tops were loaded with clothing, bed-clothes, feather beds, carpets, chairs, harnesses, calves, sheep, dogs, cats, and poultry, dead or writhing on points of branches which had themselves been broken. Timbers have lodged in the tops of tall oaks, or, from their weight, borne saplings to the earth, and the saplings left covered with fragments of household goods as if hung out to dry. Doors, partitions, roofs, and floors of houses are found from five rods to three miles from where they belonged. Horses and cattle were killed or so badly maimed as to make their death an act of mercy. Fence rails, for ten years lying on the earth till imbedded therein, were whirled out. Stumps were torn up. Great rocks of twenty tons weight, were rolled, lifted, and broken by the mighty power.

Near the residence of John Gardner stands a tall oak rising about sixty feet from the ground. The wind whisked every leaf and small twig from the tree, leaving it looking as if dead. The house—a large white one—was taken so high in the air that it was seen above the tree tops, dashed to the ground, lifted again higher than before, whirled around and dashed roof down upon the earth a few rods from its foundation, and all but a few timbers borne away. Mrs. Gardner was in the house all the time; was spilled out in the second tumble and but slightly hurt, while an infant who was clinging fast in her arms escaped without a scratch or bruise!

In a school house were twenty-four children and a young lady teacher. The building was lifted high into the air, dashed upon the ground some distance from its foundation, again lifted about forty feet and dashed bottom up to the ground, and the fragments swept away. Eight children were killed and every other occupant badly injured. One little ten year old girl, whose thigh was lacerated and broken, when found in the fields begged the people to look for the others who were worse hurt than herself. The school house is not to be found.

Mr. Bennett was blown from his own demolished residence into a cellar near by, from which a house had been torn away. In a few seconds a little girl was thrown in by him for company. At the same time a horse was hurried in, striking Mr. Bennett and badly breaking a leg. The horse kicked and struggled to release himself from the rubbish which was "spilling" in upon the party, when Mr. Bennett tried to get a knife from his pocket that he might cut the poor animal's throat, and thus save the life of himself and the girl. At this moment a span of horses with part of their harness on were hurled in upon him and killed. The wagon to which they were attached went—the box to the west—the running gear into fragments and away over the field. The man who was in the wagon driving when the storm began was thrown like an arrow into an oak thicket thirty rods south from where he started, with fatal injuries."
Joseph H. Abbot, of Beverly, offered a few remarks, corroborative of the theory advanced by Dr. Perkins relating to the formation of thunder clouds, from personal observations.

Rev. Mr. Spanulding, of Newburyport, said a few words, expressive of his gratification at being present and of the increasing popularity of the study of Nature.

John I. Baker, of Beverly, welcomed the Institute, and thanked them for holding a meeting in the town.

C. M. Tracy, of Lynn, explained the plants which had been collected during the day, interspersing his remarks with many pleasant allusions, especially in respect to the Laurel found in such profusion, as though “to the Manor born,” and thought that the reputation of Beverly could well “rest upon her laurels.”

F. W. Putnam spoke of the nest of a Red-eyed Vireo, which he had found on a small oak in a swamp. The nest contained two eggs of the Cowbunting and none of the Vireo, having evidently been deserted as soon as the Cowbunting’s eggs had been laid.

Joseph D. Tucke of Beverly presented a Lieutenant’s commission given by Gov. Dudley of Massachusetts to Thomas Whittridge of Beverly, April 23, 1707.

R. S. Rantoul read a few extracts from the memoir of Thomas Maxwell, a Revolutionary hero.

Rev. G. D. Wildes offered some reminiscences of the brave young men who had achieved our National Independence.

The Secretary read the following communication:—

“C. M. Tracy, of Lynn, one of our esteemed Members and Curator of Botany, delivered on Saturday last the closing lecture of a course of eight on Botany. This course gave great satisfaction and was much admired by an appreciative audience. Before separating a meeting was called to order and Professor Crosby was invited to pre-
side. James Upton, after a few appropriate remarks, introduced the following resolutions, which were unanimously adopted:

Resolved; That we have listened with much satisfaction to the course of lectures by Mr. C. M. Tracy, of which the concluding one has been delivered this afternoon, and that the subject has been presented by him with a discrimination of thought and felicity of language as to demand some special token of our appreciation; we therefore tender to Mr. Tracy the thanks of this audience for his very successful efforts to interest us in his favorite study, the science of Botany.

It was then Voted, that a notice of these lectures with a copy of this resolution be communicated at a meeting of the Essex Institute with a request that the same be entered upon the records."

On motion of the Secretary it was Voted: That the above communication be entered upon the records.

George W. Pousland and J. Vincent Browne Jr., of Salem, were elected Resident Members.

On motion of C. M. Tracy it was Voted: That the thanks of the Institute be tendered to Charles Davis Esq., Miss Sarah J. Tittle and other citizens of Beverly, for the kind interest they have manifested and the assistance they have afforded in carrying out this meeting.

Additions to the Museum and Library during April, May, and June, 1865.

TO THE NATURAL HISTORY DEPARTMENT.

BY DONATION.

Adams, Samuel, Hamilton. *Attacus cecropia* from Hamilton.
Allen, J. F., Salem. Larvae and Imago of Lepidopterous Insects from the Grape vine.
Baker, David, Andover. Cast off skin of a Black Snake, 5 feet 2 inches in length.
Bennett, Mrs. A., Salem. Flying fish from Atlantic Ocean. Teeth of a Squid, Crustacean and Centipede from the East Indies.
Bolles, Rev. E. C., Portland, Me. Several Insects from Portland.
Brooks, H. M., Salem. *Attacus polyphemus* from Salem.
BUFFALO SOCIETY OF NATURAL SCIENCES, Buffalo, N. Y. Collection of 183 species of Plants from the vicinity of Buffalo.


Carlen, Samuel, Salem. *Papilio Turnus* from Salem.

Carlton, Frazer, Salem. *Attacus cecropia* from Salem.

Colcord, Mrs. Helen M., South Danvers. Male, female, and young Red-winged Blackbird from South Danvers.

Conway, Mrs., Salem. Nuts from South America.

Cooke, Caleb, Salem. Collection of Plants from Zanzibar, Africa.

Ophidian from a well in Zanzibar, Africa. Young Partridge from Salem.

Carlton, Feazer, Salem. *Attacus cecropia* from Salem.

Colcord, Mrs. Helen M., South Danvers. Male, female, and young Bed-winged Blackbird from South Danvers.

Conway, Mrs., Salem. Nuts from South America.

Cooke, Caleb, Salem. Collection of Plants from Zanzibar, Africa.

Crosby, Mrs. A., Salem. Cocoon of *Attacus cecropia* containing a grain of corn between the two layers of the cocoon.

Denslow, W. W., New York. 34 species of Plants, mostly collected by Audubon on his trip to the Rocky Mountains.

Eagleston, Capt. J. H., Salem. Sulphur from Is. of Formosa.

Eaton, Peter E., South Danvers. Head of a Barbyroussa Hog killed on the Coast of New Zealand in 1845, by Charles H. Ingalls.

Emerton, James H., Salem. Gall flies and their parasites from Oak galls. Aquatic larve and larva of a Beetle from Swampscott.


Hathaway, Benj. F., Salem. Chicken with four legs.

Heath, N., Salem. Collection of Insects from Salem.


Hobart, Miss, Salem. Hymenopterous Insect and a Centipede from Honolulu, Sandwich Islands.

Tooper, Nath’l., Salem. Seeds from South America.

Huntington, Geo. C., Kelley’s Island, Ohio. 25 species, 38 specimens of Fishes from Lake Erie.

Ives, J. M., Salem. Lepidopterous Insect from Salem.

Ives, J. S., Salem. Surf Duck from Salem Harbor.

Jones, Joseph P., Topsfield. *Attacus Luna* from Topsfield.

Jones, E. W., Salem. Collection of Insect’s and Spiders from Salem.

Kittredge, Miss, Beverly. *Attacus cecropia* from Beverly.

Mack, Miss Harriet O., Salem. 16 species of Shells.

Marks, J. L., Salem. Pudding stone from Long Island Sound.

Breckenridge Coal from Kentucky.

Morgan, Miss Rebecca, Salem. Twig of a Clove tree with the leaves and fruit.


Perley, Thomas W., Topsfield. *Attacus cecropia* from Topsfield.

Pickman, H. D., Salem. Several Fishes from Massachusetts Bay.

Parasites from a Sculpin.

Porter, E. J., Salem. 25 species of Insects from Salem.

Pousland, George, Salem. Several Fishes from Massachusetts Bay.

Parasites from a Sculpin.

Putnam, Mrs. Eben, Salem. Several Insects and Cells of the Mud wasp from Providence, R. I.

Putnam, E. L., Salem. 2 Cockroaches from Santa Cruz, British Honduras.

Putnam, F. W., Salem. Nest of the Red-eyed Vireo, containing two eggs of the Cow Bunting, from Beverly.

Ropes, T., Salem. Larvae of an insect very destructive to the Tartarian Honeysuckle.

Safford, Joshua, Salem. Malformed Claw of a Lobster.

Sanborn, Francis G., Salem. Collection of Spiders from St. Louis, Mo.

Saunders, Miss Mary, Salem. Eggs of a Lepidopterous Insect from an Apple tree.

Shepard, H. F., Salem. Hydroids and Polyzoa from Atlantic Ocean, Lat. 28°N., Long. 60°W. Collected April 1, 1865.

Shepard, S. A. D., Salem. Male and female Dragon flies from Salem.


Smithsonian Institution, Washington, D. C. 66 species, 125 specimens of Bird's Eggs, principally from Arctic America.

Symonds, N. G., Salem. Embryo Skate taken from an egg found in Salem Harbor, May 1st, 1865.

Tittle, Mrs. S. J., Beverly. Spider from Beverly.

Tuck, J. D., Beverly. *Sesta pelagus* from Beverly.

Upton, Walter, Salem. 2 young Hawks taken from a nest in Beverly.

Verrill, Prof. A. E., New Haven, Ct. Collection of 46 Minerals from various localities.

Wheatland, Dr. Henry, Salem. Lepidopterous larva from the Birch.

White, Geo. M., Salem. 3 species of Spiders from Salem.

Yale College, New Haven, Ct. Dry specimens of *Astrophyton Agassizi*, *Asterias sp.*, *Solaster endica*, and *Solaster papposus* from Eastport, Me.; collected by Prof. Verrill, 1864. Collection of Minerals from various localities.
TO THE HISTORICAL DEPARTMENT.

BY DONATION.

ADAMS, SAMUEL, Hamilton. Two Stone Chisels of the Agawam Indians found in Hamilton.

BALCH, JOHN H., Newburyport. $5 bill on the Lincoln and Kennebec Bank, dated 1866.

BOWDITCH, MRS. REBECCA, Salem. Embroidered Mourning piece to the memory of Maj. Anthony Morse, 1803.

BROWNE, COL. ALBERT G., 10 inch Shell invented by Capt. James Harding, Confederate Ordnance officer, made at Charleston Arsenal and used against Iron clad Ships. Large Shell fired from Battery Putnam. 10 inch shot from Charleston. Torpedo from Charleston Harbor. 50 specimens of Confederate local scrip of various denominations. 50 cents, 1, 2, 5, 10, 50, 100, 500, dollars Confederate States currency.

BROWN, J. VINCENT, Salem. Ballot thrown in the 8th Congressional District of Virginia, Nov. 6, 1861.


CHASE, GEO. H., Salem. Confederate Scrip of various denominations.


HAMILTON, J. L., Salem. Priest's Robe made by the Rebels while in Nankin. Brick from the Porcelain Tower of Nankin.

JOHNSON, W. B. F., Salem. War Club from Feejee Islands.

MARKS, J. L., Salem. Sword blade from the Plains of Abraham.

PUTNAM, F. W., Salem. $1 note of the Hungarian fund, dated New York, Feb. 2d, 1852.

RUST, JOHN O., Salem. 6 inch Cannon Ball from the Rebel Steamer Merrimac.

SHORT, MISS LYDIA ANN, Salem. Two Memorial Pitchers made during the Revolution. Chinese Umbrella.

SMITH, WARREN A., Chelsea. Two 10 cent Confederate Postage Stamps.

TRAILL, H. S., Marblehead. Pieces of the Confederate flag from Fort Pulaski.

UNDERWOOD, JOSEPH, Marblehead. 50 cent Confederate check on the Miss. Central R. R. Co.

VAUX, WM. S., Philadelphia. 14 Continental bills of Pennsylvania, Delaware and Maryland, of various denominations.
TO THE LIBRARY.

BY DONATION.


Brooklyn Mercantile Library Association. 7th Annual Report, March 30, 1865, 8vo, pamph.

Brooks, Henry M. Statutes at Large passed 2d sess. 37th cong. U. S. A., 1861—2, 8vo, pamph.; Monthly Miscellany of Western India, 1 vol., 8vo, Bombay 1850; Youth’s Primer by Jona. Fisher, 1 vol., 16mo, Boston, 1818; Cowper’s Task, 1 vol., 16mo, Boston, 1819; Alden’s Speaker, 1 vol., 12mo, Boston, 1810; Schoberl’s Persia, 1 vol., 12mo, Philadelphia, 1828; Forbes’ Maps of Richmond and its Fortifications.


Buffalo’s Young Men’s Association. 29th Annual Report, 8vo, pamph.

Burgess, George. Burgess’ Address at the Funeral of Rt. Rev. T. C. Browwell, Jan. 17, 1865, 8vo, pamph.

Chase, George C. Friends’ Review, vol. xviii, Nos. 28 to 41, incl.

Chase, George H. Richardson’s Speech in convention of Virginia, April 4, 1861, 8vo, pamph., Richmond, 1862.

Chase, Mrs. George H. The Sanitary Reporter, three Numbers; The Sanitary Commission Bulletin, four Numbers; Pamphlets of Sanitary Commission, seven.


Colcord, Mrs. H. M., South Danvers. The Pious Christian Instructed in the Catholic Church, 1 vol., 12mo, Dublin, n. d.


Hammond, J. L. Legge’s Chinese Classics, vols. 1 and 2, 8vo, Hong-kong, 1861.
HANAFORD, MRS. P. A., Reading. The Martyred President by Mrs. P. A. H., 8vo, pamph. Pamphlets, twenty.


Kimball, Miss Elizabeth. Liberator for 1864, 1 vol., folio, Boston.


Lapham, J. A., Milwaukie, Wis. Lapham's Maps of Wisconsin, showing the remarkable effect of the Lake in elevating the mean temperature of Jan'y., and depressing that of July, 1865.


Lee, Miss Harriet R. Collection of Hand Bills and Programmes.


Lewis, Winslow, Boston. A description of the City Hospital of Boston, 8vo, pamph.

Logan, T. M., Sacramento, Cal. Reports of Bd. of Agric. to California State Agric. Soc'y., Jan'y. 26, 1865, 8vo, pamph.


Loring, George B. Boston Post for March, April and May, 1865.

Lowe, Charles, Somerville. Lowe's Sermon on the death of Lincoln at Charleston, April 23, 1865, 8vo, pamph., Boston, 1865; Lowe's Discourse, June 4, 1865, on the condition and prospects of the South, 8vo, pamph, Boston, 1865.

Mack, Miss Harriet O. "Boatswain's Whistle," pub. at National Sailors' Fair in Boston, November, 1864.

Matthew, George F. Cupriferous Rocks of South Eastern New Brunswick, 8vo, pamph.; St. John, N. B., 1865.
Norwood, J. G., Columbia, Mo.  Norwood's Notice of Producti &c., found in Western States, 1 vol., 4to;  Norwood's Illinois Geological Survey, 8vo, pamph.; Several Pamphlets relating to University of Missouri.


Owen, RiCharD, Bloomington, Ind.  Owen's Key to the Geology of the Globe, 1 vol., 8vo, Nashville, 1857; Owen's 2d Report on Geology of Arkansas, 1 vol., 8vo, Phil., 1860; Owen's Report on the Geology of Indiana, 1 vol., 8vo, Indianapolis, 1862; Catalogues of Indiana University, 1863—4, 1864—5, 8vo, pamph.

PatteRnson, RObert, Pennsylvania.  A Narrative of the Campaign in the valley of the Shenandoah, by R. Patterson, 1 vol., 8vo, Phil., 1865.


Perley, JoNAThAn.  Hepworth's Address at the Starr King Lodge of Masons, April 17, 1865, 8vo, pamph.

Pickett, WILLiAM D.  American Museum, vols. 2, 3, 6, 7, 9, 10, 11, 12. 8 vols., 8vo;  Gray's How Plants Grow, 1 vol., 12mo, New York, 1859; Whelpley's Compend of History, 1 vol., 12mo, Boston, 1821; Goodrich's Early History of Virginia &c., 1 vol., 16mo, Boston, 1833; Wakefield's Botany, 1 vol., 12mo, Phil., 1818; Guide to the Lakes of Cumberland &c., 1 vol., 16mo; Romma's Dictionnaire Francais—Italien, 1 vol., 16mo; Paris, n. d.; Spirit of the Annuals for 1830, 1 vol., 16mo, Phil., 1830; Willis' Legendary, vol. 1, 1 vol., 12mo, Boston, 1828; The Mysteries of Udolpho, 3 vols., 12mo, Phil., 1800; Goodrich's United States, 1 vol., 16mo, Boston, 1827; Memoirs of Sherburne, 1 vol., 12mo, Providence, 1831; Rambles in Italy in 1816—17, 1 vol., 8vo, Baltimore, 1818; Staunton's Embassy to China, 1 vol., 8vo, Phil., 1799; Life of Lafayette, 1 vol., 16mo, Boston, 1835; Memoir of James Jackson Jr., 1 vol., 16mo, Boston, 1836; Maitland's Narrative of the Surrender of Napoleon, 1 vol., 12mo, Boston, 1826; China and the English, 1 vol., 16mo, New York, 1833; Cathrall's Buchan, 1 vol., 8vo, Phil., 1799; Anglesey Grammarika, 1 vol., 8vo; The Children's Week, 1 vol., 12mo, Boston, 1830; Das Neue Testament Nach D. Martin Luthers, 1 vol., 12mo, Frankfort, 1830; The Saracens, 2 vols., 12mo, New York, 1810; Minot's History of the Insurrection, 1 vol., 8vo, Boston, 1810; Ostrander's Mensuration, 1 vol., 8vo, New York, 1833; History of the Trial of Warren Hastings, 1 vol., 8vo, London, 1796; Joyce's Scientific Dialogues, 3 vols., 16mo, Phil., 1825; Constock's Chemistry, 1 vol., 12mo, Hartford, 1831; Conversations on Chemistry, 1 vol., 12mo, New Haven, 1809; Blair's Grammar of Philosophy, 1 vol., 16mo, Hartford, 1822; Fowle's Linear Drawing, 1 vol., 12mo, Boston, 1825; De Porquet, the Turning of Eng.
Idioms into French, 1 vol., 12mo., Boston, 1833; De Porquet's Parisian Phraseology, 1 vol., 12mo., Boston, 1833; Comstock's Practical Elocution, 1 vol., 12mo., Phil., 1837; Dictionnaire des locutions vicieuses, 1 vol., 16mo., Paris, 1813; The Traveller's Manual in Eng., Fr., Ger., and Ital., 1 vol., 16mo., Coblenz, 1847; The Holy Bible, 1 vol., 8vo., Boston, 1831; The Holy Bible, 1 vol., 16mo., Concord, 1838; Key to Murray's English Grammar, 1 vol., 12mo., Concord, 1820; TVoodbridge's Geography, 1 vol., 16mo., Hartford, 1823; Adam's Latin Grammar, abridged, 1 vol., 16mo., New Haven, 1825; Putnam's Analytical Reader, 1 vol., 12mo., Concord, 1829.

Putnam, Mrs. E. A. 3 Pamphlets.


Safford, Mrs. Joshua. Washington's Farewell Address, 1 vol., 24mo., Newburyport, 1812.

Salisbury, J. H. Cleveland, Ohio. Catalogue of the Charity Hospital Medical College of Cleveland, Ohio, 8vo, pamph, Cleveland, 1865.


Stimpson, William, Chicago, Ill. Stimpson's Synopsis of Marine Invertebrata, 8vo, pamph.: Stimpson's Malacoological Notes, No. 1.


Trask, J. H., Wenham. Reports of Selectmen and School Committee of Wenham, March, 1865, 8vo, pamph.

Tucker, W. P. Bishop Burgess' 5th Charge, July 9, 1862, 8vo, pamph.


Waters, J. Linton, Chicago, Ill. Receipts and Expenditures of Chicago, from April 1, 1864 to April 1, 1865, 8vo, pamph.; A Guide to Illinois Central R. Road lands, 8vo, pamph., Chicago, 1865.

Wheatland, Henry. The Olive and the Pine, 12mo, 1 vol., Boston, 1859; Record of an Obscure Man, 1 vol., 12mo, Boston, 1861; Success in Life, The Mechanic, by Mrs. L. C. Tuthill, 1 vol., 12mo. New York, 1860.

Wilkes, J. H., San Francisco, Cal. 12th Annual Report of Mercantile Library Association of San Francisco, 8vo, pamph.; Views of
the works of the Gould & Curry Silver Mining Company, Virginia City, N. T., 1 vol., 4to; Life of Joseph Vico, a Japanese who was rescued by the "Fennimore Cooper," an account of his travels in the United States, in the Japanese Language, 1 vol., 8vo.


Young, S. J., Librarian of Bowdoin College. Catalogue of Bowdoin College, 1865, vo, pamph.

BY EXCHANGE.


Canadian Institute. The Canadian Journal for March and May, 1865.

Editors. Savannah Daily Herald; North American Review; Historical Magazine; American Journal of Science; Florida Union; Home Evangelist; Salem Observer; Lynn Weekly Reporter; Essex Banner, (Haverhill); Haverhill Gazette; Lawrence American.


Iowa Historical Society. The Annals of Iowa for April, 1865.

Montreal Society of Natural History. The Canadian Naturalist and Geologist for February, April and June, 1865.


Pennsylvania Historical Society. Resolutions on President Lincoln, April 27, 1865, 8vo, pamph.


Zoologische Gesellschaft, Frankfurt a. m. Der Zoologische Garten, vol. 5, Nos. 7 to 12 incl.
MONDAY, JULY 3. Regular meeting.

Henry F. King in the chair.

William H. Osgood and Joseph C. Foster, of Salem; Robert R. Endicott and George Roundy, of Beverly, were elected Resident Members.

THURSDAY, JULY 13. Field meeting at Reading.

The first Field meeting held by the Institute beyond the limits of Essex County took place in the town of Reading. The party from Salem leaving in the ten A. M. train and arriving at Reading at about eleven o'clock.

Reading is an attractive looking town, containing many hills and groves, among which are pleasant drives and walks. This town was many years ago a part of Lynn. It also included South and North Reading, which were afterwards set off in response to local requirements. On arrival, the company immediately repaired to the chapel of the old South Congregational Church, where the refreshment baskets were deposited and Vice President Goodell announced the programme for the day. As the time was limited, no very long rambles could be taken, and the few hours were passed in examining the garden of Mr. Amos Cummings situated on "Prospect Hill;" the nurseries of Mr. J. W. Manning; the old burial ground where many interesting and quaint epitaphs were to be seen; and by a trip to the pond and adjacent fields and groves.

About one o'clock the party again assembled in the Chapel, and, after partaking of refreshment, adjourned to the Church where the regular meeting was organized with

Vice President Goodell in the chair.

The Rev. Wm. Barrows, pastor of the society in whose church the meeting was held, welcomed the Essex Institute to the town of Reading, alluding to the fact that this town
was once a part of Lynn, and was then known as "Lynn Village," and, therefore, properly within the range of the researches of the Institute. The Chairman responded, thanking the people of the town for the interest they had manifested this day and for their successful efforts to make the visit of the Institute a pleasant one.

Rev. W. W. Hayward, of South Reading, read an original hymn, written by a resident of Reading, which was sung by the choir of the church.

The records of the last meeting were read, and donations to the Library and Museum were announced.

Letters were announced from:
E. W. Blatchford, Chicago, Ill.; Chas. J. Sprague, Boston; Joseph N. Howe, Boston; Prof. C. F. Chandler, Columbia College; Thomas Barlow, Canastota, N. Y.; J. Kirkpatrick, Cleveland, Ohio; Prof. J. C. Holmes, Lynn; Dr. A. Kellogg, San Francisco, Cal.; J. J. Haagensen, St. Thomas, W. I.; Dr. Frederick Brendel, Peoria, Ill.; Geo. W. Peck, New York; Prof. A. Winchell, Ann Arbor, Mich.; Chas. Stodder, Boston; G. Hastings Grant, New York, relating to the publications: Dr. Wm. Stimpson, Corr. Sect., Chicago Acad. Nat. Science; Prof. Theo. Gill, Smithsonian Institution; Prof. S. F. Baird, Smithsonian Institution; E. A. Samuels, State Cabinet; E. S. Morse, Gorham, Me.; Rev. E. C. Bolles, Portland, Me.; Prof. J. G. Norwood, Missouri State University; Dr. A. S. Packard, Jr., Brunswick, Me.; Prof. P. A. Chadbourne, William's College; G. A. Boardman, Milltown, Me.; Dr. Daniel Clark, Flint, Mich.; Prof. D. S. Sheldon, Griswold College, Davenport, Iowa; Tryon Reakirt, Philadelphia; Henry L. Hotchkiss, New Haven, Conn.; Mrs. P. A. Hanaford, Reading; A. J. Archer, Salem, on business, and acknowledging the receipt of specimens: Prof. Richard Owen, New Harmony, Ind.; Prof. E. D. Cope, Haverford College, Pa., accepting membership: Maine Historical Society; Albany Institute, acknowledging receipt of Publications.

A communication on the Geology of Reading by Mr. L. B. Pillsbury of Hopkinton, formerly principal of the High School in Reading, was read by the chair.

John M. Ives, of Salem, spoke of Birds, particularly of the Swallows, describing the habits of the various species
known in this vicinity. He also alluded to the habits of the Robin, Cow Bunting, Wren, Cherry Bird and Canada Goose, relating several curious anecdotes illustrative of the peculiarities of a number of the species.

Dr. G. B. Loring, in connection with Mr. Ives' remarks, spoke of the habits of the Eaves Swallows, a number of which had built their nests on his barn. Dr. Loring also claimed to be something of a Reading man, having once had charge of a school in that town, and related some amusing experiences connected with his professional duties. His compensation was $15 per month and "board round." He said that Rev. Dr. Flint, Hon. Amos Kendall and Rev. Cyrus Pierce had also been school teachers in the town. He related an anecdote of Mr. Kendall, who, while Post Master General under Jackson's Administration, had astonished some Reading politicians who desired a change of location in the town post office, by asking why the petition did not bear the signatures of certain leading men whom he named. "What!" said they, "do you know the name of every man in the United States?" The truth was Mr. Kendall remembered the names of some of the citizens who had been his friends, while a school teacher, at the age of sixteen.

F. W. Putnam, of Salem, made a few remarks on the geology of the town, called forth by Mr. Pillsbury's paper, and then proceeded to describe the few insects and fishes which had been collected during the morning.

C. P. Judd, of Reading, occupied a few moments, quite acceptably, with some interesting reminiscences of the early history of the town.

Ezra F. Newhall, of Salem, was elected a Resident Member.

On motion of Dr. Loring it was Voted: That the thanks of the Essex Institute be presented to the Proprietors of the old South Church of Reading, for the use of their
house; and to the Rev. W. Barrows; the members of his society; and other friends in Reading, for their kind attention to the members of the Institute during the day.

After the singing of "America" by the choir and a benediction by the Pastor, the meeting adjourned in time for the cars for home, and all were well pleased with their visit to the town and the hospitality of its inhabitants.

At the depot, the signal master called the attention of a number of the members to a pair of Blue Birds which had built a nest in one of the signal balls, from which a piece of the canvas had been torn. These birds, after raising one brood of young, had made another nest, by the side of the first, in which they had laid the eggs for a second brood. The signal ball, in which the nests were made, was lowered and hoisted about fifty times a day. The birds flying out as soon as the ball commenced its descent, and, alighting upon the fence near by, would wait patiently for it to be hoisted again, when they would at once return to their nest.

Monday, July 17. Regular meeting.
Vice President Goodell in the chair.

William E. Doggett, of Swampscott and Sarah B. Endicott, of Salem, were elected Resident Members.

The Secretary stated that the portrait of Gov. John Leverett, which was sent, at the request of Leverett Saltonstall Esq., to Mr. Howarth of Boston, to be cleaned and restored, had been returned to the Institute in excellent condition, without cost to the Society.

On motion of Judge Waters, it was Voted: That a committee be appointed to tender to L. Saltonstall Esq., of Newton, the sincere thanks of the Essex Institute for this mark of his esteem and liberality in behalf of the Institute.

Messrs. J. G. Waters, H. Wheatland and S. B. Buttrick were appointed on the committee.
Thursday, July 27. Field meeting at Georgetown.

The Fourth Field meeting of the season was held this day at Georgetown.

Georgetown is not, distinctively, an old town. Its antiquity is entirely borrowed from the interesting town of Rowley, of which, like Boxford and Bradford, it was formerly a part, having enjoyed an independent existence among the family of towns only since the year 1838, and consequently being a younger sister of the towns last named. It was known, before the separation, as "New Rowley." The original post office box, not over three or four feet long, through which the New Rowley mail passed, is still in existence, and may be seen at the native wine establishment of Messrs. M. Carter & Son. It bears the following painted inscription: "New Rowley and Georgetown Post Office, established March 17, 1824; Benj. Little, P. M. First quarterly return, $7.32. Last quarterly return, June 1, 1845, $117.96. Whole amount collected, $5,373.63."

Georgetown appears to be one of the most active and spirited of our country towns, where attention is given not only to farming, but, also, a considerable share of the capital of its men of means is devoted to the manufacture of shoes, giving steady employment to many. The crops in the town look flourishing and bid fair to be plentiful. Apples will be scarce here as elsewhere in New England; but berries, cheapest of all fruits, abound.

On the arrival of the party a cordial welcome was tendered by O. B. Tenney Esq. Chairman of the Selectmen, who offered the hospitalities of the place, and called attention to the various points of interest in the town. Numerous vehicles were also in waiting to convey the party to the various objects of interest. Among the places visited by the several parties, were the "Old Lull House,"
which is situated about two and a half miles from the village on the Newburyport road. It is owned by Mr. Gorham D. Tenney, who is proprietor of the adjoining farm, which comprises two or three hundred acres. Mr. Tenney is the son of Capt. Gorham P. Tenney, whose wife was the daughter of Dudley Lull, whose name still imparts a designation to the old house. When, in 1690, the war was being conducted against the French in Canada, the Indians became troublesome in the Provinces, and on Oct. 23, 1692, this old house, which is in that part of the Byfield Parish included in the town of Georgetown, was the scene of a massacre of which an account may be found in Gage’s History of Rowley. At that time it was occupied by a Mr. Goodrich who, with his wife and two daughters, while engaged in his family prayers, on Sabbath evening, were killed by the Indians. Another daughter, named Deborah, aged seven years, was taken captive, but was redeemed the next Spring, at the expense of the Province. She died in Beverly, as appears by the records of the First Church in that town, where the entry reads, “Buryed, March 28, 1774, Deborah Duty, aged 88, a widow.” Those who were killed are said to have been buried in one grave a few rods to the east of the house. The exact spot, as located by tradition, was pointed out.

Mr. Tenney, the present owner, was very courteous and attentive to those who visited his place, and, besides proffering acceptable comforts, exhibited, at the farmhouse which he occupies, some good specimens of Indian relics, such as a pestle, gouge, axe, and arrow-heads; all having been found upon his farm, which was evidently an Indian resort in the olden time. He conducted the party through the old house, which is now very dilapidated and of course unoccupied. It has undoubtedly undergone some alterations since the day when Mr. Goodrich and his family
were murdered, but the huge fire-places, clay-cemented chimneys, and broad and ponderous beams, betoken decided antiquity.

The famous octagonal barn of Mr. Samuel Littell was visited by a large party. This barn is said to be the largest in Essex County, being about eighty feet in diameter, each of the octagonal sides being about thirty-two feet. It has two floors in addition to the basement, and is so constructed with reference to the rising ground upon which it is built, that upon each floor there is an entrance from the ground. Situated upon a natural eminence, the view from the top of it is very extensive. Here may be seen Pentucket Pond, not far distant; Rock Pond, which flows into it; Haverhill, Groveland and Bradford; the ocean far away, and a vast extent of surrounding country, including distant eminences, among which several peaks of the White Mountains could be distinctly traced.

"Bald Pate," the highest hill in Essex County, being 392 feet above the level of the sea, and the "Ridges" were visited, as well as the Burial Grounds and other places of interest, among which was the Vineyard of Messrs. Carter & Son, who carry on a large manufactory of native wines.

The Mineral Point Mine on Atwood's Hill, was also visited. This mine yields an inexhaustible quantity of brown ochre, with which a large number of the houses in Georgetown and vicinity are painted, and which has been quite an article of export.

Another party made an excursion to the pond where a number of botanical and zoological specimens were collected.

Soon after one o'clock nearly all the parties had returned from their rambles, and assembled once more at the Town Hall, where, in addition to the refreshments brought by the company, the Georgetown people had liberally con-
tributed to the entertainment. The hospitalities having been duly partaken of, the meeting for discussion was then held, commencing at half past two o'clock.

Dr. G. B. Loring, Chairman of the Field meeting Committee, in the chair.

The Chairman opened the meeting with remarks relating to Georgetown, of an historical character, alluding to its ecclesiastical controversies; some witchcraft experiences; and the character of some of its public men.

After reading the records of the last meeting and the lists of donations to the Library and Museum, letters were announced as received since the last meeting from:


James P. Cooke and David P. Carpenter, of Salem, were elected Resident Members.

Mr. C. M. Tracy, of Lynn, was called upon by the chair, and responded in his usual happy and ready manner, giving some account of his observations during the day, and mentioned some of the principal plants collected. Among these were the Orchis, Buttonbush, Cardinal Flower,
Clethra, Asters, Golden Rods, and other varieties. In this connection some discussion arose in reference to the parasitical character of the Indian Pipe.

C. L. Flint, Esq., Secretary of the State Board of Agriculture, being called upon, made some general remarks favorable to scientific research and commending the objects of the Institute.

Rev. J. L. Sibley, Librarian of Harvard College, followed, speaking of the importance of preserving old pamphlets and papers, as having an important bearing, aside from any historical value, in settling questions involving the rights of property. He mentioned several instances which had come under his observation, and said the Institute was doing a valuable work in this connection, besides exerting an influence that was felt all over the country.

Capt. Alpheus Hyatt, of Baltimore, made some remarks with regard to the general sac like plan of the Animal Kingdom, defining the Radiata as radiated sacs, the Articulata as articulated sacs, the Mollusca as the simple typical sac and the Vertebrata as sacs divided internally into two cavities. Capt. Hyatt adduced specimens of Paludicella and Fredericella, found during the forenoon ramble, as proofs of the specialization of the sac among the Mollusca, and gave in detail their anatomical and physiological peculiarities.

Mr. F. W. Putnam, of Salem, gave a brief abstract of his day's observations, and enlarged upon the habits of the gall fly, specimens of which he produced at the meeting.

Capt. J. G. Barnes, while he made no claim to being a naturalist, said he had no doubt Georgetown could present much that was worthy the attention of a careful scientific observer. He said that during the past four years we have been making history very fast; and he looked with local pride upon what had been done in his state and town for
the maintenance of the union of the States, and suggested that it was the duty of this historical society to gather all facts and memorials tending to elucidate the history of this period.

Mr. A. C. Goodell, of Salem, gave some curious facts in regard to the names of several towns in the vicinity, and closed his remarks by reading a poem written for the occasion by a Salem lady.

Richard Tenney, Esq., Postmaster of Georgetown, gave some facts in the history of the town, especially in relation to its incorporation as a distinct municipality.

Mr. John Preston, of Georgetown, presented a leaf from a magnolia planted by George Washington at Mount Vernon.

A resolution of thanks, offered by Mr. Walton and seconded by Mr. Upham, was passed to Messrs. O. B. Tenney and Sherman Nelson, Selectmen; Maj. Moses Tenney, Capt. Barnes, Lieut. Wildes; Messrs. Stephen Osgood, John Preston, John Bradstreet, Isaac Wilson, Edmund Bailey, Chas. Carter, Samuel Wadleigh, Geo. W. Boynton, Jos. Folsom, Richard Tenney, Geo. Harnden, Wm. Horner, Robert Coker, Gorham D. Tenney, and other citizens of Georgetown, for their liberal and successful efforts in making the meeting a pleasant and instructive one.

On returning to the depot, at the close of the meeting, Mr. W. S. Horner, the depot master, displayed a few of his many Indian relics.

Wednesday, August 9. Quarterly meeting.

N. Weston, Jr., in the chair.

On motion of F. W. Putnam, it was Voted: That the following be added as a final clause to Chapter IV of the By-Laws.
"Every facility in the power of the Superintendent, consistent with the welfare of the specimens, shall be offered to persons visiting the Museum for the purpose of study and comparison."

D. B. Hagar, J. Leonard Hammond and Elizabeth A. Putnam, of Salem, were elected Resident Members.

Friday, August 18. Field meeting at North Andover.

The fifth Field meeting of the season was held at North Andover this day. About three hundred persons arrived in the train from Salem and assembled at the "First Church" before separating into small parties to visit the special objects of interest to each.

The zoologists sought the brooks and streams and found many specimens amply rewarding them for their search; the botanists the woods and meadows for various flowers; the antiquarians for the relics of olden time.

This township was first settled in 1634. In the same year the following order of the court was issued respecting the land in Andover:

"It is ordered that the land about Cochichewick shall be reserved for an inland plantation, and whosoever will go to inhabit there shall have three years immunity from all taxes, levies, public charges, and services whatever, military discipline only excepted."

The land is uneven, rising into large hills, affording fine and delightful prospects and scenery. Dr. Dwight, in his travels, some sixty or seventy years since, says of the North parish of Andover: "Its surface is elegantly undulating, and its soil in an eminent degree fertile. The meadows are numerous, large, and of the first quality. The groves, charmingly interspersed, are tall and thrifty. The landscape, everywhere varied, neat and cheerful, is also everywhere rich." Hither many come from the crowded city to
enjoy the recreation of the country; and where can a better place be found than this well known Summer resort?

The Church was founded in 1645 and consequently is one of the oldest in the County. For seventy years the desk was very acceptably filled by the two Barnards—the Rev. Thomas, and his son the Rev. John—and "during their ministry the people enjoyed a series of peace and improvement beyond what is common." The second Barnard died 14th of June, 1758, aged 68 years; he left two sons, both distinguished clergymen. One was the Rev. Thomas Barnard of Newbury, afterwards of the First Church in Salem, and father of the Rev. Thomas Barnard, D. D., first minister of the North Church in Salem; the other was Rev. Edward Barnard of Haverhill, whose portrait by Copley is in the possession of the Essex Institute.

The Great Pond, so called, is a fine, clear basin of water, containing about 450 acres, and is well stocked with fish. The outlet, known as Cochichewick brook, furnishes the power of several woolen mills, some of which belong to the estate of the late Eben Sutton, Esq., of South Danvers. This was visited by many, and from the adjacent hills fine views of the Merrimack, the city of Lawrence, and other places, were enjoyed.

The afternoon session was called to order at three o'clock.

Dr. George B. Loring in the chair.

The records of the last meeting were read. Donations to the Library and Cabinets announced.

Letters were read from:
Rev. Samuel Lockwood, Keyport, N. J.; Edward A. Brigham, Boston; C. F. Austin, Closter, N. Y.; The Abbé Brunet, Quebec, Canada; E. S. Morse, Gorham, Me.; Prof. James Hall, Albany, N. Y.; James Lewis, Mohawk, N. Y.; Dr. Julius Homberger, New York; Henry White, New Haven, Conn.; J. H. Stickney, Baltimore, Md.; S. S. Par

E. W. Buswell, of Maiden; James Hill, Henry. P Hendrick, William Haskell, A. T. Mosman, of Beverly, and Martha G. Wheatland, of Salem, were elected Resident Members.

On the table were three beautiful and very finely executed paintings of flowers by Miss Eliza B. Davis, for several years a resident of Salem, a lady long and very favorably known to our citizens as zealously devoted to this beautiful art.

The Chair made some remarks upon the early history of Andover, alluding to several incidents connected with the first settlers and their immediate descendants. He spoke of the Phillips family, and paid a high eulogium to several of its members who have been great benefactors to the cause of education, in the liberal endowments to several seminaries of learning, which bear the honored name of Phillips. He also spoke of Stevens, the founder of one of the woolen mills on the Cochichewick stream, as one of the pioneers in this branch of our domestic industry. The old Franklin Academy was mentioned, incorporated in 1801, and which had been highly beneficial to the parish and to the youth who have enjoyed its advantages equally under the superintendence of Mr. Simeon Putnam, and of Mr. Cyrus Peirce, the experienced and faithful teacher, and the first teacher of a Normal School in this State. In this
connection he alluded to the late Gen. I. I. Stevens, who fell fighting for the cause of his country in the recent rebellion, and who displayed in boyhood and youth the same intrepidity and courage which marked his later career.

The Chairman, after some additional remarks of a similar tenor, called upon Mr. John M. Ives, of Salem, who continued his observations upon the habits of many of our birds, which he had commenced at the meeting in Reading, a few weeks since, with especial reference to the migration of several species.

The Chairman stated that Andover had long been noted for its large trees, mentioning a large elm transplanted by Mr. Jonathan Frye in 1725, and called upon Mr. Goodell to give some account of what he had seen during the day.

Mr. A. C. Goodell, Jr., replied giving an interesting account of the large elm tree which he visited, and which measures, two feet from the ground, about thirty-five feet in circumference. He then spoke of his ride around the Great Pond, above alluded to, and the view from some of the high hills, concluding by mentioning some interesting reminiscences of the early history of Andover. The land, including Andover, Lawrence, &c., was purchased of Cutshamache, the Sagamore of Massachusetts, for twenty-six dollars, sixty-four cents, and a coat. The town was incorporated in 1646 by the name of Andover, receiving that name from Andover in Hampshire, England, whence many of the settlers came.

Mr. F. W. Putnam spoke of the Striped Snake and other species which were found in this vicinity. Referring to the snake bite case in Lowell, Mr. Putnam said he had himself been bitten by the striped snake and had never experienced any ill effects, and he thought that the effects said to have followed the bite in the Lowell case were wholly due to fear, as there was no venomous fang in the striped
snake. He then alluded to the fishes, giving some account of the minnows and pointed out the differences between these and those found in salt or brackish water.

Mr. E. G. Parker, of Groveland, asked some questions respecting the Tent Caterpillar, stating that from some happy but unaccountable cause all the caterpillars of this species, in this vicinity, had not had the strength to complete their cocoons, or had died soon after forming them. Considerable discussion upon the Tent Caterpillar and other injurious insects followed, participated in by Messrs. Parker, Ives, Putnam and the Chair.

The Secretary announced that Rev. Stillman Barden, a member of the Field Meeting Committee, and an ardent friend of the Institute, who had felt a great interest in, and had been a constant attendant upon these meetings, had died at Rockport since the last meeting; and upon his motion a committee was appointed to prepare suitable testimonials of respect to his memory and worth.

Mr. C. Davis, of Beverly, offered the following vote, which was unanimously adopted:

Voted; That the thanks of the Institute are due to the proprietors of the First Church in North Andover for the use of their house; to the members of "Cochichewick Engine Co., No. 2", for the use of their building; to Messrs. Moses T. Stevens, Otis Bailey, W. P. Phillips, John Bertram, James B. Curwen, Matthew Poor, I. O. Loring, Mrs. Nath'l Stevens, and other citizens and temporary residents of North Andover, for their kind attentions during the day.

The meeting then adjourned.

WEDNESDAY, AUGUST 23. Adjourned Regular meeting.

Judge Waters in the chair.

Prof. J. G. Norwood, of Columbia, Mo., was elected a Corresponding member.
Thursday, September 7. Field meeting at Newburyport.

The sixth and last Field Meeting of the season took place this day. About three hundred and seventy-five persons attended, the larger portion proceeding over the Eastern Railroad to Newburyport, and thence down the Merrimack to Salisbury Point. The party was so large that, in addition to the passenger barge usually employed, it was found necessary to charter a schooner, both being taken in tow by a powerful little tug boat called the "Thurlow Weed". The trip down the river, some three miles, occupied about half an hour, and upon arriving at the Point, the barge and schooner were run directly upon the sand beach, and the company landed without any difficulty. Here nearly two hours were spent, and a few improved the time by inspecting Fort Nichols, and rambling over Salisbury Beach proper, which extends several miles along the ocean side, and is one of the finest beaches on the coast. The heat was so intense, however, that but a small number improved the opportunity. The fort mounts ten or twelve guns. The parapet already shows signs of disintegration, the effect, probably, of the severe drought, and of the sun's rays which concentrate upon the sand heaps with overpowering intensity. There were several tents in the vicinity, occupied by "camping out" parties from up the river.

Returning to Newburyport, the company partook of the usual picnic dinner in the City Hall, and afterwards had an opportunity to visit the many places of interest in the city, including the Horton Memorial Chapel, the Whitefield Church, the Copley Portraits, the Public Library, and other objects of note heretofore described.

At three o'clock, the afternoon meeting was organized in the City Hall.
Vice President A. C. Goodell, Jr., in the chair.

The records of the preceding meeting were read. Donations were announced to the Museum and Library.

Letters were read from the following:


Joseph P. Cloutman, of Salem, was elected a Resident Member.

Mr. F. W. Putnam, of Salem, was called on for an account of the forenoon ramble. The various specimens that had been collected were displayed on the table, and Mr. Putnam took them up in order. He first showed a fish bone, and explained how from one bone, hair, tooth or scale the character of the living animal could be determined, the analysis in the present case proving the specimen to be part of the jaw of the monk fish (*Lophius*). He next showed several specimens of sandlances (*Ammodytes*), which bury themselves in the sand, when thrown up by the waves, and remain till the next tide allows them to return to their native element. These fishes often lie at the bottom of the water, apparently dead, but on being disturbed revive and become as active as ever. A bottle of
minnows was next exhibited and their characteristics explained. The next object in order was the skull of a cat, picked up on the beach, which was interesting from the very extreme age indicated by the teeth, many of which had dropped out, and the cavities become closed. The horse-shoe, or king crab, was next taken up. These were not the animals themselves, but only the shells, the tenants having vacated on their quarters becoming too close for them, a new and larger shell being secreted in a short time. They also cast out the lining of their stomachs. These animals are among the lowest of their class, approaching the fossil trilobite. The sand flea was also referred to as a proper crustacean. The sea urchin was exhibited as a specimen of the radiates, and shown to be in its structure closely allied to the starfish. A black body about two inches long, with prongs projecting from the corners, and which is popularly supposed to be a seaweed bladder, was explained to be the egg case of a skate. The fish attains its perfect form in this case, being supplied with water during its entire growth by means of the four tubes or prongs.

Dr. Henry C. Perkins, of Newburyport, was next called on. He said he came to learn, not to teach, but still would not be selfish. He thought the society had made a collection of all the specimens the waters of this region afforded. He once had a dredge made, and used for several years by a boatman, for the purpose of fishing up, if possible, some new species not found on the shore, but succeeded in finding only one—an arctic shell. He had been interested in watching an excavation in order to study the various strata and other objects of interest. The hill where the observatory stood during the last war, had changed from a northwest to a northeast slope. The sand resembles the Plum Island sand, and at the present time the drought had reach-
ed five feet, that being the point where the first indications of moisture were found. When the "James Mills" excavated the hill on the turnpike for a reservoir, they found at a depth of five feet pine logs three feet in diameter at a locality known by tradition as the "Pine Swamp." Lower still, stratified sand was found, and five feet lower, a trunk of a tree within one foot of water. In searching for organic remains he had found gravel cemented to larger stones by lime which had apparently percolated through the strata above from shells. He also referred to the change in the channel in the river, and to the storm which cut off a mile of Salisbury beach, making a channel for the largest ships.

Rev. A. E. P. Perkins, of Ware, made some remarks on geology. He thought geologists were often mistaken in deducing the age of formations, for, owing to causes which we did not understand, the alluvial formation often accumulated in a hundred years as much, as at the slow rates sometimes observed, would indicate ten thousand years. In his native town, not yet a century old, a certain location was known as the beaver dam though no traces of the dam were found or known to the present generation, till, on digging a ditch, it was discovered four feet below the surface, which proved that that depth of alluvium had accumulated in a hundred years.

He then made some remarks on the migrations of birds. He included in this term not only the annual migrations but the permanent change of habitat. Birds often appeared in great numbers in a region to which they had previously been strangers; and, on the other hand, sometimes disappeared entirely from their accustomed haunts. There were many birds in our woods which not one man in ten had ever seen, whose song could be detected by an experienced ear, but never heard by the chance passer by. He instanced the Indigo bird as an example.
Hon. Asahel Huntington, of Salem, gave an interesting reminiscence of Newburyport, and his early acquaintance with many of the prominent divines, physicians and lawyers. He highly eulogized Miss Gould, the poetess, and her father, Capt. Benjamin Gould, who took part in the Revolution and was wounded at the battle of Lexington. He built the house in which Mr. H. was born, and the first rudiments of his education he received in a school taught by a sister of the poetess. The first of Miss Gould's famous series of epitaphs was written for him, at his suggestion, in reply to her assertion that he would kill himself smoking. She complied, and wrote the epitaph off hand, together with some half dozen others the same evening. This was her first attempt at poetry.

Col. Eben F. Stone, of Newburyport, was next called upon. He said that being a new member of the Institute he came to hear, not to talk. His studies had been in other directions than science-ward. He felt the necessity of science—of a knowledge of nature to make his walks more agreeable. He had learned something, and did not believe that the study of science destroyed the poetry and charms of nature.

Vice President Goodell, Chairman of the Committee to report upon the death of Rev. Mr. Barden, presented the following resolutions:

Resolved: That in the recent death of the Rev. Stillman Barden of Rockport, the Institute deplores the loss of a sincere lover of science, and an active and zealous worker in its cause; that it is peculiarly painful to the surviving members of the Institute to reflect that its meetings will no longer be enlivened by his presence, nor its members encouraged by his ever cheerful voice and his genial manners.

Resolved: That these Resolutions be entered on the records of the Institute, and that the Secretary cause a copy thereof to be sent to the family of the deceased.
The adoption of the resolutions was moved by Dr. Wheatland, and seconded by Rev. Willard Spaulding, of Salem, who spoke with much feeling and earnestness in eulogy of the deceased. The resolutions were unanimously adopted.

The members of the Institute having received and accepted a polite invitation from Hon. Caleb Cushing to visit his house, the meeting adjourned for that purpose, after passing votes of thanks to the City authorities for the use of the Hall, to Hon. Caleb Cushing, and to Rev. Dr. Spaulding, and other citizens, for their courtesies and attentions.

Repairing to Mr. Cushing's fine residence, the company were kindly greeted by the host, who not only opened all his rooms for their inspection but also entertained them with a generous hospitality, entirely unexpected, and not often bestowed by any distinguished gentleman upon so numerous a party, principally entire strangers. The privilege of such a reception may be in some measure estimated, when it is stated that Mr. Cushing has one of the finest and most extensive private collections of rare paintings to be found in the United States. They include many celebrated works of the old Spanish masters, and other valuable specimens, not omitting some of the best of Chinese art, obtained by Mr. Cushing during his various sojourns in Mexico, and Europe, and in the Oriental World. The collection comprises more than seventy distinct pieces, of different sizes, and a variety of subjects, many of them of great historical interest and value. He also possesses some choice statuary and several fine family portraits. The examination of these splendid works of art afforded the crowning pleasure of the day.

Mr. Superintendent Prescott furnished an extra train for the return trip, and the party reached home safely, highly delighted with the closing excursion of the season.
Additions to the Museum and Library during July, August, and September, 1865.

TO THE NATURAL HISTORY DEPARTMENT.

By Donation.

Allen, J. F. Salem. Larvae and Imago of Ctenucha grata from the Grape vine.


Bowdoin, Dr. W. L. Salem. Head and feet of a large Turtle, Chelydra serpentina, from a Lake in N. H.


Cloutman, WM. R. Salem. Specimen of a Beetle, from Salem.

Cooke, C. Salem. Coleoptera, from Pond Lily leaves. 48 specimens, 16 species, Insects, from Reading. Parasites, from the intestines of the Golden-winged Woodpecker.

Cooke, C. and Pickman, H. D. Salem. Collection of Insects and Fresh water Fishes, from Rye, N. H.

Covill, T. N. Salem. 200 specimens of Pinnothereas ostreum Say, Oyster Crab.

Cheelman, Mrs. B. C. North Beverly. Specimen of Solen ensis, from Salisbury Beach.

Cross, Henry J. Salem. Ascidians, from the North River flats.

Dodge, A. W. Hamilton. Living Specimen of Lasiusr us noveboracensis Tomes, Red Bat, from Hamilton.

Edwards, Charles Salem. Specimen of Strombus, from Africa.

Emerton, James H. Salem. 256 specimens, 60 species, Insects, from North Andover. Salamander erythrornota, from the Gloucester woods. 36 specimens, 29 species, Insects, from Georgetown.


CLXVIII

HEATH, N. Salem. 105 specimens Insects and Spiders, from Salem.
HINES, Mrs. Salem. A Glow-worm (living specimen) Lampyris noctiluca (female larva), from Boston.
HOOPER, Nathaniel M. Salem. Nuts, from Cayenne, S. A. Albert Coal, from Hillsboro, N. B.
JOHNSON, Daniel H. Salem. Clam, Mya, with a double shell, from Ipswich.

KIMBALL, James Salem. 6 specimens of “Spanworm Moths,” from New York.

LANDER, Miss L. Salem. Large Moth, from Salem.
LARABEE, Eben L. Salem. A large collection of Sponges, from under the draw of Beverly Bridge.

LOVETT, Edmunds Beverly. Skin of a Leopard, from West Africa.
MACK, Dr. WM. Salem. Specimen of Tenia solium.
MASON,—— Jamestown, N. Y. Silver Ore, from Colorado Territory.
MCILWRAITH, Thomas Hamilton, C. W. Skins of Lanius excubitoroides and Plectrophanes lapponicus, from Hamilton, C. W.

NELSON, Augustus Georgetown. Clay, from Georgetown.

NORWOOD, Prof. J. G. Columbia, Mo. A collection of 687 specimens, 298 species of Western Fossils. Identified.

OSGOOD, Mrs. Chas. Salem. Specimens of a Dipterous Insect, from Salem.

PALFREY, Chas. W. Salem. 5 Eggs of the Mocking Bird, Mimus polyglottus.

PICKMAN, H. D. Salem. Dragon-fly, from Salem.
PORTER, E. J. Salem. Specimen of Epiera riparia, from Salem.
PRESTON, John Georgetown. Several Minerals, from various localities.

PUTNAM, C. A. Salem. Dipterous larva, from the Canal of Naumkeag Mills, Salem. Star-nosed Mole, Condylura, from Lawrence. 4 Trout, Salmo fontinalis, from the Aqueduct Fountains in South Danvers. 6 Osmerus; 2 Ctenolabrus; 2 Morrha (young); Physic (young); Platessa, from Salem Harbor.


ROBINSON, Asa P. New York. Skin of Rana Calisbiana, from Lake Umbagog, Me.

RUSSELL, Miss M. A. Salem. Specimen of Walking Stick, Spectrum Femoratum.
CLXIX

SAUNDERS, Capt. O. H. Salem. Lead Ore and Lime, from Island Pond, Canada.

SMITH, Samuel H. Salem. Specimen of Platiphyllum concavum, Katy-did, from Holmdel, N. J.

SPRINGFIELD CITY LIBRARY MUSEUM, by S. STEBBINS. 500 specimens Spiders, 2 specimens Polyommatus porsera, from Springfield.


STILES, Frederic Topsfield. White Rat from Topsfield.

STONE, Alfred Providence, R. I. Nest and young of Vespa maculata. Nest and young of Polistes sp?, from Providence, R. I.

TELLKAMPF, Dr. A. New York. Ascidia nov. sp., from Huntington Bay, Long Island.

TENNEY, Prof. S. Poughkeepsie, N. Y. Copperhead Snake, from Mt. Holyoke.

TRUE, Joseph Salem. Stone bored by Shells, from the Grand Banks. Insects, from Salem.

UPTON, Capt. GEORGE Salem. 2 specimens (skins) of Birds, and specimens of Polyzoa, from the Grand Banks?

WEBB, Capt. BENJ. Salem. Specimen of Spondylus, from the West Indies. 2 specimens of Coral and 4 of Minerals, from various localities. Tree Toad, from China?

WHEATLAND, Miss M. G. Salem. Minerals, from the Banks of the Genesee River, Rochester, N. Y.


WILSON, Mrs. THOS. Salem. Nest of the Chimney Swallow, from Salem.


TO THE HISTORICAL DEPARTMENT.

BY DONATION.

ABBOTT, John Beverly. Leaves of the Charter Oak.

ALLANSON, Lieut. J. S. Marblehead. 4 Confederate Buttons. 2 Confederate Torpedo caps. Several pieces of Confederate fuse. $10, and 50 cent script of Confederate States.

CARPENTER, J. S. Salem. $1, $500 and two $100 (different issues) Confederate paper currency.

CONGDON, Miss EUNICE New Bedford. 3 balls and a fragment of a shell picked up outside the Fort, soon after the Confederate troops

Denslow, W. W. New York. Revolutionary button of the 57th Regiment, British Army, found on Washington Heights.

Foote, Caleb Salem. $10 note Confederate currency.

Foote, Rev. Henry W. Boston. 13 Plaster Medallions. Seeds and leaves, from various Historical places, and other specimens.


Hotchkiss, Henry L. New Haven, Ct. Photographic views of Ike Marvel's House; Temple Street, New Haven; Library Building and Alumni Hall, Yale College; Hillhouse Avenue, New Haven; Prof. B. Silliman, Sen., and President Woolsey.

Long, Isaac M. Salem. 1628 "Patriotic Envelopes" collected during the first part of the Rebellion.

Lovett, Edmunds Beverly. 3 Native swords, from the West Coast of Africa.

Ordway, Col. Albert Richmond, Va. 120 specimens, different denominations and issues, Confederate paper currency.

Pitman, Augustus P. Salem. Palmetto Flag.

Roberts, David Salem. Confederate paper currency.

Short, Joseph Salem. Various relics from the Battle Field of Gettysburg.

Tenney, Gorham D. Georgetown. Indian Arrow Head, from Georgetown.


Williams, W. A. Salem. Indian relics, consisting of a stone pot, stone chisel, stone arrowheads and a twisting-stone, also a few small bones of a skeleton, and a piece of Red Ochre, taken from an Indian grave on Salem Neck, under the embankment of Ft. Pickering.
TO THE LIBRARY.

. BY DONATION.


Atwood, E. S. Atwood's Discourse on Lincoln, 8vo, pamph., Salem, 1865.


Batchelder, Mrs. John H. The Last will and Testament of Capt. Miles Standish, Broad-sheet.

Board of Agriculture of Lower Canada. Prize List for the Exhibition at Montreal, Sept., 1865, 8vo, pamph.

Brooks, Henry M. Fidler's observations in United States and Canada, 1 vol., 12mo, New York, 1833.

Brunet, Le Abbe Ovide Quebec. Catalogue des Plantes Canadienses by Brunet, 1st Liv. 8vo, pamph., Quebec, 1865.

Chapman, John Atwood's Discourse on Lincoln, 8vo, pamph., Salem, 1865.


Congdon, Eunice New Bedford. De Obligatione Conscientiae Praelect, Decem a Roberto Sandersono, 1 vol., 12mo, Londini, 1719.

Couper, William Quebec, C. E. Fraser's Journal relating to the Siege of Quebec in 1759, 8vo, pamph.


Drowne, Charles Troy, N. Y. Annual Register of the Rensselaer Polytechnic Institute, 1865, 8vo, pamph.

CLXXII

FABENS, JOSEPH WARREN. The Uses of the Camel, a paper by J. W. Fabens, 8vo, pamphlet, New York, 1865.


HOTCHKISS, SUSAN V. New Haven, Conn. Ten pamphlets and College Exercises relating to Yale College.


LEE, JOHN C. Stewart’s Geography for Beginners (Palmetto Series) 1 vol., 12mo, Richmond, 1864.


LORD, N. J. Boston Post for April, May and June, 1865.

MACK, SAMUEL E. St. Louis Mo. Edward’s St. Louis Directory, 1865, 1 vol., 8vo.

MANNING, ROBERT. Perry’s Eulogy on Stanley, 8vo, pamph., Salem, 1865.

MEEHAN, THOMAS. Philadelphia. The Gardeners’ Monthly, vols. 2, 3, 4, 5, 6 and 7, 8vo, Phil., 1860, &c.
CLXXIII


Osgood, George P. Autocracy in Poland and Russia by Julian Allen, 1 vol., 12mo, New York, 1854.


Paine, Nathaniel. Worcester. Bullock’s address at Worcester, June 1, 1865, on A. Lincoln, 8vo, pamph.


Safford, Joshua. Spiritual Songs, 1 vol., 12mo, Boston, 1787.

Stearns, George L. Boston. 26 Pamphlets.

Stevens, Miss Caroline. Rochester, N. Y. Rochester Directory for 1847—8, 1 vol., 12mo. Several Newspapers.


Waters, H. F. G. Regulations of Med. Dep’t of Confed. States Army, 8vo, pamph., Richmond, 1861.


Wheatland, Stephen G. Roll of Students of Harv. Coll. in the Army and Navy during the Rebellion, 12mo, pamph., 1865. Porcellian Catalogue, 1865, 8vo, pamph.

Wiggin, J. K. Boston. A. L. Stone's, Discourse on A. Lincoln, April 16, 1865, 8vo, pamph.

Williams, Henry L. 12 Rail Road Reports.

By Exchange.

American Antiquarian Society. Proceedings of Meeting April 26, 1865, 8vo, pamph.


American, Philosophical Society. Proceedings, No. 73, pamph., Phil., 1865.

Boston Public Library. A Memorial of Joshua Bates, from the city of Boston, 1 vol., 8vo, Boston, 1865.


Dartmouth College Library. Catalogus Collegii Dartmuthensis, 1864, 8vo, pamph. Catalogue of Dartmouth College for 1864—5, 8vo, pamph.


Haverhill Gazette.

Lawrence American.

Salem Observer.

South Danvers Wizard.

Lynn Weekly Reporter.

Iowa State Historical Society. The annals of Iowa for July, 1865, 8vo, pamph.

Long Island Historical Society. 2d Annual Report, 8vo, pamph., Brooklyn, 1865.


Philadelphia Academy of Natural Sciences. Proceedings No. 2, for April, May and June, 1865.

Quebec Literary and Historical Society. Transactions, Session of 1864—5, 8vo, pamph., Quebec, 1865.


Yale College Library. Catalogus Collegii Yalensis, 1865, 8vo, pamph. Obituary Record of the Graduates of Yale College, July 26, 1865, 8vo, pamph.

Tuesday, October 3. Adjourned Regular meeting.

Vice President Allen in the chair.

Samuel Q. Felt, of Salem, was elected a Resident Member.

Monday, October 16. Regular meeting.

N. Weston, Jr., in the chair.

The Secretary read by title the following communication:—“Prodrome of a Monograph of the Pinnipeds.” By Prof. Theodore Gill, of the Smithsonian Institution.

James N. Estes, of South Danvers, was elected a Resident Member.

Monday, November 6. Regular meeting.

Dr. George B. Loring in the chair.

Letters were read from:—

T. McIlwraith, Hamilton, C. W.; M. S. Bebb, Washington, D. C.; W. H. Niles, Cambridge; W. F. Endicott, Canton; H. C. Perkins, New-

Donations to the Library and Museum were announced. Adjourned to Tuesday evening, Nov. 14.

WEDNESDAY, NOVEMBER 8. Stated meeting.

N. Weston, Jr., in the chair.

Adjourned to Tuesday evening, Nov. 14.
Tuesday, November 14. Adjourned Regular and Stated meetings.

Vice President Goodell in the chair.

Donations to the Museum and Library were announced.

Mr. W. P. Upham read two letters; one, written by Col. Azor Orne, of Marblehead, to Governor Adams, dated May 20, 1796, in which Col. Orne says his advanced age and infirm health forbid his attention to public business, and therefore he resigns the office of Senator for the County of Essex to which he had been chosen. The other letter was written by Samuel Sewall, afterwards Chief Justice of the Supreme Court, and is dated Jan. 27th, 1780, at Marblehead, where he was then commencing the practise of law. The letter gives a graphic account of the sufferings of the people of Marblehead from the scarcity of wood occasioned by the great snowstorm of that winter.

Mr. Upham gave a brief sketch of the character of Col. Orne, and an account of the family of Judge Sewall.

The Communication of Mr. Upham was referred to the Publication Committee for publication in the Historical Collections.

Dr. Loring made some remarks in connection with the subjects of Mr. Upham’s communication, and narrated several incidents of the poverty of the people from 1765 to 1800.

Mr. Caleb Cooke read a portion of his notes on Zanzibar, Africa, made during a residence of four years on the Island, in which he gives an account of the Island and the customs of the inhabitants, with remarks upon the Natural History of the place.

Mr. Cooke’s notes were requested for publication.

Benjamin Pickman, M. D., of Salem, was elected a Resident Member.
MONDAY, DECEMBER 4. Regular meeting.
Rev. George D. Wildes in the chair.

Letters were announced from the following:—


Donations were announced to the Library and Museum.

Capt. N. E. Atwood, of Provincetown, made a verbal communication on the Lobster.

The Lobster is found in great abundance on our coast from the southern point of Cape Cod northward, being plentiful in the Gulf of St. Lawrence. They are caught in the vicinity of the Islands of Boston harbor and along the “North shore” during the whole year. In winter they are caught in deep water. As the spring advances, they come near the shore and are taken in vast quantities.

In March, April, May, and June, large numbers are taken and sent to Boston, New York and other markets,
where they are sold to wholesale dealers; and there are also several establishments on the coast of Maine where they are put up in cans, which are hermetically sealed, for transportation to foreign markets; the fishery thus gives employment to a great number of persons.

On the North Shore, including the coast of Maine, during July, and until the next spring, the Lobsters are less plentiful, and a large portion of them are "soft shelled" and in poor condition for an article of food.

Of the Lobsters taken on the North Shore, at all seasons, more than three quarters are males, while those in the vicinity of Cape Cod are nearly all females, at all times when they are found in that region, such is the disproportion of the sexes in different localities.

In Boston the male Lobster is preferred, consequently Lobsters from Cape Cod will not sell there until they begin to catch less on the North Shore. In New York, on the contrary, they prefer the female Lobsters and the supply for that city comes from Cape Cod, when the Lobsters can be caught there.

The female Lobster is considered the best at Cape Cod, and usually they are in the best condition. Most of the males are coarse and poor, and are nearly all thrown away when they are caught.

At Provincetown, Cape Cod, the Lobsters do not come in to the shore until late in May or early in June, they are then abundant until the last of September and are in excellent condition, and are so plentiful at times that one man will catch from three to four hundred in a single day. This is the time when they produce their young. They do not deposit their eggs in a particular locality, like fishes, where they will be exposed and liable to be destroyed before the young are hatched. When the Lobster lays her eggs they adhere to the under part of the tail by a glutinous substance, and remain there in safety during the term of incubation, consequently countless millions are hatched every season.

Before the Bluefish came north of Cape Cod (1847), Lobsters were very scarce in the waters about the Cape. The reason of this was owing to the large number of small fishes which remained along the coast during the summer
and fed upon the young Lobsters, since the appearance of the Bluefish and the consequent disappearance of the smaller fishes, the Lobsters have increased tenfold, so that the supply is now equal to the demand. The Lobsters leave the shores of Cape Cod in October, and, going to parts unknown, do not return until the next May or June.

On Mr. Putnam's asking Capt. Atwood several questions relating to his late examination of the fisheries of the Merrimack and Connecticut rivers, considerable discussion ensued regarding the practicability of restocking those rivers with Salmon and Shad, and the protection of the fish; in which Messrs. Atwood, Putnam and others participated, and Mr. Putnam explained how, in his estimation, the rivers could easily be restocked, and the fish protected by the construction of proper "fish ways" over the dams, and the enforcement of laws drawn up with reference to the habits of the fishes in question.

Monday, December 18. Regular meeting.

Vice President Goodell in the chair.

Letters were read from:

Prof. Theo. Gill, Smithsonian Institution; Prof. A. E. Verrill, Yale College; Prof. J. Wyman, Harvard College; Samuel R. Carter, Paris Hill, Me.; H. A. Smith, Cleveland, Ohio; Mrs. P. A. Hanaford, Reading; John R. Bartlett, Providence, R. I., on business matters; Edw. L. Graef, Brooklyn, N. Y.; Andrew Garrett, Tahiti, South Seas; Prof. James Hall, Albany, N. Y.; H. M. Raynor, New York, N. Y.; Prof. S. F. Baird, Smithsonian Institution; Joseph E. Chase, Holyoke, relating to the publications: Natural History Society of New Brunswick, acknowledging the receipt of publications.

The Secretary read a Biographical Notice of the late Rev. Stillman Barden, prepared by Mrs. P. A. Hanaford, which was referred to the Publication Committee, and a vote of thanks was passed to Mrs. Hanaford, for the interesting memoir of our late associate.

Mr. James H. Emerton exhibited a large and handsome living specimen of Actinia marginata, taken under Beverly
Bridge, and gave an account of its habits while in confinement. He was followed by Mr. Putnam, who explained the anatomical structure and mode of development of the Actinia and its relation to the Coral producing Polyps.

The Superintendent exhibited a number of Indian relics taken from a grave on Winter Island, Salem, near the embankment of Ft. Pickering, just west of the fosse. The grave was about four feet long, two wide, and two deep, and was made by placing a few stones about two feet from an abrupt ridge on a ledge and resting other stones from these to the ledge.

The following relics were found:—Six partially finished Arrow heads of stone. Four completely made Stone Arrow heads. One Stone Chisel or Gouge. One "Twisting Stone." (A thin oval stone with two holes in it, supposed to have been used in twisting when making a kind of twine). One "Polishing Stone." (An oval stone fitted to the hand, and probably used in rubbing skins of animals used for clothing). A number of fragments of a Pot made of soapstone and of an oval shape; estimated from the fragments to have been about fourteen inches long, ten wide, and four deep. A portion of one end of the pot has a knob or handle. The pot is smoothly finished on the inside, rougher on the outside, and formed in a regular manner, with slightly ornamented or serrated edges. The bottom of the pot showed signs of its having been used over a fire.

With the above mentioned implements were found a portion of a scapular and two bones of the foot of a Cow; a premolar tooth of a Hog; a small fragment of bone which could not be determined; considerable bone dust; and as much as a shovel full of a red substance mixed with earth and bone dust, and quite a large piece of pure red-ochre.

For these relics the Institute is indebted to the thoughtfulness of W. A. Williams, Esq., the Engineer at the Fort, who, as soon as the grave was discovered, reported it to the Institute for examination.
The thanks of the Institute were voted to Mr. Williams for his valuable donation of Indian Relics.

Donations to the Museum and Library were announced.

Joseph Peabody, Hannah M. Lord and Joseph Chandler, of Salem, were elected Resident Members. John R. Bartlett, and R't Rev. Thomas M. Clark, of Providence, R. I., and Prof. Theodore Gill, of the Smithsonian Institution, were elected Corresponding Members.

Additions to the Museum and Library during October, November and December, 1865.

TO THE NATURAL HISTORY DEPARTMENT.

By Donation.

Ashby, Miss Eliza Ann Salem. Canary 16 years old.

Bosson, A. S. Salem. Skull of Fox-hound and Fox. Italian Queen Bee.

Brooks, H. M. Salem. Plumbago, from shores of Lake Huron, Canada.


Carpenter, Mr. Kelley's Island, Ohio. Fossils, from the sandstone quarry at Kelley's Island, Ohio. Beetles injurious to the Grape vine.


Cooke, C. Salem. 20 specimens, 3 species, Medusa; 3 specimens, 3 species, Mollusks; 1 specimen Fish, from Lagulhas Banks, E. Coast Africa. 20 specimens, 2 species, of Mollusks, from Champany Island, Zanzibar Harbor. 1 Mollusk and collection of Ants, from Zanzibar, E. Coast Africa. Seed vessel, from Pangani River, E. Coast Africa.

Dall, W. H. Chicago, Ill. 1 Bat, 2 Salamanders, 3 Frogs, 1 Toad, 3 Boleosoma, from Lake Goodwin, Marquette Co., Mich.

Emerton, J. H. Salem. 51 bottles of Insects, in alcohol, from Essex County.

CLXXXIII

Farmer, James Salem. An Eel of a bright yellow color on the back, sides and fins, and a light yellow color below, from Salem Mill Pond.

Gardner, William Salem. 27 specimens of Helix cellaria, from the Greenhouse of F. Putnam.

Haskell, J. P. Marblehead. Eel, from a deep well in Marblehead. The specimen is a singular mal-formation; short head, large eyes and large pectoral fins.

Hatch, Chas. Salem. Mantis, from Senegal River, W. C. of Africa.

Huntington, Geo. C. Kelley's Island, Ohio. Fossils, from the sandstone quarry at Kelley's Island, Ohio. (Lake Erie). 3 species of Beetles injurious to the grape vine and to wine barrels, Kelley's Island.

King, Miss H. Salem. Rose Quartz, from White Mountains, N. H. Jasper, from Berlin Falls, N. H.

Lefavor, WM. Capt. Salem. Specimens of wood, from 400 miles up the Uruguay River.

Lewis, James Mohawk, N. Y. Helix, 7 species, 685 specimens; Planorbis, 1 species, 58 specimens; Cyclas, 48 specimens; Succinea, 2 species, 79 specimens; Pygidaum virginicum, 29 specimens; Physa, 1 species, 389 specimens; Melania, 2 species, 777 specimens; Paludina, 4 species, 1704 specimens; Lymnea, 1 species, 23 specimens. Also a lot of mixed Fresh-water and land shells, from various localities near Mohawk, N. Y.

Lomard, Miss M. E. Boston. Specimen of Humming Bird, Trochilus colubris, from Boston.

Marcy, Plimpton. Plumbago, from Starbridge Lead Mines.

Nichols, C. F. Salem. Scopetus Humboldti, from the Mediterranean. 4 species, 10 specimens, Land Shells, from Hesse Darmstadt, Germany. Coral, from the Blue Grotto at Capri, Mediterranean. Minerals, from Hesse Darmstadt, Germany. Limestone, from the Falls of Terni, Italy. 2 Minerals from Vesuvius. Lizard and Insects, from Malta.


Owen, Prof. Richard New Harmony, Ind. A collection containing 55 species of Land and Fresh Water Shells, from the West. Also Reptiles, Fishes, Insects and Shells in Alcohol, from New Harmony, Ind.

Packard, Dr. A. S. Jr. Boston. 4 Salamanders, 2 species; 9 Lizards, 4 species; 1 Snake, from Bailey Cross Roads, near Washington, Va.


Putnam, F. W. Salem. Skulls of Deer, Lynx, Hedge-Hog, Mink, Marten (male and female) and Domestic Sheep, from Oxford Co., Me.
Collection of Insects, Shells and Infusorial Earth, from Ipswich, Mass. Collection of Fishes, Insects, Mollusks &c., from Lake Erie and Kelley's Island, Ohio. Fossils, from Kelley's Island, Ohio.

Sanborn, F. G. Boston. 210 specimens, Diptera, 100 specimens, Hymenoptera, collected in Mass.


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Sanborn, F. G. Boston. 210 specimens, Diptera, 100 specimens, Hymenoptera, collected in Mass.
Pulsifer, David Salem. Indian Mortar and Pestle, made of stone, from California.

Putnam, Mrs. Eben Salem. Ancient Pitcher.

Savory, Benjamin Salem. Pair of Snow Shoes, over 90 years old.


Ward, Charles A. Salem. Piece of “Treenail” of the old ship “Sparrow Hawk,” wrecked at Cape Cod, in 1626.

Wheatland, George, Jr., Salem. Old Shoe and Clog.

TO THE LIBRARY.

BY DONATION.


Bartlett, John R. Providence, R. I. Bibliography of Rhode Island, by John R. Bartlett, 1 vol., 8vo, Providence, 1864. Records of the colony of Rhode Island, vols. 1, 2, 3, 5, 6, 7, 8, 9, 8 vols., 8vo, Providence, 1856. Index to Acts and Resolves of R. I., from 1758 to 1850, by J. R. B., 1 vol., 8vo, Providence, 1856. Registration Reports of Rhode Island, 2, 3, 5, 6, 7, 8, 10, 11, 8 vols., 8vo, Providence, 1856, &c. History of the Criminal Law, of R. I., 8vo, pamph. Journal of Constitutional convention at Newport, 1862, 8vo, pamph. Census of R. I., 1774, 1 vol., 8vo, Providence, 1858.


Chapple, William F. Salem Gazette for 1790, 1 vol., fol. Columbian Centinel, for 1793, 1 vol., fol.


Chase, George C. Friend’s Review, 10 Nos.

Chase, George H. The U. S. Sanitary Commission, a sketch of its purposes and its work, 1 vol., 12mo, Boston, 1863.


COOKE, CALEB. The Bombay Almanac, for 1858—60, 2 vols., 8vo, Bombay. Bombay Civil List, 1859, 8vo, pamph. Four pamphlets.


DAWSON, HENRY B. Morrisania, N. Y. The Gazette (Yonkers), from May 6 to Nov. 11, 1865.


GREEN, SAMUEL A. Boston. 40 Various Pamphlets.

GRINDEL, STOVER. One bound volume of Miscellaneous Newspapers, 1894, 1895, 1896.

HOTCHKISS, HENRY. New Haven. Several Handbills &c.

KIMBALL, JAMES. Pamphlets, 12.


LINCOLN, SOLOMON. Hingham. Notes on the Lincoln Families of Massachusetts, by S. Lincoln, 8vo, pamph, Boston, 1865.

Loring, George B. Boston Daily Post, for July, Aug. and Sept., 1865.


Massachusetts Secretary of State. Acts and Resolves 1864, 4 vols., 8vo, Boston, 1865. Public Documents, 1865, 1 vol., 8vo, Boston, 1865. Supplement to Ichnotology of Mass., by E. Hitchcock, 1 vol., 8vo, Boston, 1865.


Nichols, Mary H. A collection of Account Books kept by the late Dr. E. A. Holyoke. Account Books of the late B. Herbert Hathorne.

Pickman, Benjamin The Nation, vol. 1, Nos. 1 to 19, 4to, New York, 1865.

Rust, Lydia London Magazine, for 1796, 1 vol., 8vo. 8 Miscellaneous pamphlets.


Stearns, George L. Six pamphlets on various subjects.

Story, Norman Essex. Crowell's address at the consecration of Spring St. Cemetery, Essex, Oct 27, 1852, 8vo, pamph.


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ERRATA TO THE PROCEEDINGS.

Page V, line 12, for Camby, read Canby.
" VII, " 21, " John H. Bettis, read John B. Bettis.
" X, " 13, " conventical, read conventual.
" XIX, " 13, " 1623, read 1627.
" XXXVI, " 16, " Phaleris microcerus, read Mergulus alle.
" LXXI, " 33, " P. hyalina, read P. vitrea, and for P. pen- nissewasseeensis, read P. Arethus.
" CXXXIII, " 19, after the word "yards," insert higher.
" CXXXVI, " 25, for Thomas Maxwell, read Thompson Maxwell.
" CLVIII, " 12, " Henry P. Hendrick, read Henry P. Herrick.
INDEX

To Proceedings, Vol. IV.

Achillea millefolium, LIII
Achirus liueatus, Pectoral fins of, C
Actinia marginata, CLXXX
Additions to the Historical Department, XIII, XXXVII, LXVII, LXXXIII CVI, CXL, CLIX, CLXXXIV.
Additions to the Library, XIV, XXXVIII, LXVIII, LXXXIX, CVI, CXLI, CLXXI, CLXXXV.
"Alabama," The, relics of, LXXXVI
Alluvial formation at Ware, CLXIV
Andover North, Large Elm at, CLIX
Anemone nemorosa, XXIV
Annual meeting, XXVIII, CXVI
Antennaria margaritacea, LIII
Antrostomus vociferus, LXXXIII
Aqueducts in Salem, IX
Aquilegia canadensis, XXV
Arctostaphylos uva-ursi, LIII
Asclepias incarnata, var. pulchra, LIII
Bald Pate Hill, CLII
Barden, Rev. Stillman, biographical notice of, CLXXX — resolutions on the death of, CLX, CLXV
Barn of S. Littell at Georgetown, CLII
Beverly, fort at, LAXIX, LXXV
Birds, migration of, CLXIV
Blue Birds, singular nest of, CXLIX
Blue Fish, habits of, CII
By Laws, amendments to, XCIII, XCV, XCIV, XCVII, XCVI
Caltha palustris, XXV
Cape Ann, deed of, III
Caterpillar, Tent, CLX
Celebration of Independence, Institute requested to join in, CXXX — resolutions on, CXXX
Colts amena, LXIII
Cemetery, "Oak Hill", LVIII
Cheley Matamata, LXV
Church, "Christ", Cambridge, VIII
Church, "First", Salem, II
"South", Newburyport, LXIX
Church, "St Michael's", Marblehead, VIII
Clethra alnifolia, LIII
Codfish, habits of, CI
Committee to present claims of Institute to the Public, XXXV — on Constitution and By-Laws, VII, XX, XXVIII, XXIX, XXXII
 — on election of officers, XIX, CXVII
 — on photographs, XXXV
Copley, portraits by, LIX
Cormus canadensis, LIII
Correspondence announced, II, III, VI, VII, VIII, IX, X, XI, XX, XXVIII, XLIV, XLVII, L, LX, LXI LXXIV, LXXV, LXXX, LXXXIII, LXXXVI, CXX XI, CXIV, CXV, CXVII, CXXI, CXXII, CXXVIII, CLXII, CLXV, CLXX, CLXXV, CLXXVIII, CLXXX, CLXXXIV, CLXXXV.
Craft, Benjamin, Journal of, LXXVIII
Craft, Eleazer, Journal of, LXXIX
Cristatella, LXXV
 — ophiioidea, LXI
Cuscuta Gronovii, LXI
Cushing, Hon. Caleb, visit of Institute to residence of, CLVII
Cyclopterus lumpus, eggs of, XX
Davis, Miss Eliza B., paintings of flowers, CLXVIII
Dexter Mansion, LXX
Donations from E. I., LXXI
Drosera longifolia, LII
 — rotundifolia, LII
Duck Hawk, LXXVI
 — mustrosity, XI
East Saugus, Field Meeting at, XLIII
Eloeta virginica, LII
Epigaea repens, XXV
Epilobium angustifolium, LIII — lineare, LIII
Erythronium americanum, XXVIII
Essex Historical Society, account of, II
Empatorina perfoliata, LII
 — purpureum, LII
Everett, Hon. Edward, resolutions on the death of, XCIII, XCVI
Feathery Catkins, XXVIII
Field Meetings, XLIII, XLVII, L, LIV
LVIII, LIX, CXXVII, CXLVI, CL
CLVI, CLXI.

First Church, Salem, report of Committee on, CXXXV.

Flowers collected on May-day, XXXIV
Formica sanguinea, XCLX.
Fort Conant, naming of, IV

— Glover, "a " VI, VII
— Hale, Committee on Name of, LXXX.

Gaultheria procumbens, LII
Georgetown, Field Meeting at, CL

Indian relies at, CLI, CLV
Gilpin, J. B., drawings by, XCVIII
Gloucester, Field Meeting at, L
Grapes, analyses of, LXXXV
Gun Lock, old Spanish, XCV.

Harrison, President, Portrait of, LXXIX
Helix arborea, LII

— Binneyana, LII
— cleracea, LII
— exigua, LII
— ferrea, LII
— rhombica, LII
— millium, LII
— striatella, LII
Hepatica triloba, XCV
Hesperonyza leucopus, LXXXV
Heterodon platyrhinos, LXXXIV
Houses on Essex St., Salem, 1798.
Huronia cornica, XVII

Huntington, Hon. Asahel, Pres. E. I.,
Resolutions on his declining reelection, CXXXV
Huntington, George C., thanks to for
donation, CXV

Hypericum perforatum, LII

— sarothra, LII

Impatiens fulva, LII
Independence, celebration of, CXXX
Indian relics at Winter Island, CXXIII
Iron Foundery, first in U.S., XLV

Jenks, Joseph, one of the first American
Inventors, XLV

Kelley's Island, "Red Bug" of, LXXVIII

Lafayette, Gen., autograph letter of, LXXXV
Lee, Col. and Mrs., portraits of, by
Copley, LXIX
Leontodon autumnale, LIII
Leunathanum vulgare, LIII
Leverett, Gov. John, portrait of, CXLIX
Limax campestris, LII
Lincoln, President, death of, CXIV

Lobelia cardinalis, LII

— infusta, LII
— spicata, LII

Lobster, habits of, CLXXXVIII
Louisburgh, siege of, LXXXVII
Lull House, Old, at Rowley, OL
Lyophilus exigus, XX
Lythrum salicaria, LII

Mackerel, habits of, OL
Maranta rotata, LII
Maxwell, Major, memoir of, CXXXI

May-day, customs and observance of, XXI
Meeting House, The "Old Friends," VII
Melampus bidentatus, LII
Memorial Chapel of St. Paul's, New-
buryport,
Menhaden, habits and use of, CXLII
Mineral Point Mule, CXLII
Mitchella repens, LII
Myrioidetes caudatus, LXXXIII

Nahant, Field Meeting at, CXLV

Newburyport, Field Meeting at, LVIII

— "Oak Hill" Cemetery, LVIII
Ney, Marshal, suppressed engraving of, X
Nichols, A., Life and services of, XCVII
Nichols, William Capt., Memoir of, LXXXIII

North Andover, Churches and Ministers of,
CXLII

— Dwight's Description of, CLVII

— Field Meeting at, CLV

— Great Pond at, CLVII

— settlement of, CLVII

North Beverly, Field Meeting at, XLV
Nuphar advena, LII
Nymphoidora, LII

Observatory Hill, Newburyport, change
in slope of, CLXI

Ochre at Georgetown, CLI
Gnothra badius, LII

— pulmonia, LII
Officers for 1845—6, XXXIV

— 1855—6, CXCV
Oxalis stricta, LIII

Paintings, by Copley, LIX
Pea Hen, male plumage of, LXIX
Peatinatella, LXXI
Peregrine Falcon, LXVII
Platycnemis listeri, LXXV

— Platanthera blephariglottis, LXI
Plumatella, LXI

— Arctous (pennisetawascon-
sis), LXIII

— vitrea (hydalinna), LXI
Polyon, new species of, LIXI
Pouteredula cordata, LLI
Portraits, loan of, LXXV
Post Office Box, old, at Rowley, CL
Pupa pentodon, LII

Reading, Field Meeting at, CXLVI
Red Bug, LXXVIII
Report of Committee on naming Fort
Hale, LXXXV
Reports, Abstracts of, at annual meet-
ing, CXXIII, CXVII

— Resolutions, on Tracy's lectures on Botan-
ny, CXXXVII

Rockville, South Danvers, Field Meeting
at, LV

Sagittaria variabilis var. sagittiflora, LIII
Saltonstall, Leverett, thanks to, CXLIX
Sambucus canadensis, LII
Sanguinaria canadensis, XXVI
CXXIII

Sarracenia, \( C_{\text{LIX}} \)
Saxifraga virginiana, \( C_{\text{XXVII}} \)
Scolopochus ferrugineus, \( C_{\text{LXXXIII}} \)
Sonnem grex, \( C_{\text{I}} \)
Scutellaria intermedia, \( C_{\text{II}} \)
Sewall, Joseph, engraving of \( \frac{\text{VII}}{\text{VII}} \)
Shakespeare, tercentenary birthday, \( \frac{\text{XXII}}{\text{XXII}} \)
Shells, Land and Fresh water, \( C_{\text{LXVI}} \)
Silene inflata, \( C_{\text{II}} \)
Silk worms, \( \frac{\text{VII}}{\text{VII}} \)
Sir ery and Domestic Servitude in Essex County, \( C_{\text{VII}} \)
Solanium dulcamara, \( C_{\text{II}} \)
Somnolens bivittata, \( C_{\text{XII}} \)
Spear Head, ancient, \( C_{\text{LXIV}} \)
Specimens, estimate of number of, in Hist. Dept., \( C_{\text{XXI}} \)
Sphæra tomentosa, \( C_{\text{LIV}} \)
Sphæria foliata, \( C_{\text{II}} \)
Spalding, J. C., Field Meeting at \( C_{\text{XXII}} \)
Statica linum, \( C_{\text{II}} \)
Succeæ avara, \( C_{\text{I}} \)
Totténiana, \( C_{\text{LXIII}} \)
Tebenmophorus dorsalis, \( C_{\text{LII}} \)
Thunder Storms, Perkins on, \( C_{\text{XXII}} \)
Tracy Mansion, Newburyport, \( C_{\text{LX}} \)
Trees, barked, \( C_{\text{LXIV}} \)
Tritolium pratense, \( C_{\text{II}} \)
Turtles, \( C_{\text{II}} \)
Type Setting and Justifying Machine, \( C_{\text{LXXX}, \text{LXXI}} \)
Vaccinium oxyccous, \( C_{\text{LII}} \)
Vertigo ovata, \( C_{\text{I}} \)
Victoria Regina, Allen's work on, \( C_{\text{XCIII}} \)
presented to Institute, \( C_{\text{XCVIII}} \)
Violets, \( C_{\text{XXVI}} \)
Ward, George A., Memoir of, \( C_{\text{CXXXVI}} \)
— proceedings at special meeting on death of, \( \frac{\text{LXIV}}{\text{LXIV}} \)
— resolutions on death of, \( C_{\text{LXXXI}} \)
LXIV
Ware, alluvial formation at, \( C_{\text{LXIV}} \)
Washington Street, Salem, model of, \( C_{\text{XI}} \)
Wenham Pond, \( C_{\text{LXVII}} \)
White, D. A., Memoir of, \( \frac{\text{I}}{\text{II}} \)
Whitfield, Tomb of, \( C_{\text{LX}} \)
Winter Island, Indian relics found at, \( C_{\text{LXXXI}} \)
Wreck, Ancient, on Cape Cod, \( C_{\text{XIX}} \)
Xyris bulbosa, \( C_{\text{LIII}} \)

COMMUNICATIONS, VERBAL, BY.

Abbott, Joseph H., \( C_{\text{CXXXVI}} \)
Atwood, N. E., C., \( C_{\text{CLXXVIII}, \text{CLXXX}} \)
Baker, John L., \( C_{\text{CLXXXVI}} \)
Bauvard, Joseph, \( C_{\text{LI}, \text{LXI}} \)
Bardens, J. G., \( C_{\text{CLXXXVI}} \)
Barrows, William, \( C_{\text{CLXVI}} \)
Beals, Wm. J., \( C_{\text{CLXIX}} \)

Beaman, C. C., \( C_{\text{CLXVI}, \text{CLXI}} \)
Bolles, E. C., \( C_{\text{LXVII}, \text{LXXVI}} \)
Briggs, George W., \( C_{\text{LXV}} \)
Bruce, A. W., \( C_{\text{LXV}} \)
Choate, Wm. G., \( C_{\text{LVIII}} \)
Cooke, Caleb, \( C_{\text{XXIX}} \)
Cox, P. L., \( C_{\text{CLXVI}} \)
Crosby, A., \( C_{\text{LXIII}, \text{LVII}, \text{CLXIV}} \)
Dampney, Joseph, \( C_{\text{XLV}} \)
Emerton, James H., \( C_{\text{CLXXX}, \text{CLXXX}} \)
Flint, C. L., \( C_{\text{CLV}} \)
Goodell, A. C., Jr., \( C_{\text{CXXVIII}, \text{LII}, \text{LXIV}, \text{LXX}, \text{LXXI}} \)
CXI, CLV, CLIX.

Hammond, John Q., \( C_{\text{CXXVIII}} \)
Hinks, William, \( C_{\text{LXVI}} \)
Holmes, John C., \( C_{\text{CLXXVII}} \)
Hooper Nathaniel, \( C_{\text{CLV}} \)
Huntington, Asa, \( C_{\text{LXIV}, \text{LXXIX}} \)
Hyatt, Alpheus, \( C_{\text{CLV}} \)
Ives, J. M., \( C_{\text{CLXVII, CLXXIX, CLXXII, CLXIV}} \)
Judd, C. P., \( C_{\text{CLXVII}} \)
Kimball, James, \( C_{\text{LXXXI}} \)
Loring, George B., \( C_{\text{CXXVII, CLXLIX, CLVIII, CLXXVII}} \)
Markoe, George F. H., \( C_{\text{LXII}} \)
Morse, Edward S., \( C_{\text{LXII}} \)
Mussey, Artemas D., \( C_{\text{LXII}} \)
Newhall, Wilbur F., \( C_{\text{LXIV}} \)
Parker, E. G., \( C_{\text{CLX}} \)
Peabody, Francis, \( C_{\text{LXIV}} \)
Perkins, H. C., \( C_{\text{LXI}, \text{LXII}, \text{CLXIII}} \)
Perkins, A. E. P., \( C_{\text{CLXIV}} \)
Phillips, Stephen H., \( C_{\text{CLXVIII}} \)
Philp, G. D., \( C_{\text{CLVII}, \text{LX}, \text{LXXXV}, \text{CXV}} \)
Pierce, B. O., \( C_{\text{CLXI}} \)
Putnam, F. W., \( C_{\text{LXXXVII}, \text{LX}, \text{IX}, \text{XI}, \text{XIX}} \)
V, \( C_{\text{LXXXVIII}, \text{LXXXVII}, \text{LXXXV}, \text{XCII}} \)
V, \( C_{\text{CCLII}, \text{CLXXX}, \text{CLXXIII}} \)

Rantoul, R. S., \( C_{\text{CLIV}} \)
Rich, A. B., \( C_{\text{LXIX}} \)
Richards, John B., \( C_{\text{LXIX}} \)
Ropes, T., \( C_{\text{CLXIV}} \)
Sibley, J. L., \( C_{\text{CLV}} \)
Skinner, G. W., \( C_{\text{CLVIII}, \text{LII}} \)
Slade, James, \( C_{\text{CLXII}} \)
Spalding, J. S., \( C_{\text{LXII}, \text{CLXXXVI}, \text{CLXXVII}} \)
Stone, E. F., \( C_{\text{CLXV}} \)
Sykes, John N., \( C_{\text{LXII}} \)

26
Communications, Written by.

Allen, J. A. XXXVIII, LXV, XCV
Babbage, Charles LVII
Bach, D. M. III, LXXIV
Briggs, G. W. I CLXVII
Cook, Caleb
Emerson, G. H. III
Gill, Theodore CLXV
Gilpin, J. Bernard XCVI
Goodell, A. C. CIV
Hanford, Mrs. J. H. XLVIII, CXXX
Hoxie, William LXXXIII
Huntington, George C. LXXVIII
Hvatt, Alpheus LXI
Loring, George B. CIX
Morse, Edward S. CXXIX
Packard, A. S. Jr. IV, XXI
Perkins, Henry C. CXXXII
Pilbury, L. B. CXLVI
Ralter, B. I. XCVI
Street, Gilbert L. CXII
Upham, C. W. XCV, C
Upham, W. P. CLXVII
Verrill, A. E. V, VI
Ward, G. A. II, VI
Wild, Henry LXIII
Wildes, G. B. LXXXIII

Members Elected, Resident.

Allanson, J. S. LXIV
Almy, J. F. XLIII
Amidon, A. P. XXXV
Appleton, Isaac L
Ashon, William B. XLIII
Attwill, Theodore LXXI
Atwood, Edward S. LXXIV
Babbage, Charles CXXXII
Baker, Charles XLVII
Bertram, Joseph H. M. XLIII
Betts, John B. VII
Boardman, Francis XLI
Bower, Charles XLII
Bowker, George XLIV
Boynton, Susan T. LXXXV
Brookehouse, R. Sd. VII
Brown, Nathaniel XLIII
Brown, Nathaniel Jr. XLIII
Brown, J. Vincent Jr. CXXXVII

Browning, John P. XLIII
Bruce, A. W. XLVII
Buckwell, E. W. CLVII
Butman, Francis C. CXIV
Carlen, Samuel XLVII
Carpenter, David P. CLIII
Cate,-signet
Chamberlain, Benjamin M. XXXV
Chamberlain, James A. CXXX
Chandler, Joseph LXXXIII
Chapman, John XLIII
Choute, Francis XLIII
Clark, Mrs. John XXXV
Clough, Daniel E. XLII
Cloutman, Joseph P. CLXII
Cloutman, William R. LXXIV
Cook, James P. CLIII
Cornell, A. G. XXXV
Creamer, George G. XLIII
Creevey, Charles IV
Crosby, W. XLII
Duland, John CIV
Dankers, George P. XLII
Davis, Abner H. CXXXII
Davis, S. W. XXX
Dean, Edward CXVI
Dixey, John CH
Doggett, William E. CXLI
Downing, John H. CXIV
Doyle, Mary XLVII
Drown, Thomas R. CXVIII
Emerton, William H. LXIV
Endicott, Robert R. CXLV
Endicott, Sarah B. CXLV
Estes, James N. CLXXV
 Farrington, George P. CCLIII
 Field, John XLIII
Felt, Samuel Q. CLXXXV
Fenollosa, Manuel XLIII
Fluit, Harris O. XLIII
Fogg, Julian A. XLVII
Foster, Joseph C. CXVI
Fowler, Charles B. CXIV
Fox, George CLXXXIV
Fuller, George A. XLII
Gardner, Henry R. CXXVI
Glasier, Charles H. XLII
Goldthwaite, Willard LIII
Hagar, D. B. CLV
Hale, Henry XLIII
Hale, James F. XLIII
Hale, M. H. XLIII
Hall, Harmon XLVII
Hammond, J. Leonardi CLVII
Hanson, Joseph H. XLIII
Haskell, Daniel C. XLIII
Haskell, William XLII
Hawkes, C. M. XLVII
Herrick, Henry P. CLVIII
Hill, James CLVIII
Hodges, Samuel R. XLIII
Hoffman, Mrs. Charles XLVII
Huber, Henry XLIII
Hubon, Henry XXVII
Hunt, T. Francis CXVII
Jelly, William H. XLIII
Jewett, George B. XLII
Johnson, Emery S. CXXXIX
Kehe, William H. XLIII
Kennedy, Arthur XXVII
Kibbarn, John XXI
COMMUNICATIONS

READ BEFORE

THE

ESSEX INSTITUTE.

VOL. IV.

1864–5.

[Issued Quarterly with the Proceedings.]

S A L E M:
PUBLISHED BY THE INSTITUTE.
1866.
COMMUNICATIONS.

I. D. M. Balch, On Sodalite at Salem. p. 3.


IV. J. A. Allen, Catalogue of Birds found at Springfield, Mass., with Notes on their Migrations, Habits, &c., together with a List of those Birds found in the State not yet observed at Springfield. p. 48.

V. F. W. Putnam, Notes on the Habits of some species of Humble Bees. p. 98.


IX. A. E. Verrill, Classification of Polyps; (Extract condensed from a Synopsis of the Polypi of the North Pacific Exploring Expedition, under Captains Ringgold and Rodgers, U. S. N.) Part I. p. 145.


XIII. Alpheus Hyatt, Observations on Polyzoa, Suborder Phylactolemata. With nine Plates. p. 197. (The ninth plate will be given with the continuation of the paper in the next volume).
PLATES.

Plate 1, accompanying Dr. Packard's Paper, explanation on p. 47.
" 2, " " " " " " p. 47.
" 3, " " " " " " p. 140.
" 4, " Mr. Morse's " " p. 180.
" 5, " Prof. Verrill's " " p. 195.
" 6, " " " " " " p. 196.

Plates 7, 8, 9, 10, 11, 12, 13, 14, accompanying Capt. Hyatt's Paper, have the explanations opposite each plate.
ERRATA TO COMMUNICATIONS.

Page 9, line 14, for Phalænidæ, read Phalænidae.
" 11, " 12, after Agaristidae, insert a comma.
" 12, " 6, for lignivorus, read lignivorous.
" 12, " 30, " strangely, read strangely.
" 13, " 36, " Tortricidae, read Tortricidæ.
" 15, heading, for Zygænida, read Zygænidae.
" 15, line 24, for Zyæginiæ, read Zygenidae.
" 16, " 8, " maxillary, read labial.
" 22, " 11, " gives, read give.
" 48, " 18, " Coccyzus, read Coccygus.
" 49, " 42, " ninety-two, read one hundred and one.
" 50, " 18, for June, read May.
" 51, " 1 of foot note, for 1728, read 1788.
" 56, " 1, for Pallacit, read Pallasit.
" 60, " 9, and following pages, for Dendroica, read Dendroæ.
" 61, 92 and 95, for Sûrus, read Seiurus.
" 69, " 18, for Chickedee, read Chickadee.
" 69, " 39, " Astrigalinus, read Astragalinus.
" 70, " 11, " linarta, read linarius.
" 73, " 9, " Sûrus novæboracensis, read Seiurus novæboracensis.
" 73, " 16, " iliaca, read iliaca.
" 78, " 4, " Tringites, read Tryngites.
" 80, " 23, " Pedenthwæya, read Pedentewhæya.
" 83, " 7, " Myiotoctæ, read Myiotoctæs.
" 83, " 18, " Myiotoctæs, read Myiotoctæs.
" 86, " 12, " Ochthodromus, read Ochthodromus.
" 87, " 25, " novæboracensis, read novæboracensis.
" 87, " 36, and p. 94, No. 27, for Gambelligi, read Gambelli.
" 89, " 12, for erythrorhyncus, read erythrorhynchus.
" 89, " 36, " Temn., read Temm.
" 90, " 5, " Skau, read Skna.
" 91, " 18, " troîle, read troille.
" 92, No. 39, and p. 94, No. 4, for Pallasit, read Pallasii.
" 92, Nos. 51 and 52, for Dendroæ, read Dendroæa.
" 92, No. 72, for Harporynchus, read Harporynchus.
" 93, No. 116, and p. 96, No. 93, for Squatarola, read Squatarola.
94, "1, for Hypotryorchis, read Hypotriorchus.
96, "57, " Harporhyncus, read Harporhynchus.
96, "99, " lacticanda, read laticauda.
104, "24, and page 108, line 30, for Byturus, read Anthorophagus.
131, "9, for Mezercon, read Mezercon.
131, "11, " nest, read net.
131, "25, after female, insert situated almost wholly.
132, "15, " abnormal, insert a.
175, "29, for anterior pole, read posterior pole.
180, lines 12—13, for anterior end, read posterior end.
209, line 9, for trunk read trunks.
218, "38, " cardiac and pyloric, read oesophagal and in-
219, "1, " Oesophagal Retractors, read Lophophoric Retractors.
COMMUNICATIONS.

1864.

(Communications on Historical subjects are printed in the "Historical Collections of the Essex Institute.")
I.—On the Sodalite at Salem, Mass.

By D. M. Balch.

(Communicated February 8, 1864.)

The occurrence in our neighbourhood of this rare silicate was first noticed in Oct. 1855, by G. L. Streeter Esq., and others. The locality was the recently opened syenite quarry, on the right hand side of the road leading along Collins' Cove, from the Alms House to Hospital Point. Peculiar bluish stains in a block of stone from the quarry having attracted the attention of these gentlemen, a search was instituted which resulted in the discovery of the remains of a vein of elaeolite and orthoclase, in which were imbedded amorphous masses of the blue mineral, sodalite. Unfortunately this vein, once extensive, had been mostly quarried and carted away by the workmen, and, though it yielded some fine specimens, was soon exhausted.

An account of the discovery of this mineral and some discussion thereon (in which it is erroneously called cancrinite,) can be found in the Essex Institute Proceedings, Vol. I, p. 153—155; also a more extended description and analysis, by J. P. Kimball in Silliman's Journal; 1860, Vol. xxix. p. 65.

I visited the above locality in the autumn of 1858, and traced the vein some distance, until it was reduced to a mere seam; I noticed at that time several characteristics, rendering it highly improbable that the Salem mineral had a common origin with that of Litchfield, Me., its only other locality in the States. At the place last mentioned sodalite occurred disseminated through an erratic block, and associated with elaeolite, citron-yellow cancrinite, and zircons of unusual size and excellence (all long since exhausted,) while at the Salem locality it was found imbedded in a vein of elaeolite and feldspar, with very small zircons, biotite, marcasite, plumbago, &c.; but no trace of cancrinite, the most conspicuous of all in the Maine group,
was present. Moreover, although not enough of the vein remained for accurate observation, I was of opinion that it was not peculiar to chance boulders, but a true vein in the ledge.

An analysis, performed at that time, (Sept., 1858,) afforded me results, which, as they have never been published, are given below:

Silicic Acid. ..... 37.69
Alumina. ..... 32.31
Soda. ..... 24.80
Chlorine. ..... 6.17
Ferrous Oxyd. trace.

This agrees well with the recognized formula for Sodalite, 3 (NaO SiO$_2$ +Al$_2$ O$_3$ SiO$_2$ ) + Na Cl, except that the amount of Chlorine is a little too low.

In April, 1862, while examining the ledges on the left hand of the road I discovered quite an extensive vein of elaeolite, situated about 10 rods N. W. from the old locality, and nearly at right angles with it. This new vein varies in width from a few inches to a foot, or more, and runs irregularly along the face of the ledge for 30 or 40 feet. It is composed of orthoclase and greenish elaeolite, large imperfect crystals of black hornblende, biotite, zircon, flakes and filaments of graphite and several other minerals in small quantity; there is no sodalite near the surface; it first begins to appear at the depth of 1½—2 feet. This vein was blasted in its widest part this autumn by Mr. C. H. Higbee and myself, and yielded us some very fine specimens of sodalite, varying in colour from violet to azure blue, and subtransparent. I have analysed carefully selected specimens of both sodalite and elaeolite from this vein with the following results:

Sodalite; very dark blue. Sp. Gr=2.30. Two portions a. and b. were analysed.

<table>
<thead>
<tr>
<th></th>
<th>a.</th>
<th>b.</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>SiO$_2$</td>
<td>37.64</td>
<td>37.44</td>
<td>37.54</td>
</tr>
<tr>
<td>Al$_2$ O$_3$</td>
<td>32.13</td>
<td>32.16</td>
<td>32.15</td>
</tr>
<tr>
<td>NaO</td>
<td>24.57</td>
<td>—</td>
<td>18.94</td>
</tr>
<tr>
<td>Ca O</td>
<td>.55</td>
<td>—</td>
<td>.35</td>
</tr>
<tr>
<td>Na.</td>
<td>—</td>
<td>4.18</td>
<td>4.18</td>
</tr>
<tr>
<td>Cl</td>
<td>—</td>
<td>6.45</td>
<td>6.45</td>
</tr>
</tbody>
</table>

99.61
The composition of sodalite, calculated from the formula given on the preceding page is as follows:

\[
\begin{align*}
3\text{Na}_2\text{O} & \quad 93 \quad = \quad 18.98 \\
2\text{Al}_2\text{O}_3 & \quad 153.78 \quad = \quad 31.38 \\
6\text{SiO}_2 & \quad 184.86 \quad = \quad 37.72 \\
\text{Na} & \quad 23 \quad = \quad 4.69 \\
\text{Cl} & \quad 35.46 \quad = \quad 7.23 \\
\hline
9 & \quad 4.69 \\
& \quad 7.23 \\
\hline
490.10 & \quad 100.00
\end{align*}
\]

with this the results obtained by analysis agree quite closely. It is worthy of note, that although the specimen employed was unusually deep coloured, scarcely appreciable traces of iron were detected; the alumina thrown down from its solution in aqua regia was white, and most of the reagents for iron gave negative results; it is therefore very doubtful if this mineral owes its color to iron, as has been supposed.

Elcolite  The elcolite of this locality is filled with minute specks, probably mica or feldspar, from which it cannot be separated mechanically; this impurity amounts to about 3 per cent., and remains behind when the levigated mineral is dissolved in acids. The elcolite occurs in compact masses, of a light green colour and greasy lustre; in connection with orthoclase it forms the bulk of the vein; it has not yet been observed in crystals. Heated before the blowpipe it fuses and gives off a little moisture. Dried at about 150° C, it has the following composition:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silicic Acid</td>
<td>44.32</td>
</tr>
<tr>
<td>Alumina</td>
<td>32.69</td>
</tr>
<tr>
<td>Soda</td>
<td>17.02</td>
</tr>
<tr>
<td>Potassa</td>
<td>5.09</td>
</tr>
<tr>
<td>Lime</td>
<td>5.59</td>
</tr>
<tr>
<td></td>
<td>99.71</td>
</tr>
</tbody>
</table>

It also contains slight traces of iron. A portion dried at 100° C, and then ignited lost 1.31 per cent.

The sodalite is found near the centre of the vein in thin layers. There is no doubt that this locality will furnish fine cabinet specimens when more deeply explored. As the vein strikes downward at a very acute angle, extensive blasting will be necessary; however it well deserves a thorough exploration, for,
EMERSON, ON MAGNETITE, &c., AT NAHANT.

apart from the circumstance that this is the only American locality known, the silicate is quite scarce elsewhere. Its foreign localities are Greenland, Norway, Siberia, &c.: it is almost invariably associated with clæolite, but the latter mineral often occurs unaccompanied by sodalite.

I am at present occupied with the examination of several unrecognized minerals, which are disseminated in minute quantities through the vein. From slight indications it is probable that canerinite may yet be met with; it has not, been found at either the old or new localities. The largest zircon that I have seen measured about one-third of an inch in diameter.

Salem, December, 1868.

II. On Magnetite, and an Unknown Mineral at Nahant.

BY GEORGE H. EMERSON.

(Communicated February 8, 1864.)

Besides the minerals mentioned by Dr. Prescott in his list, communicated to the Essex County Natural History Society, in the year 1839, as occurring at Nahant, I noticed, while there last summer, that magnetite was abundantly disseminated through the diorite near "Spouting Horn," and also in a similarly constituted, but more finely grained rock, a little to the West of "Pulpit Rock." In both places it is associated with chalcopyrite and iron pyrites, and in both I found small, but tolerably perfect, octahedral crystals, though it is, for the most part, amorphous.

A recent examination of a specimen of the greenstone from the locality last named, disclosed to me a crystalline mineral which I did not recognize, and whose external characters failed to identify it. It was too imperfect to determine the form, or even with certainty, the crystalline system to which it belonged, though its cleavages, three in number, led Prof. Cooke to refer it to one of the inclined systems.

The color was a dull purple on one face, and greenish gray on the other: lustre, waxy to pearly; streak, yellow; hardness, about that of calcite. The quantity was altogether too minute
III. Notes on the Family Zygaenidae. By A. S. Packard, Jr.

(Communicated February 22, 1864.)

The primary object of the writer in preparing this paper was to give as full an account as possible of the transformations of Ctenucha virginica, and the systematic position of the genus Eudryas. The very close resemblance of the early stages of the former genus to the Arctians both in structure and habits, and the fact that the genus has been recently placed among the Bombycidae by some authors, affords us an opportunity of discussing the characters of the Zygaenidae in contrast with the allied families. For this purpose it has been necessary to study the typical European genera in connection with the American types of the group. For most of my material I am indebted to Messrs. F. G. Sanborn, Boston, Mass; A. R. Grote, New
York; F. W. Putnam, who collected the larvae and pupae of *Eudryas grata*, in alcohol at Bridport, Vt., which are now in the collection of the Museum of Comparative Zoology at Cambridge; and for specimens of *Castoria* to the collection of the Essex Institute.

Besides the interest excited by the discovery of the transformation of any member of this family of moths, the near relationship of Ctenucha to the Bombycidae attracts our attention. This genus when in the larval stage, so closely resembles the Arctians, as to have misled us wholly as to its nature upon first meeting with it. Indeed we were convinced that we had found a larva of *Phragmatobia rubricosa* Saunders and were much surprised at raising Ctenucha from it. On the other hand the moth has been referred by Walker to the Lithosiidae. Here we see such a delicate balancing of analogical and structural features, that different writers do not agree which natural group to refer the object to. Thus those who place Ctenucha among the Lithosians (the highest sub-family of Bombycidae) think of course, that the Zygenid characters which the moth possesses are those of analogy, while those of a contrary mind judge the same moth to be a Zygenid with the less essential features borrowed from the Bombycidae. This leads us to the enquiry, how far analogy differs from affinity. It is evident that the relation is only relative and not absolute. Typical animals are those having the greatest mass of characters to isolate them from others. For instance, among the Zygenidae, the Fabrician genus *Zygæna* is the type of the family, just as in the Bombycidae, *Telea Polyphemus* Hübner, or, still better, *Attacus Atlas* Linn, are the types of that family. In *Zygæna* we have forms the most unlike other genera of its family. There is not a character drawn from its structure or habits which is not *su generis*, original, unique. It is the pattern upon which the family form is moulded, and the moment the form is slightly modified, and any resemblance to some other moth is superadded, as in *Syntomis* which already begins to show Lithosian affinities, that moment something has gone from it. There is a loss in affinity, and what is thrown in to supply the vacancy is a gain in analogy.

In the genus *Attacus* we have massed together a number of characters which are those of pure affinity (using the term in its technical sense, otherwise it has no meaning in specifying
what is typical.) This is without doubt the most isolated group in the whole family. If we step higher or lower we find changes of form introduced which, slight as they are, detract from the singleness of the type. *Bombbyx mori* the silk-worm, stands next above, in the adjoining subfamily Bombycinæ. But the larva is greatly elongated, with a slight tubercle on the end of the body, being in fact sphingiform. The moth has short narrow falcate wings, which are no longer than the body. *Attacus* has falcate wings, but they are very broad and are three or four times the length of the body, while the larva is short, large and plump. The next step below is *Tropaea Luna* Hübner. This is colored green and the hind wings are "tailed." The family color is brown, not green, and the "tail" is borrowed from *Papilionidæ*, *Lycaenidæ* and *Phalangidæ*. If we descend further down in the scale we find *Hyperchiria Ino* Walker, possessing manifest analogies to *Clisiocampa* in the elongated body of the larva, the pupal form and the outlines of the imago.

The genus *Eudryas* stands at a nearly equal distance from the beginning and end of its group, and is still loaded down with features which are so unlike *Alypia* to which it is in reality closely allied, that Harris refers it to the Notodontians, though fully acquainted with its larva, and Walker refers it to the *Noctuidæ*. Its coloration is most deceptive, since the species instead of being blue or green, are white with yellow, green and purple markings. The body is unusually hairy, the antennæ are filiform as in the *Noctuidæ*, the legs tufted as in *Pygæra*, *Daiana* and allies, and the metallic scales on the thorax are only found so far as we know in *Tolype*.

The first attempt to group the Fabrician genera *Procris* and *Zygæna* was that of the authors of the *Wiener Verzeichniss* in 1801. They divide the Linnaean genus *Sphinx* into seven groups of which the last, "G," "Sphinges maculates," comprises the *Zygænidæ*, thus making it equivalent to all the *Ægeriæ*, and to any one of their five groups of the true *Sphinges*, i. e. the genera *Sphinx*, *Smerinthus*, &c.

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**ESSEX INST. PROCEED. VOL. IV. B.**
In 1807 Latreille* first under the family name Zygenides groups into three sub-divisions: I. Sesia, Thyris, Zygaena, and Syntomis; II. Procris and Atychia, and III. Glaucopec, Aglopec and Stygia. He places Castnia however among the Sphingides, placing it at the head of the family, and next to Hesperia. Afterwards according to Klug,† in the article "Papilio" in the "Encyclopedie methodique," by Latreille and Godart the group "Hesperi-Sphinxes" was formed for Castnia and Agarista, and they were still placed before the Sphingides. Also in the "Familles naturelles du Règne Animal," 1825, we see the Hesperi-Sphinxes isolated as a distinct "tribe" equivalent to the "tribe" Sphingides, and standing at the head of the "family" Crepuscularia.

Hübner has shown more than any other writer how important a guide in arranging the Lepidoptera is their style of coloration, and how useful it is in distinguishing genera. Relying upon this character perhaps more than any other, this bold innovator‡ sub-divided the Lepidoptera into generic groups which are now commonly received; thus showing an appreciation of the modern idea of a genus, far in advance of his time. Depending however too much on slight characters, his groups of genera are often forced and unnatural.—The Zygaenidae are placed in the same order as observed by Latreille.

Hübner places them at the head of his second "phalanx" Sphinxes, composing the tribe "Papilionides" which is a group equivalent to the Sesia Hübner (Ægeriæ of authors,) and also to the "Sphinxes legitime" Hübner. It embraces three "stirps;" i.e. I. Zygaena for the single genus Zygaena. II. Chrysaures which includes Procris, Atychia and Syntomis, and III. Glaucopec, for Glaucopec and a large number of its allies.

He placed Castnia however, among the butterflies, immediately after Colias, and Alypia among the Pyralidae, next to Ennychia which it closely resembles in its coloration.

In 1829, Boisduval§ while following Latreille in excluding

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* Genera Crustaceorum et Insectorum. Tom. iv, p. 211.
‡ Verzeichniss bekannter Schmetterlinge. Augsburg, 1816. 8vo.
the *Castniæres* Boisduval, and placing the *Sphingidae* between these and the *Zygaenidae*, goes a step farther in establishing the group "*Procrides*" consisting of those genera provided with pectinated antennæ. He considers the group as equivalent to the *Sesiæres* (*Ægeriidae*), to the *Castniæres* and likewise the *Zygaenidae*. The elimination of *Sesia* and *Thyris* is an improvement upon Latreille.

In 1832, Newman* divides the *Zygaenidae* into *Stygiidæ* and *Glaucopidæ*. In 1839, Dr. T. W. Harris† like the author just quoted divides the "*Sphinges adscitæ*" Linm, into three families, i.e. *Agaristidæ Zygaenidæ* and *Glaucopidæ* which last name must be a synonym of Biosduval’s "*Procrides,*" since it is used in exactly the same sense.

The year after, Westwood‡ under the term *Uraniidæ* adopts a provisional arrangement of *Urania* with *Castnia* and allies. He rejects the name *Zygaenidæ*, using instead *Anthroceridæ* Westwood, since Stephens had already rejected *Zygaena*, "the name *Zygaena* having been preoccupied in Ichthyology." This is probably an error, since Latreille’s name has priority over Cuvier’s.

Of all the writers upon the *Castniæres*, Klug has been the most thorough. His article "Üeber die Lepidopteren-Gattung *Synemon*," is a positive addition to our knowledge of these moths. Besides the quite full historical account of the group, and the descriptions and good figures of new species of the Australian genus *Synemon* Doubleday, we have a mass of new facts concerning the comparative structure of the genus above named, and very precise information about the transformation of the South American genus *Castnia*, fully confirming the observations of Madam Merian, which had been doubted by Westwood, together with important remarks on the classification of the whole group to which these two genera belong. With Boisduval he agrees in throwing *Urania* out of the group and

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‡ An Introduction to the Modern Classification of Insects, 1840, Vol II., p. 369.
§ Abhandlungen der Königlichen Academie der Wissenschaften zu Berlin, (1848), 1850.
placing it between the Noctuidae and Phalænideæ. He is aided by a fortunate discovery in arriving at the proper location of Castnia. Among some plants received from Kingston, Jamaica, was a species of Catastetum, from the bulbs of which hatched the perfect Castnia, proving that the habits of the larva is lignivorus like the Sesiae, Ægeriæ and Cossus and Heptalus. In nearly his own words, the burrowing habits of Castnia, the larva of which forms no silken cocoon, are like Sesia, but the imago differs, and as Dalman observes is nearer Zygaenæ, whence he concludes that "they seem much more like the beginning of the Spinners (Bombycidae) and through Glaucopis and a succession of other genera form the passage to Ochsenheimers Euprepia, the genera Arctia, Chelonia, Callimorpha, etc."*

This is indeed bringing order out of confusion. He then proceeds to remark that Castnia and its Australian representative Synemon, which probably has similar habits, belongs to a group of borers, at the head of which stands the "Sesien," (Ægeriæ) then Thyris, Chimera. Stygia, Eudagria, and farther on Cossus, Zeuzera, Heptalus and Crino, to end with Castnia. He speaks, from want of material, with some doubt of the affinities of Oikeicus to this group of borers, but considers that this genus may easily lead to Zygaena.

Dr. Herrich-Schaeffer† proposes a different arrangement of the family under consideration; while placing the Castniaria H-S next to the butterflies, he follows with the Epiapiaidea H-S (Hepiali Linn.), next with the Sesioidea H-S (Ægeriæ); then come the Pyromorphina H-S a group made for Pyromorpha dimidiata H-S and another genus Chrysopygus H-S. which leads to Zygenoidæ H-S. He then strangely interposes the Sphingidae, Bombycidae, Phalænideæ (Geometrideæ) and Noctuidæ between the groups of Zygenidæ above named, and the rest (Agarista and allies, Syntomis and Ægocera) of the family. Under the names of Aganaida and Agaristoidea, which groups he makes the equivalent of the Arctioidea, and the other groups of moths enumerated above, he places the genera Aganais, Agarista and Ægocera Latreille. He interposes between these two groups, a sub-family of the

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* Loc. cit. p. 255.
† Sammlung neuer oder wenig bekannter aussereuropäischer Schmetterlinge. Regensburg, 1850-58,
Bombycidae, i. e. the Arctioidea H-S (Arctiidae Leach, 1815,) and concludes the large moths with the Syntomoida H-S. (Glaucopites Newman, 1832.) Then follow the Microlepidoptera. The series of large moths ends with Ctenucha virgo H-S. which he places next to the Crambina H-S.

In the Catalogue of Lepidoptera Heterocera in the British Museum, part I and II, 1854, Walker adopts the Castnians, and the Zygaenides, as groups equivalent to the Sphingidee and the Bombycidas, but places several undoubted Zygaenid genera, i. e., Ctenucha, Aglaope Americana Boisd. and Lycomorpha among the Lithosiidas. So far as I am aware Horsfield and Moore* are the first authors who virtually placed both the Castnieres and Zygaenidæ among the Bombycidae, considering them "from the examination of the metamorphosis" of the genera of these two groups which fell under their observations, as belonging to the Lithosiidae. This work is indispensable to the American student of the Zygaenidæ and Bombycidae, since it represents the transformation of many Asiatic genera closely allied to those of America, which are not found in Europe.

I would here draw the attention of entomologists to important characters for classifying the Lepidoptera which have been hitherto overlooked. I refer to the characters drawn from the pieces of which the head and thorax is composed. Each family has a distinct form and size, and a different way of combining the three principal pieces which compose the head: i. e. the occiput which lies behind the ocelli; the epicranium which lies behind the antennæ, and the clypeus which in the Lepidoptera generally occupies the "front" of the head. In the family under consideration and the Bombycidae, those parts vary markedly in the different genera, and in each sub-family of these two families there is a distinct form for the clypeus, more especially. There are also two forms in the Noctuidæ which affords to us strong indications for their division into but two sub-families. There is also a distinct form for the Geometridæ, the Pyralidæ, Tortri- idæ, and Tineidæ, which gives a peculiar facies to each of these groups.

The mouth parts: i. e., the mandibles, maxillæ and labium

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have not given valid generic characters, with the exception of the labial palpi, the value of which are well known.

In the thorax also there is a family form, at least, in the Zygaenidæ and the succeeding group, the Bombycidæ. The comparative length and breadth especially of the meso-scutum and scutellum are of value, as are in a less degree the relative size and position, slanting or vertical, of the flanks of the thorax. But this last character owing to the remarkable constancy in the form of the thorax and abdomen of all Lepidoptera, is not often of generic value*.

I have also found the genital armor most useful in separating genera of moths, but for this purpose alcoholic specimens are necessary so that these parts may be drawn out and dissected. There is however no one general family type to which their great variations of form can be reduced.

These characters are of special use in locating mimetic forms. The Zygaenidæ do not imitate the lower moths, nearly so much as do the Bombycidæ. Indeed just as embryologists arrange groups in series by their greater or less resemblance to low embryonic forms, can we arrange animals by the greater or less proportion of mimetic forms in any group.

Mr. Bates (Linnaean Trans. 1862) has considered that the Heliconidæ stand at the head of the Lepidoptera. We venture to question this position of the family from the fact that this family mimics most wonderfully the Zygaenidæ. An instance may be quoted from Stoll of a genus allied to Glaucoptis which he calls Papilio Zubina (Pl. XI. fig. 3.) Judging from the plate simply, the antennæ, the neuration and the brown and yellow bands and white spots are unmistakedly Zygenid; the general form of the body and of the wings are like Heliconia. Among the Pieridæ, Colias has a mimetic form in the Australian Heterusia pulchella Koller figured by Herrich-Schäffer. But we cannot think of any other butterfly, or of any Hesperians, Sphingidæ or Ægeriæ which imitate the lower moths, and therefore we consider this as an argument for the superiority of their rank. On the

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*We might here say, that before we were aware of the use Dr. Leconte had made of the epimeral and episternal pieces in the Coleoptera we had used these parts to good purpose in the hymenoptera, where they are exposed to constant variation in genera and groups of genera, as well as families.
other hand it may be argued that the Zygænidæ are lower than these families, because there are forms among them (Castnia) which imitate the butterflies, others (Alypia) which resemble the (Hesperiadæ) and others again (Glaucomis and allies) which resemble the Ægeriadæ. Thus the lowest genera imitate the lowest family enumerated, while the highest genus Castnia mimics the butterflies. As happily expressed by Professor Dana, it is "a characteristic of a type of the very highest grade, that it is extensively copied after."

To distinguish Castnia therefore from the Hesperians we look for the square clypeus, and the neuration peculiar to the Castnianæ. In the lower genera allied to Glaucomis we look at the square clypeus, which is often scutellate, and also at the long slender acute porrected palpi, the pectinated antennæ, and also the peculiar neuration which it is difficult briefly to describe. In certain genera of Bombycidae, allied to Limacodes, which are difficult to distinguish from some Tortricidae, the practiced eye can by the large broad clypeus which carries the insertion of the antennæ very high up the front, at once locate the genus. Likewise the large broad clypeus enables us to separate those Notodontians from the Noctuidæ, which they resemble. If we could select with safety any single character among the moths upon which to rely, it would be the clypeus.

The Zygænidæ are distinguished from the neighboring families of Lepidoptera by the following characters: the head is of moderate size and entirely free from the thorax, but not so much so as in the Ægeriadæ or Noctuidæ. There is a great equality in the size of the three tergal pieces of the head: i. e. the occiput, epicranium and clypeus. The length of the two first of these pieces taken together is about equal to that of the clypeus, but more generally shorter, and as among all Lepidoptera the epicranium is the larger and longer. On the flanks of the head, is situated an ocellus just in the rear of the insertion of the antennæ, which are inserted on the side of the head, in front of the epicranium which narrows, and is often bilobed between their bases. In the typical genera the antennæ are simple, not setose, and slightly swelled in their middle, or partially clavate towards the tips as in Zygæna. Eyes large and globose. The clypeus is nearly square, the sides hardly con-

verging towards the front edge which is very straight, with the edge slightly revolute. Its surface is convex, often remarkably so, sometimes ending in a large mesial tubercle. The mouth parts do not afford good family characters in distinction from the Sesiidae and the higher Bombycidae—the mandibles are slender, curved, with dense setæ applied upon the well-developed maxillæ. Labium small equilaterally triangular. However there is a distinct form of the maxillary palpi, which are long, slender, acute, slightly ascending, but porrect; the third joint is long, acute, thinly scaled, and very free from the head; the first and second joints very equal in length, and with long thin scales beneath.

Thorax moderately stout, longer than broad. The pro-thorax is well developed, especially the scutum (collar), the two halves of which are partly separate, large suborbicular, and often gaily colored. The meso-scutum is small, quadrangular, shorter than broad, the sides bent down angularly under the patagia, which are half as long as the meso-thorax in Zygæna, but more generally much longer. Scutellum nearly as long as broad, lozenge-shaped, the posterior half longer, being more produced than the anterior half. The meta-thorax much as usual, though the scutellum is a little longer and more elevated than in the other families. The flanks cannot be properly described without alcoholic specimens, however, they are slightly inclined—the middle flanks occupy more than half the lateral surface of the whole side of the thorax, while the hind flanks are one fourth to one half as broad as the middle ones. Wings long and narrow, though often triangular, with very short nervules one third as long as the wing. The primaries equal the body in length; they are nearly three times longer than broad, while the costal and inner edge are more parallel than in the other moths, except the Ægeriæ. Costa straight, apex much rounded; outer edge full, half or two-thirds as long as the inner, internal angle well rounded. The costal space is narrow. The nervules more generally arise far beyond the middle of the wing, and are of very equal lengths, thus making their interspaces very equal. The s.c. nervules are unusually short, especially the fourth, while the fifth equals in length the median nervules. Both the subcostal and median nervules curve inwards and throw off the discal nervules at opposite points, which are together curved very regularly inwards, thus making the discal space which is nar-
row, less triangular than usual, and less angular at its centre and broader end. The fourth median arises much farther out beyond the middle of the wing than usual, and hence much nearer the three first, the three interspaces being of nearly the same size.

Secondaries nearly twice as long as broad, though more generally one half longer than broad, reaching half way to, or more rarely beyond the tips of the abdomen. Costa straight, but a little convex in the middle. Apex acute and much produced, or obtuse. The outer edge is nearly as long as the costa, the internal angle much rounded, and the internal edge is one half to a third shorter than the outer edge. The neuration differs greatly as in the primaries. In the typical Zygenidæ the subcostal goes straight to the apex, and the single fifth nervule arises by an angle connecting with the discal nervules, being equal in length to the four median nervules which are remarkably short, arising at the outer third of the wing. In Ctenucha and also in Alypia the subcostal sends off a branch as usual, which is not angulated near its origin, while the median nervure has only three branches, which arise near the middle of the wing.

The legs are rather stout, but well proportioned, the joints, in the typical species of very uniform size throughout, and thinly scaled, while in the Castniæ they are stouter, more sphingiform with long sharp spines, and hairy femora, while the anterior tibiae are densely pilose.

Abdomen short, being generally twice the length of the thorax, and thick, obtusely pointed at the tip, sometimes partly truncate. The scales in this family are fine, powdery and scattered thinly over the surface, often leaving naked spots on the wings. Upon the thorax and head the squamation is so fine and thin that the different parts beneath can be often easily distinguished. In the Castniæ the scales become larger, more hair-like, approaching somewhat the Sphingidæ.

Often when in doubt about the position of some genera of this family, the peculiar dark coloration of this group aids to settle the question. The general color of the Sphingidæ is cinereous, that of the Bombycidæ is brown, the Ægeriæ and Zygenidæ differ wholly in being bluish, with purplish shades of black or entirely black alternating with gay colors, golden, bronzed, or white and red. However the typical genera are ornamented

ESSEX INSTITUTE PROCEED. VOL. IV. C.
with green and bright red patches (Zygaena), or are wholly green (Ino), or as in Procris, Ctenucha and allies, deep Prussian blue, or with shades of dark brown with red about the head or pro-thorax. An exception to this general rule is Eudryas with its remarkable arrangement of colors.

Of the two subfamilies into which this family is divided, the Castniareas approach nearest the Sphinges, while the lower subfamily, the Zygeninae, have the closest affinities with the Ægeriæ. They both in the structure of the head resemble much the Ægeriæ, since in them the clypeus is square, being broader in front than in the Zygenidae. But in the last named group the epicranium is shorter, so that the antennæ arise nearer the base of the head; also in the Ægeriæ, the occiput is nearly obsolete; and they are remarkable from the fact that the head is greatly advanced in front of the insertion of the primaries. This is owing to the great length of the thorax, which agrees with the slender abdomen, and long and narrow wings. Owing to the last character the style of neuration differs from the Zygenidæ in the branches of the nervures proceeding straight out to the outer edge, and being parallel with the costa and inner edge, which last is greatly elongated, and parallel to the costa. Thus while the nervules in both families are very short, one third as long as the whole wing, all arising very near the outer edge; in the typical Zygenidæ they are curved more downwards, and are even shorter. In all the wing characters there is a much greater variation than in the Sesiæ, and we have broad wings, becoming almost geometriform, being equilaterally triangular, as in Euremia from India and China, with long nervules, arising within the middle of the wings.

Another character of importance is the form of the mesoscutellum which differs from the Sphingidæ and Ægeriæ in being much longer, especially produced behind, where it is much rounded. In Sphingidæ it is subacute. In the typical Bombycæ (Attaci) it is perfectly square behind. The tergum of the meso-thorax affords better family characters than the other parts of the thorax.

Among the typical genera (Zygaena, &c.) the abdomen is shorter than in the families mentioned above, though this is a character of little value.
FAMILY ZYGÆNIDAÈ.

Larva. It is difficult to give even in general terms the family characteristics of the larva of the Lepidoptera, since there are so many exceptional forms. In characterizing those of the Zygaenidae we select that of the European Zygaena, and say from the figures and descriptions of authors that they are short and thick fleshy cylindrical larvae, whose bodies taper rapidly towards either end. The head is very small and partially retractile within the anterior part of the pro-thoracic ring. The tip of the abdomen is likewise very small and more acute than in the typical form of other families. The feet are sixteen in number. The rings are convex, short, and with transverse rows of unequal tubercles which give rise to thin fascicles of very short evenly cut hairs, which are seldom dense enough to obscure in the least degree the outlines of the body, and are often nearly absent. Often there are one or two transverse bands of gay colors or of dark spots between the rows of tubercles and the edges of each ring. The colors are greenish or yellowish. This form is more especially that of the subfamily Zygaeninae.

When we depart from this typical form and ascend to the neighborhood of Alypia and allies we find them elongated, with large heads, and with a supra-anal tubercle towards which the body imperceptibly increases in size: the colors are gay, and the long unequal sparse hairs arise from minute tubercles. This form is evidently influenced by the close approximation of the genera to the Sphinges. This is the prevalent form of the Castniare. On the other hand in descending towards the Bombycidae, we find the larvae again elongating, but not by any means so much so as in the Castniare, while the head still increases in size, and the body is rather thickly clothed with hair, with mesial tufts of larger and party-colored hairs.

The larva of Ctenucha resembles the Arctians very remarkably. Stoll* figures the larva of a genus which resembles closely the larva of Halesidota, which is still longer than Arctia, being related to Orgyia. It is elongated, very hairy, with long pencils of party-colored hairs before and behind. The pupa is like that of Arctia, while the moth belongs to the old genus Glaucoptis, having feathered antennæ and a Sesia-like body.

When the larva is about to pupate, it constructs a dense silken cocoon generally, but Eudryas and Castnia make no

*Supplement a l'Ouvrage, intitulé Les Papillons exotiques. Par M. Pierre Cramer. PI. xi. fig. 1,a, b, c, d.
cocoon, and as we show below that of Ctenucha is formed simply of hairs. There is but one brood in the year; since the larvae hybernate, and at the beginning of summer pupate, to become moths in the middle of the season.

Pupa. The pupa of Zygaena is represented as of a form intermediate between Ågeria and Arctia, being much stouter than the first and somewhat more so than the last. The head is prominent and the tips of the abdomen subacute. Ctenucha is more arctian, while Castnia and Alypia are elongate slender, with the head made especially prominent by the tuberculous clypeus.

In common with the Sphingidae and Ågeriidae, the Zygaenidae are confined to the temperate and tropical regions. The family type Zygaena has its metropolis about the Mediterranean Sea, and thence spreads to the north of Europe, and southward to the Cape of Good Hope. Z. exulans is found as far north as Lapland, and in vertical distribution rises 6000 to 7000 feet in the Alps of Styria.

The types of the Castniares however are tropical American. Alypia is the most northern genus, extending into the Hudson Bay Territories. Glaucopis and allies which form an immense number of species are almost exclusively tropical American. In Australia as Klug observes, Castnia is represented by Synemon. The American genus Eudryas is represented by very closely allied South African genera.

From the study of the illustrations of Hübner, Moore and Herrich-Schäffer we are convinced that there are forms which lead from Castnia to Zygaena so gradually as to unite the old families of Castniares and Zygaenidae into a single group equivalent in value to the Sphingidae, Noctuidae or Phalenidae of Latreille’s families of moths, first proposed in 1807 in the “Genera Crust. et Insectorum.” The genera Eusemia, Neochera, Anagia, Milonia, Eterusia, Pintia and Agalope show this transition. They have the simple antennæ, in most cases; the broad secondaries, the long nervules, stout hairy palpi and bands and spots of the Castniares, with more superficial but striking resemblances to the Glaucopides among the Zygaenidae.

It follows, therefore, that the two subdivisions of the groups are subfamilies, each of which I would consider as the equivalent of the Lithosiidae, the Atticidae or any other one of the subdivisions of the family Bombycidæ.
In retaining Latreille's term "family" for these large groups of moths, I am aware that I go contrary to the practice of modern lepidopterists who give names to very small groups of genera after raising them to the rank of "families."

Subfamily Castniares Boisduval.*

The family name given by Boisduval to this group is adopted instead of Latreille's term Hesperi-Sphinges.

The most trenchant characters are, the large head, the prominent front, the long simple filiform, subelavate or subprismatic antennae, the stout bushy palpi, with the terminal joint very slender and projecting much beyond the head. The convex clypeus is square, but often narrows in front, and is provided with a mesial tubercle projecting beyond the hairs. The body is stout and the thorax often pilose. The meso-scutum is longer than in the Zygeninae, approaching more in this respect the Hesperiidae. The fore-wings are stout, broad triangular, with long nervules. Secondaries broad, with very obtusely rounded apices, while the internal angle reaches nearly to the tip of the abdomen, which is moderately long and terminates in a slender subacute tip. The legs are stout, often very hairy and somewhat tufted.

The larval characters given below are drawn from the caterpillars of Alypia and Eudryas preserved in alcohol, and from figures of those of Psycomorpha epimenis Harr. drawn by Abbot and now in the library of the Boston Society of Natural History; of the Australian Agarista glycinæ Boisd. (Phalænoides glycinæ Lewin); and of the East Indian genera Eusemia Dalman, Hypsa Hübner, Anagnia Walker, Attева Walker, Lyceline Moore and Bizone Walker, which are figured in Horsfield and Moore's "Catalogue."

The body is elongated, cylindrical, the eighth ring is either considerably enlarged, towards which the body increases in size, or it is simply humped on the upper surface of the ring. From this ring the end of the body rapidly diminishes in size, laterally and

*Monogr. Zygenides, 1829.
especially from above where it slopes down suddenly to the supra-anal plate which is short, broad and lunate.

There are six rows of small tubercles, or spots representing tubercles, which are largest above, and decrease in size on the sides of the body. On each ring the four tergal rows arrange their tubercles in a trapezoid. There are three rows on each side, and another row at the base of the legs. These give rise to single hairs, or slender spine-like hairs. The rings themselves are not very convex, and between the hairs and edge of the ring are crossed by bright or dark colored narrow lines or rows of spots which gives the larvæ a gay appearance.

The head is rather large and free from the pro-thorax. It is broad above, as well as below, and three-fourths as wide as the body. The clypeus is larger and its anterior division long, being equal in breadth to the length of the posterior division: its edge is not thickened, but when seen from beneath is slightly arched upwards.

The labrum is not very deeply bilobate. Each lobe may be divided into an outer corneous portion and an inner softer fleshy part. The labium and maxillæ are large and broad.

**Castnia Fabricius.**

In examining *Castnia*, a moth which is so completely Hesperian in its analogies, we are not at all baffled in ascertaining its family characters. Though with the broad head, long thorax and peculiar shape of the wings which belongs to the Hesperians, and the form of the abdomen of that group it still differs essentially even in these parts.

The head is one half narrower, the clypeus is still square, and the antennæ are inserted much higher up the front than in Hesperia. The epicranium (vertex) is one half shorter than in Hesperia. The antennæ do not differ greatly from Zygaena, and often resemble that genus much more than the antennæ of the Sphingidae. The palpi are more like the higher butterflies; in Alypia they are more like those of Hesperia.

The meso-thorax, as well as the pro-thorax, is greatly elongated. The meso-scutellum is very long and rounded behind instead of being short and acute posteriorly as in the Bombycidæ; in this respect closely resembling the Hesperians and butterflies generally.

In the triangular primaries, with their regularly curved costa,
the produced and acute apex, and the very straight outer edge and rectangular internal angle; and in the peculiar form of the secondaries, the analogies to the Hesperians are remarkably close. This is shown especially in the fact that the internal edge of the secondaries is longer than the outer edge, much of which goes to make up the broadly rounded apex. They also reach out even with the tip of the abdomen; in Coronis, Cocytia and Alypia they are considerably shorter.

But in considering the neurature, we find it pursuing a plan very diverse from all the butterflies, which at a glance reveals the affinity of Castnia to the other Zygaenidae. The subcostal nervule in the butterflies throws off its five very short nervules upon the costa. In Castnia all the nervules are remarkably long, and are directed in just the reverse direction from the Hesperians, i.e., downwards and outwards upon the outer edge.

The four median nervules are remarkably long and continuous with the nervure. In Hesperia and other butterflies the first median often becomes the "independent" of authors, and the three below are grouped together separately. Castnia and the allied genera have an additional nervure, the submedian, which is generally in the Lepidoptera obsolescent. In the secondaries the subcostal is like that in Hesperia, but there are four median nervules, while in Hesperia there are three only, and they are much longer, arising very near the base of the wing.

The coloration and squamation which are so near the Hesperians have always been remarked by authors.

**Alypia** Hübner.

Head small; front long, pilose, the scales surrounding the conical projection of the clypeus, but not concealing its apex. Antennæ long, a little thickened in the middle, with scattered lateral setæ. Clypeus square, the front margin very obtusely round-pointed. First and second joint of the palpi stout, pilose; third joint long slender; the whole palpus porrect, the third joint passing beyond the front of the head.

Thorax more than usually pilose, especially the pro-thorax and patagia. Wings short and broad. The primaries are one-half as broad as they are long, being broadly triangular. The nervules are rather short, and arise at a greater angle with the main nervures than in *Eudryas*. Secondaries rounded, trian-
regular, the outer margin full, rounded at the apex and also at the internal angle.

The legs have the first pair of femora and tibiae densely spreading pilose and stretched out in front of the body as in some Notodontians. The hind pair of legs are large and long, with stout tibiae armed with two unequal pairs of spines, of which the terminal pair is the shorter.

In coloration the species are black moths with large white and yellow rounded patches upon both pairs of wings, and with deep vermillion upon the pro-thorax.

**Pupa.** The specimen described is from the cast skin, consequently broken, from Dr. Harris' Cabinet, kindly loaned me by Mr. Scudder. Compared with that of *Eudryas* the body is not at all contracted at the base of the abdomen, there being a continuous curve from the pro-thorax to the tips of the abdomen, while that of *Eudryas* is very sensibly contracted at this point. The head is too much injured to describe. The pro-thorax differs in being square behind, where in *Eudryas* it is a little pointed. The meso-scutellum is not at all defined in outline, nor is the whole meso-notum so much produced behind, being more bluntly rounded, thus making the meta-thorax longer. The wings are in form, relative size and position as related to the abdominal rings, much as in *Eudryas*. The basal abdominal rings are beneath, broader than in *Eudryas*, and the spiracles are much more distinct.

The abdomen tapers much the same in both genera, the chief difference lying in the tenth ring and the genital parts. This ring is much smaller and one-half shorter. Seen from above the ring is larger; the upper pair of tubercles are broad and squarely docked, and the tergum is lengthened out even with them, while the surface has longitudinal rugae. The lateral tubercles are obsolete. Beneath is a distinct curved line, which is the trace of the claws of the anal legs of the larva. This mark is obsolescent in *Eudryas*. The larva previous to pupating constructs an earthen cocoon, like that of *Ægeria*, according to Harris

**Eudryas** Boisduval.

Head rather large, eyes and ocelli large and full. Antennæ not thickened in the middle, with short lateral setæ in the male and pubescent beneath. Front prominent, densely pilose, though the hairs hardly conceal the conical clypeal tubercle, which
last is very large and truncated at the apex. The clypeus in front is square. Palpi large, porrect; two basal joints evenly pilose to the tip of the second. Third joint small, cylindrical, short, porrect reaching nearly one-half its length beyond the front.

Thorax pilose, with a broad median crest of metallic-colored scales, succeeded by a dorsal row of similar tufts upon the basal half of the abdomen which diminish in size from the thorax.

Wings shaped as in Alypia, but the primaries are more rounded at the apex, internal angle rounded. The nervules are nearly continuous with the direction of the main branches. Subcostal nervules long, first subcostal arising one-third of the distance out to the apex of the wing. The hind wings hardly reach to the outer fourth of the abdomen, being much as in Alypia. Outer margin a little scalloped below the apex, below straight and parallel with the costa of the primaries. Discoidal nervules situated within the middle of the wing. The femora and tibiae of the fore-legs are very pilose, forming a dense tuft projecting in a mass over the first tarsal joint. Hind pair of legs stout, with longer tibial spines than in Alypia.

The very intimate relationship of this genus to Alypia may be better seen after a more detailed comparison.

The head of the genus under consideration is much larger, the eyes are nearly twice larger, more globular, and occupy a larger extent of the sides of the head. The whole front of Alypia is proportionally narrower than that of Eudryas, the ocelli and antennæ are therefore more approximate in the former genus. The occiput is much developed in Alypia, occupying a much larger area than in Eudryas, where it forms but a narrow rim. The convex epicranium is larger in Eudryas, being twice as broad as long, and having a slight ridge between the ocelli. In Alypia it is nearly two-thirds as long as broad, convex, and narrow in comparison with Eudryas. The clypeus in Alypia is very distinctly rectangular, the sides being exactly parallel, and the angles well pronounced, while the same piece in Eudryas narrows rapidly anteriorly, is longer than broad and has the angles of the anterior edge a little rounded. Both genera possess a large truncated conical tubercle rising from the surface of the clypeus a little in advance of the middle, but it is smaller and slenderer in Alypia.
The mandibles of Alypia are equilaterally triangular, as is also the labrum. In Eudryas these parts, at least in the specimens at hand, are much less developed. Beneath, the head of Eudryas is narrower between the eyes, and the labium is larger and longer than that in Alypia. The antennae of Alypia are most Zygenid in character, being swollen a little beyond their middle; those of Eudryas are Noctuid, being filiform, tapering gradually toward the tip, and setose. The palpi of the two genera do not differ essentially, though in Eudryas they are stoutest, most thickly scaled, and the most depressed, being porrect, while the third joint does not go so far beyond the front as in Alypia. They also agree in the structure of the legs: in both the fore tibiae are thickly tufted, but especially so in Eudryas, wherein this genus resembles closely some Notodontians. In both genera also, the hind tibiae are large and thick with four nearly equal spurs, but longer and more slender in Eudryas.

The wings agree very nearly in outline. In Eudryas the costa of the primaries is straighter, the apex more rectangular and also the outer edge is straighter than in the other genus. The neurature is very similar in both genera, but Eudryas has its nervules longer, arising at about the middle of the wing, while in Alypia their origin is carried farther out beyond the middle; thus the first, second and third subcostals are farther apart at their origins, longer and more parallel to the costa, since by their decrease in length in Alypia, they go to the costa and apex more rapidly and at a greater angle. In Eudryas the third subcostal subdivides at the inner third of its length, but in Alypia nearer its middle. The intercostal space has the inner side shorter than the outer in Eudryas, while in Alypia it is longer than the outer side. The fifth subcostal remains in the former genus attached to its nervure, while in Alypia it is detached, being removed towards the middle of the median area. The nervules of the median are more approximate at their origins in Eudryas. The first and second median are nearest together at their origin in the last named genus; the second and third are nearest together in Alypia, where also the median area of the wing is shorter and broader than in Eudryas, which has a longitudinal crease reaching from the base of the wing to the point of juncture of the two discal nervules.

The secondaries also agree remarkably well in their form and neurature. The nervules are still very long. But the first median in Eudryas is continuous with its nervure, and its origin
is identical with that of the lower discal nervule, while the course of the nervule in Alypia is much more flexuous.

The abdomen in Alypia preserves the peculiar family form; in Eudryas however it is slenderer and gradually tapers towards the pencilled tip.

The Bombycid characters of Eudryas are found in the peculiar squamation: i.e., in the thickly scaled thorax, the middle of which is covered with the steel colored large and broad scales which occur in the same place in Tolype, and it resembles Heterocampa and Datana, near which the genus was placed by Dr. Harris, who has given quite full details about the habits in his descriptions of the two species E. grata and E. unio.

Mr. F. W. Putnam has observed the larvæ of E. grata feeding on the grape vine in Bridport, Vt., and collected the larvæ and pupæ in alcohol, which are in the Museum of Comparative Zoology at Cambridge. The moth of E. unio has been collected by a friend in Bangor, Maine.

Dr. Fitch has raised the larvæ of both species from the grape. He says of E. unio* that it "is equally common with the preceding, and the worms are so much alike that we as yet know not whether there are any marks whereby they can be distinguished from each other." p. 399.

Larva. The head is of good size, being three-fourths as wide as the body. It is nearly as broad across the vertex, as in front, above it is rather deeply impressed by the median line. The V-shaped epicranium is large not sunken below the level of the front; its apex is rather blunt, its sides bulge out from the apex to the anterior third of its length, where it is slightly contracted; and when it joins the clypeus its edge is linear. The short transverse clypeus is as broad as the epicranium is long, its front edge being straight and very slightly raised.

The labrum is divided half of its length by a sinus, into two lobes which are farther sub divided into two portions, the outer corneous and hard, and shaped somewhat like the mandible of the mature moths of this family, while the inner portions meet on the median line, and are more fleshy.

The two jointed antennæ are placed directly opposite the thick sub triangular truncated mandibles.

*Third Report Insects N. Y. 1856.
The labium and basal portion of the maxillae are broad and thick.

The body is elongated and gradually increases in width to the eighth ring, which is much enlarged and raised into a hump, from which the body rapidly narrows, and the tergum falls down at an angle of about 45° to the broad lunate supra-anal plate.

The rings are slightly convex; across their middle is a row of tubercles ending in hairs equal in length to that of the ring itself. Upon the tergum of each ring are four large tubercles arranged in a broad trapezoid, two in front and two more distant, on the middle of the ring; on the thoracic rings these tubercles are arranged in a single transverse line and on the supra-anal plate in a square. Below is a lateral row of similar warts, one for each ring, immediately below which is the row of stigmata, behind which, on each ring, is a minute wart. On the pleural line of the body, formed by the triangular raised portion of the side of each ring is a tubercle; and at the base of all the legs is a single similar wart. On the sternal side of the body on the segments between the legs, is a transverse row of smaller warts than those above, which are inclined to be geminate between the true and false legs. There is a distinct thickening of the skin on the sides of the anal legs, as in the Bombyces.

The coloration of the body generally, is a light hue, with linear transverse tergal stripes, about six for each ring, and nearly black in color, which are interrupted near or between the tubercles.

On the vertex of the head are four black spots; below in a curvilinear line are three black spots on each side of the epicranium, and two on the front edge of the clypeus. Around the V-shaped apex of the epicranium are smaller dots. There is a single dot within and opposite the eyes which are arranged in a line forming a little more than a semicircle. All these spots give rise to minute hairs.

In another lot (which may possibly be the young of *E. unio*) are some smaller than the specimens noticed above. The head is much the same, but the clypeus is smaller, and its sides do not bulge out. The spots on the head are the same, but the eyes are not surrounded with black. The eighth ring is more distinctly humped. The whole body is smoother, since the tubercles in Eudryas grata are here merely black spots, and much smaller, so that the transverse tergal lines are much more
prominent. There are no hairs on the body, while in Eudryas grata they are prominent.

_Pupa._ Dr. Harris (p. 427) merely remarks that "the chrysalis is dark brown, and rough with elevated spots." The whole body is elongate and rather slender; both the head and pro-thorax taper continuously towards the clypeal, tubercle, which is quite prominent. The antennae do not reach to the end of the wings. The pro-thorax is twice as broad as long; slightly carinated. The sides of the body are continuous and straight from the base of the wings to the fourth abdominal ring, while the body itself is hardly depressed or constricted at the juncture of the thorax and abdomen. The wings meet upon the sternum, reaching to the middle of the body. Fifth to seventh rings of the abdomen separated by deep sutures, while the surface of each ring is flat, not convex, with two rows of small teeth; while lower down on the sides of the body are four tubercles, being the remnants of the two middle pairs of prop legs. The remaining rings are less angulated. The tips of the abdomen is obtusely conical, ending in four tubercles, the pair above long and truncate, those below broad and short. On the under side are two minute approximate tubercles.

The whole chrysalis is of a dark mahogany brown, with the surface finely granulated.

Length, .80; breadth, .20 inch.

**Subfamily Zygeninæ.**

We use for the subfamily name one previously employed by Swainson in 1839 for a family of Sharks. He was evidently mistaken in saying that Cuvier was the first to adopt the name Zygena. That name was long before proposed by Fabricius in 1775, and adopted by Latreille in 1807.

The head is large and prominent; the front very convex, nearly square, with the angles well defined, with rather long or short scales. The occiput and epicranium together equal in length the clypeus which is square, convex. The antennae are inserted therefore midway between the front edge and the base of the head. They are in the typical genus simple, much thickened towards the extremity or, as in the lower genera, well pectinated. The two ocelli are situated at either end of the raised suture or ridge between the occiput and epicranium, and immediately behind the insertion of the antennae. The eyes are large, globose. Labrum short and broadly triangular.
Mandibles long and narrow, the tips incurved, the dense setae on the inner side converge over the base of the maxillae, which last are well developed, reaching when unrolled, nearly to the posterior trochanter. The three-jointed labial palpi are large and long, ascending, and often reaching beyond the front by the length of the third joint. The joints are nearly equal in length, from the two basal joints depend long scales; those on the third are short and generally fine.

Thorax but moderately stout, being a little wider than the abdomen. The two prothoracic scales (scutum) large, orbicular and very distinct. Patagia often large and long. Meso-scutum shorter than broad. The large scutellum encroaches upon it, being one-half and sometimes two-thirds as large as the scutum. It is a little longer than broad, very equally produced before and behind, being longitudinally somewhat lozenge shaped.

Meta-thorax short, scutellum transversely linear, while the scutal pieces are small and narrow, being crowded away on the sides of the thorax.

Wings long and narrow, and the nervules arise beyond the middle of the wing in nearly every genus, being much shorter than usual, and having their origins very approximate and equidistant. Primaries nearly three times as long as broad. Costal edge convex near the base and towards the obtusely rounded apex. The outer margin is on the average one-fourth shorter than the internal margin with which it is nearly continuous, the internal angle being obscure.

Marginal and subcostal nervures at nearly equal distances from each other, subcostal nervules short, their origins approximate, and all arise beyond the middle of the wing. Third generally forked. Fourth either independent, being removed towards the middle of the discal space, or simply branching out from its nervure as usual.

The four median nervules are very short, nearly equal in length; their origins nearly equidistant, all four being grouped closely together, since the fourth is remarkably short. Submedian often present, or its place when absent indicated by a well marked fold. Internal long, terminating near the end of the fourth median.

Secondaries long, narrow, and acute, rarely short and obtuse. Costa long, inner margin one-half as long as the outer. Nervules generally short and very equal in length. Discal space divided by a well marked curve; discal nervules directed
inwards to meet it. Subcostal and median nervules as described in the primaries. Submedian most often present.

The trochanters are very nearly vertical, or in the slender-bodied genera much inclined, and are then long and slender. Legs long and slender, all the joints slender, and of very uniform thickness; the tibial spurs are small, the tarsal joints long, very slowly diminishing in size.

The abdomen is hardly twice as long as the head and thorax together, generally stout and obtusely pointed at the tip, which is rarely tufted; sometimes slender. The scales that cover the body are fine and powdery; on the wings they are especially so, and are often absent in the middle, making them transparent. Moths of this family are of brilliant rich and gay colors, being of different hues of green, deep blue, black, black and white; red and brown, yellow and black, and white and red with bright bands and spots. The crust of the body is often shiny black.

The characters of the typical larvae and pupae have been considered under those of the family, and farther on in the description of Ctenucha.

**HARRISINA nov. gen.**

Under this name may be placed the *Procris americana* of Dr. Harris, *Aglaope coracina* Clemens and another undescribed form from the middle states communicated by Mr. F. G. Sanborn. Without attempting to improve upon Dr. Clemens' excellent description of this genus*, we would merely point out some marked differences from *Procris* Fabr. and *Aglaope* Latr. From the latter genus Harris states† that the *americana* entirely differs. With Fuessly's figure of Latreille's *infausta* from Southern Europe before us, which has broad wings and bright colors, and differs throughout, we are convinced of Boisduval's mistake in referring our species to it.

However it differs nearly as much from *Procris vitis* and allies of Europe. The wings are a third longer and much narrower, the apex is much more rounded and the outer margin much more oblique. One of the best distinctions lies in the very ovate secondaries of *americana*, owing to the convex outer

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*Contributions to American Lepidopterology, vii, p. 539.
† Loc. cit. p.33.
edge, which in *Procris* and *Ino* as well as *Zygaena*, is angulated in the middle, thus giving the wing in those genera a squarish appearance. The nervules are longer and more parallel with the costa. When expanded the secondaries only reach to the basal third of the abdomen, while in *Procris* they reach to the basal two-thirds. The abdomen is remarkably square, a little flattened and slightly spreading in the female of *Harrisina*, in *Procris* it tapers gradually to an obtuse point.

Dr. Harris has given ample details of the history and transformation of the *americanus*, and it is most appropriate to dedicate to his memory the genus to which it belongs.

Dr. Fitch also gives the following summary of its aspect and habits. "In August standing in a row side by side on the under surface of the (grape-vine) leaf, eating its edges, and leaving only the coarse veins, little yellow worms about .60 (inch) long and slightly hairy, with a transverse row of black spots on each ring; forming their tough oblong oval cocoons in crevices; the moth appearing the following July."


**Harrisina Sanborni** nov. sp. Another interesting species belongs here, kindly loaned me by Mr. Sanborn, to whom it is dedicated. It is half the size of *H. americanus*, has shorter wings; primaries with a more convex costa, while the costa in the secondaries is straight. The neuration also differs. The costal nervure goes more rapidly towards the costa, and in fact the whole costal area is broader, the median nervures are more angulated at their origins, and are wider apart, with consequently larger interspaces than in *H. americanus*. The abdomen is much shorter. The antennae likewise differ in having stouter pectinations.

It would at first, from the similarity of its colors, be easily mistaken for a dwarfed *americanus*, but it differs throughout. From Dr. Clemens' *A. coracina*, of which unfortunately no measurements are given by that author, it will be known by having a saffron collar which is however smaller than in *americanus*.

Our species is wholly deep blue black, the tinge being decidedly bluish and not greenish as in *americanus*. Length, female. 20; Exp. wings, female, .61 inch.

We would place after this genus, *Pyromorpha dimidiata* H.-Sch., Exot. Schm. 1855, of which *Malthaca pertucidula*
Clemens Proc. Phil. Acad. Nat. Sc. Nov. 1860, is evidently a synonym. Of the former genus a figure was simply published, Dr. Clemens has however given a careful description of the genus as named by him.

**Ctenucha Kirby.**

In 1839 Dr. Harris placed *Ctenucha* as a subgenus of Glaucopis immediately after the subgenus Lycomorpha, and including *C. semidiaphana* Harris in it, gives generic characters to suit the admission of this last named species.

In 1854 Walker divides the genus *Ctenucha* into four groups of species. Group 1. *Ctenucha* proper, includes *C. latreillana* Kirby. Group 2. *Philoros*, includes three species from Mexico and New Grenada. Group 3. *Scepsis*, includes a single species *S. fulvicollis*, and group 4. *Aglaope* is restricted to *A. americana* Boisd. for which Mr. Walker thus makes a new synonym *Ctenucha americana* Walker. His description of the species is copied *verbatim* from Harris, except that the measurements are omitted, though three specimens are referred to as coming from Georgia, and “presented by E. Doubleday Esq.” p. 286.

In 1860 Dr. Clemens excludes *Aglaope americana* Boisd. and divides Ctenucha into four groups, with *C. latreillana* Kirby as the type, discarding Walker’s subgenera *Philoros* and *Scepsis*.

We venture to say that of all the species referred to this genus by Walker only *C. virginica* Grote (latreillana Kirby) and *C. cressonana* Grote belong properly to it, and would limit it, for the present, by the characters subjoined. *Ctenucha virgo* H-S. from the “Antilles” belongs to another genus.

Mr. A. R. Grote has shown that *Ctenucha latreillana* Kirby is the Sphinx? *virginica* Charpentier. Edit. Esper’s Exot. Schm. Sphing. Exot 1830 Plate 2, fig. 3 male, 4 female. He says also, “I have taken it in damp woods in the vicinity of Buffalo, N. Y., as well as along the Canadian shore of the Niagara River. It has also been reported to me as having been taken in different parts of the Eastern and Middle States.”

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* Cat. N. Amer. Sphinxes.
In this genus the front of the head is as broad as the distance
from the insertion of the antennae to the front edge of the cly-
peus, being full and convex. Ocelli large. Eyes full and
globose, of the usual size. When denuded the clypeus is seen
to be short and scutellate, as long as broad, rising between the
antennae into a low obtuse point. In front it sweeps rapidly
away from the eyes, rising from them, while the front edge
contracts rapidly, the sides being slightly excavated just behind
the square subtruncate front edge, which seen from below is
somewhat arched. On the surface is a slight mesial ridge ex-
tending and increasing in size to the base of the piece. The
two pieces behind, i.e., occiput and epicranium are together in
length equal to the clypeus, so that the antennae are situated
very exactly midway from the base to the front of the head.
The “vertex” of the head is clothed with much longer scales
than the frontal ones which project out between the antennae.
The occiput is regularly transversely oblong, being about four
times as wide as long. The epicranium is narrower, subtri-
gular, truncate in front; and at its base encroaches a little upon
the occiput, than which it is one-fourth longer. The triangular
labrum is short, broad and obtusely pointed. Mandibles slen-
der, being nearly twice as long as broad, not very acute, with
long setae converging over the maxillae which are well de-
veloped, and when unrolled reach to the base of the abdomen.
The palpi are long and slender, of good size, porrect, somewhat
flexuous in their course, curving downward at their base, and
then rising a little, in front of the head; while their tips are a
little depressed. First joint nearly as long as the second, with
long depressed scales beneath, but generally the scales are fine.
Second joint twice as long as broad, and with the third
which is a little shorter and acute, reaches out in front of the
clypeus.

Antennæ half as long as the primaries, with long finely
scaled pectinations, each of which bears a terminal seta. In the
female the pectinations equal in length that of the joints of
the antennæ.

Thorax and body generally, stout and finely scaled. Patagia
large free from the tergum beneath, reaching behind nearly to
the posterior edge of the meso-scutellum, while its posterior
scales reach to the base of the abdomen. The prothoracic scales
are orbicular, large, and are unitedly considerably broader than
the head. Meso-scutum short, broader than long; scutellum
large and pentangular, the longest side being the posterior edge which is a little convex, and scarcely angulated in the middle. Wings broad; the primaries a little less than half as long as broad. Costa full, convex towards the apex, which is rounded acute. Outer margin half as long as the costa, more than usually oblique. Inner edge two thirds as long as the costa. The costal area is very narrow in this genus, since the subcostal runs very near the edge of the wing, and its first, second and third nervules are very long and parallel to the costal edge. Third subcostal simple, the fourth arises midway between the apex of the wing and the origin of the second subcostal. Fifth slightly removed towards the middle of the discal area, arising directly opposite the first and second median nervules, the origins of which are united, the second being straight, while the first and third are arched, the last named one arising very near the two first. They then enclose a very regular semi-oval area. Fourth median arises at a distance from the third equal to the length of the two discal nervules, which are straight, and unitedly are directed exactly at right angles to the costa.

The secondaries are broadly triangular, reaching nearly to the tips. The costa is decidedly convex within its middle, the apex is produced, but very much rounded, as in the internal angle, though the inner edge is itself very straight, and is one half as long as the costa. The lower discal nervule is directed obliquely outward, and both are curvilinear. The space between the first and third median is acutely triangular, since the nervules are nearly straight.

The legs are long and slender, the hind tibiae with two pairs of small acute unequal spurs, of which the inner pair are the smaller. Hind tarsi longer than the hind tibiae, and the first tarsal joint is a little shorter than the three succeeding ones taken together. Abdomen twice the length of the thorax, provided with minute lateral tufts, slowly tapering towards the tip which is subacute, though not abruptly pointed.

The colors of the genus are deep indigo blue, with a smoky tinge on the primaries, a lighter blue abdomen and saffron "collar." The nervules may be concolorous or as in the very interesting C. cressonana from Pike's Peak, described by Mr. Grote—to whose kindness I am indebted for a specimen of this rare species—the median and submedian nervules are white and thus remarkably distinct. The size of the genus is large, both species expanding two inches and a half.
I find after receiving a specimen of *C. cressonana* from Mr. Grote that there will have to be no modification of the generic characters given above, which were drawn from a single species *C. virginica* Grote. In the first named species the palpi are more curved up in front of the head than in the latter, otherwise the differences are merely those of coloration.

**Larva.** The head is large, being nearly as wide as the pro-thoracic ring. The vertical region is largely developed, and is considerably narrower above than in front. The epicranium is small, being nearly equilaterally triangular, the clypeus is narrower than the epicranium is long, and is raised, thickened, and its front edge distinctly convex. The labrum is short, and divided into two remote broad and short lobes. The mandibles are very broad, short obtuse and thick. The labium and maxillae can not very well be made out in my specimen, they are fleshy and with no determinate form for comparison.

The body is short and rather thick, the rings moderately convex, and in consistence the skin is softer and more flexible than usual. On each side of the body are six rows of tubercles—the tergal ones much the largest. There are on each ring of the abdomen four tergal warts, arrayed in a broad trapezoidal, becoming linear in position on the thoracic rings, and on the supraanal plate. These tubercles give rise to dense fascicles of evenly cut hairs, which radiate out on every side so as nearly to conceal the body, and give it when viewed from above a regular broad elliptical form, with very even sides. The eighth ring is not enlarged, but the body from that ring tapers posteriorly rather rapidly to the tip, though not by any means so much so as in Eudryas. The abdominal legs are short, thick and hairy and the thoracic legs are still more bristly.

The hairs on the upper part of the larva are collected into a mesial line of slight tufts. The head seen from above is concealed by dense overarchig hairs True and false (abdominal) legs covered by lateral radiating hairs. The outline of the ter-gum is hardly tufted, but rather scalloped, the scallop on the third and twelfth rings of the body being the most prominent, becoming short thick tufts. The hairs when magnified are seen to have long thick set spines.

The specific characters are these. The body of the larva is purplish livid covered with white and yellow hairs. Those hairs on the first two thoracic, and last two abdominal rings are all white. The head is a bright shiny red, black in
L. Trouvelot, on stone from nat.
front. There is a subdorsal and lateral row of bright yellow elongated spots, one for each ring, which are conspicuous through the hairs. Thoracic legs black, abdominal legs reddish, nearly concolorous with the head.

A few specimens in the fourth (?) stage, i.e.: that next to the last moulting differed thus: They are more oblong in outline. Those hairs which in the fullfed larva were described as black are here white. The mesial line of scallops here become actual tufts and black in color, of which the first and last are the longest. The hairs overarching the head and tip of the abdomen are whitish gray. The colors of the body and the two rows of yellow spots are the same as in the mature larva. The "frass" is short thick cylindrical with no markings.

These larvae in both the stages of growth above described were found June 6th, 1862, on the spears of grass, which grew in a sunny place upon a high neck of land running out into Casco Bay, Maine. Most of the caterpillars were feeding, a few mature larvae were running about restlessly. A year after at the same place but a single specimen in the fourth (?) moulting was found May 16th. This one was kept in confinement until July 8th. Towards the last it languished until numerous Braconid larvae issued in different directions from the body and spun their silken cocoons in a bunch upon the outside of the larva, when it died.

June 13th the Ctenucha larva began to construct its cocoon. Early in the morning it described an ellipse upon the side of the glass vessel of hairs plucked from just behind the head. From this elliptical line as a base, it had by eight o'clock built up rather unequally the walls of its cocoon; in some places a third of the distance up, by simply piling upon each other the spinulated hairs, which adhered firmly together. At four o'clock in the afternoon, the arch was completed, and the larva walled in by a light thin partition. Soon afterwards the thin floor was made. No silk is spun throughout the whole operation. I afterwards carefully examined portions of the cocoon under the microscope, and could detect no threads of any kind.

Four days after, the pupa appeared, and July 15th the moth came out. The female laid smooth green spherical eggs in a patch, side by side upon the side of the vessel, which hatched out July 28th. The young larvae were about twice the size of those of Orgyia when of the same age. They had large heads, and the body gradually decreased in size towards the opposite
extremity. The hairs were sparse, long and rather uneven, much resembling young Orgyia. Owing to my absence the larvae could not be raised. It will be seen that the larva lives twelve days in the egg, about ten months as a larva, since there is but a single brood in the year, and they must hybernate when two-thirds grown; it spends about twenty days in the pupa state, and but a few days as a moth.

I have taken the moth late in July at Perry, Me., and early in August at Brunswick. It flies in the hot sun, hovering over flowers, and is not difficult to capture, since its flight is not strong or rapid. In cloudy days it clings to the stems of plants, and can be easily taken with the hand.

A good illustration of the larval characters of the family compared with those of the Bombycidae, is seen in the growth of the young Ctenucha, which at first has a very large head and long unequal hairs, like the larva of Orgyia and in a less degree like the Ceratocampadæ in their first stage. Afterwards in the third and fourth stage of growth they resemble the Bombycidae in having tufts of longer hairs than those around and differing from them in color. This act of throwing off the characters of a lower family in the course of its growth, is an index of the relative rank of the two groups. The young Ctenucha thus resembles a mature Arctian perhaps as much as any Bombycid, but no particular genus, since the resemblance is only very general. Stoll’s figure, before referred to, shows us a perfect Zygaenid, evidently higher than Ctenucha which resembles strikingly Halesidota which is one of the lowest Arctian genera. If we follow the general law of embryology too rigidly in classification we shall be led into occasional errors.

Pupa, female. The pupa is short and thick, approaching rather closely in form that of the Arctians, being shorter than that of Eudryas. Seen from above the body is of nearly equal thickness from the thorax to the fourth abdominal ring, thence it diminishes a little in size, until at the eighth ring it suddenly terminates in a mucronate point. At the third abdominal ring however the body is somewhat swollen.

The head is of good size but not at all prominent, very slightly projecting beyond the pro-thorax, with which it is very continuous since there is no clypeal tubercle. The vertex (epicranium and occiput) forms a continuous piece with the clypeus; next to the pro-thorax it spreads out, and has a slight
mesial ridge, continuous with that of the pro-thorax. The scutellate clypeus is as long as the base is broad, the sides narrow somewhat towards the square front edge. There is an appearance of a short transverse oblong piece like that in the pupa, (the clypeus-anterior Newport?) to which are attached the minute triangular labrum, and on each side are the mandibles, whose form cannot be distinctly made out. The space between them is filled in with a piece whose surface is longitudinally convex.*

The eyes cover a much broader space than in the imago but are flatter, from their under side depend the broad flattened maxillae, whose bases are excavated next the eyes, the inner side being the longer, and between them is a minute triangular piece, the homologue of which in the imago we do not know. They do not extend along the abdomen quite so far as the antennæ, whose tips partially embrace them. The antennæ are crossed by the sutures which define the joints, which are very short. Only two pairs of legs are exposed in the pupa. The hind pair are long and narrow especially towards their base, while the more anterior (probably the first pair) are twice as broad as the others near their base. All these appendages with the wings extend as far as the posterior edge of the fourth abdominal ring.

The wings are not broad, and the outer edge is much more oblique than in Eudryas.

The thorax is very short. Pro-scutum consisting of the two scales united into one piece by a raised median line; convex behind, in front deeply excavated by a triangular incision. The surface of the meso-scutum is very convex, the hind edge rounded and encroaching deeply into the metascutum, which is very short, expanding triangularly on the sides.

On the sternal side of the ninth ring are seen the traces of the genital armor of the imago, consisting of two triangular pieces closely approximated upon the mesial line of the body, appearing as if coming out from under the eighth ring, since the ninth is carried under the preceding one at this point. A longitudinal impressed line in the middle of the tenth ring marks the site of the anal opening. The two minute obtuse

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* The accuracy of this description of the mouth-parts will have to be tested by renewed observations. The supposed division of the clypeus into two pieces, which do not appear in the imago, is of great interest in a morphological point of view.
spines which are very closely united terminate the obtuse tip of the abdomen, and are no doubt homologous with the supraanal plate of the larva.

The surface of the pro-thorax and abdomen is finely punctured. The color of the pupa is a uniform dark shiny mahogany.

Length, .65; breadth, .20 inch.

While the form of the pupa of Arctica Isabella is almost identical in its general outlines and proportions with Ctenucha, there are still important differences which it will be interesting to notice. The head parts are less distinctly marked; the vertex and clypeus are broader; the antennæ and legs are very much shorter, not reaching to the ends of the wings, which meet in front of them, and are united at their tips by a distance equal to the length of the fourth abdominal ring. The wings of Arctica have the outer edge very much less oblique than in Ctenucha, the thorax is much longer throughout; the female genital armor is the same, though the ninth ring is longer, and the supraanal spine is a large flattened single stout spine, its edges terminating in two slender small spines.

One imago died just as it was breaking through the pupa case, affording a means of ascertaining the mode of exclusion of the imago. The meso-scutum was split widely apart, throwing the pro-thorax with the head and its mouth-parts forward and downwards; this act likewise forced outwards and downwards the wing, thus allowing the feet and wings of the immature imago to become exposed to the air long enough to harden, and thus serve to aid the moth in freeing itself from the rest of the body, which remains whole, after the moth has escaped from it. The antennæ were also drawn out and extended in front of the head; to effect this, the eyes of the pupa were evidently separated from the pro-thorax, thrust downwards by a space equal to the width of the antennæ, which were then enabled by the splitting asunder of the antennæ and wings of the pupa, to be extended forward.

By the pectinations of the antennæ, the specimen is evidently a female, its genital armor agrees exactly with that of the pupa above described, so that the sexes of the two are the same.

The hairs of the body within the pupa case are the same in density and coloration as in the mature moth.

Scepsis Walker.

The head is larger in proportion to the rest of the body than
in Ctenucha, since it is a little broader than the pro-thorax, while in Ctenucha it is not as broad. The vertex is not so thickly scaled, the front edge of the clypeus is broader and straighter, thus making the whole clypeus square, as long as broad since the sides do not narrow so much as usual towards the front edge. Upon removing the scales, the occiput and epicranium are together equal in length to the clypeus. The occiput is transversely oblong, and divided by a mesial impression into two halves, considerably shorter than broad. The epicranium is subtrapezoidal, narrowing rapidly in front, and bilobed anteriorly by a deep mesial impression. The two ocelli are situated, not on either of the pieces, but just below the antennae, and at each side of the suture between the two above mentioned pieces. The clypeus is a little longer than broad. At its base it is obtusely angular between the antennae; its sides narrowing slightly towards the front edge, which is nearly square. On the basal half of the piece is a narrow ridge. Mandibles very slender, directed outwards, with long fine dense bristles. Labrum small, equilaterally triangular. Maxillae well developed, reaching when unrolled beyond the base of the abdomen.

Antennae like those of Ctenucha, but with longer and more hairy pectinations. In the female the pectinations are stouter; clavate, ending in setae which are more apparant than in Ctenucha. Palpi ascending, acute and slender, reaching beyond the front by a distance equal to that between the bases of the antennae. Thorax rather slender, a little longer than broad. The scutal pieces of the pro-thorax are united closely along the medial suture, each half not being so separate, or so orbicular as in Ctenucha. The patagia are narrow, not reaching to the end of the meso-scutellum. Owing to the thin scanty squamation the form of the tergal pieces of the thorax can be very distinctly seen: the meso-scutellum is hardly as long as broad, and is very obtusely pointed behind. It is much narrower and longer than in Ctenucha: so also the meta-scutellum, which is rounded behind, and very slightly produced into a slight obtuse angle.

Primaries three times as long as broad, being long and narrow. Costa straight to the outer third, where it is curved slowly around to the somewhat produced apex. Outer margin one-half as long as the inner, very oblique.

The costal nervure terminates at the outer third of the wing, and runs very close throughout its length to the edge of the

ESSEX INSTITUTE PROCEED. VOL. IV. F.
wing. First subcostal arises very near the upper discal; second subcostal arises a little beyond the middle of the first subcostal; third subcostal is short, and arises a little beyond the middle of the distance between the apex of the wing and the origin of the upper discal nervule. The fourth subcostal branches off very near the apex, and is very short, being but one fourth as long as the fifth subcostal, which last arises at a less angle from its nervure than in Ctenuchia. The discal nervules are much more curved inwards than in Ctenuchia. The median beyond where it throws off its fourth median is bent upwards exactly parallel with the costa. Though longer, the nervules are thrown off from the nervure much as in Ctenuchia, but the distance between the origins of the third and fourth median is proportionally greater than in Ctenuchia.

Secondaries not quite half as broad as they are long, being much produced towards the apex, and behind reaching to the basal third of the abdomen. Costa straight, convex near the base. Apex acute. Outer edge nearly three times as long as the inner; straight on the outer half of its length, but becoming a little convex towards the internal angle, which is well rounded, while the inner edge itself is straight. The subcostal goes remarkably straight to the apex where it curves a little downwards; it throws off a single straight nervule a little within the outer third of its length. The upper discal is a third longer than the lower, which is the stouter of the two. The three first medians are very short, one third as long as the whole median, the third shortest. First curved, second and third straight, fourth curved downwards near its origin. The submedian is obsolete at its basal third, the terminal portion being more like a nervure than a mere fold. It is close to the internal and remote from the median. Internal straight, cutting off a large triangular area comprising the internal angle.

Legs rather long, slender, thinly scaled, the spines minute and weak. The hind legs differ from Ctenuchia in being much slenderer not at all swollen. There are the same proportions in the length of the joints.

Abdomen broad, and acutely pointed at the tip in both sexes, with slight lateral tufts along the sides. The female tip is more obtuse than in the male, thus approaching female Procris with its truncated tips, more than Ctenuchia with its simple pointed tip. The genitals are simple and concealed within the eighth ring of the abdomen. There is apparent a tergal piece, and a sternal
pair of short clavate appendages. Without more alcoholic speci-
mens of this and the other genera it is useless to study these parts,
which a casual inspection of dry specimens assures me afford
excellent generic and specific characters in this family.

In coloration it differs from Ctenucha in the saffron pro-thorax,
and dark head, and the semihyaline secondaries.

While at first sight distinguished from Ctenucha by its long
wings and slender body, and obtusely pointed, almost triangular
tip of the abdomen, and the difference in the tergum of the tho-
racic rings, there are additional characters which separate the
two genera, and show conclusively that Scepsis should be con-
sidered as a group of equal value with Ctenucha itself, and not
a subgenus of it. These are: the curved palpi which are consider-
ably shorter; the thicker clavate pectinations of the antenne,
the marked differences in the neuration, and the slender hind
femora. The clypeus is much wider, and the mesial ridge is
not so prominent or so long as in Ctenucha, the clypeus of which
narrows much more rapidly towards the front edge.

To show how accurately, in insects at least, the generic char-
acters can be discovered from the inspection of a single species
of the group, I would state that the above description was
drawn up from specimens of S. fulvicollis only. Upon com-
paring afterwards specimens of a Californian species in the Mu-
seum of Comparative Zoölogy at Cambridge, which is closely
allied to the species first mentioned, I find that the characters
considered above as generic will in no case have to be altered.
In the Californian species the style of coloration is the same, the
palpi are a little more curved, the antenne are the same, so
also the pro-thorax, the neuration is identical throughout, and
there is the same broad obtusely pointed tip of the abdomen.
The specific distinctions are these; a light tint of brown, a
brownish abdomen, instead of deep blue, and a more hairy
thorax than in S. fulvicollis; while in size, the two species are
much alike.

Scepsis fulvicollis Walker is found in Canada West (St.
Catharines, Coll. S. H. Scudder) It will no doubt occur in
southern New England.

Lycomorpha Harris.

The front of the head is provided with long scales extending
to the base of the maxillæ. When the head is denuded, the
clypeus is broadly scutellate, the length being equal to the
breadth, with the basal margin produced backwards and encroaching more upon the epicranium than usual. The front edge contracts suddenly into a square portion resting above the mandibles and maxillae. The epicranium is small and short, deeply impressed by a mesial line and divided thereby into two triangular halves; while the occiput is transversely oblong, being twice as broad as long.

The antennae have short setiferous densely scaled pectinations; in the female they are serrated, the teeth terminating in single setae. Mandibles rather long and slender projecting out beyond the scales of the front.

The body of this genus is long and narrow, slender. The thorax is narrow, and the pleurae of each thoracic segment are very oblique. Pro-thoracic scales (being the two halves of the pro-scutum) ovate elliptical. The meso-scutum is remarkably small, being shorter than broad, and no longer than the scutellum, which is of much greater length than usual. The form of this last piece is much different from what we find in Ctenucha. In form it is pentagonal, the front edge being transverse, the two posterior sides forming a triangle, while the two anterior sides are, though nearly parallel, yet slightly divergent. Wings remarkably long and narrow: primaries nearly three times as long as broad, being remarkably long and narrow as in the Lithosia. Costa straight as far as the apex, which is much rounder than usual, as is also the internal angle, while the inner edge is but one-fourth shorter than the costal. The nervules arise remarkably equidistant, and their origins are much shorter and nearer the outer edge than in the allies of the genus. The short subcostal nervules run rapidly to the costal edge. First, second, and fifth of equal lengths, the third not branched and equal in length to the fourth, while the origins of each are opposite the inner third of the fifth, which arises near the middle of the discal space. Two discal nervules of equal length meet to form an angle pointing inwards, from which a fold is thrown inwards along the middle of the discal space.

Median nervules much straighter than usual, their interspaces oblong and of very equal size. Origins of second, third and fourth equidistant. Submedian nervure long and distinct.

Secondaries long and narrow, the apex much produced, the inner angle not reaching to the tips of the abdomen. Costa convex, a little excavated just before the apex. Outer margin two-thirds as long as the costa, angulated slightly on the second
median. Inner edge very short, being one-half as long as the costal. First and second subcostal nervules nearly equal in length. The upper discal is very long and oblique, and with the lower discal is parallel with the outer edge of the wing. But three median nervules present. First, obsolete; second and third parallel; third and fourth shorter than the second and directed downwards. Distance between the two first median nervules one-third as great as that between the third and fourth.

The slender abdomen is a little more than twice the length of the head and thorax. The male genital armor is large and well developed in the genus. The two tergal pieces consists of a semielliptical horizontal piece, beneath which comes out another tergal piece of the same length, but linear, and curving downwards and inwards. The side pieces are large, concave, broad and long, nearly meeting beneath, along the mesial line of the body. Each piece is widest in the middle, thence narrowing rather rapidly, becomes truncate at the extremity, ending in a pair of hooks separated by a deep sinus.

The coloration is prussian blue, with saffron bases to the wings, somewhat as in Pyromorpha.

Compared with other genera of the subfamily this interesting genus presents some notable differences, all the characters being, as it were, influenced by the close relationship to the Lithosiae. This is seen in the dentated antennæ, neither simple as in the Lithosiae, or pectinated as is the rule in its own group. The Lithosian characters also appear in the head, in the form of the clypeus especially; and in the unusually slender body, with its narrow wings, and elongated scutellum of the mesothorax. Though after all the Zygenid characters prevail so extensively that it is a little strange that observers after Dr. Harris' time should change his location of the genus to a place among the Lithosiidæ. Though the larva is a lichen-feeder and thus in this early stage is like Lithosia and allies, we must consider the insect as simply analogous in its habits as well as structure to that genus, and not be misled by these very strong resemblances.

I have taken L. Pholus on the wing in the daytime about stone walls on which lichens were plentiful, in Brunswick, Maine.

Anatolmis nov. gen.

Head of moderate size, broad and short. Occiput and epicranium together equal in length to the clypeus; epicranium
bilobate, much as in *Lycomorpha*, with much the same proportions. The clypeus is very broad, scutellate, just as broad as long, covered with broad flat scales which converge towards the median line. Eyes small, hemispherical, their diminished size adding to the breadth of the broad clypeus between them. Antennæ situated nearly midway between the front edge and the base of the head; rather slender, with very short broad pectinations, equalling in length the joints, and covered densely, especially on the sides, with stout hairs, and terminating in a single seta. Maxillæ well developed, longer than the head is broad. Palpi long porrect, reaching beyond the front: third joint minute conical subacute, nearly continuous with the second, which is not very broad.

Body slender, thorax not much broader than abdomen; wings remarkably long and narrow. Primaries a little more than three times as long as broad; costa very straight, a little convex on the outer third; apex rounded; outer edge very convex, very short; inner edge remarkably long, and nearly parallel with the costa, very straight, the usual convexity near the insertion very slight.

Costal very near the margin and impinging on the middle of the first subcostal; third subcostal of very equal length, first curved towards the costa, the third shorter than first; fourth branched within its middle, enclosing a narrow long triangular apical interspace; fifth, not removed from its nervule at its origin. Median nervules arise at the outer third of the wing. First and second are united at their base; third and fourth, are equidistant from the second. Submedian curve long well marked, but no nervure. Very long internal nervure. Fringe rather long, especially just below the apex.

Secondaries very long, twice as long as broad, narrow triangular, hardly reaching to tip of abdomen. Apex much produced, though obtuse. Costa very straight, outer edge very long, remarkably straight, internal angle rectangular not reaching much beyond the base of the anal tuft.

Subcostal subdivides near the outer fourth of the wing; first and second median very short, nearly parallel; third, very remote but of the same length.

Legs long and slender, finely scaled. Hind tibial spurs very small unequal acute, inner pair very remote, and half as large as the terminal pair. Tip of abdomen provided with large anal valves, of unusual size, being laterally broad lanceolate.
The squamation is fine and powdery. Compared with _Lycomorpha_, to which it is nearest allied, besides the very different style of coloration, the primaries are narrower, costa straighter; secondaries more triangular, owing to the rectangular inner angle. But in the structure of the head, of the antennae, of the thorax and abdomen it agrees closely with _Lycomorpha_, and these characters are those which place it without doubt in the _Zygaenidae_, though after a casual glance one would not hesitate to call it a Lithosian. The bluish scales of the body, the dark mahogany colored tegument, the fine powdery squamation, and the slender very equally jointed legs and pectinated antennae aid in determining the true systematic position of this interesting genus.

From the resemblance to the parallel genera _Hypoprepia_ and _Atolmis_, among the Lithosiidae, I have proposed the name above given.

A. _Grotei_ nov. sp. Vermillion red and smoky purple; head and appendages purple, thorax red; primaries red throughout except the purple fringe and the edge of the outer third of the costa. Secondaries red on the basal third, beyond smoky purple; the red extends from just within the middle of the inner edge to near the apex upon the costal edge. Legs purple, concolorous with the abdomen. Beneath colored the same as above. There are no other markings on the wings.

Length, .38; exp. wings, 1.20 inch.

Pike’s Peak, Colorado Terr. (Coll. Phil. Ent. Soc.)

Dedicated to Mr. A. R. Grote, to whose kindness in securing for study this and many other rarities I am under special obligations.

EXPLANATION OF THE PLATES.

**Plate I.**

Fig. 1. _Cituchua virginica_ Grote. 1a, Palpus enlarged.

1b. Head denuded and enlarged. 1c, Primary wing. 1d, Secondary wing.

Fig. 2. Larva seen from above. 2a, side view. 2c, front view of head enlarged. 2f, last abdominal ring seen from above.

Fig. 3. Young larva, after the fourth moult.

Fig. 4. Pupa seen from above. 4a, side view.

**Plate II.**

Fig. 1. _Atypia octomaculata_ Hubner, head denuded and enlarged. 1a, Primary wing. 1b, Secondary wing.

Fig. 2. Pupa of _Eudryas gratia_ Boisduval. 2a, dorsal view.

Fig. 3. Head of the same, denuded and enlarged. 3a, Primary wing. 3b, Secondary wing.

Fig. 4. _Lycomorpha Pholus_ Harris, head denuded and enlarged. 4a, Primary wing. 4b, Secondary wing.
Nearly all the land birds known to inhabit New England are found in the Valley of the Connecticut, at one season or another; and during spring and fall the number of passengers from the northern to the southern parts of the country, and vice versa, is immense; even some of those species usually esteemed quite rare occur in considerable numbers. The number of individuals of land birds, during the periods of migration, seems to be much greater at Springfield than at most localities in the eastern part of the State; yet some species are more numerous in Eastern Massachusetts than at Springfield; and some are common there through the breeding season, which at Springfield are almost unknown, or at least occur in much fewer numbers. Among such may be mentioned Coccyzus americanus, Hirundo bicolor, Carpodacus purpureus, the Ammodromi, &c. The rapacious birds, owing to the absence of extensive woods, are comparatively rare, especially in summer and winter, and the water birds are limited to the fresh water or river Ducks and Grallae, which are, with few exceptions, far from numerous.

Among some of those species noticed as of very rare occurrence here, may be mentioned Nyctale Richardsonii, Picoides arcticus, Centurus carolinus, Helminthophaga peregrina, H. celata, Dendroica tigrina, Icteria viridis, Mimus polyglottus (found breeding), Melospiza Lincolnii, Coturniculus Henslowii, Corvus cornicorius, &c. The "Turdus aliciae" of Baird, I have found to be not rare; and from a careful examination of many specimens of both T. aliciae and T. Swainsonii, I have found aliciae to be based on faintly colored specimens of Swainsonii, and not to be a distinct species, as heretofore
supposed. This subject is noticed at length under Turdus Swansonii.

Springfield being situated near the northern confines of the Alleghanian Fauna, some of the more southern species found here are represented merely by a few individuals in the breeding season, while the southern limit of many others properly belonging to the Canadian Fauna is removed but a few miles to the north, varying from sixty to one hundred miles in the Valley of the Connecticut, and in the mountainous districts of Western Massachusetts falls nearly as low as Springfield.

I have designed to include no species, in the following list, which I have not known taken or observed in the immediate vicinity of Springfield, (except in the case of a few Ducks, noticed below,) preferring to err in omitting some really existing in the prescribed region than to include a single species not belonging to the locality. I have introduced, however, those very probably occurring, which have not, to my knowledge, been observed here; but these are not reckoned as a part of the list. The times of migration given are generally an average of observations covering several years.

In order to render the list as complete and valuable as possible, I have not failed to solicit aid from others, and am pleased to be able to acknowledge valuable assistance; chiefly from Messrs. C. W. Bennett and L. Hyde, whose very complete collection of our native birds forms a valuable part of the collections of local natural history in the "Ethnological and Natural History Museum" established a few years since in Springfield; to Mr. B. Hosford, for various useful notes, and to Dr. Wm. Wood, of East Windsor Hill, Ct., who has kindly furnished me with many valuable facts, particularly in reference to the water birds. The names of contributors follow the facts resting on their authority. Several of the Ducks included in the list, (Aythya vallisneria, Bucephala albeola, Harelda glacialis, Melanetta velvetina,) are inserted from their having been taken on the Connecticut River, by Dr. Wood, some fifteen miles below Springfield; and though not known to have been taken here, undoubtedly occur, and have only been overlooked from a want of more thorough searching on the part of collectors. The whole number of species included in the Springfield list is one hundred and ninety-five; the number of those found in Massachusetts not observed at Springfield is ninety-two, of which the greater part are truly coast species.

ESSEX INSTITUTE PROCEED. VOL. IV. G.
In order to give a complete list of the birds of our State, I have appended a catalogue of those found in Massachusetts not yet noticed at Springfield. No species is included of which there is not good evidence that it has been taken in the State. Some occasional visitors may have been overlooked, but it is believed such instances are few. Those probably occurring but not to my knowledge detected, are also mentioned but are not counted as a part of the list. To present a general view of the Ornithology of our State in a condensed form, I have appended tabular lists of those birds that are resident the whole year in the State, those that breed, those that are summer, winter, or spring and autumn visitors, and those that are merely rare, occasional, or chance visitors, &c.

1. *Falco anatum* Bonap. *Duck Hawk.* Very rare. One or two pairs are known to breed regularly on Mount Tom, some fifteen or twenty miles north of Springfield. Nest on the rocks, very early in the season, the young being full grown by the last of June. Mr. C. W. Bennett, who gives me these facts, took some young birds from the nest a few years since. This species has also been found breeding on Talcott Mountain, Ct., a few miles south-west of Hartford. Four nearly full-fledged young were taken from the nest June 1st, 1861, and the female was shot.* (Dr. W. Wood, in Hartford, Ct., Times, June 24th, 1861. See a valuable series of twenty-one articles, by Dr. Wood, on the Rapacious "Birds of Connecticut," published in the Hartford Times, March 14th to August 9th, 1861.)


* Since the above was written, the eggs have been obtained (April 19th, 1864,) from a nest on Mount Tom, by Mr. C. W. Bennett, of Springfield. The female was also obtained, and the identity of the eggs ascertained beyond question.
5. *Accipiter cooperii* Bonap. Cooper's Hawk. "Chicken Hawk." Common summer visitant, breeding, but is most numerous in September.


8. *Buteo lineatus* Jard. Red shouldered Hawk. Not uncommon, arriving early in spring, and breeds here. Is most common in autumn, when those that breed further north are migrating southward.


12. *Circus hudsonius* Vieill. Marsh Hawk. "Blue Hawk." "Bog-trotter" of sportsmen. Common summer visitant; arrives early in March, and nests on the ground in the marshes, often many years on the same site. It is by far our most common Hawk. Both sexes incubate.


14. *Pandion carolinensis* Bonap. Fish Hawk. A few are seen along the Connecticut and its tributaries during the spring months. Have never heard of its breeding in this vicinity.

15. *Bubo virginianus* Bonap. Great Horned Owl. "Cat-Owl." Rather common. Resident, but seems to be more common in autumn and winter.


17. *Otus americanus* Bonap.*. Long-eared Owl. Not

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*Strix americana* Gmelin, Syst. Nat. I, (1728) 288; *Otus Wilsonianus* Less. Traité d'Orn., I, (1832) 130.—Why the specific name *americanus* has not been adopted for this species by the later ornithologists I cannot perceive, it being that having the priority of all others.
common. Probably resident, but most frequently taken in autumn.

18. *Brachyotus Cassinii* Brewer. Short-eared Owl. Resident. Rather common in autumn and winter. Dr. Wood has found it breeding in Connecticut, a few miles from Springfield.


The Great Gray Owl (*S. cinereum* Aud.) may occur occasionally, but I have never known it taken here.


21. *Nyctale Richardsonii* Bonap. Richardson’s Owl. Very rare winter visitant. Obtained a specimen in December, 1859. A specimen in the Museum of Comparative Zoölogy, Cambridge, taken at Malden, Mass., and one taken by Dr. W. Wood, in East Windsor, Ct., were obtained the same winter.

22. *Nyctea nivea* Gray. Snowy Owl. Winter visitant, and usually rare; in some winters quite common. Has been taken third week in November.

23. *Coccygus americanus* Bonap. Yellow-billed Cuckoo. Extremely rare; in the eastern part of the State it occurs frequently. Though it has been an object of special search with collectors here for several years, but one specimen has been obtained. Dr. Wood says it is "very rare" at East-Windsor Hill, Ct., where he has found its nest and eggs.


27. *Picoides arcticus* Gray. Black-backed Three-toed Woodpecker. A very rare or accidental winter visitant. The only specimen I have known taken here I shot in January, 1860; a Woodpecker, however, was seen here for several weeks in March of the same year, which I think, from descriptions of it, must have been this species.
28. *Sphyropicus varius* Baird. Yellow-bellied Woodpecker. Not common, and only seen in fall and spring when migrating. I have never seen this species in summer, and do not think it breeds here, though they breed plentifully on the hills in Western Massachusetts, twenty or thirty miles west of Springfield. (W. H. Niles.)


30. *Melanerpes erythrocephalus* Swain. Red-headed Woodpecker. Very rare summer visitant. Have taken but two specimens in five or six years. Three were taken in 1860 by Messrs Bennett and Hyde. A few are still known to breed within about twenty miles, in several directions, (at Amherst, Mass., C. W. Bennett.) Twenty-five or thirty years ago they were very abundant here.


32. *Trochilus colubris* Linn. Humming Bird. Common summer visitant, breeding plentifully. Arrives early in May, and in August is very abundant wherever the *Impatiens fulva* abounds.

33. *Chaetura pelasgia* Steph. Chimney Swift. "Chimney Swallow." Abundant. Usually arrives about the first of May, but are frequently seen the last week in April; greater part leave early in September, but some often remain till the middle of September, and even sometimes till near the first of October. Arrives earlier and commonly remains later than any of the true Swallows, except perhaps *Hirundo bicolor*. Raises two broods, the last young sometimes not leaving the nest before August 15th or 20th.

34. *Antrostomus vociferus* Bonap. Whip-poor-Will. Common summer visitant, arriving about April 25th. A few of the males are musical till into September; have heard them throughout the summer till September 25th, about which time they leave us.


37. *Tyrannus carolinensis* Baird. King Bird. Summer visitant, breeding very abundantly. Arrives about May 10th, and departs early in September; usually by the 10th or 12th, sometimes by the 1st.

38. *Myiarchus crinitus* Cab. Great-crested Flycatcher. Rare summer visitant. Have taken it May 15th, and Sept. 17th. Breeds on Mt. Tom (C. W. Bennett), and in some other parts of the State.

39. *Sayornis fuscus* Baird. Pewee. Phoebe. Common summer visitant, arriving about the last of March. Begins nesting in April, and have found freshly laid eggs in the middle of August, it raising two, perhaps occasionally three, broods, in a season.

40. *Contopus borealis* Baird. Olive-sided Flycatcher. Summer visitant; not very rare. Arrives about May 12th, and breeds in high, open woods, far away from which it is seldom seen. Leaves about the middle of September.


42. *Empidonax Traillii* Baird. Traill’s Flycatcher. Rather rare summer visitant; arrives May 10th to 15th, and probably breeds.

43. *Empidonax minimus* Baird. Least-Flycatcher. Abundant summer visitant. Arrives the last of April; sometimes as early as April 20th. Most abundant in orchards and cultivated grounds, where it commonly breeds, but also frequents open woods. Leaves before, or by, the middle of September. Exceeds in abundance all the other *Empidonaces* taken together.

moist thickets, which are its exclusive haunts. Under Muscicapa querula (Small Green-crested Flycatcher), Wilson, in a few words, has very correctly indicated the habits and notes of this species. It is the most spirited and tyrannical of all our Empidonaces, with which its sharp, quick note, like que-queah, uttered sharply and hurriedly, and its erect, Hawk-like attitude eminently accord. It is very quarrelsome with its own species, a battle ensuing whenever two males meet; they pursue each other fiercely, with snapping bills and sharp querulous twittering notes. It is also a very shy and difficult bird to collect, frequenting exclusively, so far as I have observed, thick alder swamps and swampy thickets, keeping either concealed among the thick bushes, or at too great a distance from the collector.

45. Empidonax flaviventris Baird. Yellow-bellied Flycatcher. Rare. Have taken it from May 15th to June 5th.

46. Turdus mustelinus Gmelin. Wood Thrush. Summer visitant, arriving May 1st to 10th. Not common, usually breeding in deep, moist woods. Is more terrestrial in its habits than the other Wood Thrushes.

This species has commonly been described by authors as remarkable for its shyness of man, and for selecting for its haunts the most secluded woodlands; and though this is generally true, there are some noteworthy exceptions. So far as I have seen, however, it is not so recluse in its habits as has been very generally supposed; having found it (in May) where there were but few trees and a scanty undergrowth, and even within the limits of a thickly peopled village. Mr. W. H. Hall has informed me of a nest of this species, which he found in the summer of 1861, built within a few yards of the road leading up Mt. Holyoke. For three successive summers a single Wood Thrush has lived among the elms and maples of Court Square, Springfield, spending the whole season in its immediate vicinity, pouring out his melodious strains at early dawn, and at various hours of the day till late in the evening, as wholly undisturbed by the people on the walks beneath him, or by the noise and rattle of moving vehicles in the contiguous streets, as though in the usual wild-wood haunts of his species. His superior musical powers have caused him to become a well-known and protected favorite with the people, familiarly searching for his food along the gravel walks of the Square.
47. *Turdus Pallacii* Cabanis. Hermit Thrush. Abundant in spring and autumn. Seen in small parties from April 15th to May 10th in spring, and in fall from October 1st till November, sometimes till the 10th, commonly in swamps and low woods, and occasionally in open, plowed fields. Never sings while here, and is quite unsuspicious. Have not found it breeding here.

48. *Turdus fuscescens* Stephens. Tawny Thrush. Wilson’s Thrush, Veery. Abundant summer visitant. Breeds in swamps and low woods, nesting on or very near the ground, beginning to sit the first week in June; have found its eggs May 29th. Arrives about May 10th, and leaves early in September. During the summer months is quite arboreal in its habits, collecting a large part of its insect food among the foliage of the trees. It is the most numerous here of all the woodland Thrushes, and the only one that breeds here in abundance, and the only one, excepting *T. mustelinus*. Have found three nests in an hour’s walk.

49. *Turdus Swainsonii* Cab. (*Turdus Swainsonii* and *T. aliciae* of Baird.) Swainson’s Thrush. Olive-backed Thrush. Common in spring and fall. Seen in spring from May 16th to June 3d, usually in small parties about woodlands, but often frequents open fields, and even gardens; is quite unsuspicious, and seldom sings while here.

After a critical examination of a very extensive series of specimens, including many fresh, I am forced to the conclusion that *T. aliciae* and *T. Swainsonii* form but one species. I have carefully studied the bills, feet, wings, size, and proportions for specific differences, and find that, though there is more or less variation in all these, as there is among individuals of almost every species, there is nothing that approaches to constant specific difference. Indeed, the principal character that has ever been urged as separating them is that of the color. But this I find is not a constant character. I have had specimens before me during the last year exhibiting every gradation in the color of the breast, sides of the neck, eye circle, &c., from the strongly buff-tinted of the true *T. Swainsonii* to the pale gray of the typical "aliciae," where the buff was scarcely perceptible or quite obsolete.

Prof. Baird, in his original description of *aliciae* (*P. R. R. Exp. and Surv. IX. 217*) observes: "These parts [sides of the neck and breast] are not of as pure white as the belly,
having the faintest possible shade of yellowish red, but it is barely appreciable, nor is it any more distinct in raising the feathers. There is the faintest possible shade of reddish in the tail and its coverts above, but this is only to be observed on a close examination. This species comes much nearest to *Turdus Swainsonii*, the Olive-backed Thrush, agreeing with it in the dark greenish olive of the upper surface. This, however, is decidedly darker, and showing a clearer greenish than usual in the other. The absence of any buff on the throat, breast, and sides of the head, and the predominating ashy on the latter, with a white ring instead of a reddish yellow round the eye, are strong points of distinction. The bill appears more slender, and the whole bird is larger. It is barely possible that it may constitute a variety only of *T. Swainsonii*; but if so a very strongly marked one.”

Detecting *T. "alicie"* among specimens I had collected, and many specimens intermediate in color between this form and strongly marked *T. Swainsonii*, I began to search for some more constant character than color to separate the two forms; and found by extensive measurements that both the largest and the smallest specimens occurred in the form recognized as *T. Swainsonii*, though some *T. alicie* were larger than the average of the series. On comparing the proportions of the primaries, some *alicie* agreed with *Swainsonii* while others differed. Comparisons made between the bills, feet and other characters, gave similar results; while in color the majority of the specimens ranged between those having the greatest amount of reddish-yellow and those in which the buff was scarcely appreciable. The difference in color is merely one of intensity, dependent neither upon sex nor season, possibly upon age, and extends throughout the plumage; thus those that have the breast of the brightest buff, have also more of this tint pervading the whole plumage, the paler specimens being of the purest dark olive above, without the brownish cast observable in the more rufous individuals.

Among individuals of *Turdus fuscescens*, collected the past summer at Springfield, I have detected a difference similar in kind and as great in degree as that separating forms heretofore considered typical respec-
tively of \textit{T. Swainsonii} and \textit{T. aliciae}. Thus one specimen is very highly colored throughout, being very bright reddish brown above, and has the breast bright reddish buff, of about the same tint as in highly colored \textit{T. Swainsonii}, and the spots very distinct, while the other is very pale throughout, being of a decided yellowish brown above, and has the breast pale buff, and the spots more indistinct than in the first. Both specimens were taken May 29th, 1863. The depth of color also varies more or less in different specimens of \textit{Turdus Pallasii}, though hardly so marked as in \textit{T. Swainsonii}; but even in \textit{T. Swainsonii} the gradations from one extreme to the other are so minute and complete that the state described as \textit{T. aliciae} can now hardly be considered "a very strongly marked" variety.

50. \textit{Turdus (Planesticus) migratorius} Linn. Robin. Abundant summer visitant. Are sometimes seen in February, but commonly arrive in March, from the 15th to the 25th. Are last seen in autumn from the 7th to the 14th of November. Breeds plentifully in orchards and gardens, often in the woods, and is a familiar inhabitant in the village and city. Have observed it at all seasons in the eastern part of the State, where many are resident. Some also spend the winter along the south side of Mount Holyoke, feeding on the berries of the red cedar.

51. \textit{Sialia sialis} Baird. Blue Bird. Abundant, often arriving in February, and is generally common by the 15th to the 25th of March. Nests early, the first brood of young generally leaving the nest as soon as June 1st, and the second during the third week in July. Commonly leaves about the last week in October.


54. \textit{Anthus ludovicianus} Licht. Titlark. "Sky Lark". Spring and autumn visitant. Seen for a week or ten days in the early part of October, often in large flocks, fre-
quenting stubble and newly-plowed fields, and the muddy banks of streams and ponds; also for a few days in May.

55. *Mniotilta varia* Vieill. Black and White Creeper. Common summer visitant. Have found it breeding, nesting on the ground. It appears to nest in various situations, according to different observers; in hollow trees, on the ground, and in crevices among rocks. Arrives about April 25th, and for several weeks is very abundant, but the greater part going further north to breed, is not so common in summer, but becomes abundant again the last of August and early in September.

56. *Parula americana* Bonap. Blue Yellow-backed Warbler. Very common, particularly in May. Many remain through the summer and breed, nesting about June 1st. Seem to prefer high mixed woods and thick spruce and larch swamps, keeping almost wholly in the tops of the taller trees and near the extremities of their larger branches. On their first arrival, about May 5th, they frequent the orchards, and keep lower among the undergrowth in the woods than they do later in the season. Leaves 10th to the 15th of September.

57. *Geothlypis trichas* Cab. Maryland Yellow-throated Warbler. Summer visitant. Very abundant, breeding plentifully in all swampy situations, nesting on the ground. Arrives about May 10th, and leaves the first or second week in September.

58. *Geothlypis Philadelphia* Baird. Mourning Warbler. Very rare. Have taken two specimens about the middle of September. Five specimens of this Warbler were taken in Lynn, a few years since, from the 4th to the 29th of September, by S. Jillson. (Ms. notes of S. J.) The Connecticut Warbler (*Oporornis agilis* Baird) may probably be found here as an extremely rare species, but I have not known it detected here.

59. *Icteria viridis* Bonap. Yellow-breasted Chat. Extremely rare. Has been seen here but a few times. In May, 1863, I saw a few pairs which appeared likely to breed here, but being harrassed and some of them killed, by collectors, the others sought a safer haunt. Was seen here in September, a few years since, by R. B. Hildreth, Esq.

60. *Helminthophaga ruficapilla* Baird. Nashville War-
bler. Abundant in May, and in the early part of autumn. Arrives May 1st to 5th, and for two or three weeks is a common inhabitant of the orchards and gardens, actively gleaning insects among the unfolding leaves and blossoms of the fruit trees. Nearly all go north, but a few retire to the woods and breed. During June, 1863, I frequently saw them in my excursions in the woods, often three or four males in an hour's walk. Its song so much resembles the song of the Chestnut-sided Warbler (Dendroica pennsylvanica) that it might readily be mistaken for it. To this cause, and to the difficulty of seeing such small birds in the dense summer foliage, is doubtless owing the fact of its being so commonly overlooked by naturalists during the summer months, rather than to its extreme rarity in this latitude at that season. I have found the nest of this species for two successive seasons, as follows:—May 31st, 1862, containing four freshly laid eggs. The nest was placed on the ground, and sunken so that the top of the nest was level with the surface of the ground, and protected and completely concealed above by the dead grass and weeds of the previous year. It was composed of fine rootlets and dry grass, lined with fine dry grass and a few horse hairs, and covered exteriorly with a species of fine green moss. The eggs were white, sprinkled with light reddish brown specks, most thickly near the larger end. Longer diameter sixty, and the shorter fifty, one-hundredths inches. The following year, June 5th, 1863, I found another nest of this species, within three or four feet of where the one was discovered the previous year, and containing three eggs of this species and one of the Cow Bunting, in all of which the embryos were far advanced. The nest in every particular was built and arranged like the one above described, and the eggs must have been laid at just about the same season. In both cases the female bird was secured, and the identity of the nests ascertained beyond question. The locality of the nests was a mossy bank, at the edge of young woods, sloping southward, and covered with bushes and coarse plants. Probably the male of the first nest, mating again, selected the same site for the second nest; and it may have been occupied for a longer time.

61. Helminthophaga celata Baird. Orange-crowned
Warbler. Very rare; perhaps accidental. Shot a single specimen May 15th, 1863. Saw quite a number of this species among the fruit trees of the garden and orchard, then in blossom, but thinking them only pale individuals of *H. ruficapilla*, which thronged every tree, I neglected at first to shoot. Finally, being strongly in doubt, I shot one, and the specimen proved to be *H. celata*, which, as the group immediately passed on to a piece of woods, was the only one I secured.


The Golden-winged Warbler (*H. chrysoptera* Cab.) probably rarely occurs here, as it is occasionally taken in other parts of the State. Probably also the Blue-winged Yellow Warbler (*H. pinus* Baird) and the Worm-eating Warbler (*Helmintherus vermivorus* Bonap.) may yet be detected here, but they must occur only as very rare visitants. Of the *Helminthophaga, H. ruficapilla* is abundant and breeds here, while all the others appear to be extremely rare.


64. *Sirus noveboracensis* Nutt. Water Wagtail. Not uncommon in spring and fall, and apparently a few breed here, having seen them in June, July, and August; is very rare during the summer months. Arrives May 12th to 20th.

The Large-billed Water Wagtail (*Sirus ludoviciana* Bonap.) ought to occur here, but after several seasons of careful search I have not found it.

65. *Dendroica virens* Baird. Black-throated Green Warbler. Abundant in May, and the last week of August and the first part of September. Though some breed, it is not much observed in summer, as it keeps mostly in the tops of the trees in thick woods. Arrives May 5th and later, being most numerous in spring from May 15th to
25th, when it is often seen in the gardens and orchards, gleaning insects among the opening foliage.

66. *Dendroica canadensis* Baird. Black-throated Blue Warbler. Common from May 15th to 25th, and again the fore part of September. Found in the breeding season on Mt. Holyoke (C. W. Bennett), and along the ridges in the western part of the State (B. Hosford).

67. *Dendroica coronata* Gray. Golden-crowned Warbler. Myrtle Bird. Yellow-rumped Warbler. Very abundant spring and autumn visitant. Commonly arrives first week in May, in great numbers, but generally passes rapidly northward, and is usually abundant but four or five days. Stragglers are sometimes seen the last of April, and a few as late as May 15th. Are often so abundant as to seem to be in an almost continuous loose flock, equally common in orchards, thickets, cultivated grounds and woodlands, keeping up a constant motion northward, others continually arriving to fill the places of those which have passed on. In autumn they are longer in passing, moving much more leisurely than in spring; are very abundant for ten days to two weeks in the fore part of October. Often alights on the ground, particularly in autumn, and is then rather more common about cultivated fields, flying along fences and hastening from field to field, than in deep woods. None breed here.

68. *Dendroica Blackburniae* Baird. Blackburnian Warbler. Not very uncommon. Arrives about the middle of May. A few probably breed, having taken it here June 24th. Most common in mixed or hard wood forests. The nest was found in the eastern part of the State some years since, by Dr. Brewer. (Aud. Orn. Biog., vol. v., 73.)


70. *Dendroica pinus* Baird. Pine Warbler. Very common, breeding plentifully. This is the earliest warbler to arrive in spring, except perhaps *D. palmarum*, and remains till the second week of October. In 1861, they were common in the pine woods April 4th, though the ground was covered with several inches of snow, some of which remained for a week after their arrival. During the last
weeks of April and the early part of May they frequent open fields, obtaining much of their food from the ground, associating with *D. palmarum*, and at this time closely resembling it in habits. A little later they retire to the pine forests, where they almost exclusively remain during summer, keeping mostly in the tops of the taller trees. During a few weeks, about October first, they again come about the orchards and fields.

71. *Dendroica pennsylvanica* Baird. Chestnut-sided Warbler. Common. Arrives about May 9th, and many spend the summer and breed. Mostly frequents, in the breeding season, low woods and swampy thickets, nesting in bushes, and is not generally found much in high trees. Leaves early in September.

72. *Dendroica striata* Baird. Black-poll Warbler. Abundant spring and autumn visitant. Arrives the latest of the Warblers in spring, seldom being seen before May 20th, and remains till June 1st. None breed. In fall becomes common the latter part of September, and remains till the last of October.

73. *Dendroica aestiva* Baird. Yellow Warbler. Summer Yellow Bird. Abundant summer visitant, arriving early in May, and breeds in great numbers among the willows of river meadows, and among the fruit and ornamental trees of the city. Does not frequent the woods, and in many localities is rare, except in May, seeming to prefer the vicinity of water courses and alluvial meadows.


76. *Dendroica palmarum* Baird. Yellow Red-poll Warbler. Common in spring from the first or second week of April to the middle of May, frequenting, in company with *D. pinus*, the edges of thickets, orchards, and open fields, and is much on the ground. Is not seen in summer, but becomes common again the last week of September, and is seen throughout October, and sometimes
the first week of November, remaining the latest of all the Warblers. Is sometimes seen in spring before the snow is gone.

77. Dendroica discolor Baird. Prairie Warbler. Usually very rare, but was rather common in May, 1862. Have not known it detected here in summer, though it breeds in other parts of the State. The region is not of the kind they appear partial to, rather preferring rocky barrens, with scattered, dwarfish cedars and pines. Its habits are peculiar, and its notes are very much so.

Of the twenty-two species of Dendroica inhabiting the United States, thirteen have been found at Springfield, and one other (D. coerulea) may occur as accidental or extremely rare. Four of them (D. virens, pinus, pennsylvanica, estiva) are known to breed here, and two others (D. Blackburniae, castanea) have been taken in the breeding season. None are permanent residents, and none are seen in the winter. The remaining five (D. coronata, striata, maculosa, tigrina, palmarum) are at present known merely as spring and autumn visitants. D. coronata is most abundant; striata next so; virens, canadensis, maculosa, estiva and palmarum are but little less common; Blackburniae is more rare; castanea and discolor are quite rare, while tigrina is extremely rare. The earliest to arrive are pinus and palmarum, commonly appearing early in April; striata is rarely seen before May 30th; the others commonly arrive from May 5th to 12th, and stragglers remain till June. D. coronata is decidedly gregarious in its migrations, and is everywhere about equally abundant. The others are usually seen in small parties, and keep pretty closely to the woods, except D. estiva and palmarum, estiva being never found in the deep woods.

78. Wilsonia* pusilla Bonap. Black-capped Flycatching Warbler. Rare. Have taken it May 12th to the 18th, and August 23d. Probably breeds. Generally found in swampy thickets.

Probably the Hooded Flycatching Warbler (Wilsonia mitrata Bonap.) will yet be found here.

* The prior use of Wilsonia in Botany does not appear to me to be sufficient reason for discarding its use in Ornithology.
79. *Euthlypis canadensis* Cabanis. (*Myiodyoctes canadensis* Aud.) Canada Flycatching Warbler. Common spring and autumn visitant, frequenting all woody situations. Arrives May 12th to 20th, and stragglers are seen till June 3d; returns about the first week of September. Has been found breeding at Lynn, Mass., by George Wells. (Dr. T. M. Brewer, Proc. B. S. N. H., vol. vi., p. 4.)

80. *Setophaga ruticilla* Swain. Redstart. Very common in all wooded places during the greater part of May, and for two or three weeks about September 1st. A very few breed, but the greater part retire to the mountains or northward.

81. *Pyranga rubra* Vieill. Scarlet Tanager. Rather common summer visitant, in high open woods, where it breeds. Occasionally visits open fields, and have known a pair nest in an apple tree, remote from any forest. Arrives about May 15th, and leaves early in September. Gathers its insect food almost wholly among the foliage of the forest trees.

82. *Hirundo horreorum* Barton. Barn Swallow. Very abundant from about May 1st to September 1st. A few usually seen the last week in April; stragglers often seen till the middle of September. One season knew some Barn Swallows to take possession of the nest of a pair of Cliff Swallows, placed as usual under the eaves of a barn, driving off the Cliff Swallows; the next year they built a nest themselves under the eaves, in place of the old one that had fallen down. Have known Barn Swallows to attempt to build in the same place since, but after persistent efforts generally fail, and take to their old quarters inside the barn.

83. *Hirundo lunifrons* Say. Cliff Swallow. "Eave Swallow." About equally common with the preceding; arrives commonly a few days later, and leaves a week earlier. Nests under the eaves of buildings.

84. *Hirundo bicolor* Vieill. White-bellied Swallow. Not very common; apparently least abundant of the Swallows, while in some of the maritime parts of the State it is the most abundant, arriving in numbers the second week in April.

85. *Cotyle riparia* Boie. Bank Swallow. Common,
arriving about the second week of May; leaves last of August. Arrives the latest, and leaves the earliest, of the Swallows. Breeds in communities.

86. *Progne purpurea* Boie. Purple Martin. Not abundant. Arrives early in May; leaves last of August. All the Hirundines are gregarious during the latter part of summer, and at other times as much so as the duties of incubation will admit.

87. *Ampelis garrulus* Linn. Bohemian Wax-wing. Winter visitant. Accidental. One was taken a few years since a few miles south of this city.—(East Windsor Hill, Ct.—Dr. W. Wood.)

88. *Ampelis cedrorum* Baird. Cedar Bird. Cherry Bird. "Wax-wing." Abundant during the summer. Is quite irregular and roving in its habits; seen here at nearly all seasons. Seems to be influenced in its wanderings by the supply of food rather than by climate, having observed it in Cambridge in every winter month, where it is often excessively abundant in February and March, feeding on cedar, ash, and hawthorn berries. Are also found in winter along the south side of Mount Holyoke. (C. W. Bennett.) Have observed them often in February and March at Springfield, but they are not common settled visitors till late in May. Seldom begins nesting before the 15th or 20th of June, often laying its first eggs as late as the 25th; have seen the young of the second brood scarcely fledged September 12th. In May they gorge themselves to excess with the petals and stamens of apple blossoms, and generally depend on the smaller fruits for sustenance; they also take many insects, darting from a perch upon them, like the Flycatchers, and towards the end of summer hunt them in the air for half an hour together, pursuing them like the Swallows, but more clumsily, and apparently for amusement rather than from necessity. Gregarious at all seasons, but seen in smaller parties while breeding.

89. *Collyrio borealis* Baird. Great Northern Shrike. Butcher Bird. Regular winter visitant, but not very common. Seen from last of October to middle of April.

90. *Vireo (Vireosylvia) olivaceus* Vieill. Red-eyed Vireo. Abundant, breeding in open woods everywhere, generally fixing its nest to bushes and saplings, four to
ten or twelve feet from the ground. Arrives about May 5th, and is common till the last week of September. Most abundant of the Vireos; as numerous as all the others together.

91. *Vireo gilvus* Bonap. Warbling Vireo. Common. Arrives first week in May and remains till last week of September. Frequent orchards and gardens, and is very common among the shade trees of the city, but is very rarely seen about woods or thickets. Continues its song throughout the season.


Have never known the White-eyed Vireo (*V. novoboracensis* Bonap.) taken here, and if occurring, as it very probably does, being not very uncommon in the eastern parts of the State, must be excessively rare. In above a thousand specimens of the smaller land birds taken at Springfield during the last three years, by different collectors, not a single White-eyed Vireo has been found. *Vireo philadelphicus* Cass. may also occur, having been taken the past season at Waterville, Me., by Prof. C. E. Hamlin. (A. E. Verrill.)

Of the thirteen species of *Vireo* described by Prof. Baird as inhabiting the United States, only three (*V. olivaceus*, *gilvus*, *flavifrons*) are at all common here, but one other (*V. solitarius*) occurs, and perhaps two more (*V. novoboracensis* and *philadelphicus*) will yet be detected here. All but *V. philadelphicus*, of the above mentioned, are known to breed within the State. *V. olivaceus* is rarely seen outside the woods, and *gilvus* as rarely elsewhere, while *flavifrons* is common to both situations.

94. *Mimus polyglottus* Boie. Mocking Bird. Very rare. Appears to be its extreme northern limit. Have been known to breed in Springfield several times within five years, and in 1860 two pairs nested here. June 20th, 1860, I found a nest containing three freshly laid eggs,
incubation not having been begun. Locality, a sandy field growing up to pitch pines, in one of which the nest was placed, about three feet from the ground. The pair was secured, with the nest and eggs.

95. *Galeoscoptes carolinensis* Cab. (*Mimus carolinensis* Gray). Cat Bird. Very abundant, breeding in hedges, thickets and swamps everywhere. Arrives the last week in April; leaves about middle of October.

96. *Harpornynchus rufus* Cab. Brown Thrush. Brown Thrasher. Abundant summer visitant. Breeds in hedges and thickets, occasionally in fields, near woods or thickets. The nest is very generally placed on the ground; very rarely in bushes, one to three feet from the ground. Among scores of nests I have seen here, only three were placed in bushes, though most authors describe it as always nesting in bushes. But whether the nest is placed on the ground or in bushes may depend upon the nature of the soil, as many birds vary the situation of their nest according to circumstances. Those nests I have observed on the ground have all been in dry and sandy, and consequently warm, localities, favorable for nesting in such a manner while in some cases where the nest has been found in bushes the ground was cold and wet. Here in the Connecticut Valley the nest is almost universally placed on the ground, and only in a few exceptional cases in bushes.


98. *Troglodytes* (*Anorthura*) *hyemalis* Vieill. Winter Wren. Rare spring and autumn visitant; occasional in winter. Found in swampy thickets and borders of moist woodlands. A specimen was taken in January, 1863, by Mr. B. Hosford.

All the Wrens are quite rare here, and though I have really detected no others, probably others occur very sparingly, as *Telmatodytes palustris* Cab., and very possibly *Cistothorus stellaris* Cab., and *Troglodytes americanus* Aud. Dr. W. Wood has found the short-billed Marsh Wren (*Cistothorus stellaris*) breeding in the river marshes, at East Windsor Hill, Ct.

mostly in high open woods, but is also common in the city. Breeds sparingly. Mr. Bradley Hosford showed me a nest of this species, June 2d, 1863, containing young, that apparently had been hatched some four or five days. The nest was in a large elm, in Court Square, Springfield, about ten feet from the ground, and built behind a strip of thick bark that projected in such a way as to leave a protected cavity behind it.


The Blue-gray Gnatcatcher (*Polioptila caerulea* Scl.) perhaps will be found as a rare summer visitant.

102. *Parus atricapillus* Linn. Chickedee. Black-capped Titmouse. Resident, and abundant at all seasons. Seems to be the only Titmouse yet observed here.


105. *Carpodacus purpureus* Gray. Purple Finch. Chiefly a spring and autumn visitant. But very few breed, and rarely stragglers are met with in the winter. Rather common in April, September and October, but are never so abundant as I have seen them at Cambridge, where, in the spring of 1863, they were the most numerous species of bird for several weeks, occurring in flocks from March 25th to April 20th. Not uncommon in winter on Mount Holyoke. (C. W. Bennett)

This species seems to have greatly increased in numbers, in the last twenty-five years, in this State, as well as in other of the Eastern States, judging from the accounts of the older naturalists.

young September 1st. Is gregarious most of the year, especially in winter, and of roving habits.

107. *Chrysomitris (?) pinus* Bonap. Pine Finch. Regular winter visitant, but not abundant. Arrives first or second week in October, and are seen in small parties till second or third week of May; often frequents orchards in autumn and in May to feed on a species of *Aphis* that infests the apple trees. A nest of this species, found in Cambridge a few years since, is in the Museum of Comparative Zoology.

108. *Aegithus linaria* Cab. Red-poll Linnet. Lesser Redpoll. Irregular winter visitant, occasionally abundant, occurring in very large flocks, as in February and March, 1860, and again are not seen for several years.

109. *Curvirostra americana* Wilson. Common Crossbill. Red Crossbill. An irregular and often very abundant visitor. Though seen here at all seasons I have never been able to find it breeding. But few are generally observed here, but at intervals of several years the pine woods are found in the winter to abound with them, as in the winters of 1853-4, and 1859-60, when in February and March they were in full song; were also abundant in the spring of 1863. Are at all times gregarious, and are sometimes seen in large flocks.


111. *Plectrophanes nivalis* Meyer. Snow bunting. Regular winter visitant, roving about in flocks, and most numerous in severe weather. Stragglers are sometimes seen the last of October. Mr. C. W. Bennett tells me that a pair spent the summer of 1862, and reared their young, in Springfield.

The Lapland Longspur (*Centrophanes lapponicus* Kaup, *Plectrophanes lapponicus* Selby,) may rarely occur.


113. *Poecetes gramineus* Baird. Grass Finch. Bay-
winged Sparrow. Summer visitant, breeding abundantly in open sandy fields and dry pastures. Arrives about April 1st, and remains till the first week in November. Breeds two or three times in a season, first young leaving the nest the last week of May.

114. *Coturniculus passerinus* Bonap. Yellow-winged Sparrow. Abundant summer visitant. Arrives about the first week in May, and leaves in autumn the earliest of the Sparrows, generally about the middle of September. Breeds in dry fields and pastures, raising two broods in the season.


116. *Zonotrichia leucophrys* Swain. White-crowned Sparrow. Rare spring and autumn visitant, possibly breeds here. Have taken it May 22d, and October 1st to 15th 1860; May 7th to June 6th 1861; and May 14th 1863. In 1861 were not very rare in May, and remained latest in spring of all those migratory Finches that do not breed here. Arrives in autumn with the White-throated Sparrow.

117. *Zonotrichia albicollis* Bonap. White-throated Sparrow. Common spring and autumn visitant. Seen in spring from the last week in April till May 20th; in fall from last week in September till the last week in October. Its favorite haunts, while here, are moist thickets, but is found much elsewhere. The males do not attain their mature colors till the second spring. The young males sing equally well with the adults, and probably breed in this plumage. Observing many birds singing in the garb of the female drew my attention to the subject, and dissection showed them invariably to be males. This accounts for the great proportion of birds in the livery of the female, both in spring and fall, often observed.

118. *Junco hyemalis* Sclater. Snow Bird. Spring and autumn visitant; a few are occasionally seen in winter. Arrives from the north about October 1st, and is abundant
till the last of November; appears in spring early in March; is very abundant till the middle of April, and stragglers are seen till May. Are in full song on their arrival in spring, and at all times are seen in loose flocks. While the snow is passing off in spring they seem to be more numerous than all other birds. Breed among the mountains of Berkshire County, according to Prof. Emmons, and as far south in Hampden County as Blandford and adjoining towns.

119. *Spizella monticola* Baird. Tree Sparrow. Common winter visitant. Seen from October 20th to about May 1st. In winter inhabits sheltered ravines and swamps, and feeds much on the seeds of weeds that remain above the snow in open fields. Are gregarious, and when feeding, particularly in severe weather, keep up a peculiar tinkling twitter. This species was found breeding in the eastern part of the State in the summer of 1855, its nest and eggs being found by Mr. E. Samuels. (Proc. B. S. N. H., vol. v, p. 213.)

120. *Spizella socialis* Bonap. Chipping Sparrow. Very common summer visitant, breeding everywhere in the vicinity of farm-houses, in the city, and even in remote fields, nesting in trees. Arrives about April 1st; leaves second or third week of October. Is not so gregarious while here as its congeners.

121. *Spizella pusilla* Bonap. Field Sparrow. Wood Sparrow. Common summer visitant. Breeds in old bushy fields, nesting on the ground. In one or two instances only have I found it nesting in bushes. The males sing the whole summer, and almost constantly from April till July. Arrives about April 1st, collects into loose flocks in August and September, and leaves about the middle of October. In autumn emit tinkling notes, similar to those of *S. monticola*.

122. *Melospiza melodia* Baird. Song Sparrow. Abundant summer visitant. Breeds about meadows and in moist situations. Arrives the last of March, and is extremely abundant during April, but is not properly gregarious, though occasionally found in considerable flocks when feeding; retires south late in October.

123. *Helospiza Lincolnii* Baird. (*Melospiza Lincolnii*
Baird.) Lincoln’s Sparrow. Very rare. Shot one in May, 1860, and another May 14th, 1863. No account of its previous capture in New England.*

124. *Helospiza palustris* Baird. (*Melospiza palustris* Baird.) Swamp Sparrow. Not uncommon in spring and fall, and probably some breed; though I have never taken it later than May 25th. In spring arrives first or second week in April, and appears fully as aquatic as the Water Thrush (*Sirus noveboracensis* Bonap.), associating with it about the margins of ponds and streams, hopping in the shallow water, and is very rarely seen away from watery situations; in autumn is found in bushy marshes and wet places, becoming common about the last week of September, and continuing till the last week of October. Said by Audubon to be abundant, *in winter*, about Boston.

125. *Passerellailliaca* Swain. Fox-colored Sparrow. Abundant in fall and spring, in small parties, scratching in thickets and moist woods. Arrives in fall October 15th; leaves last of November; appears again early in March, occasionally in February, in open winters, and leaves about April 10th. Often sings finely while here in spring, and sometimes in fall. Audubon was mistaken in saying this species is abundant about Boston, *in summer*.

126. *Guiraca ludoviciana* Swain. Rose-breasted Grosbeak. Summer visitant, breeding in open woods. Not abundant. Arrives May 10th to 15th. One of our most noted woodland songsters, the male occasionally singing while sitting on the nest, both sexes incubating. Nest placed in shrubs and low trees, often in evergreens, six to ten or twelve feet from the ground. Seems to have increased in numbers in the last twenty-five years, in all parts of the State.

127. *Cyanospiza cyanea* Baird. Indigo Bird. Not very common summer visitant. Breeds in bushes, near gardens, orchards, edges of woods, and in bushy meadows. Arrives about the middle of May; leaves middle of September.

* Since the above was written I have taken another specimen (shot May 25th, 1864.) It was a female, and the largest eggs contained in the ovary were not bigger than a common pin’s head.

ESSEX INST. PROCEED. VOL. IV. J,

129. *Dolichonyx oryzivorus* Swain. Bobolink. "Skunk Blackbird." Summer visitant. Arrives about May 10th. Abundant in orchards and meadows. Is scarcely gregarious in the breeding season, though many are usually found nesting in the same meadow, but begin to collect into flocks about the third week in July, at which time the old birds are beginning to moult.

130. *Molothrus pecoris* Swain. Cow Bird. Cow Blackbird. Abundant summer visitant. Polygamous, and more or less gregarious at all seasons. In spring and fall are sometimes seen in flocks of many hundreds, particularly in fall. Arrives first to third week in March, and commonly leaves last week in October. Dr. Brewer was mistaken in saying that the Cow Bird leaves Massachusetts before the first of July, or earlier, &c. (See Aud. Orn. Biog., vol. v, p. 490.)


132. *Sturnella magna* Swain. Meadow Lark. Common summer visitant. Breeds in meadows and moist pastures. Arrives second or third week in March; leaves about the first week in November; a very few remain in winter. Partially gregarious, especially in autumn.

133. *Icterus Baltimore* Daud. Baltimore Oriole. "Golden Robin". Abundant summer visitant. Breeds plentifully in orchards and shade trees, the elm and the apple being its favorite nesting trees. Arrives about May 10th, and remains till the second week of September. In August and September hunts much in the tall deciduous woods, where it sometimes breeds, feasting, in loose, roving parties of sometimes several dozens, upon the caterpillars
and beetles that infest the trees, and are then seldom seen in the orchards they so much frequent in the breeding season.

134. *Icterus spurius* Bonap. Orchard Oriole. Rare summer visitant. A few pairs breed every season.

135. *Scolecoptagus ferrugineus* Swain. Rusty Grackle. Rather rare. Stragglers are seen in fall and spring; occasionally small flocks. In spring arrives early, and is seen as late as May; seen in autumn from the last week in September till November; have seen it November 24th.


137. *Corvus carnivorus* Bartram. American Raven. Accidental. One was taken by Mr. C. W. Bennett, in the fall of 1859. One was killed at Tyngsborough, Mass., a few years since. (Agr. of Mass., 1859, Secy's Rep., p. 143.)

138. *Corvus americanus* Aud. Common Crow. Resident. Very abundant in spring and fall, appearing in immense flocks. Seems to have diminished very materially in numbers in the last six or eight years, hundreds, and probably thousands, having been killed in the State by the use of strychnine almost every year. Fewer have bred here for the last few years than formerly.

139. *Cyanura cristata* Swain. Blue Jay. "Corn Bird." Common resident. Somewhat gregarious. Resides in the woods, but makes frequent excursions over the open country, visiting the orchards for piratical purposes in the summer, and the farmer's corn crib in the winter. In winter have found in its stomach the eggs of the common tent caterpillar in abundance.

140. *Ectopistes migratoria* Swain. Wild Pigeon. Seen in some years in great numbers; in others very rarely; are usually more or less common at all seasons, except winter, and a few generally breed. Lays but one egg at a time, but breeds two or three times in a summer.

76

J. A. ALLEN, CATALOGUE OF

tant. Often nests in orchards, and generally in low pine woods. Lays two eggs, and breeds more than once in a season. Arrives second week in March, or earlier; have seen it March 5th. Collects into loose flocks the last of July, frequenting old rye fields, and for two months is abundant, and much hunted by sportsmen, so that at all seasons it is a shy bird. The greater part leave about the 1st of October, but some remain till the second or third week.


143. **Ortyx virginiana** Bonap. Quail. Resident, and now extremely rare. As late as 1851 it was quite abundant, but severe winters and sportsmen have nearly exterminated the species in this vicinity.

144. **Herodias egretta** Gray. White Heron. A single specimen was taken a few years since. There is a fine specimen of this species in the Springfield Museum, taken in West Brookfield, Mass., in 1860.


146. **Ardetta exilis** Gray. Least Bittern. Extremely rare. Has been taken here. (C. W. Bennett.) Have seen specimens taken in other parts of the State.

147. **Botaurus lentiginosus** Steph. Bittern. "Stake-driver." Common in the marshes and river meadows. Arrives first week in April; remains till second week of October, or later.


149. **Nycticardea Gardeni** Baird. Night Heron. "Squawk." Common. Arrives about the middle of April. In August have seen several dozens in the air at once, near their feeding grounds, soon after sunset. Are gregarious and breed in communities. Says Dr. Wood, in a letter to the writer, "I know of a swamp some fourteen miles from here [East Windsor Hill, Ct.] where thousands breed. I have counted eight nests on one maple tree.
I knew two sportsmen shoot a business wagon body full one forenoon—probably two hundred."


152. Ægialus semipalmatus Reich. (Ægialitis semipalmatus Cab.) Semipalmated Plover. Spring and autumn visitant. Not rare.


157. Actodromas minutilla Coues. (Tringa Wilsonii Nutt.) Least Sandpiper. Occasionally taken towards autumn; probably occurs also in spring. Bonaparte's Sandpiper (Actodromas Bonapartii Cass.) is undoubtedly to be found here occasionally in autumn.


159. Gambetta melanoleuca Bon. Greater Tell-tale Tatler. Rare spring and autumn visitant; less common than the next.


163. Bartramia laticauda Less. (Actiturus Bartramius Bonap.) Field Plover. Bartram's Sandpiper. Summer visitant; breeds, and towards autumn is often very common.

164. Tringites rufescens Cab. Buff-breasted Sandpiper. Rare spring and autumn visitant.


166. Porzana carolina Vieill. Common Rail. Sora Rail. Arrives in April, and some remain till November. Breeds, and is pretty common in September and October.

The Yellow Rail (P. noveboracensis), being found in other parts of the State, may be looked for here, but only as a rare species.


Dr. W. Wood says: "I have taken five in a season. They come after most ducks have gone north, and resort to the small and inland ponds." Breed in some parts of Massachusetts.

168. Bemicla canadensis Boie. Canada Goose. "Wild Goose." Common spring and autumn visitant, but seldom seen except flying in the air. Pass to the north in March and April, and to the south in November. Have seen flocks as early as September 28th, and as late as December 10th. Were unusually abundant in the fall of 1859. November 19th, 1859, between the hours of 10 A. M. and 12 M., I noted ten flocks in a breadth of two miles, estimated (more than half being actually counted) to contain more than seven hundred geese, a remarkably large number for the length of time. Probably does not breed in the State, though supposed to by Audubon.

169. Bemicla brenta Steph. Brant. Not common; seen at the same seasons as the preceding.

170. Anas boschas Linn. Mallard. Taken near here by Dr. Wood, and undoubtedly occurs here, but is very rare, as it is in all parts of the State.

171. Anas obscura Gm. Black Duck. Abundant. Arrives in March and remains till May; becomes common again in September and remains till late in November; a few sometimes seen in winter. Our most common Duck. Breeds in the mountainous parts of Western Massachusetts.


174. *Querquedula discors* Steph. Blue-winged Teal. Common, but less abundant than the preceding.


178. *Aythya vallisneria* Bon. Canvass-Back Duck. Very rare; found occasionally near here (Dr. Wood), and undoubtedly is to be found here. Occurs in other parts of the State. Probably the Red-head (*A. americana* Bon.) is also to be found here.

179. *Bucephala americana* Baird. Golden-eye Duck. "Whistler." "Whistle-wing." Not uncommon in winter. Dr. Wood, says it is abundant on the river in winter, but very difficult to obtain unless you are pretty familiar with its feeding grounds.


181. *Harelda glacialis* Leach. Long-tailed Duck. "South Southerly." Occasionally taken near here (Dr. Wood), and undoubtedly occurs at Springfield.

182. *Melanetta velvetina* Baird. Velvet Duck. Rare. Dr. Wood has taken two specimens at East Windsor Hill, Ct., and it must occur here.

183. *Erismatura rubida* Bon. Ruddy Duck. Rare: there is a specimen in the Springfield Museum taken here by Mr. L. Hyde.


186. *Lophodytes cucullatus* Reich. Hooded Merganser. Winter visitant; rather less common than either of the two immediately preceding.

187. *Thalassidroma Leachii* Temm. Leach's Petrel. Very rare; probably accidental; has been taken here in a few instances only. Common off the coast of the State.

188. *Larus Smithonianus* Coues. (*Larus argentatus* Brünn.) Herring Gull. Not very uncommon at times along the river, especially in spring and fall. Abundant along our coast in autumn, winter, and early spring.


191. *Colymbus septentrionalis* Linn. Red-throated Diver. Rare winter visitant; chiefly young that are seen

192. *Podiceps (Pedicellus) Holboell* Reinh. (*Podiceps griseigena* Gray.) Red-necked Grebe. Chiefly a winter visitant; not common. Possibly breeds, as it has been taken here the third week of May in full breeding plumage.


194. *Podiceps (Dytes) cornutus* Lath. Horned Grebe. Rare; chiefly young taken here. A pair was killed here a few years since, about June 1st, in full breeding plumage.


List of Birds found in Massachusetts not observed at Springfield.

To complete a catalogue of the Birds known to exist in the State of Massachusetts, I have added, in the following list, all those known to have been obtained within the
State that have not been noticed at Springfield. The list will be seen to consist mainly of those Water Birds that frequent the coast and are not found far inland, with a few rare or accidental visitors. No species is admitted of which there is not good evidence of its capture in the State; and when the species is extremely rare, the authority is cited on which it is inserted. Consequently some species that have been attributed to Massachusetts, from their occurrence in adjoining States, though probably to be found here as rare visitors, and are thus mentioned, are not counted as a part of the list; very careful observers will, doubtless, yet detect most of them here.


2. _Cathartes aura_ Ill. Turkey Vulture. Accidental. Two were taken in the State in 1863. (E. A. Samuels, _Agr. Mass._, 1863, Secy’s Rep., App., p. xviii.)


5. _Surnium cinereum_ Gmelin. Great Cinerous Owl. Occasional in winter. (Marblehead, February, 1831, and January, 1835; S. Jillson, Proc. Ess. Inst., vol. 1, p. 204.) Seven were taken in the State during the year ending February, 1843. (Dr. S. L. Abbot, Proc. B. S. N. H., vol. 1, pp. 57 and 99.) Two specimens in the _Mus. Comp. Zoölogy_ were obtained in 1848, in the Boston markets, and were _probably_ killed in the State.

The Hawk Owl (_Surnia ulula_ Bon.) is said by Prof. Emmons to have been seen in autumn. Though I have
found no notice of its capture, it is not improbable that it may occasionally occur along the Green Mountains in the Western part of the State.

The Banded Three-toed Woodpecker (*Picoides hirsutus* Gray) has been repeatedly attributed to the State, and may occur as a very rare or accidental winter visitor.

6. *Hylotomus pileatus* Baird. Pileated Woodpecker. "Log Cock." Rare. Driven from most parts of the State by the absence of extensive forests, but is still found in the wooded, mountainous parts of Berkshire County.

The Varied Thrush (*Ixoreus novius* Bon.) is said by Prof. Baird, in the Reports on the Pacific Railroad Explorations and Surveys, vol. ix, pp. xxi and 219, to be accidental near Boston, quoting Dr. Cabot (Proc. Bost. So. N. H., vol. iii, p. 17) as authority. Dr. Cabot states that a specimen of this species was obtained in Boston market, but adds that it was *shot in New Jersey*. This is the only notice I can find respecting this species being found in Massachusetts, either by Dr. Cabot or others.


9. *Helmitlierus Swainsonii* Bon. Swainson’s Warbler. Audubon states, on the authority of Dr. T. M. Brewer, that one was taken in Massachusetts by Mr. S. Cabot Jr. (Aud. Orn. Biog., vol. v, p. 462.) Mr. Peabody probably alludes to the same specimen (Rep. on Orn. of Mass., p. 213.) Very rare in this State.


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* Fishes, Reptiles and Birds of Massachusetts.
The Blue Warbler (*Dendroica cerulea* Baird.) is said to be a rare summer visitant, (F. W. Putnam, Proc. Ess. Inst., vol. 1, p. 207,) but I have failed to find an authentic instance of its capture in this State. Audubon says it has been taken at Picton, Nova Scotia, and so may very naturally be expected to occur in Massachusetts.


The Hooded Flycatcher (*Wilsonia mitrata* Bon.; *Myioides mitratus* Aud.) may be looked for in this State, as it has been found in Connecticut and New York. Mr. E. A. Samuels, in his recent list of the Birds of Massachusetts, (Agr Mass., 1863, Secy's Rep., App., p. xxii,) gives it as a rare summer visitor.


The Blue Gray Gnatcatcher (*Polioptila cerulea* Sclat.) is said by Peabody to be found in Massachusetts, on the authority of Dr. Brewer, (Rep., p. 297.) Having been found in adjoining States,—in New York north of the latitude of Boston, as well as in Nova Scotia, and in Connecticut,—it may be looked for as a rare straggler from its usual habitat. I have been unable as yet to learn of its actual capture in this State.

The Crested Chickadee (*Lophophanes bicolor* Bonap.) though mostly a southern species, Audubon states (Orn. Biog., vol. v, p. 472) is common in Nova Scotia, and hence may be expected to occur here.


Resident at Calais, Maine, but not common.


20. Ammodromus caudacutus Swain. Sharp-tailed Finch. Common summer visitor in salt marshes, where it breeds. Have taken it in the marshes of Charles River the last week in October.


22. Eospiza americana Bon. Black-throated Bunting. Probably rare or occasional. Said to be found here by Nuttall (Man. Orn., vol. i, p. 461). According to Peabody, “is found in high meadows near salt water marshes, from the middle of May till the last of August.” (Rep. Orn. of Mass., p. 319.) Mr. E. A. Samuels informs me that he has seen two specimens killed in this State; one was sent him from Woburn. Nuttall, in his account of the notes and habits of this species, as observed here, has described the peculiar song and habits of the Yellow-winged Sparrow (Coturniculus passerinus Bon.) with remarkable aptness, which species he evidently mistook for the Black-throated Bunting. Nuttall seems not to have known the Yellow-winged Sparrow, under its proper name, at the time he wrote, and it is difficult to tell what he had in mind when describing its habits and distribution in the breeding season; his description of its song, which he strangely likens to that of the Purple Finch, and of its eggs, being not at all applicable to the Yellow-winged Sparrow. As Nuttall has been the authority chiefly depended on for the occurrence of Eospiza americana in this State, I strongly doubted its having been taken here, till assured of the fact by Mr. Samuels.

The Blue Grosbeak (Guiraca cerulea Swain.) may be
looked for as an occasional visitor. Has been found at Calais, Maine, where it is "very uncertain, but common in the spring of 1861." (G. A. Boardman, Proc. B. S. N. H., vol. IX, p. 127.)


24. *Quiscalus major* Vieill. Boat-tailed Grackle. Accidental. Have heard of one that was killed in Cambridge a few years since. Mr. E. A. Samuels tells me that a pair bred in Cambridge in 1861.

25. *Corvus ossifragus* Wils. Fish Crow. An occasional visitor along the southern coast of the State.


The Wild Turkey (*Meleagris gallopavo* Linn.) is now probably extinct in this State. Within a few years it has been said to occur wild on Mts. Tom and Holyoke; but I can find no authentic instance of its recent capture in this State. The accounts of those recently taken seem to rest on the authority of hunters, who might readily mistake a stray domestic turkey for a wild one, and not on the authority of reliable naturalists. It is well known that the domestic turkey will sometimes take to the woods, assuming the habits of the wild bird; hence these reports may well be received with considerable caution. In winter the wild birds are found in Boston markets, but are brought from distant parts of the country, chiefly from the West.

28. *Garzetta candidissima* Bonap. Snowy Heron. Ac-
cidental. Stragglers have been taken in a few instances. Have seen one that was killed near Boston, in 1862.

29. *Florida cœrulea* Baird. Blue Heron. Stragglers only taken here. There is a specimen in the State Agricultural Cabinet, taken in the eastern part of the State.

30. *Ibis Ordii* Bonap. Glossy Ibis. Occasional; apparently accidental. Have been taken here at irregular intervals. In June, 1830, three were obtained in the eastern part of the State. (Nuttall, Man. Orn., vol. ii, p. 88.) Others have been taken. (Cabot, Proc. B. S. N. H., vol. iii, pp. 313, 333, 355; vol. iv, p. 346.)


32. *Ægialeus melodus*. (Ægialitis melodus Cab.) Piping Plover. Common visitant, mostly along the seacoast in summer, some breeding.


34. *Strepsilas interpres* Ill. Turnstone. Common spring and autumn visitant, along the coast. The American Avoset (*Recurvirostra americana* Gmel.) and the Black-necked Stilt (*Himantopus nigricollis* Vieill.), from their general distribution, may be looked for in Massachusetts as very rare species.


Knot. "Gray Back." Spring and fall; sometimes very abundant in autumn, arriving in August.


42. Actodromas Bonapartii Cass. (Tringa Bonapartii Schl.) Bonaparte's Sandpiper. Coast in spring and fall; sometimes abundant.

43. Ereunetes pusilla Cass. Semipalmated Sandpiper. Common along the coast in spring and autumn.

44. Limosa fedoa Ord. Marbled Godwit. Rare passenger in spring and fall.


47. Numenius hudsonius Lath. Hudsonian Curlew. Spring, fall and winter.


49. Rallus crepitans Gm. Clapper Rail. Rare or accidental. (S. Cabot Jr., Bost. So. N. H., vol. iii, p. 326.)

50. Porzana novboracensis —? Yellow Rail. Found in spring and fall; perhaps breeds. Not common.


52. Gallinula martinica Lath. Purple Gallinule. Like the preceding, occurs as a very rare, chance visitor from the south, but is oftener met with. Has been taken but a few times in this State.


54. Anser Gambellii Hartl. White-fronted Goose. Have seen specimens obtained in Boston market that were probably taken in the State.

This species is introduced as a bird of Massachusetts with considerable doubt. For its occurrence here, we have the authority of Nuttall, (Man. Orn., vol. ii, p. 362) who mentions it as a straggler on our coast,—and of Giraud, who says it is quite abundant some seasons on the coast of Massachusetts. Lindsley, in his Catalogue of the Birds of Connecticut, (Am. Jour. Sc. and Arts, vol. xlv, p. 249) says it is not unfrequently taken in Connecticut in spring.

56. *Bernicle leucopsis* —.? (*Anser erythropus* Linn.) Barnacle Goose. Is said to have been shot at Quincy, Mass., by Dr. S. Cabot Jr., (Proc. B. S. N. H., vol. iii, p. 136.) Prof. Baird says, "its occurrence in North America is very doubtful, resting only on very insufficient evidence. (P. R. R. Ex. and Surv., vol. ix, p. 768.)"


59. *Mareca penelope* Bon. European Widgeon. Has been taken at several points along the eastern coast of the United States, and has been found apparently breeding on Long Island, (Dr. T. M. Brewer, Proc. B. S. N. H., vol. vi, p. 419) where it has been repeatedly found. One has been taken in this State. (E. A. Samuels.)


63. *Aythya americana* Bon. Red-headed Duck. "Redhead." Autumn and winter. Not very common. Abundant in the markets of Boston in winter, but, like the Canvasbacks, are brought from the bays and rivers of the Middle States.


65. *Camptolemus labradorius* Gray. Labrador Duck. Rare winter visitant.


69. *Somateria spectabilis* Leach. King Eider. Rare visitor in winter.

The Smew (*Mergellus albellus* Selby) Mr. E. A. Samuels attributes to this State, having seen a specimen which he was told was taken in Massachusetts Bay.

The American Pelican (*Pelecanus erythrorhyncus* Gmelin) has recently been taken at Calais, Me., (G. A. Boardman, Proc. B. S. N. H., vol. ix, p. 130) and, according to DeKay, was formerly numerous on the Hudson and other rivers and lakes of New York. It probably occurs as a chance visitor in this State.


75. *Thalassidroma pelagica* Bon. Mother Cary’s Chicken. Rare, off the coast, as far south as Provincetown. (E. A. Samuels.)


78. *Puffinus anglorum* Temn. Mank’s Shearwater. Rare, off the coast in winter.

*Essex Inst. Proceed. Vol. IV. L.*
81. Stercorarius cephus Lawr. Buffon’s Skau. Rare. Has been taken near Boston.
83. Larus delawarensis Ord. Ring-billed Gull. Not very uncommon near the coast in winter.
84. Larus leucopterus Fabr. White-winged Gull. Rare winter visitant.
86. Rissa tridactyla Bon. Kittiwake Gull. Very common about the islands in Massachusetts Bay in autumn and winter.

The Fork-tailed Gull (*Xema Sabinii* Bonap.) may occur on our coast as an occasional visitor.

88. Sterna fuliginosa Gm. Sooty Tern. Rare summer visitor. (E. A. Samuels, Agr. Mass., 1863, Secy’s Rep., App., p. xxix.) Mr. Samuels informs me that it breeds on Muskegat Island, near Martha’s Vineyard.
89. Sterna hirundo Linn. Wilson’s Tern. Common in summer, breeding on the rocky islands in the Bay.
92. Sterna frenata Gambel. Least Tern. Spring and

Other species of Sterna undoubtedly occur as rare visitors off our coast, as the Caspian Tern (Sterna caspia Pall.) in winter, from the north; and possibly, at the same season, Trudeau's Tern (Sterna Trudeaui Aud.) as a very rare, or accidental species.


94. Colymbus arcticus Linn. Black-throated Diver. rare autumn and winter visitor.


100. Cataractes lomvia Bryant. (Uria arra Pall.) Thick-billed Guillemot. Murre. Rather common in winter.


The birds found in Massachusetts may be conveniently grouped into the following classes: I. Species that regularly breed in the State. II. Resident species. III. Winter visitants. IV. Spring and autumn visitants. V. Summer visitants. VI. Accidental or irregular visitants.

I. Species that regularly breed in the State.

Those marked with a star, though repeatedly found breeding in some localities, breed very sparingly, and not generally over the State. Some others are common in some parts of the State, but are unknown or very rare
in most parts. Several others have been known to breed, but apparently only accidentally, as in the case of *Chrysomelis pinus*, *Spizella monticola*, and a few others. A few not in the list may occasionally breed.

1. Falco anatum *Bonap.*
2. Tinnunculus sparverius *Vieill.*
3. Accipiter Cooperii *Bonap.*
4. " fuscescens *Bonap.*
5. Buteo borealis *Vieill.*
6. " lineatus *Vieill.*
7. " pennsylvanicus *Bon.*
8. Circus hudsonius *Vieill.*
9. Halliatus leucocephalus *Sav.*
10. Pandion carolinensis *Bon.*
11. Bubo virginianus *Bonap.*
12. Soopsasio *Bonap.*
13. Otus americanus *Bonap.*
15. Syrniun nebulosum *Gray.*
17. Coocygas americanus *Bon.*
18. erythropthalmus *Bon.*
19. Picus villeous *Linn.*
20. " pubescens *Linn.*
22. Hylotomus pileatus *Baird.*
23. Melanerpes erythrocephalus *Sw.*
24. Colaptes auratus *Swain.*
25. Trochilus colubris *Linn.*
27. Antrostomus vociferus *Bon.*
28. Chordeiles popetue *Baird.*
29. Ceryle alectr *Boie.*
30. Tyrannus carolinensis *Bd.*
31. Myiarchus crinitus *Cab.*
32. Sayornis fuscescens *Baird.*
33. Contopus borealis *Baird.*
34. " virens *Cab.*
35. Empidoxas Trailli *Baird.*
36. " minimus *Bd.*
37. " acalidus *Bd.*
38. Turdus mystalinus *Gmelin.*
40. " fuscescens *Steph.*
41. " migratorius *Linn.*
42. Sialia sialis *Baird.*
43. Maiotiita varia *Vieill.*
44. Parula americana *Bon.*
45. Geothlypis trichas *Cab.*
46. Icteria viridis *Bon.*
47. Helmitherus vermiculosus *Bon.*
48. Helminthophaga rupeicapilla *Bd.*
49. Icterus auroradicans *Swain.*
50. " noveboracensis *Nutt.*
51. Dendroica virens *Baird.*
52. Dendroica canadensis *Bd.*
53. " Blackburniae *Bd.*
54. " pinus *Baird.*
55. " vestiva *Bd.*
56. " discolor *Bd.*
57. Euthlypis canadensis *Cab.*
58. Setophaga ruticilla *Sw.*
59. Pyraga rubra *Vieill.*
60. Hirundo horreorum *Barton*
61. " lunifrons *Sav.*
62. " bicolor *Vieill.*
63. Cotyler riparia *Boie.*
64. Progne purpurea *Boie.*
65. Ampelis cederorum *Baird.*
66. Vireo olivaceus *Vieillot.*
67. " gilvus *Bonap.*
68. " noveboracensis *Bon.*
69. " flavivors *Vieill.*
70. Minus polyglottus *Boie.*
71. Galeospetes carolinensis *Cab.*
72. Harpophenchi rufus *Cabanis.*
73. Cistothorus palustris *Cab.*
74. " stellaris *Cab.*
75. Troglodytes aedon *Vieill.*
76. Certhia americana *Bon.*
77. Sitta carolinensis *Gmel.*
78. Parus atricapillus *Linn.*
79. Carpodacus purpureus *Gray.*
80. Astralginus tristis *Cabanis.*
81. Passerculus savanna *Bon.*
82. Porosetes gramineus *Baird.*
83. Coturnicius passerinus *Bon.*
84. " Henslowii *Bon.*
85. Ammodornus caudacutus *Sw.*
86. " maritimus *Sw.*
87. Junco hyemalis *Selater.*
88. Spizella pusilla *Bonap.*
89. " socialis *Bonap.*
90. Melospiza melodia *Baird.*
91. Helospiza palustris *Baird.*
92. Girassca ludoviciana *Swain.*
93. Cyanospiza cyanes *Baird.*
94. Pipilo erythropthalmus *Vieill.*
95. Dolichonyx oryzivora *Swain.*
96. Molothrus pecoris *Swainson.*
97. Agelaius phoenicurus *Vieill.*
98. Sturnella magna *Swain.*
99. Icterus purpurus *Bon.*
100. " Baltimore *Bon.*
101. Quiscalis versicolor *Vieill.*
102. Corvus americanus *Aud.*
II. Resident Species.

Of a few species more properly to be regarded as spring and autumn or summer visitors, a few individuals are sometimes found in winter, as of *Ceryle alcyon,* Turdus migratorius, *Melospiza melodia,* &c., but since the majority are migratory, they are not placed in the list of resident species.

1. Falco anatum *Bon.*
2. Tinnunculus sparverius *Vieill.*
3. Buteo borealis *Vieill.*
4. Circus hudsonius *Vieill.*
5. Halietus leucocephalus *Savigny.*
6. Bubo virginianus *Bonap.*
7. Scopasio *Bonap.*
8. Otus americanus *Bon.*
10. Syrnum nebulosum *Gray.*
11. Nyctale acedia *Bonap.*
12. Picus villosus *Linn.*
13. " pubescens *Linn.*
15. Certhia americana *Bon.*
17. Parus atricapillus *Linn.*
18. Atragilus tristis *Cab.*
19. Corvus americanus *Aud.*
20. Cyanura cristata *Swinin.*
22. Bonasa umbellus *Steph.*
23. Ortyx virginianus *Bonap.*
24. Fulica americana *Gmel.*
25. Anas obscura *Gmel.*
26. Mergus americanus *Cass.*
27. " serrator *Linn.*
28. Aix sponsa *Boie.*
29. Thalassidromus Leachii *Temm.*
30. Sterna Hirundo *Linn.*
31. " macroura *Nauin.*

III. Winter Visitants.

Those species marked with a star are occasional or irregular visitors, but some of them sometimes occur in great abundance. A few individuals are often found in winter of some of those species properly to be considered as spring and autumn visitants, and as such are placed in the next list below.

1. Astur atricapillus *Bon.*
2. Archibateo lagopus *Gray.*
4. Aquila canadensis *Cass.*
5. Syrnum cinereum *Aud.*
6. Nyctale Richardsonii *Bon.*
7. Nyctea ulva *Gray.*
8. Picoides arcticus *Gray.*
10. Ampelis garrulus *Linn.*
11. Collyrio borealis *Baird.*
12. Troglodytes hyemalis *Vieill.*
13. Sitta canadensis *Linn.*
14. Parus hudsoniens Forst.*
15. Eremophila cornuta *Boie.*
16. P incumbens canadensis *Cab.*
17. Chrysomitra pinus *Bonap.*
18. Curvirostra americana *Wils.*
20. Egitthus linaria *Cab.*
IV. Spring and Autumn Visitants.

Of some species properly regarded as spring and autumn visitants, a few individuals remain through the winter, in sheltered situations, or through the summer, now and then breeding. Those of which some remain in winter are marked with this *; those in summer, with this †. There may be a few other species of this character not thus marked, as Empidonax flaviventris, Vireo solitarius, &c., that should be.

1. Hypotyphichis columbarius Gr. 20. Dendroica palmarum Bd.
3. Empidonax flaviventris Baird. 22. Entlypis canadensis Cab.†
15. Dendroica coronata Gray. 34. " hyperboreus Temm.
17. " striata Bd. 36. Macroramphus griseus Leach.
18. " maculosa Bd. 37. Tringa canutus Linn.

V. Summer Visitants.

Of some species of which the greater part are merely summer visitants a few individuals remain in winter; but not enough to entitle the species to be considered resident, and are marked thus $; those of which the greater part pass north to breed, thus †; those of which but few reach us in summer from the south, thus ‡.

1. Aecipiter Cooperii Bon. $ 18. Parula americana Bon.
2. " fuscus Bon. 29. Geothlypis trichas Cab.
5. Coccycus americanus Bon. 32. Helminthophaga ruficapilla Bd.
7. Sphyropieus varius Baird. 34. " novaboracensis Naut.‡
8. Melanerpes erythrocephalus Sw. 35. Dendroica virens Bd.
9. Colaptes auratus Swain. 36. " canadensis Bd.†
10. Trochilus colubris Linn. 37. " Blackburnia Bd.†
15. Tyrannus Carolinensis Bd. 42. Wilsonia minuta Bon.
16. Myiarchus crinitus Cab.§ 43. Setophaga ruticilla Sw.
17. Sayornis fuscescens Baird. 44. Pyranga rubra Vieill.
<table>
<thead>
<tr>
<th>Page</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>55</td>
<td>Mimulus polyglottus Boie.†</td>
</tr>
<tr>
<td>56</td>
<td>Galeoscoptes carolinensis Cab.</td>
</tr>
<tr>
<td>57</td>
<td>Harporhyncus rufus Cab.</td>
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<tr>
<td>58</td>
<td>Cistothorus palustris Cab.</td>
</tr>
<tr>
<td>59</td>
<td>&quot; stellaris Cab.</td>
</tr>
<tr>
<td>60</td>
<td>Troglytes adon Vieill.</td>
</tr>
<tr>
<td>61</td>
<td>Carpodacus purpureus Gr.*†</td>
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<tr>
<td>62</td>
<td>Passerculus savanna Bon.</td>
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<tr>
<td>63</td>
<td>Poecetes gramineus Bd.</td>
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<td>64</td>
<td>Coturniculus passerinus Bon.</td>
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<td>&quot; Henslowii Bon.</td>
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<tr>
<td>66</td>
<td>Ammodramus maritimus Sw.</td>
</tr>
<tr>
<td>67</td>
<td>&quot; caudacutus Sw.</td>
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<tr>
<td>68</td>
<td>Spizella pusilla Bon.</td>
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<tr>
<td>69</td>
<td>&quot; socialis Bon.</td>
</tr>
<tr>
<td>70</td>
<td>Melospiza melodia Baird.</td>
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<tr>
<td>71</td>
<td>Helospiza palustris Bd.</td>
</tr>
<tr>
<td>72</td>
<td>Euspiza americana Bon.</td>
</tr>
<tr>
<td>73</td>
<td>Guiraca ludovicana Sw.</td>
</tr>
<tr>
<td>74</td>
<td>Cyanospiza cyanea Baird.</td>
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<tr>
<td>75</td>
<td>Pipilo erythrophthalmus Vieill.</td>
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<tr>
<td>76</td>
<td>Dolichonyx oryzivorus Sw.</td>
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<td>77</td>
<td>Molothrus pecoris Sw.</td>
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<td>78</td>
<td>Ageleus phenicicus Vieill.</td>
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<tr>
<td>79</td>
<td>Sturnella magna Swain.*</td>
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<tr>
<td>80</td>
<td>Icterus spurius Bon.†</td>
</tr>
<tr>
<td>81</td>
<td>Icterus Baltimore Daud.</td>
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<tr>
<td>82</td>
<td>Quiscalus versicolor Vieill.</td>
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<tr>
<td>83</td>
<td>Ectopistes migratorius Sw.</td>
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<tr>
<td>84</td>
<td>Zenadura carolinensis Bon.</td>
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<tr>
<td>85</td>
<td>Ardea herodias Linn.</td>
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<tr>
<td>86</td>
<td>Ardetta exilis Gray.</td>
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<tr>
<td>87</td>
<td>Botaurus lentiginosus Steph.</td>
</tr>
<tr>
<td>88</td>
<td>Butorides virescens Bon.</td>
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<tr>
<td>89</td>
<td>Nyctiaraea Gardenii Bd.</td>
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<tr>
<td>90</td>
<td>Oxyechus vociferus Reich.</td>
</tr>
<tr>
<td>91</td>
<td>Ochthodromus Wilsonii Reich.†</td>
</tr>
<tr>
<td>92</td>
<td>Aegialus melodus Cab.</td>
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<tr>
<td>93</td>
<td>Squatarola helvetica Cur.</td>
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<td>94</td>
<td>Hematopus palliatus Temm.</td>
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<tr>
<td>95</td>
<td>Philohela minor Gray.</td>
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<tr>
<td>96</td>
<td>Gallinago Wilsonii Bon.</td>
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<tr>
<td>97</td>
<td>Symphymia semipalmata Hartl.</td>
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<tr>
<td>98</td>
<td>Tringoides macularius Gray.</td>
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<tr>
<td>99</td>
<td>Bartramia laticauda Less.</td>
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<tr>
<td>100</td>
<td>Rallus virginianus Linn.</td>
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<tr>
<td>101</td>
<td>Porzana carolina Vieill.</td>
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<tr>
<td>102</td>
<td>Aix sponsa Boie.</td>
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<tr>
<td>103</td>
<td>Sterna hirundo Linn.</td>
</tr>
<tr>
<td>104</td>
<td>&quot; paradisea Brunn.†</td>
</tr>
<tr>
<td>105</td>
<td>“ aranea Wils.</td>
</tr>
<tr>
<td>106</td>
<td>“ fuliginosa Gm.†</td>
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VI. Accidental and Irregular Visitors.

The following species are known in this State merely as rare chance visitors, a few only excepted, from the common habitat of their respective species. The others are very irregular in their visits. There are many other species so extremely rare that there are but few known instances of their capture in the State; but from what is known of their distribution we are not to regard them in the light of chance visitors.

1. Cathartes atratus Lesson.
2. " aura Ill.
3. Falco candidans Gmelin.
4. Surnym cinereum Aud.
5. Nyctale Richardsonii Bon.
6. Picoides arcticus Gray.
7. Centaurus carolinus Bon.
8. Icteria viridis Bon.
9. Pyranga aestiva Vieill.
10. Ampelis garrulus Linn.
11. Mimulus polyglottus Boie.
12. Parus hudsonicus Forster.
15. Centrophages lapponicus Kaup.
16. Chondestes grammaca Bon.
17. Helospiza Lincolini Baird.
18. Euspiza americana Bon.
19. Cardinalis virginianus Bon.
20. Quiscalus major Vieill.
23. Tetrao canadensis Linn.
24. Garzetta candidissima Bon.
25. Herodias egretta Gray.
27. Ibis Ordii Bon.
28. Ochthodromus Wilsonii Reich.
29. Rallus crepitans Gm.
30. Gallinula galeata Bon.
31. " martiana Lath.
32. Bernica leucopsis Linn.
33. Nettion crecca Kaup.
34. Mareca penelope Bon.
35. Sterna paradisea Brunn.
36. " fuliginosa Gm.
Summary.

Number of species found at Springfield .................................. 195

" " " " in the State .................................................. 296

" " " " that breed in the State ........................................ 131

" " " resident species .............................................. 28

Winter visitants ............................................................. 67

Spring and Autumn visitants ........................................... 75

Summer visitants ............................................................ 196

Chance visitors ............................................................... 35

Springfield, April, 1864.

Supplemental Notes. While the preceding paper has been passing through the press the following facts have been ascertained:

A specimen of the Snowy Owl (Nyctea nivea Gray) was taken in Springfield, the present year, about May 20th. Another instance of its capture here late in May has occurred within a few years. It has been found here repeatedly in November, and consequently spends at least half the year here.

A specimen of the Yellow-billed Cuckoo (Coccygus americanus Bonap.) was killed here in May this year, by Mr. B. Hosford, who informs me that he obtained another specimen here several years since. The capture of only three specimens of this species at Springfield has as yet come to my knowledge.

That the Hermit Thrush (Turdus Pallasi Cab.) does occasionally breed at Springfield I am now convinced, having seen a specimen shot here in July, but the instances appear to be extremely rare.

In the preceding list of the Birds of Springfield, the Prairie Warbler (Dendroica discolor Baird) is mentioned as rare, and as not breeding at Springfield. I find it not uncommon in sandy fields, growing up thinly to pitch pines, the present summer, where it is breeding quite plentifully. It was not uncommon in June to hear several males singing at a time.
A pair of Yellow-breasted Chats (*Icteria viridis* Bonap.) are breeding here the present season. Noticed another pair in Ludlow, Mass., about June 3d, which were probably also breeding. Have seen a specimen taken in Berkshire county, in the breeding season. Only straggling pairs of this species, however, reach Massachusetts.

The following species of Hawks, though extremely rare in winter, should probably be properly included in the above list of "Resident Species:" *Hypotriorchis columbarius* Gr., *Accipiter Cooperii* Bon., *A. fuscus* Bon., *Buteo lineatus* Jard., and *B. pennsylvanicus* Bon.

July, 1864.

V. *Notes on the Habits of some species of Humble Bees.*

By F. W. Putnam.

(Communicated October 22, 1863.)

During the summer of 1862, while in Warwick, Mass., my attention was called to the Humble Bees by finding three nests of *Bombus fervidus* Fabr. and *B. vagans* Smith. These nests were formed of the deserted nests of mice, one under a barn in an old stump of a tree, the other two under piles of stones in a field. One of the nests of *B. fervidus* I kept in a box for some time, and watched the actions of the bees, but as I then neglected to make full notes, and as my first observations were confirmed by later ones, I allude to them here only to introduce an incident which has relation to the duration of life of the various kinds which always compose the communities of the Humble Bees. Upon leaving Warwick I left my valise, in which was a nest of bees, at the depot. Two months afterwards, in November, it was brought to me, when upon examining the nest several large queen bees were found in a lively condition, while the males, small females and workers were all dead. When the valise was left at the depot there was but one queen in the nest. This incident proves that the queens are not only late in leaving the cells, but that they are capable of enduring cold which is
fatal to the other bees. In the summer of 1863 while at Bridport, Vt., on the borders of Lake Champlain, I was so successful, in my entomological excursions, as to find as many as twenty-five or thirty colonies of bees, and to collect fifteen complete nests. These were of the following species: *Bombus fervidus* Fabr., *B. ternarius* Say, *B. separatus* Cresson and *B. virginicus* Fabr. As the general economy of these four species is the same, my observations may be considered as made upon one community, preceded however by the following special statements in regard to the several species.

**Bombus ternarius.** Two nests collected: one under an old stump in a deserted mouse nest; the other, in September, under the clapboards of a house, about eight feet from the ground. Upon removing the boards, a large bunch of sheep's wool was found, evidently collected by rats, as there was a quantity of nut shells, with the under jaw and other bones of a rat among the wool. In the centre of the wool the bees had their cells. By etherizing the bees twenty-eight specimens were collected, which, as it was after dark, when the bees are generally at home, I have reason to believe were nearly all that belonged to the nest. There were thirty-five cells containing young, and thirty that were filled with honey, having their tops covered with wax. This is the only instance of my finding the honey cells closed over. There were also a number of bunches of pollen in which there were no eggs.

This species is not so common as *B. fervidus* and is far more savage in its disposition. I was informed by Mr. Brigham Rockwood, that he had noticed that this species never takes possession of the nests of mice (*Arvicola*) which are found so plentifully among the grass, but always chooses a place under cover of boards or stumps.

**Bombus fervidus.** This is the most common species at Bridport, and is of quite a gentle disposition, allowing its nest to be disturbed for some time before it makes any show of resistance, merely exhibiting its uneasiness by buzzing. The communities of this species are found in old mice nests, both under stumps and boards; and also among the grass in the nests of the common field mice (*Arvicola riparia*). They also occupy the forsaken nests
of the house mice, as in one instance a colony was found under the flooring of a shed, in a nest made of bits of paper, rags, &c. This was the largest community collected, consisting of about seventy adult bees, one hundred and fifty cells containing young, and two hundred young larvae, in various stages of growth, in the pollen masses, besides fifty cells filled with honey. This nest was found on the 23d of July. July 28th a nest was discovered in which there was a single queen bee and five or six large queen cells still soft and recently finished.

July 8th. Two queens were seen fighting upon the outside of a nest. So firmly were they united that they did not part until placed in alcohol, although pushed about for some time. They were both of the same species, but one might have been an invader, as I have found upon placing a strange queen, in a nest, that the rightful sovereign immediately commenced battle and in a short time expelled the intruder.

One community kept under glass on a window, with free ingress and egress, continued working, until, on a very hot day, the young became baked in their cells, by the heat of the sun. Then the old ones left and did not return.

Aug. 6th. A nest was brought home and the cells, containing young, placed apart from all old bees for the purpose of ascertaining if the young bee cuts its own way out of its cell. The cells were all of large size. In about half an hour a queen bee had come out and was seen walking over the other cells. She was immediately removed and the other cells were examined, but no signs of their having been cut could be seen. In the evening a slit was noticed in one of the cells and the young bee was seen at work cutting with its jaws. In a short time it made an opening in the cell large enough for it to push its head through. It then commenced cutting on each side, from the slit, above and below; now and then withdrawing its head and resting. Then it tried to force its way through the opening; but finding this was not large enough it cut a little more. The bee evidently did not wish to work more than was necessary, for it often tried to force its way out. At each attempt it made but a small enlarge-
HABITS OF THE HUMBLE BEE.

ment of the orifice; but, after spending half an hour in alternate work and rest, it succeeded in freeing itself from its prison. Then it stood, for a short time, on the sides of the cell, moving its wings, after which it commenced walking over the other cells. This was a queen bee. Aug. 8th, another bee came out in the same way. Aug. 10th, two. Aug. 14th, one. Aug. 15th, another, which was the last in the cells. They were queens and all quite light colored when just from the cells.

These facts prove that the young cut their own way out of the cells. In another nest a young bee was seen to come from the cell while the old bees were present, which did not concern themselves about the matter further than to give a few passing glances and to cut off some jagged pieces of the cell. As soon however as the young bee was out of the cell, one or two old bees trimmed the edges of the cell and removed a few fragments from the inside.

BOMBUS SEPARATUS. Several colonies of this were found under old stumps and in other situations similar to those in which the nests of B. fervidus were found. This species is nearly as ferocious, on being disturbed, as B. ternarius.

BOMBUS VIRGINICUS. A single nest of this species was found under an old stump in an orchard. On the 27th of August three males were captured while flying under a large tree on which they frequently alighted. So much did these bees resemble large flies in their actions, that at first I mistook them for those insects. Male Humble Bees are often seen flying in this manner under trees. Are they not the drones which have left or been driven from the nest?

Let us now notice the life of a colony in its different stages. In the spring, the queen bee, having left her old home, may be seen roaming about in search of a new one, which she soon finds in some such place as previously described. She immediately collects a small amount of pollen mixed with honey, and in this deposits from seven to fourteen eggs, gradually adding to the pollen mass until the first brood is hatched. She does not wait, however, for one brood to be hatched before laying the eggs of
another, but, as soon as food enough has been collected, she lays the eggs for a second. The eggs are laid, in contact with each other, in one cavity of the mass of pollen, with a part of which they are slightly covered. They are very soon developed; in fact the lines are nowhere distinctly drawn, between the egg and the larva, the larva and pupa, and again between the latter and the imago; a perfect series, showing this gradual transformation of the young to the imago, can be found in almost every nest.

As soon as the larvæ are capable of motion and commence feeding they eat the pollen by which they are surrounded, and gradually separating, push their way in various directions. Eating as they move and increasing in size quite rapidly, they soon make large cavities in the pollen mass. When they have attained their full size they spin a silken wall about them, which is strengthened by the old bees covering it with a thin layer of wax, which soon becomes hard and tough, thus forming a cell. The larvæ now gradually attain the pupa stage and remain inactive until their full development. They then cut their way out and are ready to assume their duties as workers, small females, males or queens according to their individual formation.

It is apparent that the irregular disposition of the cells is due to their being constructed so peculiarly by the larvæ. After the first brood, composed of workers, has come forth, the queen bee devotes her time principally to her duties at home, the workers supplying the colony with honey and pollen. As the queen continues prolific, more workers are added and the nest is rapidly enlarged.

About the middle of summer, eggs are deposited which produce both small females and males, and it is supposed by some observers that it is from the union of these, at the last of the season, that the eggs are laid from which the queens are developed: but there seems some reason to doubt this, as a new nest, previously mentioned, was found on the last of July occupied only by a queen and queen larvæ. It is true, however, that all eggs, laid after the last of July, produce the large females, or queens, and, the males being still in the nest, it is presumed that the queens are impregnated at this time, as, on the approach
of cold weather all, except the queens, of which there are several in each nest, die.

The efforts of my friend Mr. Rockwood to procure nests for me during the winter have as yet been unsuccessful, those which he had marked for removal having been destroyed by mice.

It is desirable to ascertain whether the queens remain torpid during cold weather and what use is made of the pollen and honey stored during the last of summer and in the fall, which perhaps is food for the queens during the mild weather in spring before plants are in blossom.

But little wax is made by the Humble Bees, as it is only used for covering the cocoons of the larvae, for thinly lining the nest on the inside, strengthening the old cells which are used for honey pots, and occasionally covering these pots, and propping up the old cells.

During some years Humble Bees are very numerous. This is generally the case when a dry and early spring is followed by a summer producing a good crop of clover. After such a season, if the following spring be favorable, nests are very abundant.

Though very similar to those made by Reaumer, over a hundred years ago, it will be noticed that my observations differ, in several particulars, from those made by some European naturalists who have written on the Bombi.

Some observers have stated that the eggs of the Humble Bee are deposited in cells, partly filled with pollen, which are enlarged by the workers as the young increase in size, and that the old bees, cutting holes in the cells, feed the young until they are fully developed when they relieve them from their prisons. This is quite contrary to the results of my observations in New England.

At present I cannot believe that the peculiarity of food, or the structure of the cells, produces a difference of development in Humble Bees, for the larvae, as has been previously stated, were seen to make their own cells from the pollen paste, while the old bees were quite indiscriminate in selecting the plants from which they procured both pollen and honey.

Is it not more natural to believe, as has been suggested to me by Professor Wyman, that the difference in the de-
development of the eggs is owing to their being laid at various times after impregnation? Thus, if I am right in supposing that the queens are impregnated by the males late in the summer, the eggs laid soon after produce the large queen larvae: the next set of eggs, laid in the spring, produce the workers, or undeveloped females, while from those deposited still later, male bees are principally developed.

This opinion seems to be corroborated by the state of the nest, previously noticed, found on the 28th of July, which had been recently commenced and contained only queen cells, the parent queen being obliged, by her recent impregnation, to lay only such eggs as were adapted to the season. As no first brood of workers, or second one of males and small females, had existed in this nest, the eggs producing the queen larvae must have been laid by the large female or queen, found in the nest, and not by a small female.

The fact, that our species of Humble Bees take possession of the nest of mice and rats, accounts for the large number of mites found in most nests.

Three parasites are common in the nests of our New England Humble Bees. They are, a small beetle of the genus Byturus only known thus far in the imago state; a moth of the genus Nephopteryx: the larvae of which is quite abundant in most nests, and a dipterous insect which is often found in the larval state.

It is singular that in all the nests, which I collected, not a single specimen of Apathus was found by Mr. Packard, though this parasitic bee is generally supposed to be quite common in the nests of Bombi.

Additional Notes, August 3, 1864. A nest of Bombus pennsylvanicus was found at Upton, Me., on the sixth of last June, in which there was but a single queen bee with seven cells of the smallest size, containing larvae, and several eggs in a mass of pollen.

A queen of B. pennsylvanicus was taken, on July 20th, under leaves in a wood.

Professor A. E. Verrill found a queen Humble Bee in a torpid state under leaves, before the snow was off the ground in the spring of 1863.
VI. Notes on the Leaf-cutting Bee. By F. W. Putnam.

(Communicated Oct. 22, 1863.)

While at Bridport, Vt., I was enabled to make a few observations on the habits of the Leaf-cutting Bee (Megachile). My attention was first called, on the 26th of June, to a female busily engaged in bringing pieces of leaf to her cells, which she was building under a board, on the roof of the piazza, directly under my window. Nearly the whole morning was occupied by the bee in bringing pieces of leaf from a rose bush growing about ten yards from her cells, returning, at intervals of a half minute to a minute, with the pieces which she carried in such a manner as not to impede her walking when she alighted near her hole. About noon she had probably completed the cell upon which she had been engaged, as during the afternoon, she was occupied in bringing pollen, preparatory to laying her single egg in the cell. For about twenty days the bee continued at work, building new cells and supplying them with pollen. At the end of this time she had probably completed her allotted task, as she was not seen again.

On the 28th of July, upon removing the board, it was found that the bee had made thirty cells, arranged in nine rows of unequal length, some being slightly curved to adapt them to the space under the board. The longest row contained six cells, and was two and three quarters inches in length. The cells averaged about one half an inch in length; the whole leaf structure being equal to a length of fifteen inches. Upon making an estimate of the pieces of leaf in this structure, it was ascertained that there must have been at least a thousand pieces used. In addition to the labor of making the cells, this bee, unassisted in all her duties, had to collect the requisite amount of pollen (and honey?) for each cell and lay her egg therein, when completed. Upon carefully cutting out a portion of one of the cells, a full grown larva was seen engaged in spinning a slight silken cocoon about the walls of its prison, which were quite hard and smooth on the inside, probably owing to the movements of the larva and the consequent...
pressing of the sticky particles to the walls. In a short time the opening made was closed over by a very thin silken web. The cells, measured on the inside of the hard walls, were .35 of an inch in length and .15 in diameter.

The natural attitude of the larva is somewhat curved in its cell, but if straightened, it just equals the inside length of the cell.

On the 31st of July two female bees came out, having cut their way through the sides of their cells. Five other cells were opened, in the hope of finding a pupa, but without success; two of them containing larvae, and three, dead bees fully formed. In these last mentioned cells, several hundred minute Ichneumons were seen, which came forth as soon as the cells were opened.

August 4. Three more bees came out. One was a male, and differed from the female by not having a sting; by its blunt abdomen; by the hairs on the under side being fewer and shorter and not of so deep a red color, and by being very hairy about the underside of the head.

August 5, and 6. A female came out each day, after which no more appeared, the rest of the cells having probably been ichneumoned, as upon being opened in October, by Mr. Packard, Ichneumons were found in nearly all. Most of these parasites being then in the larval or pupal stages, were probably not developed until the spring. Are there two broods of Ichneumons in one year, or are those that came out on the last of July of a different species?*

July 3. A female Megachile was discovered making a cell of pieces of leaf in a small hole in the ground. The hole was about two inches in depth and the cell was just commenced, as there were but four quite fresh pieces in it, which appeared to have been cut from locust leaves. This was of the same species as the one that built her cells on the piazza, and which has been identified by Mr. Packard as M. centuncularis.

Another species was also seen cutting pieces from the rose leaves, but its cells could not be discovered. This

* For further observations on these parasites, see Mr. Packard's remarks in the following article.
was yellow, with the four terminal segments of the abdomen black.

July 22. Two cells of Megachile were brought to me, having been found in the crown of a bonnet in a closet. One of these cells, about half filled with pollen (mixed with honey?) contained a small larva, and was closed by several pieces of leaf which were quite fresh. The other cell was empty and not completed.

August 4. A third species was discovered, in considerable numbers, on the same bushes. These were of about the same color as the preceding, but so much larger as to be easily recognized.

These three species, assisted by a single specimen of a blue species of Osmia, which was captured while cutting out a piece of leaf, on the 28th of June, were so numerous, and worked so diligently, that they ruined five or six rose bushes, not leaving a single unblighted leaf uncut, and were forced to take the leaves of a locust tree as a substitute, though they almost invariably hovered over the rose bushes before going to the locust tree.

During the last of August many specimens of the three species of Megachile were collected from the thistle flowers, where they were quite abundant.

VII. The Humble Bees of New England and their Parasites; with notices of a new species of Anthophorobia, and a new genus of Proctotrupide. BY A. S. Packard Jr.

[Communicated April 23, 1864.]

The following descriptions of all the species of Humble Bees known to inhabit New England, together with descriptions of some of their parasites will, it is hoped, draw the attention of entomologists to the great interest attending the study of the growth and economy of our native bees.

Mr. E. T. Cresson in a "List of the North American species of Bombus and Apathus" published in the Proceedings of the Entomological Society of Philadelphia for July, 1863, has given descriptions of over forty species of Bombus, and eight species of Apathus. This has been of
service to me in distinguishing our species. I have also followed his synonymy of the species therein given.

We have in this country nothing published concerning the economy of our Bombi previous to the present year. For two years past Mr. F. W. Putnam has paid considerable attention to observing the habits of several species of wild bees, the results of which he has embodied in the interesting articles preceding. I am indebted to him for nearly all the material upon which these notices are based. I have also been much aided in identifying the species by a labelled series of most of our species received from Mr. E. Norton several years since, and more recently by a small collection of species from different parts of the country sent by him to the Museum of Comparative Zoology at Cambridge, Mass; the Museum also contains over twelve hundred specimens, of four species, in all stages of growth, being the collection made by Mr Putnam. I have also had access to the small collection of this genus in the Harris Cabinet now belonging to the Boston Society of Natural History.

Among the numerous parasites upon the Humble Bee we have insects belonging to the Hymenoptera, the Lepidoptera, Diptera and Coleoptera. Each have a distinct mode of attack. The Stylops and Conops live within the abdomen of the bee upon the fatty tissues of its body. The Meloe clings to the outside of its body and sucks in the juices of its victim through the joints of its corneous harness; and after it assumes the pupa stage, passes a period of inactivity safely lodged among the cells of the bee's nest. The Byturus is less intimate in its friendship and probably troubles the bee only as it consumes the stores of food laid up for the bee grub, while it may also prove to be serviceable in acting as a scavenger in clearing the nests of the cadavers of those bees which have perished within their enclosure. The unknown dipterous larva noticed below, is undoubtedly, from the structure of its mouth, a carnivorous animal, and lives by sucking in, like a leach, the juices of the young bees. The species of Nephoteryx, which differs so much from its allied species in its habits, feeds largely upon the waxen walls of the bee cells. As to the habits of Apathus,
in its early stages especially, we know nothing definite. We are not yet acquainted with the forms of the larva and pupa as distinguished from those of the bee upon which it is a parasite, and indeed know the two sexes of but a single species. As yet we know of no ichneumon parasite of Bombus. It will be of interest to determine whether this genus by reason of its secluded habits while in the preparatory stages of its existence, is exempt from the attacks of these vigilant enemies to most other insects.

For a proper study of our Humble bees, we should collect the nests and colonies from the last of May until late in the autumn. We should watch the queen bees as they are searching for deserted mice nests, or other convenient places, in which to rear their colonies, and follow them to their holes. We should then watch for the different broods, and collect the young and mature bees of both sexes, and also of the workers, or undeveloped females; and as it is a well known fact that each sex including the workers are composed of individuals of two sizes, we should endeavor to trace the history of each of the six forms into which the species is specialized and ascertain the functions of each. Early in the spring we can only capture those queens which have survived the winter, while late in the fall we can often secure the males in large numbers, as they frequent autumnal flowers.

It will therefore be necessary in order to collect the young of all these different broods, to take the nests at short intervals during the summer. The cells containing the young, with whatever parasites that may be found among them, may be placed in alcohol, while the mature bees may be pinned. The simplest method of collecting the nests is to visit them before sunrise or after sunset, when all the bees are in the nest and we can secure the whole colony. The bees can be picked up with forceps as they emerge from the nest, or caught with the net and then pinned. Refractory colonies may easily be quelled by pouring in ether or chloroform, or burning sulphur at the aperture, as is the best method of procedure with wasps' nests. The alcoholic specimens of the mature bees may
be dissected open for the purpose of finding the Stylops and Conops lodged within. The author would be greatly obliged for material to aid him in the study of our wild bees, and would take pleasure in corresponding with those interested in the study of their habits and forms.

**Bombus fervidus** Fabricius.

**Male.** Head yellow in front both above and below the antennae. Thorax yellow. Abdomen yellow with the tip black. The black band between the wings is broader than in the female, while also the front is much narrower and the legs and wings are paler. Length, .65—.70; breadth, .30—.32 inch.

**Female.** Head long in front; black, with a few yellow hairs above the insertion of the antennae. Whole body lemon yellow except a narrow black band between the wings, and the two black terminal rings of the abdomen. Wings not as dark as in B. pennsylvanicus, but dark smoky. Legs with the second to the fifth tarsal joints very little longer and slenderer than in the females of the other species, though hardly differing from B. pennsylvanicus to which this species seems nearest allied; they are black; tibiae with fuscous hairs on the tip and along the edges, while the first tarsal joint is dark fuscous above, beneath much lighter. Compared with the male, this sex often differs in having no yellow hairs below the antennae, while throughout the body the hairs are finer, shorter and more dense. The tip of the abdomen is pure black, while in the male it is partly yellow. Length, 1—1.25; breadth, .40—.45 inch.

**Worker.** Only differs in size from the female. Length, .40—.60; breadth, .17—.35 inch.

In a nest of this species, collected by Mr. Putnam at Warwick, Mass., which numbered five females and forty workers, all had black fronts below the insertion of the antennae. But another colony of twenty females and workers from Bridport, Vt., had the fronts almost wholly yellow, with a few exceptions. This was especially marked in the larger sized females, while most of the smaller sized females had black fronts. I am hardly prepared to say that such differences as these
distinguish the two broods of larger and smaller sized females, but would at present consider that the variation noticed above is not confined to either size.

This species is common in all parts of Maine, and is one of the most common species in New England.

**Bombus pennsylvanicus** Cresson.

*Male.* "Head black, intermixed with obscure yellowish on the face and vertex; eyes very large and prominent, almost contiguous on the vertex. Thorax above and on the sides tawny-yellow, with a blackish band between the wings; in some specimens the thorax is entirely yellowish. Wings fusco-hyaline, darkest along the costa and towards the base. Legs black; hairs of the basal joint of the posterior tarsi pale; tarsi brown. Abdomen with the first three segments tawny-yellow, slightly mixed with blackish on the base of the first segment; remaining segments black. Beneath black, sparsely clothed with pale hairs. Length 10 lines," Cresson.

*Female.* Head and eyes as described in *B. fervidus* but the antennæ are longer and more slender; black in front. The yellow band on the thorax is broader than in the male; in some specimens there are a few yellow hairs on the scutellum. The three basal rings* of the abdomen are yellow above, and the basal one is often partially black, the remaining rings black. First tarsal joint fuscos, much larger than in *B. fervidus*. In the form of the body this and *fervidus* are closely allied, both being flatter and a little longer than in the other species. Length 1.05; breadth, .45; expanse of wings 1.85 inch.

The measurement given would indicate that this species was the same size as *fervidus*, but it is a little larger by about .05 inch.

From want of specimens I am obliged to quote Mr. Cresson's description of the male. This is our least abun-

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* For convenience of description in this paper I have practically ignored the fact that the basal ring of the abdomen is in most hymenoptera thrown forward upon the thorax, as I have observed the passage to take place in the semi-pupa state; hence what is in reality the second segment of the abdomen is called in this paper the first or basal segment.
dant species, being very rare in Maine, but growing more abundant as we go southward. My specimens were collected by Mr. Sanborn in the vicinity of Boston.

**Bombus terricola** Kirby.

*Male.* Head broad and short, eyes narrow, as in B. fervidus; the front is a little broader than in that species but the eyes do not approximate so much above; there are a few yellow hairs on the vertex, and on the clypeus are a few yellow hairs mixed with black. Front of the thorax yellow, as are the sides; beneath black; no yellow hairs on the scutellum. Basal ring of the abdomen black, the second and third rings yellow, the remainder black, with scattered tawny hairs around the tip. Legs much as in the male of B. fervidus, but the basal joint of the tarsus is more arcuate, being broader in the middle, and narrowing more rapidly towards the base; they are black except the fuscous tarsi, with long black hairs on the under side of the femora, and the tips of the claws are black. Length, .65; breadth, .32 inch.

Compared with B. fervidus the antennae are nearly one-fourth shorter, so that by this character it would be easily mistaken for a worker, though the hairs are much looser and more uneven than in the other sex.

*Female.* Head very broad and short, eyes of moderate width, much as in B. pennsylvanicus; front black, discolored with a few yellow hairs above and below the antennae. There is a narrow line of black on the front edge of the thorax; behind, and extending as far as the insertion of the wings, is a yellow band; beyond, the thorax and basal ring of the abdomen are black. Second and third rings of the abdomen lemon-yellow, the hairs at the base of each ring honey-yellow; remaining rings black with long loose fuscous hairs about the tips and on the hind edge of the penultimate ring, the presence of which easily distinguishes this species from B. pennsylvanicus; beneath smoky black. Wings dark smoky, but not so much so as in the other species. The legs are also paler, but stouter with broader joints, while the femora and the tibiae are black with smoky black hairs beneath.
The first tarsal joint is still more arcuate than in B. pennsylvanicus, and broader, while the remaining joints are shorter and thicker and more fuscous. Length, .80—.85; breadth, .45 inch.

Worker, length, .55—.60; breadth, .25—.30 inch.

This species replaces B. pennsylvanicus, in Maine where it is one of the most abundant species. The females are common early in the spring, while the workers first appear in the middle of June. I have one worker from Mr. Sanborn collected about Boston. It may be easily mistaken for De Geer's B. pennsylvanicus but it is shorter, broader and somewhat smaller. In form more regularly elliptical when seen from above than any of the other species. The broad head, honey tint of the basal abdominal rings, shorter antennae and especially the fuscous hairs about the tip of the abdomen will further distinguish it from De Geer's species. Sometimes a few yellow hairs are present upon the scutellum.

BOMBUS VIRGINICUS Fabricius.

Male. Head short and broad; the front being broader and the eyes narrower than in B. fervidus; the joints of the antennae are also a little shorter than in that species; vertex of the head yellow; between this and the insertion of the antennae the front is often black but more often yellow, while the clypeus is covered with black and yellow hairs. Whole thorax above and beneath, the under side of the femora and basal joint of the abdomen yellow, while the rest of the abdomen is black. Beneath on the side of the abdomen are thin yellow hairs; the basal yellow portion on the upper side of the abdomen is indented on the mesial line of the body. The legs are a little slenderer than in B. fervidus, while the tarsal joints are more cylindrical, longer, more dilated and provided with longer and slenderer spines; black; tarsal joints tinged slightly with fuscous brown, with fuscous hairs. The whole body is shorter and broader, more elliptical, the abdomen shorter, the sides converge more towards the acute tips; the wings are paler and the hairs longer and hardly so thick as in B. fervidus. The size of the male is equal
to that of the worker of B. fervidus. Length, .50—.55; breadth, .25—.30 inch.

I have carefully compared male specimens from Maine and Massachusetts in Dr. Harris' cabinet labelled by him "Bombus impatiens Say Ms." They do not differ from undoubted males of B. virginicus, and I agree with Mr. Cresson in considering it as a synonym of our common species.

I have taken the males very abundantly flying about asters and solidagos during the middle of October, when out of twenty males but a single worker of some other species occurred.

Female. Head broader than in B. vagans, front black with a few yellow hairs between the antennæ, and less than the usual number on the vertex. Thorax and basal joint of the abdomen yellow above and on the sides, black beneath; remainder of the body black. Wings paler than usual. Legs with the tarsal joints longer than in B. vagans; the first joint longer and slenderer, with fusous hairs on the edges, and the remaining joints dilated more than in B. vagans; dark fusous, with lighter fusous hairs. Length, .30; breadth, .42; expanse of wings, 1.60 inches.

Worker. Length, .50; breadth, .20 inch.

Bombus separatus Cresson.

Male. Head a little broader than in B. virginicus, to which this species is very closely allied; the eyes are large and full, and the front is narrower by one third than in any other species; vertex yellow, the tuft larger than in B. virginicus; a yellow tuft below not reaching to the base of the labrum; both the maxillæ and lingua are shorter than in B. virginicus; lingua with a single circle of spinules near the tip, which last is longer than in that of B. fervidus; the joints of the antennæ are shorter and more contracted in the middle than usual. Thorax and abdomen colored as described in worker. Legs black; tarsal joints slightly tinged with testaceous; femora beneath thickly clothed with long yellow hairs; first posterior tarsal joint longer and narrower, remaining joints much stouter, though no longer than
in B. virginicus. Abdomen wholly black beneath. Length, .65; breadth, .35 inch.

Compared with B. virginicus this species is considerably larger; the head when seen from above is much broader, eyes twice as large, outer edge of the fore wings straighter, making the wings more triangular, and they are a little darker. In form the two species are very similar.

**Worker.** Head short and broad; the front is black, with a transverse yellow tuft just above the antennae; the hairs are remarkably short, dense and more glossy and velvety than usual. Thorax of a rich lemon-yellow above; in certain lights, especially on the sides, tinged with pruinose. Two basal segments of the abdomen obscurely fuscos, intermixed at the base with yellowish hairs; second ring most distinctly fuscos; remainder of the abdomen black, with very short hairs. Length, .55; breadth, .22 inch.

This species connects B. virginicus with B. vagans and B. ternarius, which last it resembles in its broad head and compact body. The obscurely brick-red base of the abdomen will serve to separate this species from B. virginicus, besides the smooth, glossy, velvety bloom which is due to the short, evenly cut, dense hairs.

Mr. Cresson observes in a letter, "that the second ring of the abdomen varies from yellow to dark fuscos, sometimes quite red. The hairs on the head are sometimes mixed with yellow on the vertex and sometimes entirely black."

Mr. Putnam collected a nest of over twenty workers at Bridport, all of which had the second ring reddish above. At another time a solitary male was captured which did not differ from the workers. Another male was taken near Boston by Mr. Sanborn.

**Bombus vagans** Smith.

**Male.** In form and size closely resembling B. virginicus; the front is wholly yellow. Black: thorax above and beneath, two basal joints of the abdomen and the under side of the femora yellow; beneath, on the side of the abdomen to just before the tip are sparse yellow hairs. Tarsi dark fuscos, with fuscos hairs. Wings pale. Length, .55; breadth, .28 inch.
Compared with B. virginicus, the head is smaller, antennæ slenderer, front more yellow, and there are not so many yellow hairs beneath the abdomen as in that species, while the first tarsal joint is narrower and all the joints are a little more fuscos.

**Female.** Head a little narrower than usual; front dark, with a yellow tuft above and below the antennæ. Black; thorax and the two basal abdominal rings pale lemon-yellow. Abdomen wholly black beneath. Legs black; femora beneath black; first tarsal and remaining joints black. Length, .65—.80; breadth, .28—.42; expanse of wings, 1.04 inches.

**Worker.** Length, .35—.50; breadth, .17—.22 inch.

This species is full and plump. The larger sized females have finer, denser hairs than the workers, where they are more than usually loose and uneven. These last are often found with very pale yellow hairs.

In a colony of thirty workers collected at Warwick, Mass., by Mr. Putnam, there occurred no special variation except in the different shades of yellow on the fronts. It is one of our common species, and occurred abundantly the last of August in company with B. ternarius about Chamberlain Lake at the head waters of the Penobscot river.

**Bombus ternarius Say.**

**Female.** Head broad and short; front broad with yellow tufts above and below the antennæ. Black; thorax and basal ring of the abdomen yellow; an irregularly defined black band between the wings, sometimes produced behind into a triangular point on the scutellum, extending to the base of the abdomen; second and third abdominal rings red; fourth yellow, and the tip black; beneath black, the posterior edges of the third and fourth abdominal rings provided with yellow hairs. Legs black; tarsi fuscos, especially the inner side of the first joint; femora clothed beneath with yellow hairs. Wings pale smoky, of the same size and form as in B. vagans. Length, .70; breadth, .32; expanse of wings, 1.30 inches.

**Worker.** Length, .40—.45; breadth, .17—.25 inch.

**Male.** "Colored same as the female," Cresson.
Compared with B. vagans, the legs are very similar; the first tarsal joint is however not so broad and convex without, while the remaining joints are much the same.

In a nest of twenty-three specimens collected by Mr. Putnam at Bridport, Vt., the scutellum was invariably yellow. Most of these specimens have the fifth abdominal ring red, so that there are three instead of two red rings. In nearly every case the front of the head was darker than above described, since by their pollen gathering habits the longer yellow hairs easily rub off. It is a common and widely distributed species ranging according to Cresson from Maine to Utah, Puget Sound and Arctic America, and southward to Pennsylvania.

I append the description of three additional species described from Connecticut and New York by Mr. Cresson.

**Bombus perplexus Cresson.**

"Male. Head black, with a tuft of pale hairs in front below the antennae; vertex yellowish. Thorax bright honey-yellow. Wings hyaline, apical margins faintly clouded. Legs black; base of femora beneath yellowish. Abdomen with the three basal segments bright honey-yellow, the third segment having a slight admixture of black; remaining segments black. Beneath black, slightly mixed with yellowish. Length 8 lines.

Female and worker not seen.

One specimen, Connecticut. (Coll. Norton.)

This species closely resembles B. hudsonicus, but the form of the body is more elongate and not so compact as that of the latter species, and the color is much brighter."

**Bombus bimaculatus Cresson.**

"Male. Head black, mixed with yellowish on the face and vertex. Thorax honey-yellow. Wings sub-hyaline, slightly stained with yellowish. Legs black, clothed with yellowish hairs, especially on the femora beneath. Abdomen with the whole of the first segment above, and the second, except a few black hairs on the middle, and a round black spot on each side, pale honey-yellow; the fourth segment mixed with black and yellow; the third
and apical segments black. Beneath yellowish, hairy. Length, 7 1/2 lines.

_EtC._

**Female and worker unknown to me.**

One specimen, Connecticut. (Coll. Norton.)

**Bombus affinis** Cresson.

"**Female.** Head black. Thorax in front and on the sides yellow; between the wings black; scutellum, yellow. Wings fusco-hyaline. Legs black. Abdomen with the whole of the first and the sides and posterior margin of the second segments above yellow; remainder of the second segment rufo-fulvous; remaining segments black; beneath black. Length, 8 lines.

**Male.** Colored the same as the female, except a slight admixture of yellowish hairs on the vertex. Length, 8 lines.

Canada, (Saunders); and New York, (Coll. Norton.)"

**Apathus.**

The genus _Apathus_ may be distinguished from _Bombus_ by the males having broader fronts, and the tibiae being convex instead of concave on the outer side, the whole joint being rounder and thicker, while the first tarsal joint is longer and not so convex on the posterior edge as in _Bombus_, being very straight and oblong.

The females are more easily known by having very acute, triangular, bidentate mandibles instead of having them spatulate and three toothed as in _Bombus_. The head is also shorter and broader; the front is much broader, since the eyes are a little smaller, as are the ocelli; both the clypeus and labrum are shorter and broader, and the antennæ are a little stouter. The tip of the abdomen is larger, acute, the surface convex and not concave as in _Bombus_, and the sides are flat, giving the tip a quadrangular form.

**Apathus Ashtoni** Cresson.

This is the largest New England species yet discovered and differs very considerably in its coloration from the others.

**Female.** The head is short and broad, the front broad
and covered with short wholly black hairs. Thorax lemon-yellow above, descending partially down the sides in front of the fore wings; there is a short lozenge-shaped black space, lying partly on the hinder edge of the meso-scutum and the anterior half of the scutellum, while the hinder convex edge of this last piece is rather broadly margined with yellow. The two basal rings of the abdomen and half of the third are black, while the side of the third is yellow; fifth ring black above, yellow on the sides; tip naked, large, triangular, incurved, with an oval depression on the upper side; beneath, the body is wholly black. Legs stout, short, black; tips of the tibiae fuscous; the inside of the first tarsal joint partially, or in certain lights, wholly deep fuscous; remaining joints dark fuscous; the fifth one including the claws darker than the others. The wings are a little paler than in A. elatus, with black veins. Length, .75; breadth, .35; expanse of wings, 1.45 inches.

I have taken several female specimens of this handsome species during the middle and last of summer, at Brunswick, Me. There is one specimen, "No. 215," not labelled, in the Harris collection belonging to the Boston Society of Natural History, which, as nothing to the contrary is stated, must have been captured near Boston.

In size and form and partially in its colors it is similar to B. fervidus, and is perhaps a parasite upon it.

**Apathus contiguus** Cresson.

*Male.* Front black; vertex yellow; thorax and two basal joints of the abdomen yellow; body beneath, and the five terminal joints of the abdomen black. Legs black; tarsi fuscous, the basal joint blackish except on the edges.

It very closely resembles *B. vagans* Smith, differing from it by the nearly twice as broad front, which is black instead of yellow, as in *B. vagans*, and the body is entirely black beneath, where *B. vagans* has long yellow hairs. Length, .67; breadth, .28 inch. (Mus. Comp. Zoöl., Mr. Norton.)

**Apathus citrinus** Smith.

*Male.* Front black, a few greyish-yellow hairs on the vertex. Thorax and four base-abdominal rings covered
with sparse greyish-yellow hairs, being very thin between the wings, and on the middle of the fourth joint of the abdomen; beneath black. The abdomen is at the extremity a little broader and more incurved than in the preceding species. My specimen is very pale greyish-yellow, Mr. Cresson however describes it as "pale lemon or greyish-yellow above and on the sides," and it is most probable that the specimen before me is hardly mature. Legs, outer half of tibiae, and tarsi fuscous. Length, .55; breadth, .28 inch. (Mus. Comp. Zoöl., Mr. Norton.)

**Apathus elatus** Cresson.

*Male.* Very closely resembling *B. fervidus* Fabr. The head is black, rest of the body, except a black band between the wings, and the black tip of the abdomen deep lemon-yellow. Wings much darker than in the preceding species. Legs black, sometimes dark fuscous; femora clothed with yellowish hairs beneath. The extreme tip of the abdomen has a few fulvous, or yellow hairs. Distinguished from *B. fervidus* chiefly by the black front. Length, .55—.85; breadth, .25—.35 inch.

**Nephopteryx** Hübner.

**Nephopteryx Edmandsh** nov. sp.

Cinereous, with a decided purplish hue. Head, antennæ, thorax and abdomen rather pale cinereous, colorous, without any dark scales; palpi much darker at the tips and on the outer side; within paler. Fore wings with two transverse parallel lines; the inner one a little outside of the basal third of the wing; blackish, diffuse, angulated just before the costa, straight below; a slight blackish discal dot; the outer sub-marginal line is situated on the outer fourth of the wing; it is dark within, the outer half pale, straight, angulated acutely opposite the discal dot; not angulated in the costa; just within this line and in front of the discal dot there is a pale patch, free from the dusky scales. An obscure marginal row of dots, the apical one much larger than the others. Fringe pale cinereous. Secondaries, abdomen and legs uniform pale shiny
cinereous; the former paler towards the internal edge; beneath both wings are nearly concolorous, the primaries a little darker however, but without any markings. Length of the body, .37; expanse of wings, .75 inch.

Larva. Body cylindrical, tapering slightly towards each end. The head is of moderate size and somewhat flattened as usual, presenting the usual semi-elliptical form; the three simple eyes are placed in nearly a straight line parallel with the anterior edge of the pro-thoracic ring. The pro-thoracic (cervical) shield is sub-lunate; each of the two succeeding rings is impressed by three transverse lines, forming four transverse ridges. On the abdominal rings there is but one of these impressed lines like the suture between the different rings, except that it extends only as far as the sides of each ring; like the sutures they are roseate flesh-colored; there are two sub-dorsal rows of minute setiferous tubercles, one on each elevation of the ring; and a similar lateral row; the pleural region is raised considerably; of the nine stigmata, the pro-thoracic one and the last abdominal one are the largest, and the pro-thoracic stigma is placed a little below the line of the others; the supra-anal plate is semi-oval; ten pairs of rather short abdominal (prop-) legs. Of a pale flesh-color with the lines and sutures deeper roseate. Length, .45; breadth, .08 inch.

These larvae were observed Jan. 16th, twenty or more in number, in a box containing the remains of a nest of Bombus fervidus taken during the previous fall at Warwick, Mass. The larvae had eaten up all the cells, and while some were spinning their thin cocoons, which were very slight compared with those of Galleria, the honey-bee moth, others had died for want of food.

Pupa. The body is obtusely spindle-shaped, since the upper and under sides are continuously convex from the head to the tip of the abdomen. Head prominent, the front convex; epicranial piece large and broad, convex behind, on the sides deeply excavated for the insertion of the antennæ; the clypeus nearly round, being convex behind and on the sides, which narrow towards the square slightly concave front; in front of the clypeus is the transversely narrow labrum which is a little produced in
front and obtusely pointed; in front are two triangular pieces, united for a slight distance along the mesial line, but they soon separate to allow the base of the maxillae to pass up between them; these last are very long and slender, and with the legs and wings extend down to the anterior edge of the fifth abdominal ring; the forewings are long, narrow and acute, the outer edge very oblique, and continuous with the hind edge; the pro-thorax is short, excavated in front, with a slight mesial tooth; the hind margin convex, with a mesial excavation corresponding to the tooth in front; there is a mesial ridge on the pro- and meso-thorax; the meso-scutellum is soldered in front without suture, behind acutely pointed; behind is (probably) the post-scutellum, transversely linear, but distinct; meta-thorax as usual, square behind; the second pair of wings are visible at their insertion and along the hinder edge. Ten abdominal rings very equal in length, minutely punctured, smooth on the emarginated hind edge; from the fifth, the tip slowly becomes conical; the extreme tip is rather obtuse, not spinous, but with a few hairs. In color it is of the usual reddish testaceous tint, but paler than usual. Length, .34; breadth, .08 inch.

The year after this larva was discovered at Warwick, Mr. Putnam raised it from the larvae found in bees' nests at Bridport. This species is respectfully dedicated to Miss A. M. Edmands of Cambridge, who was the first to draw attention to its interesting habits. In this respect it differs much from other species of the same genus. Ratzeburg in his "Forstinsecten" figures two species which feed on the pine leaves, and Dr. Clemens* describes the habits of two species which feed upon the American Elm.

Microgaster Latreille.

**Microgaster nephoptericis nov. sp.**

*Male.* The body of this species is black with pale and black-brown legs. The eyes are provided with short scattered pale hairs thickest around the margin like those on

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the head, which is wholly black. The surface is finely punctured, and the front is covered with fine hairs, especially thick on the middle of the clypeus where they form two lines of silvery hairs pointing inwards, while the lines themselves diverge outwards, thus forming a triangular space, and below is another triangle of silvery, but much shorter hairs on the labrum; the four sub-equal jointed labial palpi are pale testaceous; the basal joint darker; the three-jointed maxillary palpi have the middle joint pale, the other two darker. The surface of the black thorax is hardly punctured, but finely and irregularly striated. The pale white wings contrast with the black body; patagia pale testaceous; base of the wings black, nervures pale; the marginal one darkening towards the blackish pterostigma which is a little paler in the middle. Legs black at their base; outer two-thirds of first pair, outer half of second, and tip of third pair of femora pale; fore and middle tibiae and tarsi pale, hind pair pale on the basal two-thirds; the hind tarsi dark; all three pairs of claws blackish. Abdomen black, with a few pale sparse hairs. Length of body, .13; breadth, .03; length of one primary wing .09 inch.

This species agrees well with the typical European species in most respects. The antennæ are 18-jointed, and the joints are long cylindrical, impressed in the middle by a slight constriction. The neuration is like Ratzeburg’s figure of *M. flavilabris*, but the pterostigma is a little broader, and the outer cubital cell is still more incomplete, no traces of the third and outer side of the minute triangular cell being present.

Two males found by Mr. Putnam to be parasitic on the species of *Nephopteryx* described above, were raised by him while at Bridport, Vt.

**Conops** Linnaeus.

The history of this genus is very fragmentary. I quote from Westwood’s "Modern Classification of Insects" a summary of what was known in regard to its habits up to the date of the publication of that work. "These insects are
generally prettily colored, and are met with upon plants and flowers. The species are parasites in the larva state upon bees, as first discovered by Baumhauer. Latreille also states that the *Conops rufulpes* undergoes its transformations in the interior of the abdomen of living humble bees, escaping at the margin of the segment, having reared four specimens of the Conops in a box in which he had placed some of the Bombi; and Messrs. Lachat and Audouin have published an interesting memoir upon an apod larva found in the intestines of *Bombus lapidarius* which Latreille attributed to this species of Conops. M. Robineau Desvoidy has also observed a species of Conops pursuing a Bombus with great patience, and flying on it several times (*Comptes Rendus de l’Acad. No. 23, 1836*), as has also M. Dufour, who, moreover, possesses a *Bombus terrestris* from the anal part of which a *Conops rufulpes* is dependent, the swollen extremity of the abdomen of the latter being retained within the former. (*Ann. Sc. Nat. Jan. 1837.*) I have also frequently observed *Myopa atra* flying about sand-banks in which were the burrows of various bees.” Vol. ii p. 560.

I translate two passages from the memoir of Messrs. Lachat and Audouin*, referred to above, which describe the larvae and their habits. “A white, very soft and footless larva (figs. 1, 2, 3, 4,) was found the 7th July 1818, between the ovaries above the stomach, between it and the sting and under the dorsal vessel of a *Bombus lapidarius* Fabr. which was deprived of its fat; it had eleven rings, a long neck, a mouth, two lips, two hooks and several papilles dependant from the skin; the rest of its body was distended, a little furrowed above and beneath, by a longitudinal series of points grouped usually three by three on the side of each ring, which likewise appeared plainly constricted. The extremity opposed to the mouth, corresponds to the rectum of the Bombus, has an anus slit vertically, and two more elevated lateral plates, placed near each other and very curious in their organization and their importance. It bears much resem-

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blance to *Dipodium apiarium* of Bosc, and is like several dipterous larvae described by Réaumur (Mémoires, tomes iv and v.) M. Latreille refers it to *Conops rujipec* of which he has found four individuals in a box in which he had placed some Bombus terrestris Fabr.”

“This larva, then, passes its first three stages, lodged directly within another insect, there living upon the fats, and receiving like most dipterous larvae, through its posterior openings, an abundant supply of air, that another being inspires for it. Already has M. Dumeril surmised, that from the curvature of its abdomen, the Conops must lay its eggs within the body of some other insect.”

The larvae are represented by the authors as being flask-shaped, convex above, flattened beneath, with the anterior portion of the body elongated and very slender; while upon the obtuse anal extremity are placed the crescentic respiratory organs.

We have nothing new to communicate respecting the habits of this genus, but merely to note the occurrence of a species which is parasitic either upon *Bombus vagans* Smith, or *B. fervidus* Fabr. Unfortunately the specimen died while issuing from the body of the bee so that the wings were not expanded and the colors were not developed; and since a colony of each of the two species above mentioned were pinned in the box, it is uncertain upon which species the Conops was a parasite.

In the dilapidated specimen, which Baron Osten Sacken has referred to the genus Conops after reading my description, the large eyes do not meet on the vertex, but their opposite edges are straight and parallel, leaving the front of the head between them of even width above and below, and as wide as the breadth of either of the eyes; the front is deeply excavated for the reception of the antennæ, on each side of a triangular prominence; the antennæ are apparently three-jointed; the first very long, square, and truncated at the tip; the second is a third shorter than the basal joint, but broader and conical, and continuous with the slender, minute, acute third joint; the proboscis is very long, reaching nearly to the tip of the abdomen and clavate at the extremity. The abdomen is apparently somewhat shrivelled, and is cylindrical, the
tip a little obtuse and incurved. The legs are large and long, with stout joints and strong claws: the femora are dilated, the tip of the tibiae much enlarged; and the tarsal joints are broadly triangular.

Notes on an unknown larva allied to that of Volucella.

Westwood (Intr. II. p. 558) states that the "larvae of Volucella reside in the nests of Bombi and Vespa, upon the larvae of which they subsist; they have the body long, narrowed in front, transversely wrinkled, with fine lateral points, and the tail armed with six radiating points; the mouth is armed with two bifid mandibles, and with three pairs of tentacula." The pupae of this genus have not been described, DeGeerfiguring only the larva and imago of V. bombylans (Mém. tom. vi. tab. 8. fig. 4—9; and see Réaumur, Mém. tom. iv. pl. 33.)

Several nests of Bombus fervidus and B. vagans were found by Mr. Putnam to be infested by larvae which it will be seen agree in many respects with the above description of those of Volucella.

They were 13-jointed. The terminal triangular portion appears to consist of a single ring, though in reality made up of three segments soldered together. In form the larvae are oval lanceolate, narrowing in front, and the dorsal surface is convex continuously from the head to the anal tip, and beneath flattened; with two dorsal and two lateral rows of stout bristles spinulated at the base. The head is broad oblong, flattened from above; it is nearly as long as the pro-thoracic ring, and two-thirds as broad; very square in front, the sides are parallel and very slightly convex, arising from the front edge of the head, and above the mouth are two minute setae which do not appear to be jointed, or to differ structurally from the other spinules upon the surface of the body, except that they are simple; these are all the appendages to the head that can be seen when the mouth is retracted; in one specimen however where the mouth is partially thrust out there is seen attached a v-shaped organ (maxillae?) such as are described as occurring in Volucella; on
each side and near the base of the head is a convex raised vertical ridge, with its edge armed with obtuse short spines which probably protect a simple eye situated at the bottom of the depression. The middle of the body is nearly twice as wide as the pro-thoracic ring. All the rings are separated by well defined sutures; they are convex, and angularly so on the sides; the spines are very equal in length, the two dorsal rows approximate and are rather remote from the two lateral rows; the tip of the abdomen, which, judging from the three pairs of spines, is originally composed of three rings, is semi-ovate, triangular in form, suddenly flattened above; at the base is a pair of obsolete spines; the remaining spines are longer than those on the front of the body, radiating outwards, but like them are armed at the base with three or four pairs of obtusely bifurcate spinules which stand out stiffly at right angles to the spine itself; the longitudinal anal opening is protected on the sides with minute obtuse spines; on the under side of each ring of the body, with the exception of the terminal one, are two transverse angulated ridges; the front one smooth, while the posterior ridge is provided with a single row of minute toothlike spines. The larvæ are of a dirty pale flesh color. The head is concolorous with the rest of the body and of but little harder consistence. Length, .36; breadth, .10; height, .07 inch.

While bearing a general resemblance to the larva of Volucella as figured by Westwood, they differ in being much narrower, very hairy, or rather spinulated, and the terminal portion of the body is not provided with stout spines as in Volucella, but is continuously hairy with the rest of the body.

I quote in this connection notices by Westwood of other dipterous genera which are parasitic on wild bees, with the hopes of stimulating observers in this country to search for these interesting parasites in the nests of American wild bees.

"Some species of Anthrax were supposed by Latreille to be parasitic on bees, while Réaumur (Mém. tom. vi. pl. 27. fig. 13) figures Anthrax morio, of which he observes. "Plusieurs mouches de cette espèce ont été tirées d'un
nid creusè dans le bois”. p. 290. “All these authors have, however, overlooked the direct observations of Schaffer, who has figured the larva, pupa and imago of Anthrax ornata (or a closely allied species) as one of the parasites in the nest of the Mason bee (Megachile muraria) (Abhand. v. Ins. vol. ii. pl. 5. figs. 11, 12, 13.)”

“M. V. Audouin has confirmed in his unpublished observations the parasitic habits of Anthrax morio by rearing it from the nest of an Anthophora. He has given me one of the exuviae of the pupa, which retains its previous pupa-form, and exactly resembles the pupa of Bombylius. He remarked that the Anthrax makes its way out of the cell of the bee, immediately before assuming the perfect state, by the assistance of its dorsal spines, in the same manner as Cossus. I have also found exactly similar exuviae in the nest of Megachile muraria.” p. 534.

The muscid genus Tachina besides attacking parasitically grasshoppers, caterpillars, the larvæ of saw-flies and other insects, is known also to frequent the burrows of the smaller species of wild bees, such as the Andrenidæ.

**Antherophagus Latreille.**

**Antherophagus ochraceus** Melsheimer.

*Female.* Pale testaceous honey yellow, with darker antennæ, legs, and elytra; the head and pro-thorax above and beneath are honey yellow; the anterior two-thirds of the head, pro-thorax and elytra is covered with very fine yellowish hairs arising from the fine punctures which cover the upper part of the body; the antennæ are also very finely haired; on the head the minute hairs are arranged longitudinally; while upon the pro-thorax they all converge to a mesial point near the hind edge of the pro-notum. The elytra are a little darker especially along the suture. The ends of the antennal joints, the base of the coxae and tibiae, and tip of the terminal joint of the tarsi are black. Length of the body, .16—.18; breadth, .06—.08 inch.

This species was identified for me by Mr. F. G. Sanborn of Boston. He informs me that the species is common
on the flowers of the sweet briar and other Rosaceæ, but that my female specimen is much larger than usual. Hence the above description will not be out of place.

Both at Warwick, Mass., and at Bridport, Vt., Mr. Putnam found several nests of bees infested by this beetle. Though it is probable from the fondness which these insects manifest for the sweets of flowers, that they visit the nests of the bees for the purpose of consuming the honey stored up within them, we do not as yet know the extent of the injury they cause, or whether in their early stages of growth they are not true parasites.

_Larva of Meloe angusticollis Say._

This insect, as is well known, is parasitic in its early larval stage on the bodies of wild bees, and dwells as a pupa in their nests. I have found them several times upon the bodies of _Bombus_, _Halictus_, and _Andrena_, with their heads plunged in between the head and thorax of their victims. During the flowering of the willows in April, I have found them in abundance upon the flowers, while those bees which had evidently brought them there were more or less infested by them. I have tried in vain as yet to rear the larvae by feeding the bees with sugar. They are comparatively hardy and with proper care in changing the bees as fast as they die can most probably be raised to maturity. They are very active in their habits, very quickly deserting the half-dead bee for a newly introduced and more lively one.

I would here venture to suggest that there is nothing very abnormal in the development of this genus of Coleoptera, so far as concerns the different forms of the young; judging simply from the form of the _semi-pupa_ figured by Newport, which is called by him and previous observers a distinct _form_ equivalent to the _larva_ and _pupa_ form, I would suggest that that stage is simply the beginning of the _pupa_ form.

In studying the development of _Bombus_, I have ascertained that the _semi-pupa_ takes on a most remarkable form, intermediate between that of the worm-like _larva_ and the
matured pupa; but the transitional forms between show that they gradually merge together. Owing to the great rapidity with which the pupa is developed beneath the larval skin which in most insects is hard and thick, the intermediate stages pass on so rapidly that we know really little about them.

The "semi-pupa," as it may be called of Meloe has not been compared with the similar stage in other Coleoptera, of which we know almost nothing, hence it is not to be wondered at that so philosophic and acute an observer as Newport should call the immature pupa of Meloe, a fourth stage of existence, intermediate between the larval and pupal.

The specific characters of our larva can be best brought out by comparing it with the figure of Newport.* It is shorter and broader throughout. The head and thoracic rings are together longer than the abdomen, which is shorter and more ovate than in the European species; the head is longer and the pro-thoracic ring is longer than the two succeeding rings, where, according to Newport's figure, it is a little shorter than the mesial thoracic ring; the two hinder rings also dilate more on the posterior edge, as do the abdominal rings; the setæ attached to the hinder edge of each abdominal segment, which are large and conspicuous in Newport's figure, are in our species minute, and the terminal setæ are shorter; the legs of our larvae are a little stouter than in the species referred to. Its color in the young is very pale, becoming in the full sized individuals nearly black. Length, .06; breadth, .02 inch.

Andrena, carried to England from Nova Scotia, which was in the collection of Mr. G. B. Sowerby; it was figured by Prof. Westwood and with many details formed plate 59 of Griffith's Cuvier, Part Insects. Though named by Mr. Gray, no description has ever been made. The insect has not subsequently been noticed by observers in this country.

On the 29th of April I captured an *Andrena placida* Smith flying about the flowers of the Mezercon. This specimen was stylized, and flying briskly within the nest and in company with the bee was a male Stylops, which agrees in all respects with Westwood's figures, except that he does not represent the abdomen as being long enough. In a few hours my specimen died, and its abdomen long and flexible, which the insect had kept in constant motion, opening and shutting its large and broad anal forceps, soon partially dried up, then resembling more Westwood's figure which must evidently have been taken from a dried specimen. The whole body, the antennæ and appendages of the mouth were velvety black; abdomen slightly brownish; legs and anal forceps pale resinous brown; the tarsal joints, and tips of tibiae pale testaceus.

I have little doubt but that this male was at the time of capture adhering to the body of the bee in order to unite with the wingless female within the abdomen of the bee, and thus the use of the long flexible abdomen and large terminal forceps are obvious.

Is the wingless specimen a pupa, or female? That it is a female, and was destined in about six weeks to produce immense numbers of young there can be little doubt.*

I proceed to notice a female and young discovered during the preceding year.

On the 18th of June while collecting Hymenoptera which were feeding upon the flowers of the garden Raspberry I captured an *Andrena vicina* Smith, which was stylized. Near the middle of the abdomen, on the upper side, projected from between the rings, the flat triangular head of the female. Upon drawing out the whole body,

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* During the middle of May I captured two more of the same species of *Andrena*, each with a female Stylops within its body.
which was very extensible, baggy and full of a thin fluid, I examined it under a high power and found multitudes, at least three hundred, of very minute, dust-like Styllops larvae issuing in every direction from the body of the parent. Most of them issued from near the head, over which they ran, as they must do when the parent is in its natural position, in order to get out upon the surface of the bee. The soft body of the female rapidly dried up, causing the death of many of the larvae, and as I was unable to rear them, my only object in mentioning them now, is to describe briefly the appearance of the female and the young at the time of birth. It appears therefore that the female does not lay eggs, but is viviparous. Siebold was the first to show that the females were such, though ap- terous, wormlike, of so abnormal form and so different from the winged male; and it seems a little strange that Westwood and others should call this form a "larva" when they plainly perceived that its body was filled with the newly hatched young. The head of the single female that fell under my observation resembles very closely the figures of Newport in the Linnean Transactions; it is flattened, triangular, nearly equilaterally so, with the apex or mouth-region obtuse, and the two hinder angles each containing a minute simple eye; the larger part of the head above consists of the epicranium, which is narrowed in front and its edge convex; no clypeus, or labrum can be distinguished; the mandibles are also obsolete, being two flattened portions lying in front of the "gena" and sepa- rated from that region by a very distinct suture; the mouth is transverse and opens on the upper side of the head, while in front lies the rather large labium, and the rounded papilliform maxillae.

The larvae are in form linear elliptical; head semi-ovate, while the tip of the abdomen is truncate. The sides of the body are continuous, there being no suture between the segments; seen laterally the larva is thickest at the meta-thoracic ring. Two simple eyes are lodged near the base of the head. The body is so transparent that the intestine can be traced easily to just before the tip, where it ends in a cul de sac. The two anterior pair of legs are much alike; coxae short; femora and tibiae small, cylindri-
OF NEW ENGLAND.

133

cal; a single slender tibial spur; tarsi consisting of a single clavate joint equalling the tibia in length, much swollen at the tip, where no claws can be discovered; the hind tarsi are longer, very slender, two jointed, the terminal one being bulbous. The pair of terminal stylets inserted in the fourteenth and terminal joint of the body are a little more than one half the length of the body. The whole body, especially the abdomen is partially covered with long setose scales, which project from the side of each ring. In color the body is pale grayish.

In their movements these infinitesimal larvæ were very active, as they scrambled over the surface of the body of the parent or of the glass slide, holding their caudal setæ nearly erect.

Notes on a new species of Anthophorobia parasitic on the Leaf-cutting Bee, and a new genus of Myrmarides probably parasitic on the former.

In Westwood's "Introduction to the Modern Classification of Insects," we find the following notices of chalcid parasites on wild bees and wasps. "Pteromalus apum is parasitic gregariously in the nest of the mason bee. A brood of Encyrtus varicornis was obtained by Esenbeck from a cell of Eumenes coarctata. Réaumur has described and figured (Mém. vi. pl. 20, fig. 2, and pl. 21, fig. 3,) a species of Chalcis, which is parasitic in the nests of the American wasp (Epipone nidulans) and which he regarded as the female of that wasp." Westwood also mentions that Monodontomerus lives in the nests of Osmia, the mason bee; and on the authority of Audouin states that the same genus is also "parasitic in the provisioned nests of Odynerus, Anthophora and Osmia. The male has most singular antennæ, and minute rudiments of wings, so that it does not quit the cell."

Newport* has given us many new details of the history of the wild bee parasites. He states that the larvae of Monodontomerus are flat, very hairy, and spin silken co-

coons when about to pupate. The imago appears about the last of June, perforating the cell of the bee. The larva is an "external feeding parasite" consuming the pupa as well as the larva of Anthophora. Very full information is given concerning the habits and structure of two species of a new genus of these minute parasites, which he calls Anthophorabia. The males differ remarkably from the females, especially in having simple eyes instead of compound organs of sight, besides the usual three ocelli.

We were fortunate enough in cutting open the cells of Megachile centuncularis, brought by Mr. Putnam from Bridport, Vt., to find that nearly a dozen were ichneumonated by these parasites. There were counted in one cell upwards of one hundred and fifty of the larvae; whereas Mr. Newport only found thirty to fifty in a cell of Anthophora. A few perfect females had hatched out, it being the middle of October, and there were besides a few pupae, but the large majority were larvae which have survived the winter as such, so that a new and much larger spring brood of the Chalcids must appear, when it is to be hoped we shall have an opportunity of describing the male. The larvae were all clustered upon the outside of the dead and dry Megachile larva.

Upon one of the female Anthophorabia I accidentally discovered an exceedingly minute Proctotrupid, one-ninetieth of an inch in length, which I am unable to refer to any known genus, and which will be found partially described on a following page; it is highly probable that it is an egg-parasite, as are most of the Mymaridae, to which section it properly belongs; and it is not too large to live in the eggs of the Anthophorabia, small as the last named insect is.

Anthophorabia megachilis nov. sp.

Female. The head is very stout, broad and flattened posteriorly; the front is rounded ovate, narrowing a little anteriorly; the occiput is very distinct, and its vertex is very considerably elevated and slightly angulated; above the ocelli-bearing piece it is linear, but towards the eyes widens out into a linear triangular portion; in front, is a
tranversely oblong piece bearing the three ocelli; in front of this is a smooth triangular area which rapidly contracts to a narrow line which connects this area with the anterior portion of the epicranium, thus dividing the front region of the head into two lateral halves composed of the large broad pieces, unusually developed in this genus, which bear the ovate eyes; the anterior portion of the epicranium is narrow triangular, and its surface is very convex; clypeus very short, tranversely linear oblong; the mandibles are long and narrow, their tips very acute and slightly incurved; antenna nine-jointed; second joint nearly as long as all the remaining ones collectively, a little dilated beyond the middle, but not bent so much as in A. fasciata Newp.; the succeeding four joints are shorter and more closely united together than in A. fasciata and the three terminal ones are united apparently into a single joint more acute than in the European species. Thorax and abdomen much flattened, hardly convex above; pro-thorax longer than broad, triangular; meso-scutum very small, trapezoidal, the sides converging a little towards the scutellum, which is larger than the scutum, oblong, twice as long as broad, the sides very exactly parallel and a little convex behind the curved transversely oblong post-scutellum; on each side is a linear oblong parapsidal piece, and the parapsidal pieces on each side of the scutum are here especially marked, occupying a space larger than the scutum itself; meta-thorax narrow, small, shorter than broad. The fore wings have the costa divided into three-convex portions of which the basal third is most convex; the sub-costal nervure follows these convexities, terminating nearly at the outer third of the wing, directed inwards at its extremity towards the middle of the wing, being more incurved than in A. fasciata. Hind wings nerveless, lanceolate, obtusely angulated in the middle of the costa, apex sub-acute. The legs are rather long and slender; coxae long; femora, especially the hind ones, considerably swollen; tibiae long, slender, not dilated at the extremity, with very slight and unequal spurs; tarsi five-jointed, slender, of very equal length, not dilated at the extremity, hairy and having the tip of each joint provided with a slender spine. The six-jointed abdo-
men is flattened, oblong, ovate, the sides quite parallel; tip a little obtuse ending in the slightly exerted ovipositor which is only visible from beneath. The body is of a uniform pitchy blackish brown including the entire head and antennae. The legs are of a uniform pale testaceous honey yellow. Length, .04 inch.

Pupa. Side view. Head and thorax very exactly equal in length to that of the abdomen. The head is very narrow, and the rather long ovate eyes are situated nearly midway between the vertex and the anterior edge of the "gena" near where the antennæ are inserted. The thorax is bent at nearly right angles to itself a little in front of the middle; the terminal half of the antennæ lie near and parallel to the wings and the middle pair of long slender legs, which last reach to the middle of the abdomen. The first pair of legs are seen bent upon themselves midway between the insertion of the wings and the head; only the femora and tibiae are visible, the tarsi being laid under the antennæ and the front of the head. Only the first pair of wings are visible, being inserted just half way from the vertex of the head to the base of the abdomen; they are long and narrow oblong, and in length equal the distance from the vertex of the head to a point parallel with the base of the abdomen. From under the tip of the wings proceed the tarsi of the last pair of legs, which terminate a little beyond the basal third of the abdomen; they are a little incurved towards the middle of the sternal surface. The meso-scutellum is distinctly seen, and is quite separate from the meta-thorax, when the body of the pupa is slightly contracted. In outline, the abdomen is elongate oval; the pleural line between the tergum and under side runs diagonally from the tergum of the base to near the tip. The minute, slender ovipositor surrounded by the pupal membrane projects considerably beyond the tip.

It differs very considerably from Newport's figure of the pupa (side view) of A. fasciata. The head is larger and the vertex much lengthened, rising up beyond the thorax which is stouter and bent at right angles to itself, while in A. fasciata it is simply convex. The wings are laid straight upon the side of the body, while in A. fasciata they are directed a little forwards.
Seen from below, in its general outline, the insect is long, narrow, elliptical ovate. The head is ovate, being longer than broad, and narrowing in front of the eyes; the vertex is very high and convex; eyes remote, the intermediate space broad and curvilinearly ridged just within the eyes; between the insertion of the antennae and the eyes is a broad space; the antennae are inserted near the anterior fourth of the front of the head; they are elbowed at the end of the second joint, which projects at a right angle beyond the head, thence they are folded upon the sternum, converging slightly, and their very acute tips reach to just before the coxae of the second pair of legs. All the three pairs of coxae are visible. The forelegs terminate at the second pair of coxae. The ovipositor seems as if a continuation of the mesial ridge, and is nearly one-third the length of the entire abdomen.

**Larva.** Body short and thick, fourteen jointed, cylindrical, both extremities much alike; the larva assumes a lunate form, the head being inclined towards the tip of the abdomen, which is likewise incurved; the head is concolorous with the rest of the body, which is pale, pearly white; the rings are slightly convex, with no lateral raised line; terminal anal segment orbicular and rather large. Length, .04 inch, being one-third as broad as long.

**Pteratomus** nov. gen.

This genus will be easily distinguished from Anagrus, to which it is nearest related, by the obtusely conical abdomen and the narrower linear wings. The generic characters laid down by authors are so scanty that the comparison with other genera of this group cannot be carried farther. In the figure, a side view of the insect is given, and the following description is made from the insect in that position. Owing to its minute size the single specimen was unfortunately lost from the glass slide before a complete description could be prepared. Hence I am unable to state the number of tarsal joints, or the exact

* From the Greek *pterον*, a wing, and *atomοs*, an atom.

ESSEX INST. PROCEED. VOL. IV. R.
number of the antennal joints, since they could not be distinctly made out with the light used; the figure represents the insect when magnified 250 diameters. It will be noticed that one of the forewings is fissured, while the other is undivided, but has the base of the inner edge of the wing dilated into a tooth-like expansion, at a point corresponding to the origin of the lower branch in the other wing. I am inclined to think that the simple wing is the normal form. The fact that one of the wings is fissured is interesting as showing the tendency of the wings of a low Hymenopterous insect to be fissured like those of Pterophorus and Alucita, the lowest Lepidopterous genera. In the figure I have not attempted to place the wings in their natural position. It will also be noticed that the right hind tibia and tarsus were wanting in the specimen. The species, which so far as I am aware is undescribed, is dedicated to my friend Mr. Putnam, who has enabled me to bring it to the notice of entomologists.

**Pteratomus Putnamii** nov. sp.

*Male.* Side view. Head very large, equalling the thorax in size, but surpassing that of the abdomen; in outline sub-rhomboideal, five sided, the vertex being equal in length to the under side of the head; the greatest length of the head is from the base to the obtuse point in front of the eyes; the eyes are large, globose, occupying a third of the side of the head; antennae equalling in length the thorax; divided into three portions, the basal thick and cylindrical, the fourth joint large and much swollen, while the terminal joints form a slender cylindrical tip. The thorax is short and high; the outline of the tergum is very convex, especially above the insertion of the wings; the hind edge of the meso-scutum extends a little behind the middle of the entire thorax, whence it descends at an angle of 50° to the insertion of the abdomen; the wings are nearly twice the length of the body; the forewings in the single specimen are dissimilar, since one is deeply fissured into two linear spatulate feather-like portions, while the edges of the wing are fringed with long nearly straight hairs; the other primary is as large as the former, but a little longer, it is entire, spatulate, dilated
slightly on the base of the inner edge, with a central row of fine scales representing a median nervure, and the edges of the wings are fringed with hairs much longer than those on the other wing, and a little curved, thus giving a graceful, feather-like appearance to the wing. The hind wings are half as large, very slender linear and fringed like the forewings. Legs very long and slender, hardly longer than the whole body, hairy on the tibiae and especially so on the tarsi; coxae long and narrow; all the remaining joints are very equal in length and size in each pair of legs; femora linear, not swollen; tibiae linear; tarsal joints very indistinct, slender and hairy beneath; no claws distinguishable. Abdomen compressed, triangular, truncated broadly at the tip which is obtusely rounded. In color the species is of a uniform dark piceous, with pale, almost whitish legs. Length, one-ninetieth of an inch.

A species of mite is also abundant in the nests of bees. According to Mr. Putnam several of our species of Bombus almost invariably occupy the forsaken nests of field mice, and he supposes that these mites which are of comparatively large size, come from the mice. This opinion is most probably the correct one. Mr. Newport has given a most interesting account of a new genus of mites peculiar to Anthophora which lives on that wild bee in all stages of its existence, but mostly while a larva. *Heteropus ventricosus* Newp. was found in immense numbers in the bee cells. When the female mite is full grown, its previously small abdomen swells to an enormous size, so that the animals look like "clusters of microscopic grapes." This immensely distended abdomen serves as a nidus for the young, which it is probable, are born alive, as Lyonnet has observed to be the case with the cheese-mite when exposed to high temperatures. (It is worthy of notice that the viviparous Stylops lives in a high temperature; i. e. in the abdomen of living bees.) We also learn that there are two other genera of Acari peculiar to the Apidæ; the *Trichodactylus* Dufour which is parasitic on Osmia, and *Ansetus* Dujardin.
VIII. On Native Grapes. By D. M. Balch.

(Read December 26, 1864.)

It has been proved from numberless trials and disappointments extending over a long course of years, that the wine grape of Europe (Vitis vinifera) cannot be cultivated in the States east of the Rocky Mountains, with success, except under glass, both fruit and vine in open air culture, being sooner or later destroyed by disease, even in latitudes where the fruit would otherwise be perfected.

This much to be regretted failure is due neither to the cold of winter nor the heat and aridity of summer, but probably to the great and rapid fluctuations of temperature peculiar to these States; for on the Pacific coast where the climate is far more equable most European grapes flourish luxuriantly, and the bearing vines of California now number millions.

Such being the case we in the East must turn for our table fruit and wine to the various indigenous wild grapes, (Vitis labrusca, aestivalis, &c.) healthy and hardy plants, which grow spontaneously, varying in kind with the climate from Maine to Texas. The fruit of these wild vines is in most cases of the very worst quality, being acid, astringent and of a peculiar musky odour and taste, the so-called foxiness; but that horticultural skill and patience, by which have been elaborated from the common choke-pear all our well known varieties, approaching per-
fection in quality and ripening throughout the entire year, is being applied to the wild grape, and the results of the few past years are astonishing. The goal of perfection in this case is still far distant, but we have many good and some excellent varieties; and the number of these is being yearly augmented, so that it is by no means improbable that many grapes, hitherto popular, will be gradually discarded as others of better quality or habit arise to fill their places: I refer to the Isabella, Catawba, Hartford, &c., in all of which there is large room for improvement.

To be of value as a table fruit or for wine a grape must contain a sufficient quantity of free acid, and sugar enough to temper, modify or partially disguise this acid, so that the juice shall not be flat and insipid but vinous and sparkling. In the case of table grapes the minor considerations of size, beauty, flavour, thin skin, deficiency of central pulp, etc., are of great importance, but the first point to be ascertained in a wine grape is the quantity of free acid and saccharine matter it is likely to produce in favourable circumstances.

To ascertain which (if any) of the native grapes ordinarily ripening in this vicinity, was best adapted to wine-making, I have this autumn analyzed the fresh must of many varieties. I had also another object in view, viz.: to ascertain if the table adapted to Oechsle’s must-scale by Gall, from numerous analyses of European musts in 1851, ’52 and ’53, were applicable to the must of our native grapes.

The method of analysis in all cases was as follows. The grapes were gathered when perfectly dry, pressed and the juice strained through linen. The specific gravity of this clear must was taken by weight in bottle with perforated stopper; a portion of must was diluted with 50 times its bulk of water and sugar contents ascertained by Fehling’s method, (Annalen der Chemie und Pharm., Bd. 72. S. 106.); this method is very accurate if carefully performed: finally the free acid in a weighed portion was neutralized by a solution of caustic soda of such strength that 1 c. c. equalled .00825 grm. of Tartaric acid (C_4 H_6 O_7). All the free acid in must is not Tartaric, but in calculating
results we can consider it so with small inaccuracy. The percentage results obtained are as follows:

<table>
<thead>
<tr>
<th>Variety</th>
<th>Time of Gathering</th>
<th>Sp. Gr.</th>
<th>Sugar</th>
<th>Acid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rogers' No. 15,</td>
<td>Sept. 5,</td>
<td>1.0783</td>
<td>9.20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&quot; &quot; &quot; 26,</td>
<td>1.0783</td>
<td>16.47</td>
<td>.66</td>
</tr>
<tr>
<td></td>
<td>&quot; &quot; &quot; 5,</td>
<td>1.0839</td>
<td>#17.90</td>
<td>.70</td>
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<tr>
<td>Delaware.</td>
<td>&quot; &quot; &quot; 5,</td>
<td>1.0896</td>
<td>19.70</td>
<td>.70</td>
</tr>
<tr>
<td></td>
<td>&quot; &quot; &quot; 26,</td>
<td>1.1021</td>
<td>20.63</td>
<td>.65</td>
</tr>
<tr>
<td>Hartford Prolific</td>
<td>Sept. 26,</td>
<td>1.0721</td>
<td>15.01</td>
<td>.45</td>
</tr>
<tr>
<td>Concord.</td>
<td>&quot; &quot; &quot; 5,</td>
<td>1.0615</td>
<td>11.83</td>
<td>.56</td>
</tr>
<tr>
<td>Adirondac.</td>
<td>&quot; &quot; &quot; 5,</td>
<td>1.0714</td>
<td>14.00</td>
<td>.28</td>
</tr>
<tr>
<td>Allen's Hybrid,</td>
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<td>1.0780</td>
<td>*16.20</td>
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</tr>
<tr>
<td>Union Village,</td>
<td>&quot; &quot; &quot; 5,</td>
<td>1.0556</td>
<td>*10.00</td>
<td>1.21</td>
</tr>
<tr>
<td>Rogers' No. 4,</td>
<td>Sept. 26,</td>
<td>1.0749</td>
<td>15.46</td>
<td>.61</td>
</tr>
<tr>
<td></td>
<td>&quot; &quot; &quot; 5,</td>
<td>1.0819</td>
<td>*17.30</td>
<td>.65</td>
</tr>
<tr>
<td></td>
<td>No. 22,</td>
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<td>14.56</td>
<td>.76</td>
</tr>
<tr>
<td></td>
<td>&quot; &quot; &quot; 5,</td>
<td>1.0796</td>
<td>*16.70</td>
<td>.59</td>
</tr>
<tr>
<td>Clinton,</td>
<td>Sept. 26,</td>
<td>1.0688</td>
<td>18.77</td>
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<tr>
<td>Alvey (Hagar),</td>
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<td>1.0640</td>
<td>10.37</td>
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</tr>
<tr>
<td></td>
<td>&quot; &quot; &quot; 5,</td>
<td>1.0734</td>
<td>*14.70</td>
<td>2.02</td>
</tr>
<tr>
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<td>Sept. 5,</td>
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<td>11.20</td>
<td>2.16</td>
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<tr>
<td></td>
<td>&quot; 21,</td>
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<td>14.70</td>
<td>.66</td>
</tr>
<tr>
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<td>1,</td>
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<td>.62</td>
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<td>1.0650</td>
<td>13.41</td>
<td>.87</td>
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<td>26,</td>
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<td>33,</td>
<td>1.0572</td>
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<td>1.01</td>
</tr>
<tr>
<td></td>
<td>41,</td>
<td>1.0749</td>
<td>15.63</td>
<td>.76</td>
</tr>
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<td></td>
<td>30,</td>
<td>1.0630</td>
<td>*11.80</td>
<td>.54</td>
</tr>
</tbody>
</table>

The sugar percentage marked * in the table were not obtained by analysis, but are Dr. Gall's for the corresponding densities.

From these analyses native grapes would seem to be divided into three classes:

1st. Those in which the proportions of acid and sugar are well balanced: as Delaware, Rogers' 4 and 15, Allen's Hybrid, &c.: these grapes should yield good wine.
2d. Those in which the acid is deficient; for instance, Adirondac, Hartford, &c.

3d. Those in which the great excess of acid overpowers all else and renders the fruit nearly unetable; such are Clinton, Franklin, &c.

The analyses also prove that Dr. Gall's table for Oechsle's must scale can be safely used in finding the saccharine contents of native musts, the numbers obtained by analysis agreeing closely in most instances with the tabular amounts for corresponding densities.

To produce a wine that shall keep it is necessary that the must should contain at least 15 per cent. of sugar.

In Germany the must of the best grapes (Riesling) of the most favourable seasons contains 24—28 per cent. of sugar,.65 per cent. of free acids; this yields the most excellent wine, and is regarded as the normal standard with which inferior musts are compared and often made to resemble as far as possible by dilution and addition of sugar.

This method of bettering the must of partially ripened grapes, by which in bad seasons (total failures excepted) a wine can be made equal to the product of favourable seasons, is due to Dr. Ludwig Gall, who has published a treatise on the subject, an abridged translation of which may be found in the Patent Office Report, Agriculture, 1860.

To be of value for the production of wine, available for vineyard culture, a vine should be hardy enough to endure severe winters with slight protection; healthy and vigorous, so as to be little subject to the attacks of mildew, for it is very well known that a vine which has lost most of its foliage from this or any other cause cannot ripen its fruit. Injury from frost is little to be feared if the fruit be well ripened before its advent; the clusters should hang on the vine as long as the weather permits, and the ripest (better if slightly shrivelled) removed in three or four successive gatherings; they should be picked on a dry day and all defective berries removed. Many things influence early ripening, among which are soil, position, culture, variety and age of vine and crop adapted to its strength. The flavour of wine depends on the ripeness of the grapes and the proper proportion of free acids; this
flavour is not present in the must but is developed during fermentation and the after-preservation of the wine.

It might appear that undue preference had been given in these analyses to the “Rogers' Hybrids”; this is simply owing to the fact that these grapes, arising from the union of the wild grape (Vitis labrusca) with the Black Hamburgh, and retaining some features of both, are more largely planted in this vicinity than other varieties, and are consequently more plenty in their season.

It has been asserted that these grapes are not true hybrids, but only seedlings of the “Mammoth Globe,” and contain no foreign blood whatever. Such a conclusion is diametrically opposed to the horticultural experience of a century. For it is a well known fact that out of a large number, say five hundred chance seedlings of any fruit, but one or two at most will excel their parent; but these remarkable “seedlings,” some forty in number, have not a bad grape among them, and are so far superior to the “Mammoth Globe” as to preclude all comparison. Their admixture of foreign blood is patent in the heavy clusters of fruit, so far pulpless as to yield 75—80 per cent. of juice, and the indigenous element recognizable in the health, hardiness and habit of the vine.

The chief value of analyses of grape-must lies in their repetition and comparison. The product of various seasons, climates and soils should be examined. If this is done we shall soon arrive at the grapes suitable for wine in different latitudes, and no doubt other important results. Those parts of the country lying on an Isotherm of 70°-72° for the growing months, June, July, August, and September, wherever the summer rains are not excessive, are best adapted to wine growing; for a mean temperature of at least 65° for the above months is required for the ripening of even the earliest and hardiest varieties of grapes. The average temperature of Salem and vicinity, as deduced from observations extending over 45 years, is about 66.5°, and several degrees above this can be gained in well cultivated and protected gardens.

The above analyses are imperfect, several prominent grapes having been omitted, but I hope to extend and improve the collection at some future time.
IX. Classification of Polyps: (Extract condensed from a Synopsis of the Polypi of the North Pacific Exploring Expedition, under Captains Ringgold and Rodgers, U. S. N.). By A. E. Verrill.

(Communicated February 29, 1865.)

The report upon the collection made by Dr. William Stimpson, naturalist to the expedition, having been much delayed, the following tabular view of the classification adopted is here presented, with the hope that, if imperfect like every other, it may, nevertheless, afford some aid in illustrating the natural affinities of these humble forms.

Although in a communication read before a Zoological Club at Cambridge, Jan. 1862, I attempted to demonstrate the existence of the three natural orders among polyps, I refrained from presenting this view in a paper published last year, in order that I might make further investigations upon the subject before finally publishing it.

CLASS CNIDARIA OR POLYPI.

ORDER I. MADREPORARIA.

Polyps simple or compound with embryonic or rudimentary basal or abactinal region, which has no special function unless for vegetative attachment while young. Actinal area well developed, form broadly expanded, having a tendency in the higher groups to become narrowed towards the mouth. Tentacles simple, conical. Dermal tissues, and usually the radiating lamellae, depositing solid coral; the radiating plates being between the lamellae, are, therefore, ambulacral and appear to originate from the surfaces of the lamellae and the connective tissues extending across the ambulacral chambers and filling them from below. Interambulacral spaces distinct.

ESSEX INST. PROCEED. VOL. IV. S.
Suborder I. Stauracea (Madreporaria rugosa*).

Coral simple, or compound by budding; chiefly epidermal and endothecal; septa apparently in multiples of four, sometimes wanting. Type embryonic, like a young Astrea or Fungia.

Families,—Stauridae, Cyathophyllidae, Cyathaxonidae, Cystiphyllidae.

Suborder II. Fungacea.

Polyps either simple or compound by marginal or disk budding, rarely by fissiparity. Tentacles numerous, in multiples of six, imperfectly developed, scattered on the actinal surface, usually short and lobe-like. Upper part of polyps scarcely exsert. Coral broad and low, growth mostly centrifugal, tissue chiefly septal; walls imperfectly developed, often perforate, subordinate, usually forming the basal attachment.

Families,—Cyclolitidae, Lophoseridae, Fungidae, Merulinidae.

Suborder III. Astreacea.

Polyps mostly compound, either by fissiparity or various modes of budding. Tentacles usually well developed, long, subcylindrical, limited in number, in multiples of six

* This group is placed here with considerable hesitation and principally on account of the close resemblance in structure to the young of the succeeding and higher groups, when they first begin to form a coral, which then consists of a ring of epithea or epidermal deposit with a few, imperfect, rugose septa radiating from the centre. If the number four be a constant feature of the arrangement of their septa, it is possible that they may be entitled to rank as a separate order of Polyps. To this opinion Prof. J. D. Dana inclines. Prof. Agassiz unites the group with Hydrozoan Acalephs on account of their resemblance, in some features, to the Tabulata. It seems to me, however, that the absence of transverse plates in Cyathaxonidae and Cystiphyllidae and the perfection of the vertical septa in Stauridae, Cyathaxonidae and some of the Cyathophyllidae, together with their general structure, shows them to be more closely allied to the Fungacea and Astreacea, of which they may be considered embryonic types, while at the same time the group is a synthetic one, having analogies with nearly all the higher groups of Polyps and also in some respects, with Hydrozoans.
OF POLYPS.

encircling the disk. Coral mural, septal and endothecal; growth vertical and centrifugal, producing turbinated forms which are often elongated.

Families,—Lithophyllidae, Méandrinidae, Eusmillidae, Caryophyllidae, Stylinidae, Astreinae, Oculinidae, Stylophoridae.

SUBORDER IV. MADREPORACEA (Madreporaria perforata).

Tentacles in definite numbers, twelve or more, well developed, encircling the narrowed disk, therefore nearer the mouth; polyps with the upper portion much exsert, flexible; growth chiefly vertical; coral mural and septal, porous. Polyps compound by budding, sometimes simple.

Families,—Eupsammidæ, Gemmiporidae, Poritidae, Madreporidæ.

ORDER II. ACTINARIA.

Polyps with well developed, often highly specialized, basal or abactinal region. Walls well developed, tentacles longer, more concentrated around the mouth, which is also, usually, if not always, furnished with special tentacular lobes or folds. Ambulacral spaces always open, destitute of connecting tissues and solid deposits.

SUBORDER I. ZOANTHACEA.

Polyps encrusting, adherent, budding from mural expansions; tentacles simple, short, at edge of disk.

Families,—Zoanthidae, Bergidae.

SUBORDER II. ANTIPATHACEA.

Polyps connected by a cœnenchyma, secreting a solid sclerobase or coral axis. Tentacles few, six to twenty-
four, simple, conical.
Families,—Antipathidae, Gerardidae.

Suborder III. Actinacea.

Polyps free, capable of locomotion, with a highly specialized, muscular base or abactinal area. Tentacles well organized, either simple or branched; varying from ten to many hundreds, often with accessory organs arising from the same spheromeres, such as inner tentacles, verrucæ, complicated or simple branchial lobes, cinclidae, eyespherules, suckers, etc. Mouth with special lobes or folds. Most of the species are simple, a few are compound by fissiparity, many abnormally bud from the wall near the base, a few secrete from the base a horn-like deposit similar to the axis of Antipathes.
Families,—Actinidae, Thalassianthidae, Minyidae, Ilyanthidae, Cerianthidae.

Order III. Alcyonaria.

Polyps with well developed actinal, mural and abactinal regions, compound by budding. Tentacles eight, pinnately lobed, long, encircling a narrow disk. No inter-ambulacral spaces. Ambulacral ones open and wide.

Suborder I. Alcyonacea.

Polyps turbinate at base, budding in various ways, encrusting, adherent to foreign bodies by the coenenchyma.
Families,—Alcyonidae, Xenidae, Cornulariidae, Tubiporidae.

Suborder II. Gorgonacea.

Polyps cylindrical, short, connected by a coenenchyma, secreting a central supporting axis.
Families,—Gorgonidae, Plexauridae, Primnoidae, Gorgonellidae, Isidae, Corallidae, Briaridae.
OF POLYPS.

Suborder III. Pennatulacea.

Polyps forming free, moving colonies, the composite basal portion with locomotive functions and special cavities, with or without a solid free axis.

Families,—Pennatulidae, Pavonaridae, Veretillidae, Renillidae.

Among the most interesting species in this collection the following may be mentioned:

**Stephanoseris lamellosa** Verrill.

Coral low, subcylindrical, with a broad base, which completely covers small univalve shells with the exception of the opening; wall rudimentary; septa in four cycles, the primaries much the largest with subentire rounded tops; columella well developed, papillose, costae prominent, unequal.

Loo Choo Islands. Dr. Wm. Stimpson.

**Heterocyathus alternata** Verrill.

A low species with very unequal septa and costae, the primary septa very prominent. Encrusts and covers small univalve shells.


**Balanophyllia capensis** Verrill.

A species about half an inch high, broadly attached, slightly turbinated, with an epitheca rising within a line of the margin. Calicle deep, broadly oval. Septa in four cycles, the principal ones much exsert, vertical, narrowed at top, those of the fourth cycle joining the columella in pairs. Color of the living polyp bright orange.

Cape of Good Hope. Dr. Wm. Stimpson.
EUPSAMMIA STIMPSONII Verrill.
Coral free, elongated, turbinate, blunt at base. Calicle oval, deep; columella well developed, septa broad, the principal ones with entire inner-edges, rounded. Length an inch or more; breadth of cell .30
Interesting as a living representative of a genus hitherto known only in the fossil state.
North China Sea. Dr. Wm. Stimpson.

METRIDIUM FIMBRIATUM Verrill.
A species closely allied to *M. marginaturn* of this coast, but apparently more elongated, with longer and more slender tentacles which are almost hair-like. Disk within the tentacles narrow. "Color pale orange, translucent, body punctate with dark brown, mouth deep orange."
San Francisco, Cal. Dr. Wm. Stimpson.

PHELLIA COLLARIS Verrill.
A species remarkable for its great size compared with previously known species from Europe.
Hong Kong, China. Dr. Wm. Stimpson.

PHELLIA CLAVATA Verrill.
*Edwardsia clavata* Stimpson, l. c. 1855.
A species even larger than the last.
Near Ousima, Japan. Dr. Wm. Stimpson.

AMMONACTIS nov. gen.
Column elongated, subcylindrical, with well developed basal disk, covered, as in *Phellia*, with a persistent epidermis extending to near the summit, naked above; but differs in having a lobe-like tubercle below each tentacle, distinct from the margin. Tentacles long and numerous.
Ammonactis rubricollum Verrill.
*Edwardsia rubricollum* Stimpson, l. c. 1855.
Hong Kong, China. Dr. Wm. Stimpson.

Halocampa brevicornis Verrill.
*Edwardsia brevicornis* Stimpson, l. c. 1855.
Hong Kong, China. Dr. Wm. Stimpson.

Halocampa capensis Verrill.
Body elongated, tentacles twenty, blunt; ambulacra subpapillose. Six tentacles have their inner bases dark brown; body pale reddish with dots and patches of flake white; inner side of tentacles flake white.
Cape of Good Hope, 12 fathoms, sand. Dr. William Stimpson.

Cerianthus orientalis Verrill.
A large species similar to *C. americana* nobis. Body elongated, in a tube of mud. Tentacles long and slender. Color of body deep reddish brown, outer tentacles translucent, yellowish and white, pale brown on their inner sides, greenish at base; inner ones purplish brown or sometimes grass green.
At low water mark, Hong Kong, China. Dr. William Stimpson.

Nephtya thyroidea Verrill.
Polyps forming thyrsiform bunches of closely clustered branchlets, three inches high and two broad. Color wine-yellow or light brown, with a dark purplish tinge below the tentacles; tentacles nearly white; spicula forming elevated, transverse lines of silvery white on the stalks.
Cape of Good Hope, 20 fathoms, rocks. Dr. Wm. Stimpson.

Telesto ramiculosa Verrill.
*Cornularia aurantiaca* Stimpson, l. c. 1855, non. *T. aurantiaca* Lamx.
Hong Kong, 10 fathoms, shelly bottom. Dr. Wm. Stimpson.
Parisis laxa Verrill.
Coral forming openly reticulate fronds; papillae numerous rounded, on all sides of the branches; coenenchyma minutely villous in alcohol. Calcareous joints shorter and internodes longer than in P. fruticosa nobis.
Hong Kong. Dr. Wm. Stimpson.

Acanthogorgia coccinea Verrill.

Nepthya coccinea Stimpson, l. c. 1855.

Hong Kong, 10 fathoms, on shells. Dr. Wm. Stimpson.

Veretillum Stimpsonii Verrill.

A large species six or eight inches long, the upper portion enlarged, more than half the entire length. Polyps much exsert, upwards of an inch long; tentacles very long. Axis thick, short, fusiform, a third of an inch long. Base white, somewhat striated; body light cream-color; polyps transparent, bluish white at the bases of the tentacles.

Hong Kong, 6—10 fathoms, mud. Dr. Wm. Stimpson.

Veretillum baculatum Verrill.

Club-shaped, the base about a third of the length. Polyps scattered, not numerous. Axis small, fusiform, about half an inch long in a specimen three inches long.

Sea of Ochotsk, off Siberia. L. M. Squires.

Kophobelemnon clavatum Verrill.

Veretillum clavatum Stimpson, l. c. 1855.

Polyps more numerous and crowded than in K. Burgeri Herkl. which it resembles; body more claviform, naked dorsal space very narrow.

Hong Kong, 6 fathoms, mud. Dr. Wm Stimpson.
X. Notes on the Habits and Distribution of the Duck Hawk, or American Peregrine Falcon, in the Breeding Season, and Description of the Eggs. By J. A. Allen.

(Communicated November 14, 1864).

The Duck Hawk, Great-footed Hawk or American Peregrine Falcon, \( \textit{Falco anatum} \) Bonap. \( \textit{Falco peregrinus} \) Wilson, Audubon and Nuttall), has not long been known to breed within the limits of the United States. Dr. T. M. Brewer, in the "North American Oölogy," (part I, page 8,) published in 1857, says that but one authenticated instance has come to his knowledge of its having been met with, in the breeding season, south of Newfoundland. This was near Columbia, in Pennsylvania, where the young that had fallen from the nest had been procured by Prof. S. S. Haldeman; but the eggs had not been discovered, nor many particulars learned beyond the fact of its breeding there. In a note on this subject from Prof. Haldeman to Dr. Brewer, published in Dr. Brewer's account of this species, Prof. Haldeman says: "A pair [of these hawks] had a nest for many years about a hundred yards from my house, on a high and almost vertical cliff; but as a railroad now traverses its base, it is not probable that the species will return to the locality. * * * * * The nest was difficult of access, and I never saw it; but it was once reached, and the young taken by getting down from above." Prof. Haldeman also states that he felt confident they bred among the cliffs at Harper's Ferry, as he had seen them flying about there.

It has recently been ascertained that the Duck Hawk regularly breeds on several of the mountains in and near the Connecticut River Valley, the young having been procured from Mount Tom and Sugar Loaf Mountain in Massachusetts, and from Talcott Mountain, ten miles west of Hartford, in Connecticut. From accounts that I have received from different persons of a hawk agreeing in habits with the noted Duck Hawk, I am fully satisfied it has long nested on some of the precipitous mountains bordering on the Connecticut River in the States of Vermont and New Hampshire. Mr. J. G. Boardman says it...
breeds on the cliffs of Grand Menan, where it is resident the whole year.* Although the young have been procured, as above stated, from Mount Tom and Sugar Loaf Mountain several times in the last few years, and according to Dr. W. Wood, also from Talcott Mountain†, I am not aware that the eggs have been found in New England, or even in the United States, before the present season, when they were procured from a nest on Mount Tom, (April 19th, 1864) by Mr. C. W. Bennett‡. The only egg figured by Dr. Brewer was from Greenland, and its authenticity not ascertained wholly beyond doubt. Dr. Brewer mentions a drawing in his possession, by Dr. Trudeau, of another egg from Labrador; these being the only specimens to which he then had access.

In fall, winter and spring, this Falcon is not unfrequent along our Eastern sea coast, wherever its favorite prey, the sea ducks and other marine birds, abounds, but it is not at that season very commonly distributed over the country. Although it has been found throughout Eastern North America, chiefly near rivers, from Greenland to Cuba, and as far westward as the mouth of the Vermillion River, on the Upper Missouri§, but little definite information has yet come to ornithologists of its distribution and habits in the breeding season. Hitherto it has generally been supposed to retire to regions north of the United States to spend the summer and rear its young||; and though many do so, quite a proportion, it is evident, are resident in the northern parts of the United States the whole year, retiring to inaccessible cliffs for the purpose of breeding, and thus generally escaping the notice of naturalists during that important season. Poultry yards that chance to be in the vicinity of its nests are so frequently visited for plunder by this daring

†Hartford, (Conn.) Times, June 21, 1861.
‡The writer is indebted to the kindness of Mr. Caleb W. Bennett, of Springfield, Mass., for the specimens and many important facts which form the basis of the present article. Great credit is due Mr. Bennett for the persevering efforts he has made to discover and procure the eggs of the Duck Hawk; his complete success has not been unmerited.
||Audubon found it breeding quite plentifully along the high rocky shores of Labrador and Newfoundland.
species, that it is well known to many of our farmers and sportsmen, who readily distinguish it from other hawks by its bold dashing flight, and peculiar manner of capturing its prey; and its nests, I learn, are sometimes found by them, and the young destroyed.

All accounts agree that they nest in almost inaccessible cliffs; and often the nest can only be approached by a person being let down by a rope from above. The old birds are represented as bold in the defence of their nest, approaching so near as generally to be easily shot. They arrive early at their nesting place, and though they often bestow no labor in the construction of a nest, beyond the scraping of a slight hollow in the ground, they defend their chosen eyrie for weeks before the eggs are laid, and are known to return for several years to the same site. Incubation commences very early, the young having been found in the nest at Mount Tom May 30th, nearly fledged*, and on Talcott Mountain in the same condition June 1st, so that the laying of the eggs must occur by the last of March, or very early in April. The number of eggs has been known in several instances to be four.

Mountains Tom and Holyoke, in Massachusetts, afford several localities favorable for the nidification of the Duck Hawk, and sometimes several pairs, and probably usually more than one, breed about these mountains†; about the last of May, 1863, Mr. Bennett saw five adult birds of this species about Mount Tom. Dr. W. Wood of East Windsor Hill, Ct., informs me, that two pairs of Duck Hawks were evidently breeding on Talcott Mountain in the summer of 1863.

**Discovery of the eggs on Mount Tom.** Although the Duck Hawk has been long known to breed at the localities in Massachusetts mentioned above, those conversant with the fact were not aware that any special interest was

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*According to R. B. Hildreth, Esq., of Springfield who visited this nest May 30th, 1861, and noted the fact. The nest on Talcott Mountain, Ct., was found the same season, and first visited only a few days later—about June 1st, 1861. (See Hartford Times, as quoted above).

† Since the above was written I have been informed by Mr. Bennett, that a pair of these Hawks actually raised their young on Mount Tom, in the summer of 1864, notwithstanding one pair was broken up the same season.
attached to it, or that its eggs and breeding habits were but very little known to ornithologists; and so, until very recently, no particular efforts have been made to obtain the eggs. Mr. Bennett, becoming aware of this, resolved to procure the eggs. He accordingly visited Mount Tom for this purpose April 7th of the present year, when he searched the whole ridge of the mountain, discovered the old birds and the particular part they most frequented, and also the site of a nest, where young had been raised. The old birds were continually near this spot, and manifested much solicitude when it was approached, often flying within six or eight rods, and once the female came within three, screaming and thrusting out her talons with an expression of great rage and fierceness. The birds did not appear at all shy, being easily approached quite near to, though in walking the cracking of sticks and the clinking of the splinters of trap rock made no little noise. One of the birds appeared to keep close to the eyrie, and both would approach whenever it was visited, screaming at and menacing the intruder, notwithstanding that at that time there were no eggs, as was afterwards proved. Mr. Bennett suspecting that incubation had already commenced visited the locality again on the 9th, but only saw the old nest, the birds behaving as before. On April 19th, ten days later, he made another visit, and creeping carefully to the summit of the cliff, at a point near the eyrie already spoken of, he saw the female, on looking over the cliff, sitting on the nest, and but five or six yards distant. She eyed him fiercely for an instant, and then scrambling from the nest to the edge of the narrow shelf supporting it launched into the air; in a twinkling Mr. Bennett's unerring aim sent her tumbling dead at the foot of the precipice, several hundred feet below. The nest contained four eggs, which were soon safely secured, and the body of the female was obtained from the foot of the cliff. The male soon coming about, was shot at, but he was too shy to come within range, except once, while the gun was being reloaded. The eggs were all laid after Mr. Bennett's visit April 9th, and their contents showed, April 19th, that they had been incubated but a day or two. Incubation seems in this case, to have commenced several weeks
J. H. EMERTON, on wood.
later than usual, which may be owing to the late snows and unusual coldness of the weather this year during the first half of April.

Location and Description of the Eyrie. The situation of the eyrie was near the highest part of the mountain, about one-third of the length of the mountain from the south end, on a narrow shelf in the rock, eight or ten feet from the top of a nearly perpendicular cliff, one hundred and fifty or two hundred feet in height, and was inaccessible except to a bold climber, and at one particular point. The nest was merely a slight excavation sufficient to contain the eggs; no accessory material had been added. The site had been previously occupied, and probably for several years; and for weeks before the eggs were laid was carefully guarded by the bold and watchful birds.

Description of the eggs. The eggs, four in number, as already stated, differ greatly both in shape and coloring, the extremes in either being widely diverse. They are described in detail, and probably in the same order as laid.

No. 1. Longer diameter, 2.18 inches; shorter diameter 1.71 inches; the shorter diameter is .885 the longer. The form is somewhat ovoid, one end being slightly larger than the other; but neither end is very pointed; the point of greatest transverse diameter is .645 the length of egg from the smallest end. In form this egg is very nearly like the egg from Greenland, figured by Dr. Brewer in the "North American Oology" (pt. I, pl. II, fig. 11) The general color is chocolate-brown, darker and more dense and uniform about the ends, the part about the middle being lighter, varied with small irregular blotches and specks of a darker tint than the ground color. The color of the smaller end is nearly a uniform dull red-ocher. There is also an irregular belt of scattered and apparently very superficial blotches of very dark-brown, or nearly black. Something similar is often noticed on the eggs of many birds that lay brown or speckled eggs.

No. 2. Longer diameter 2.21 inches; shorter diameter 1.67 inches; shorter diameter .755 the longer. Form nearly an ellipsoid, the point of greatest transverse diameter being scarcely to one side of the middle (.54 the length of the egg from the smaller end); ends very nearly equal
and not very pointed. The distribution of the color in this is nearest of any of the four eggs before me to that figured by Dr. Brewer and only differs from it in tint. One end (the smaller?) is very light-reddish, or reddish-white, becoming lighter from the middle towards this end, about which it is the lightest and thinly marked with irregular mottlings of dark reddish-chocolate, which present a very superficial grayish tinge that is very characteristic; the other end (the larger?) is of a uniform dark ferruginous-brown or dull red-ochre, varied towards the middle by the appearance of the light ground color between the there scarcely confluent blotches of dark-brown that give the uniform deep tint towards and about this end.

No. 3. Longer diameter 2.32 inches; shorter diameter 1.70 inches; shorter diameter .733 the longer. Form ovoid, the smaller end elongated and much pointed. This egg is the longest, and much larger in proportion to its diameter than either of the others. The point of greatest diameter is .656 the length of the egg from the smaller end. In this specimen the contrast between the ground color and the markings becomes very strong, the ground color which is seen chiefly in a broad band about the middle of the egg, being white or reddish-white, and the markings very dark reddish-brown nearly approaching purple, and are quite uniformly distributed in blotches of various sizes, the largest being near the larger end of the egg; the sub-markings are of a lighter reddish-brown and are more blended.

No. 4. Longer diameter 2.16 inches; shorter diameter 1.65 inches; shorter diameter .765 the longer. Form regular ovoid, the smaller end rather more pointed than the same in No. 1; point of greatest transverse diameter .60 the length of the egg from the smaller end. In this specimen the contrast of the ground color with the markings is very striking, especially when compared with specimens No. 1 and No. 2; and the most peculiar part is that the greater end of the egg, which in the eggs of most birds is the end usually most subject to markings and to the greatest depth of color, is white, sprinkled sparingly with reddish specks, while the smaller end is deep, bright, brick-red, here and there relieved by small specks and patches.
of white ground color. About the middle of the egg the colors are in more equal proportions, the white patches becoming larger on the smaller end towards the middle, and the red patches on the larger end increase towards the same point, where the colors meet and become mixed in irregular patches of various sizes, from mere dots to blotches. The smaller end has a few streaks and blotches of dark-purple overlying apparently the other colors, as in specimen No. 1.

These specimens are very interesting, as indicating the great amount of variation to which the American Peregrine's eggs are subject, and especially so since they are all the product of one pair of birds, laid in one set, and identified as such beyond question. In coloration a transition can be traced between the extreme in the order they are numbered, which is undoubtedly the order in which they were laid, as indicated by the thickness of the shell as well as by the depth of color.

Table of Comparative Measurements.

<table>
<thead>
<tr>
<th>No.</th>
<th>L'gth.</th>
<th>Breadth.</th>
<th>Prop of breadth to length</th>
<th>Point of greatest transverse diameter from small end</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.18 in.</td>
<td>1.71 in.</td>
<td>0.785</td>
<td>0.640 l'gth of the egg</td>
</tr>
<tr>
<td>&quot;</td>
<td>2.21 &quot;</td>
<td>1.67 &quot;</td>
<td>0.756</td>
<td>0.540 &quot;</td>
</tr>
<tr>
<td>&quot;</td>
<td>2.32 &quot;</td>
<td>1.70 &quot;</td>
<td>0.732</td>
<td>0.656 &quot;</td>
</tr>
<tr>
<td>&quot;</td>
<td>2.16 &quot;</td>
<td>1.65 &quot;</td>
<td>0.763</td>
<td>0.600 &quot;</td>
</tr>
<tr>
<td>Average</td>
<td>2.22 &quot;</td>
<td>1.68 &quot;</td>
<td>0.759</td>
<td>0.600 &quot;</td>
</tr>
<tr>
<td>Greater extr.</td>
<td>2.32 &quot;</td>
<td>1.71 &quot;</td>
<td>0.785</td>
<td>0.656 &quot;</td>
</tr>
<tr>
<td>Lesser extr.</td>
<td>2.16 &quot;</td>
<td>1.65 &quot;</td>
<td>0.732</td>
<td>0.540 &quot;</td>
</tr>
<tr>
<td>Am't of variation</td>
<td>0.16 &quot;</td>
<td>0.06 &quot;</td>
<td>0.053</td>
<td>0.116 &quot;</td>
</tr>
<tr>
<td>Dr. Brewer's spec.</td>
<td>2.00 &quot;</td>
<td>1.56 &quot;</td>
<td>0.780</td>
<td></td>
</tr>
</tbody>
</table>

From the above table it will be seen that the range of variation in the four specimens in length is .16 of an inch; or nearly seven and half per cent. of the average length; in breadth .06 of an inch, or about three and a half per cent. of the average breadth; in the proportion of breadth to length, about fifteen per cent. of the length, or nearly twenty per cent. of the average proportion; the variation in the position of the point of greatest tranverse diameter is about eleven and a half per cent. of the whole length of the egg, the form of the eggs varying from an ellipsoid in No. 2 to an ovoid, which in No. 3 has the
smaller end considerably elongated. It will be observed
that the egg measured by Dr. Brewer is considerably
smaller than my smallest specimen, and that the propor-
tion of breadth to length scarcely differs from the same
proportion in No. 1.

In comparing the eggs of the American and the Euro-
pean Peregrine Falcons, Dr. Brewer, observes: "It [the
American] closely resembles a variety of the eggs of the
European species, but seems to present differences suffi-
ciently well marked to be regarded as specific. * * * * The
ground colors of both American and European are a
reddish-yellow, and both are thickly covered with fine
dottings of chocolate and ferruginous-brown, diffused over
the whole egg, in nearly equal degree, and to such an
extent as nearly to conceal the ground. The length of the
American egg is slightly less, but it is of equal or greater
capacity, and varies in its markings from all the European
specimens that I have ever met with. These variations,
though readily traceable by the eye, are not so easily de-
scribed. The shades of coloring in both are closely alike;
the variation consists more in the distribution of these
markings. In the European specimens, the fine markings
of chocolate are distributed with nearly exact uniformity.
In the American, the secondary colorings are now more
thickly and now more thinly diffused, here leaving the
ground color nearly unchanged, there becoming confluent
and blending into waving lines, blotches and bold dashes.
The egg in consequence, presents a more varied appear-
ance. These markings are also in greater proportion
around the larger end of the egg, and the blotches are of
da deeper shade, so there is a variation in the shading
between the smaller and larger extremities not noticeable
in any European egg that I have met with."

The amount of variation presented by the eggs of the
Duck Hawk described above, shows that but little depen-
dence can be placed on the eggs in deciding specific dif-
fences. The eggs mentioned by Dr. Brewer, are not
much different from those of the true European Peregrine.
One or two of the specimens before me considerably
resemble Dr. Brewer's, and likewise eggs of the European
species as figured and described by authors, while the
others are very different, one being remarkably so.
The eggs of the different species of this group of Falcons seem to resemble each other greatly, and to be subject to considerable variation in the same species. In the manner of laying the eggs there is also a similarity, as might be expected among closely allied species; the same species sometimes laying them on the bare rocks, and again in a bulky nest of sticks and other coarse materials. The nest of this species visited on Talcott Mountain, Ct., was of the latter kind, while on Mount Holyoke the eggs were laid on the bare earth.

Audubon thus describes the nest and eggs of the Duck Hawk as observed by him at Labrador:

"I have nowhere seen it so abundant as along the high, rocky shores of Labrador and Newfoundland, where I procured several adult individuals of both sexes as well as some eggs and young. The nests were placed on the shelves of rocks, a few feet from the top, and were flat and rudely constructed of sticks and moss. In some were found four eggs, in others only two, and in one five. In one nest only a single young bird was found. The eggs vary considerably in color and size, which I think is owing to a difference of age in the females, the eggs of young birds being smaller. The average length of four was two inches, their breadth one and five-eighths. They are somewhat rounded, though larger at one end than the other; their general and most common color is a reddish or rusty yellowish brown, spotted and confusedly marked with darker tints of the same, here and there intermixed with lighter. The young are at first thickly covered with soft white down. * * * * In several instances, we found these Falcons breeding on the same ledge with Cormorants, Phalacrocorax carbo."

Audubon adds that he is perfectly convinced that the Great-footed Falcon, or Duck Hawk of the later ornithologists is not different from the Peregrine Falcon of Europe. "Since my first acquaintance with this species," he says, "I have observed nothing in its habits, form, or marking on one continent that is different from what is found on the other." Since the difference in breeding habits supposed to exist when Bonaparte separated them in 1838, and which influenced his judgment in the matter, has been found to be not real, there seems to be nothing whatever in the breeding habits or in the appearance of the eggs to indicate specific difference between the American and European birds.


ESSEX INST. PROCEED. VOL. IV. U.
After becoming acquainted with the perfect unity of plan in the Radiata and the connected series of homologies, running through the whole branch, (as demonstrated by Prof. Agassiz in his private lectures) my interest was excited, to discover, if possible, a like symmetry of development in the Mollusca. Finding the universality of vertebration among the Vertebrata, of articulation among the Articulata, and similarly of radiation among the Radiata, I could not but believe that in the Mollusca some plan lay hidden, which, when unfolded, would as definitely convey their type, and unite them all, as in the other branches. It is not enough to call them soft bodied animals; for in considering their shell as a part of their organization, we have among them many of the hardest animals known, and we also have an equal number of soft bodied animals in the other branches. Their bilaterality, as expressing anything definite, is an equally unsatisfactory character. Prof. Huxley has given an archetype, or common plan of the Mollusca, as he conceives it, with many truthful homologies, in the article “Mollusca,” English Cyclopaedia, Vol. III., p. 855. In his figure of the archetype however, which is bilaterally symmetrical, we have details of structure only.

Prof. Agassiz in his “Methods of Study in Natural History” also suggests his idea of the plan, or structure, when he says, p. 34, “Right and left, have the preponderance over the other diameters of the body,” and says furthermore, that collectors unconsciously recognize this in the arrangement of their collections. “They instinctively give them the position best calculated to display their distinctive characteristics, and to accomplish this they necessarily place them in such a manner as to show their sides.” This can refer only to the Lamellibranchs, and their shells are displayed on the sides, because they naturally fall in that position. This lateral preponderance of structure only obtains among the Lamellibranchs. All Brachiopods
are displayed from the dorsal or ventral valve. Also the Gasteropods, particularly the flat forms like Patella, Chiton, etc. and the Nudibranchs as well, while in the figures of the naked Cephalopods we most usually have a dorsal view.

Though Prof. Agassiz speaks of radiation as characterizing the Radiates, and similarly of articulation and vertebraion as characterizing the Articulates and Vertebrates, yet Mollusks are spoken of as first introducing the character of bilaterality, or division of parts along a longitudinal axis, that prevails throughout the Animal Kingdom, with the exception of the Radiates. This then can be no restricted definition for the Mollusca, since it pervades the two higher branches; and who will deny the evidence of bilaterality among the Radiates, the higher Echinoderms for instance, as Clypeastroids and Spatangoids, where we have as good a definition of a longitudinal axis, as we obtain in many Mollusks. Even among the Polyps, as in the Actinaria, the antero-posterior axis is clearly expressed in the undue prominence of the primary radii.

Prof. Dana has been the first to publicly announce the plan of Mollusca, when he says, "The structure essentially a soft, fleshy bag, containing the stomach and visera, without a radiate structure, and without articulations."*

As far back as 1855 he has presented this thought in his lectures at Yale College.

In the year 1882 Mr. Alpheus Hyatt had independently worked out a similar result, and has already in MSS. notes, the necessary data demonstrating the same.†

Mr. Hyatt also proposes the name Saccata as more fully and truthfully expressing the type, than the unmeaning word Mollusca. This name not only expresses the Plan, but is equivalent to the titles Vertebrata, Articulata, and Radiata, and is in no way a qualitative appellation.

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† Mr. Hyatt has relinquished all ideas of publishing on this subject, since becoming aware that I was to do the same. During the preparation of these pages, I enjoyed his companionship, and many of the points herein stated, were fully and freely discussed between us, and to him I am indebted not only for the privilege of announcing his proposed name, Saccata, but for the suggestion of certain points to be hereinafter mentioned.
Objecting as all must to the introduction of a new name, still one so appropriate as that proposed by Mr. Hyatt, in lieu of one that has no relation to the Branch, except its traditional use, is certainly worthy of consideration, as it so clearly indicates what is believed to be the fundamental idea in the Branch, that of the Sac.

It might be said, in one sense of the word, that all animals are bags, or sacs, in various degrees of development. And if we mistake not, Prof. Pierce of Harvard University has expressed this idea, modified by saying that one is a radiate sac, another a simple sac, another an articulate sac, and finally a vertebrate sac, or a sac having two compartments. Viewing the Radiates as degradational, in relation to the higher animals, or partaking a plant-like character, we may justly be allowed to remark, that the Mollusks, as a type, present the sac feature most completely, for nowhere (with few exceptions, e.g. Cirripeds), do we find the various organs so essentially concealed, or possessing the power of retraction within a sac, as in the Mollusca. And that this is the leading feature in Mollusca might properly be inferred from the following; that in the four prominent branches of the Animal Kingdom, we have sketched out, in the incipient stages of the embryo, or at least, in its first indications of permanent characters, its typical features.

Thus, in the vertebrate ovum, after segmentation, we have the area pellucida, and primitive trace as indicating the future region, and direction of the vertebrate column. Among the Articulates, we have the transverse division of the embryo: and certainly the most prominent feature in the Molluscan embryo is the sac or mantle; as in the Gastropods, where we not only have in the embryo a mantle developed, but a distinct nautiloid shell, from which the little animal thrusts himself. In Cephalopods also, as Kölliker has shown in the development of Sepia officinalis, the mantle, or sac, is the first figure traced on the germ mass.

In my search after homologies between the different groups in this Branch, I always met with difficulty in the relations of the classes;—and though many of the views to be presented, I had long ago worked out, and had consid-
ered, and tested them, by personal examinations of the ani-
imals, it was not till I comprehended the importance of
the sac character, and understood the "Principles of Cephal-
ization" first enunciated by Prof. Dana, that I was enabled
to clear up previous doubts, discover new relations, and, as
I believe, rightly interpret the relations of the classes.

"As the principle of Cephalization is involved in the very
foundation of the diverse forms that make up the ani-
mal kingdom, we may look to it for authoritative guid-
ance, with reference to the system that prevails among
these forms."

In the following considerations, all preconceived ideas
regarding the relative positions of the dorso-ventral, and
antero-posterior diameters of the animal must be laid aside,
and the essential structure of the animal if rightly under-
stood, must be our guide. The gradual morphological
changes of the contents of the sac, and all other relations,
are based on the principle of Cephalization. In the plate
presented (Series I) I have given a typical figure of the
six prominent groups of the Saccata; namely, Polyzoa,
Brachiopoda, Tunicata, Lamellibranchiata, Gasteropoda,
and Cephalopoda.

For obvious reasons, only the intestine, head, and pedal
ganglia within the sac are represented. These six figures are
placed in their normal position, anterior pole downward,
the dorsal region is turned to the left. Commencing with
the Polyzoa (Series I, P) we have the sac closed, while
the mouth and anus terminate close together at the pos-
terior pole of the sac; the mouth occupying the extreme
posterior position, and by a dorsal bend of the intestine
upon itself, terminating dorsally. The nerve mass is found
between the oral and anal openings. In this class the
mouth and anus have the power of protrusion from the
sac. In the three lower orders, Cyclostomata, Ctenost-
tomata, and Cheilostomata, the polyzon, when complete-
ly evaginated, presents no fold or inversion of the sac,
while in the higher group Phylactolæmata, there is a partial
and permanent inversion of the sac under like condi-
tions.

*"Classification of animals based on the principle of Cephalization." Dana,
This latter group, combining the permanent inversion of the sac-walls with the lophophoric arms, is the first approach to the Brachiopoda. No organ corresponding to a heart has yet been discovered. In the Brachiopoda (Series I, B) we have a permanent invagination of the sac, and the mouth, as in Terebratula, already occupies a position some distance from the posterior edges of the overlapping shells, and the brachial coils permanently occupy the space thus made.*

We have in this group a dorsal flexure of the intestine, and a tendency to terminate as in the Polyzoa. In Lingula it terminates posteriorly and at one side. By the permanent inversion of the sac, the mouth makes a great advance toward the anterior pole. In Terebratula, Waldheimia, and allied genera, where the sac is very short and swollen, and the brachial coils very large, the viscera are crushed to the front, and the intestine, which is short and simple, is nearly bent upon itself, though still occupying a median line. In Lingula, where we have a very long and flat sac, the intestine is long, and has ample room for convolutions, but the anus, instead of terminating in a line with the mouth, is thrown to one side, in consequence of this excessive flatness of the sac. The heart will be found on the outer bend of the intestine and actually on the ventral side; the nerve occupying its homological position.

(The manner in which I view the Brachiopoda, if true, will entirely reverse the accepted poles of their structure. What has been considered as dorsal, is here regarded as ventral, and what has been considered as anterior, is here regarded as posterior. Further remarks on this will be made hereafter).

Thus far the balance of structure has been thrown to the posterior pole of the sac, and though we see a cephalization, or concentration of the muscular system and viscera, toward the anterior pole in Brachiopoda, yet that pole being essentially closed, we have no function manifested at that end, except the degradational one of adhesion. In

* "Terebratulina caput-serpentes, and Crania anomala, projected their cirri beyond the margin of the open valves, and moved them as the Polyzoa move their oral tentacles, but in no instance were the arms extended." Woodward's Treatise, p. 466.
the Tunicata (Series I, T) we have, through continued cephalization, the mouth thrown to the bottom of the sac, or nearer the anterior end, and now the anus terminates behind the mouth, and posteriorly.

The heart has also followed the intestine in its rotation and becomes anterior, and partially dorsal. The nerve mass is still posterior, and occupies a position between the two openings as in Polyzoa.

We have commencing in this group, the Tunicata, that erratic bending of intestine, and varied position in its anal termination, that is witnessed higher up in the scale, and though apparently governed by no law, we can yet trace the progressive movements toward a normal condition, by comparing Appendicularia, one of the lowest forms of the Tunicates, and representing the larval condition of their class. In this form the intestine has a ventral flexure, and terminates on the ventral side. In Pyrosoma it makes an abrupt bend toward the anterior dorsal region, and terminates anteriorly. In Salpa it terminates dorsally, on a line with the mouth, though still anteriorly. In Botryllus it creeps up, and terminates nearer the posterior pole of sac, though still dorsally. We have in this genus, and other compound Ascidians, the excurrent orifices of several individuals coalescing, forming a common cloaca for a community. The dorsal flexure is distinctly seen in Clavelina borealis. In these three classes; namely, Polyzoa, Brachiopoda, and Tunicata, the sac is essentially closed at the anterior end, and consequently the mouth opens toward the posterior end, and with few exceptions all are attached by the anterior end.

This makes a natural division, corresponding to the Molluscoidea of Milne-Edwards, the Anthoid Mollusks of Dana, and a portion of the neural division of Huxley. In the Lamellibranchiata (Series I, L) we have the sac opening anteriorly, and the mouth permanently occupying the anterior region, though in the lower forms pointing posteriorly, and in all cases the tentacular lobes pointing in that direction, and the mouth bent downward (ventrally), and partially obstructed by the anterior adductor, or by the undivided mantle. The gradual enlargement of the anterior opening is clearly seen, where in the Gastrochoe-
nidae, we have first a minute orifice, for the passage of an immature foot, or metapodium; this opening gradually enlarging in different genera, until in the Unionidae we have the sac almost completely separated, except dorsally. It will be noticed that the anterior opening is also ventral, or nearly so, in the lower forms. In Gasteropoda (Series I, G) the posterior end of the sac becomes essentially closed, and the ambient fluid now finds access to the gills through the anterior (though partially ventral) portion of sac, while with Cephalopoda (Series I, C) the opening is all anterior. Thus far we have traced the gradual cephalization of the contents of the sac, and of the sac itself. The dotted lines X X, running through the oral opening of each figure in Series I of Plate, show the gradual advance of this opening from the lower to the higher classes. In the lowest class all the display of structure, with the oral and anal openings, lies at the posterior pole of sac. In this highest class, all this display of structure lies at the anterior pole. Advancing from the Polyzoa, by the gradual advance of the mouth, the posterior pole becomes less prominent. Even when the sac opens anteriorly as in the Lamellibranchiata, the posterior end of sac remains open, and the mouth, partially inclined that way, receives its food from that end; the food being conducted to the mouth by ciliary motion as in the three lower classes. The nature of their food is also identical, being of an infusorial character, and as such it is obvious that masticating organs, or biting plates, such as we find in the two higher classes, are not needed.

So long also as the posterior end of the sac remains open, the anus terminates at that end; when this opening becomes closed, as in the higher classes, the anus seeks an outlet through the anterior opening, and the mouth, that before received its food from the posterior end of the sac, and by ciliary motion, now distinctly points the opposite way, and is furnished with the proper organs to procure food, the nature of which requires separation and trituration.

In nearly all the foregoing homologies, and also the position in which I place the Tunicate sac, I am sustained by the writings of eminent naturalists. With the Brachiopoda, however, my views completely reverse the accepted
poles of the body, though, even here, according to "Woodward's Treatise on Mollusca," page 204, Forskahl and Lamarck "compared Hyalea with Terebratula; but they made the ventral plate of one answer to the dorsal valve of the other, and the anterior cephalic orifice of the pteropodous shell correspond to the posterior, byssal foramen of the bivalve!" And, if the views I advance prove correct, they were precisely right. In all my previous attempts to homologize the different classes, I had always met with an obstacle in the apparently aberrant characters of the Brachiopods: never for a moment doubting the truth of the accepted views, that indicated the regions to be called dorsal and ventral, as such, I labored in vain. When I undertook to interpret the relation of these classes on the principle of cephalization, I found that these accepted views must be doubted, and it was with amazement that I beheld such unlooked for results: that the so-called anterior pole is really the posterior pole, and that the so-called dorsal region is really the ventral region.

It has not been without patient consideration that I now advance these views, knowing that by many they will be received with opposition; nevertheless, the more I try to make them conformable with already received relations, the more I am convinced that such relations are wrong; and it is only in believing that continued research will but confirm these propositions, that I now dare to offer them.

According to the views here advanced, the Brachiopods are attached by a prolongation from the dorsal area, as in the lower Polyzoa, where they lie on the back. That in their natural position in life, this valve is really uppermost. That the process of attachment also proceeds from the anterior pole of the body, as in all the members of the Branch even to Gasteropods, with the exception of those attached by one valve, (e.g. Ostreans, Clavagella,) whether it be by a byssus, confined in cells of their own making, or buried in the mud, it is the anterior end which is fixed. In several lower forms, like Tridacna and Anomia, the point of attachment springs from the dorsal area, as in the two lowest classes. In regard to the posterior position of the mouth in Polyzoa and Brachiopoda, we have similar anal-

ESSEX INST. PROCEED. VOL. IV. V.
ogies among the Articulata; Cirripedia, for example, where we have animals becoming attached head downward, and all the oral parts, as in the pedunculated forms, tending towards the posterior pole of the body; or in Limulus, where we have such a decephalization as it were, the mouth occupies nearly a central position in the ventral region.

Again, considering the intestine as a simple tube, opening at each end, with the weight of structure evenly divided between the two openings, is it any more incredulous, that the oral opening should be posterior, than that the anal opening should be anterior, as in the Gasteropods?

In Polyzoa, the oral and anal openings occupy a similar position in all the forms. In Brachiopods, while the mouth remains in nearly a constant position, the anus terminates either in a median line, or by a lateral deflection of intestine to one side. In Tunicata, while the mouth occupies a permanent position at the front of the sac, the anus terminates at various portions of the sac, generally in a median line, though there is usually a lateral deflection of the intestine.

In Lamellibranchiata, the mouth and anus terminate in a median line, with few exceptions, (e. g. Pecten) though the intestine convolutes in various ways. In Gasteropods we have again lateral deflection of intestine, and though in many genera the anus terminates in a median line, yet in the bulk of the Gasteropods it terminates at one side or the other. In the Dibranchiate Cephalopods we have again the termination of the intestine in a median line.

The diagram here given (Fig. 1) represents an ideal longitudinal section of the sac, similar to those of Series I. The arrow within the sac, shows the direction of rotation of the bent intestine; carrying with it the heart, (see Plate, Series I.) which in Brachiopoda we find on the ventral region; in Tunicata on the anterior dorsal region; in Lamellibranchiata on the dorsal region; in Gasteropoda on the dorsal region and also further back; and in the Cephalopods at the posterior portion of sac. The different positions of the sac openings (represented in fig.
1 by arrow O) follow the same direction, that is, from posterior to anterior, ventrally. Thus in Tunicata the two openings are posterior and posterior dorsal; the posterior dorsal, being the anal or excurrent orifice; this is always the shortest in Tunicata. In Lamellibranchiata the anal tube moves nearer the branchial tube; in the lower forms their outer covering coalescing and of equal length, while, higher up, the tubes becoming entirely separate, and in some of extreme length, the anal tube being the longest. In Pisidium and other forms the branchial tube disappears, and water is received through a ventral opening; while the anal tube yet remains, occupying a posterior position on a line with the antero-posterior axis, in the same position the branchial tube occupied in the Tunicata: and, finally, both tubes become nearly obsolete, and the mantle is cleft all round, except dorsally. Thus the progress of sac opening follows in the same line of rotation with the intestine. The progressive regions of attachment move in an opposite direction (Fig. 1, arrow A). Commencing with the Polyzoa as the lowest class, we have, as in the Cheilostomata, the dorsal portion large and spreading, this being the fixed portion; the anal opening being turned toward this region, as in the Brachiopoda and Tunicata. (The movable part of the ventral surface, which is uppermost, being represented by the little lid). This mode of attachment is the lowest feature; namely, attached along the entire dorsal region.

As we ascend to the higher forms of the class, we have a freeing of the posterior portion of sac, and the viscera permanently occupies this freed portion. In the Brachiopoda we have the sac free, held only by the peduncle; the means of attachment springing anterior, and from the dorsal valve, as in the partially freed Polyzoa. (Crania and Descina are attached as in Lepralia).

In Lingula, where we have the lengthened and flattened sac, the animal stands vertical in the sand. In Terebratula and allied genera, the dorsal valve already assumes preponderance over the ventral valve, and now obtains its normal position uppermost.

All the Tunicates with few exceptions are attached, and by their anterior end.
In the compound Ascidians like Botryllus, where we have a community of individuals clustering round a common centre, their dorsal as well as anterior regions are attached, or, in other words, the ventral and posterior regions are free only.

Among the Lamellibranchiata nearly all the lower forms, and many of the higher forms are fixed or stationary; and whether moored by a byssus, buried immovable in the mud, or imprisoned in cells of their own making, it is the anterior end which is fixed. This obtains, with important exceptions.

The Monomyarians combine in their structure both high and low characters. In their open mantle, and certain other features, they rank high. In their fixed position, the attachment generally springing from the dorsal region, they rank low. For these reasons, I have placed them in the centre (see Plate, Series II, M) not indicating by this their equal value with the other groups, for I doubt if their separation from the Diniyarians is valid, since the large adductor, composed of two elements, would indicate the presence of both anterior and posterior adductors, combined in consequence of the excessive shortness of their antero-posterior diameter. The Monomyarians present singular features of analogy with the Brachiopoda. Thus they are generally inequivalve. The viscera are compacted toward the dorsal region, and, when attached, they are generally by a process from the dorsal portion, (e.g. Anomia) the lowest feature of attachment. In all these instances, particularly with Anomia, the analogy is very striking; it is analogy only, and nothing more, for in their whole structure, and in the relative proportion of their diameters, they present just the opposite extreme. While we have in Brachiopoda the growth laterally, that is, spreading on the sides and depressed dorsally, and the valves, dorsal and ventral, in the Monomyarians we have the other extreme; the valves are right and left, and the display is on the side, the growth extending ventrally as it were. So narrow are they that in certain forms, Placuna for example, it is almost impossible to conceive the presence of soft parts between the valves. We compare the relative diameters between the Brachiopods and Monomyarians, to show how unlike they are in this respect.
ERRATA.

Page 175, line 12 from bottom, for anterior pole read posterior pole.

Page 180, lines 12—13 from top, for anterior end read posterior end.
For reason of their excessive narrowness, the greater number of Monomyarians lie on the right or left valve, and as their peculiar form precludes the possibility of locomotion by the usual organ, the foot, they either remain fixed, or swim freely about in the water, by violently closing their valves, as in Lima and Pecten.

Among the Unionidae, the highest family in the Lamellibranchiata, the animal assumes nearly a horizontal position in crawling, though the anterior end is always the lowest, and generally buried in the mud. Its embryos, like Monomyarians in shape, are attached to the ovisac by the dorsal margin, which is straight, as in Pecten. (Lea's paper on Embryonic forms of Unionidae, Journ. Acad. Nat. Sci., 2d Series, Vol. IV., plate 5).

By their violent shutting of the valves, while in embryo, they may, after birth, swim, even as Pecten swims; at all events they are said to become attached by a byssal thread while young. Among the Gasteropods we have a few genera attached, or fixed, as in Magilus, Siliquaria, Vermetus, Spirogyphus, Nerinea, and Petaloconchus. These are now attached posterior end downward. In Calyptraea they are in a fixed position, secreting a ventral valve, upon which they rest. (It would be interesting to know for a certainty which part first becomes attached in Vermetus and allied forms; their first point of attachment must take place at the mouth of the tube or aperture, which is really anterior and ventral). The Cephalopods are free.

Thus we have the various regions of attachment, changing and following in the direction indicated by the arrow A, in Fig. 1.

1st, Polyzoa: dorsal attachment.
2d, Brachiopoda: dorsal and anterior attachment.
3d, Tunicata: anterior.
4th, Lamellibranchiata: anterior and ventral attachment.
5th, Gasteropods: ventral and posterior attachment.

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Brachiopods</th>
<th>Monomyarians</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antero-posterior</td>
<td>Medium</td>
<td>Small</td>
</tr>
<tr>
<td>Dorso-ventral</td>
<td>Small</td>
<td>Very large</td>
</tr>
<tr>
<td>Transverse</td>
<td>Large</td>
<td>Very small</td>
</tr>
</tbody>
</table>

- Diameter:
  - Antero-posterior: Medium
  - Dorso-ventral: Small
  - Transverse: Large

- Brachiopods:
  - Antero-posterior: Medium
  - Dorso-ventral: Small
  - Transverse: Large

- Monomyarians:
  - Antero-posterior: Small
  - Dorso-ventral: Very large
  - Transverse: Very small
While we have thus seen that the area of attachment first springs from the dorsal region, and gradually changes as we ascend in structure toward the anterior end, so we find the principal organ of locomotion, i.e. the foot, is first developed from the ventral region, and in like manner tending toward the anterior end, as we ascend in the scale, until, in Cephalopoda, the specialized divisions of the foot surround the head, and point directly forward.

Having personally communicated the substance of this paper to Professor James D. Dana, he has, in a letter to me, indicated certain gradient relations among the Lamellibranchs, Gasteropods, and Cephalopods, as manifested in the special characteristics of the head, or anterior part of the body, so clearly illustrating the principle of Cephalization that I now take the liberty of presenting them. In the Lamellibranchs the foot is a simple muscular organ developed from the ventral surface and protruding anteriorly. It is simply an organ of locomotion, in the lower forms not even performing this function. The oral opening is a simple slit, without the power of seizing or triturating its food.

In the Gasteropods the foot is more specialized, and as an organ of locomotion far superior to that of the Lamellibranchiates, having oftentimes three well characterized regions, called by Huxley, the pro-, meso- and metapodium, these regions oftentimes supporting certain processes, e.g. cirri, opercula. The foot not only performs locomotion but in many cases has the power of seizing and retaining its prey (e.g. Natica). The mouth has an apparatus for biting and triturating its food, being furnished with an upper jaw, or buccal plate, and a tongue, armed with silicious particles. In the Cephalopoda the foot is so far differentiated as to be separated into prehensile arms furnished with rows of suckers, or hooks. These arms surround the head, and are thrown directly forward. They are capable not only of locomotion, but of seizing their prey, and performing also movements of aggressive action. In the higher forms of Cephalopods, the function of locomotion is delegated to other organs, while the arms serve the uses of the head alone, and the mouth, furnished with two powerful mandibles opposed vertically, forcibly
reminds us of a parrot's beak, or that of certain other vertebrates. Thus we have cephalic power manifested in the mechanical action of the foot.

1st, Lamellibranchs—Locomotion.
2d, Gasteropods—Locomotion, Prehension.
3d. Cephalopods—Locomotion, Prehension, and Aggression.

According to the principle of Cephalization, cephalic power is manifested either as a mechanical, sensorial, or psychical force. Thus the Cephalopods possess in the greatest measure, all three; while Gasteropods, not indicating, to any great extent, aggressive action, may be said to manifest but little psychical power; and the Lamellibranchiates manifest essentially only mechanical action.

We have based the preceding considerations on the common structure of each class, and for comparison have given an archetype, as it were, of each class (Series I). In continuing these archetypal figures, as illustrating the relative diameters and mean forms for each class (Series II and III), and also the mean, or average position in nature of the antero-posterior axis (Series IV), we obtain singular features of polarity,* which I will now proceed to indicate; premising, however, that what follows is offered with reluctance, as I have not at present the opportunity to verify the statements as I would wish. In Series II the average lateral form of each class is given. In Series III a transverse section is given of the same figures in Series II. In Series II the arrow A indicates the direction of anterior pole, and D indicates the dorsal region in Series II and III. In Series IV a line for each class is given, representing the average position of their antero-posterior axis in nature (A, anterior pole, P, posterior pole). The central figures in Series II, III, and IV represent corresponding views of the Monomyarians. In the Polyzoa, (Series II, P) the sac is long and cylindrical, the mouth and anus terminate at the posterior pole, and the tentacles surround the mouth only; the anus terminating outside the lophophore. Witness in the highest order of Cephalopods, the Dibranchiates, the sac as in Loligo (Series II, C), long and cylindrical, and in all cases mouth and

*We use this word in its most general sense.
anus opening anteriorly; the arms surrounding the mouth only. Two rough diagrams, alike in form, but reversed in one case, would represent each class as we have it here.

In Brachiopoda (Series II, B) we have the sac widening laterally, and correspondingly depressed dorsally; mouth and anus opening posteriorly. In Gasteropoda (Series II, G) we have the same features, except that the parts are reversed again. In Tunicata (Series II, T) the sac is lengthened and swollen. Lamellibranchiata (Series II, L) the same. The relative diameters of the Monomyarians are unlike those of any other class, as before pointed out.

It is confidently believed that when these relations, or polarities, between the ascending, and descending, or, as Professor Dana terms them, the Holozoic and Phytozoic classes, have been farther studied, new and interesting features will be revealed. Thus, the resemblances between the Tunicates and Lamellibranchiates are too obvious to indicate.

Among the Brachiopods and Gasteropods, beside what has been pointed out, we have unlooked for similarities, as for instance Descina and Calyptrae, or Terebratula and Hyalea. Among the Polyzoa and Cephalopoda, though no polarities are brought to mind, except those given above, yet we cannot help remarking how strong the resemblance is between the Polyzoa and Protozoa, through Vorticella: and if Vorticella belongs to Polyzoa, as Professor Agassiz appears inclined to believe, a few steps more bring us to the Ammonitic forms of the Rhizopods. This is speculative (though suggestive), as it is now considered by many that the Protozoa forms a fifth Sub-Kingdom.

In considering a transverse section of the sacs, as shown in Series III, we obtain a like order of polarity. Thus the highest orders in Polyzoa and Cephalopoda present a circular section. Brachiopoda and Gasteropoda are transversely oval; Tunicates and Lamellibranchiates are longitudinally oval, or in lower forms circular; while the Monomyarians have the dorso-ventral diameter in excess, and the transverse diameter reduced to the minimum.

In considering the position, or angle of the antero-posterior axis of each class in nature, we obtain similar results (Series IV).
Polypoa and Cephalopoda, we place in a horizontal position, taking a swimming Dibranchiate for comparison: this may be premature however.

Brachiopods and Gasteropods with posterior pole slightly elevated, as in Cyrtia and allied forms of Brachiopods, and any coiled Gasteropod for example. Tunicates and Lamellibranchiates with the axis vertical, the anterior pole being below, and the Monomyarian horizontal again. It must be remembered that the above considerations are taken in their most general sense, representing only the mean for each group, many of them perhaps erroneous. They are given rather for the purpose of indicating a future path of inquiry, which the writer considers fruitful and intends to follow, than as points in any way settled.

In ascertaining the mean position of the antero-posterior axis for the whole branch of Saccata, (that is, the average) we find that a line at an angle of 45° would represent its position in nature; the lower end being anterior. In the Radiates a line through the mouth to the opposite region of the body would stand vertical. In Articulates the antero-posterior axis would be horizontal. Among the Vertebrates, Fishes would be horizontal, as in Articulates; Reptiles have the head slightly elevated; Birds and Mammals still more elevated; so that a mean line, for these classes might be drawn at an angle of 45° the cephalic region being uppermost. Man stands vertical. Thus in a diagram we would have the following:

```
Man.  
Vertebrata.  
Articulata.  
Saccata.  
Radiata.  
```

Fig. 2.

In the preceding considerations I have endeavored to show the importance of the sac, as the principal and prominent feature in their plan of structure. All animals, re-
duced to their primary elements, are sacs in one sense of the word, though in one case a radiate sac, in another an articulate sac, etc. Yet nowhere does this character predominate so universally, nor is it expressed so simply as in the Mollusca; the leading idea as it were. It was shown also that, essentially, the heart is on the outer bend of the intestine, or between that and the sac wall, while the principal nerve mass was on the inner bend of the intestine. We would thus state their characters.

**SACCATA.**

1. Animals of a varied form, without a radiate structure and without articulations.
2. Stomach and viscera enclosed by a fleshy sac, which may be closed or open, at either one or both ends.
3. Principal nerve masses, consisting of ganglia, which are adjacent to, or surround the esophagus.
4. Intestine bending inward, or having an outward flexure.
5. Heart on the outer bend of intestine.

\[
\begin{align*}
\text{SACCATA:} & \\
\text{HOLOZOOIC, or} & \begin{cases} 
\text{Sac open at anterior end.} & \text{CEPHALOPODA.} \\
\text{Mouth opens anteriorly.} & \text{GASTEROPODA.}
\end{cases} \\
\text{PHYTOZOOIC, or} & \begin{cases} 
\text{Sac open at posterior end.} & \text{TUNICATA.} \\
\text{HEMIPTYPIC.} & \text{POLYZOA.} \\
\text{Mouth opens posteriorly.} & \text{BRACHIOPODA.}
\end{cases}
\end{align*}
\]

We must now consider the relations of the Saccata to the other branches of the Animal Kingdom. In the paper of Professor Dana’s, above referred to, he has used the terms alphatypic, betatypic, and gammatypic, as a numbering of the grades of types, whether of branches, classes, or orders; also, below gammatypic, we have degradational.

The Radiates are regarded as degradational, and below this, hemiphtyloid, also, the terms used above, namely, Holozoic, or true animal forms, and Phytozoic, or plant-like forms.
Applying these terms to the classes or groups of Saccata, we have the following:

**HOLOZOIC.**
- Alphatypic, Cephalopoda.
- Betatypic, Gasteropoda.
- Gammatypic, Lamellibranchiata.
- Degradational, Tunicata.
- Hemiphytoid, Brachiopoda.

**PHYTOZoIC.**
- Alphatypic, C-ophyta.
- Betatypic, Garnniatypic.
- Gammatypic, Tunica.
- Degradational, Brachiopoda.
- Hemiphytoid, Polyzoa.

Prof. Danahas pointed out many interesting parallelisms between the groups of the different branches. Let us now look at the parallelisms between the groups above indicated, and the other branches. Cephalopods approach nearest the Vertebrae through their lowest class, the fishes, and already many interesting analogies have been pointed out between them.

Gasteropods may be likened to Articulates, through their lowest class, the Worms, through certain resemblances many forms bear to the Leeches, Planarians, and Trematodes. Lamellibranchiates may be considered the essential embodiment of the branch to which they belong. Tunicates and Polyzoa may be compared to Radiates.

Or, in considering their freedom or fixedness in life, we have Cephalopods free, as in all Vertebrae; Gasteropods, a few fixed, as in Articulates; Lamellibranchiates, many fixed as in Saccata, with relation to the other branches. Tunicates, the greater portion fixed, though they do not compare so well with the Radiates in this respect, but Brachiopods and Polyzoa fixed as in the lowest class of Radiates, the Polyps.

We would thus have

<table>
<thead>
<tr>
<th>Alphatypic</th>
<th>Cephalopods</th>
<th>Vertebrates</th>
<th>Fishes.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gammatypic</td>
<td>Gasteropods</td>
<td>Articulates</td>
<td>Worms.</td>
</tr>
<tr>
<td>Betatypic</td>
<td>Lamellibranchiata</td>
<td>Saccata.</td>
<td></td>
</tr>
<tr>
<td>Degradational</td>
<td>Tunicates,</td>
<td>Radiates.</td>
<td></td>
</tr>
<tr>
<td>Hemiphytoid</td>
<td>Brachiopods,</td>
<td>Polyzoa,</td>
<td>Radiates,</td>
</tr>
<tr>
<td></td>
<td>Lamellibranchiata,</td>
<td>Polyps.</td>
<td></td>
</tr>
</tbody>
</table>
Explanation of Plate IV.

Series I. Represents a typical figure of each principal group in Mollusca—viz., P, Polyzoa; B, Brachiopoda; T, Tunicata; L, Lamellibranchiata; G, Gasteropoda; and C, Cephalopoda—(M, indicating Monomyaria, of the second series). These figures are represented anterior end downward, the dorsal region being turned to the left. The tube within each cut, represents the intestine, the larger end of which is the mouth, and the smaller end the anus. The harp-shaped figure represents the heart, and the star represents the pedal ganglion.

Series II. Represents similar views, with less detail. The dorsal region in this series is uppermost, and the anterior end, is turned to the left, as indicated by arrow A. The curved line indicates the intestine, the large end being the mouth.

Series III. Represents transverse sections of corresponding figures in Series II.

Series IV. Represents the mean position in nature, of the antero-posterior axes of the figures represented above, A, Anterior pole, P, Posterior pole. The vertical rows of figures are identical.

Note. Since lines 7—12, page 164, were printed I have had an opportunity of quoting the remarks made by Professor Peirce as reported in the Proc. Amer. Acad. Arts and Sci., Vol. III, p. 8.

“Professor Peirce also presented a communication upon the form assumed by an elastic sac containing a fluid.

The positions of unstable equilibrium he found to divide themselves into four special forms, the annular, cylindrical, that of a cylinder with a bilateral character, and the double or multiple cylinder. The ultimate form of the first case is a sphere.

He also alluded to the interest of this fact to those who were not themselves mathematicians. For the primitive forms which Professor Agassiz had found to be the four types of the animal kingdom were the same, the Radiata being represented by the sphere, the Mollusca by the cylinder, the Articulata by the bilateral, and the Vertebrata by the double cylinder. Now, as all animal forms begin as elastic sacs, containing fluids, these forms seem the necessary ones for the condition of equilibrium.”

It was Mr. Hyatt who defined the animal forms in the terms used on page 164.

E. S. M.
XII. Synopsis of the Polyps and Corals of the North Pacific Exploring Expedition, under Commodore C. Ringgold and Captain John Rodgers, U. S. N., from 1853 to 1856. Collected by Dr. Wm. Stimpson, naturalist to the Expedition. With Descriptions of some additional Species from the West Coast of North America. By A. E. Verrill.

Part II, Alcyonaria. With two Plates.

[Communicated February 29, 1865.]

The specimens upon which the following descriptions are based were mainly collected by Dr. Wm. Stimpson while acting as naturalist to the expedition. They were for the most part preserved in alcohol, and many are accompanied by notes and drawings of the soft parts, which have been reproduced in the plates. In most instances I have given the descriptions of the colors of perishable parts, as well as notes on the mode of occurrence, in Dr. Stimpson's own words.

Descriptions of a few species in the collection of the Smithsonian Institution and the Yale College museum, from the Pacific Coast of America, have been added, for the sake of making the paper more complete.

SUBORDER, PENNATULACEA.

FAMILY, PENNATULIDÆ.

Pteromorpha expansa Verrill.

Plate 5, figure 1.

The pinnate portion is broad ovate, abruptly rounded below; peduncle, or basal portion, thick, swollen, a little less than half the entire length. Pinnae crowded, about thirty-two on each side, long and wide, somewhat thickened, angular, the naked posterior margin somewhat concave, the anterior rounded and supporting numerous small polyps, and strengthened with sharp spines, which are often in clusters of two or three. The outer half of the sides of the
pinnae as well as their anterior edges, are covered by small polyp-cells; basal half of the lower surface densely covered by small papillæ. Axis strong, pointed at the ends; interior cavity of the base small. Length of a large specimen in alcohol 6 inches, breadth across pinnae 3.5, length of peduncle 2.75.

"Color (in life) white, bases of the polyps dirty white, on the stalk there are a few scattered blackish spots.

It lives with the stalk immersed in the mud like Renilla; undulating, moving contractions are often seen in the stalk, resembling those of a Holothuria."

Bays opposite Hong Kong, China. Common in 6 fathoms, mud, April, 1854. Dr. Wm. Stimpson.

Leioptilum Gray.

This genus is most nearly allied to Pennatula, but differs in having soft, fleshy pinnae, with even borders and no apparent spicula. The polyps are in two or more rows along the edges of the pinnae. The peduncle is enlarged into a conspicuous, contractile bulb. The axis is very slender, quadrangular, and extends only through the middle portion of the body. The rudimentary individuals on the back are developed in the form of conspicuous papillæ.

Leioptilum undulatum Verrill, nov. sp.

Basal portion smooth, pointed at the end, swelling into a large bulb just below the pinnae. Posterior part of the body, except along a narrow median band, covered with large verruciform rudimentary polyps, forming rounded papillæ, some of which are a tenth of an inch in diameter. Pinnae large, very broad and rounded, with narrow bases, the edges thrown into undulations or frills. Polyps rather large, arranged in three alternating rows along the edges of the pinnae. Axis very slender, about two inches long, extending from about an inch above the basal end to about the middle of the pinnate portion. The naked base, of a specimen 4.25 inches long, is 1.75; the largest pinnae .75 long and 1.12 wide. This specimen has twenty-five pinnae on each side. Pinnacati Bay, Cal. Mr. Stone. (Coll. Smithsonian Inst.)
This section of the genus *Sarcoptilus* Gray seems to be sufficiently distinct from the original type of that group to rank as a separate genus.

The form is thick, club-shaped; the pinnae numerous, crowded, with thickened edges on which the polyps are arranged in several rows, each cell surrounded by prominent, spine-like spicula. The back of the body, except along a narrow median space, is covered by two broad bands of rudimentary polyps, appearing like crowded granulations. The basal portion is thick and bulbous, with two large interior cavities, one of which extends along the anterior surface, communicating with the pinnae, the other along the dorsal portion.

The axis is long, fusiform, tapering to very slender points, which are curved (in preserved specimens) into a loop at each end. Connected with the lower part of the axis are very strong thickened muscles, which pass obliquely upward and outward to the wall-tissues, while higher up, a little above the lowest pinnae, other shorter ones are attached, which pass obliquely downward to the wall.

**Ptilosarcus Gurneyi.**


Basal portion about one half the whole length, thick, bulbous, very muscular, the surface strongly sulcated in contraction. Pinnae smooth on the sides, broad, rounded, nearly semicircular with a broad base, the posterior edge extending beyond the base as a rounded lobe: the edge is thickened and covered by the polyps arranged in four rows, each cell armed with two sharp spinules. Along the back are two broad bands of very small papillae or granuliform, rudimentary polyps.

Length of a large alcoholic specimen, having fifty-two pinnae on each side, 10 inches; greatest breadth 2; length of pinnae .80, breadth 1.50; length of naked base 4.75, diameter 1.25.

Puget Sound, Wash. Terr. Dr. C. B. Kennerly, Dr. G. Suckley. (Coll. Smithsonian Inst.)
Family, Pavonariidae Dana, restricted.

Virgularia pusilla Verrill, nov. sp.

Plate 5, figure 2.

Very small and slender, the pinnæ extending nearly to the base, which is rounded and bulbous; pinnæ of the upper portion surrounding the stalk on all sides except the back, which is naked; below they are separated also by a narrow anterior space, but the pinnæ of the opposite sides appear to coalesce anteriorly higher up, producing a sub-verticillate arrangement. The middle whorls are separated about .1 of an inch; polyps small, twelve to fourteen in the median whorls, somewhat crowded; tentacles slender, elongated, with slender, rather distant, lateral lobes along nearly their whole extent. Length 1.75 inches; diameter at the middle .12.

"Bays opposite Hong Kong, China, in 6 fathoms, mud. April, 1854. Color pale orange or dirty red." Dr. Wm. Stimpson.

The only specimen in the collection is probably young.

Family, Veretillidae Gray, emended.

Veretillum Stimpsoni Verrill, these Proceedings, p. 152, April, 1865.

Plate 5, figures 3, 3a.

Polypiferous portion of surface thick, swollen, somewhat fusiform, broadest below the middle, the surface granulous; basal portion less than a third of the whole length, bulbous, smooth, and very contractile; polyps rather distantly scattered, arranged somewhat in quincunx; between them are numerous minute papillæ or rudimentary polyps; in expansion the polyps are much exsert with very slender elongated tentacles, bordered with rather distant, elongated, slender lobes in a single row on each side, commencing close to their bases; axis short, thick, fusiform, situated just below the commencement of the polypiferous part.

Whole length of the largest specimen in alcohol 3.5 inches; naked part 1; diameter where broadest 1; length
of axis .35. When living, length 6.5 inches; breadth 1.75; polyps about .75, exsert.

"Hong Kong Harbor, China, in 6 to 10 fathoms, mud, March 1855; also in 24 fathoms, shelly sand, China Sea, 23° N. lat. April, 1855. Body whitish cream-colored; polyps transparent with an opaque digestive tube, bluish white about the bases of the tentacles; base white, somewhat longitudinally striated." Dr. Wm. Stimpson.

**Veretillum baculatum** Verrill, these Proc. p. 152, April, 1865.

Small, clavate, broadest near the upper end, which is obtusely rounded; polypiferous portion about one half the whole length; naked basal portion elongated, pointed below, in one specimen, with a distinct terminal pore; axis small, fusiform, less than one half an inch long; polyps much smaller and more numerous than in the preceding. Length of the only specimen obtained 2 inches; diameter .3.


**Kophobelemnon clavatum** Verrill, l. c. page 152.


_Plate 5, figures 4, 4a, 4b._

Polyps large, the tentacles long and slender with oblong lateral lobes; surface of the body between the polyps, irregularly papillose, variegated, punctate with orange and spotted with brown; basal portion white, with a pointed extremity. Length 2 inches.

Bay opposite Hong Kong, in 6 fathoms, mud, April, 1854. Dr. Wm. Stimpson.

This species is more claviform and has more crowded polyps than K. Burgeri Herklots. The naked dorsal space is scarcely apparent, owing to the crowding of the polyps towards it upon each side.
Verrill, Synopsis of Suborder, Gorgonaceae.

Family, Gorgonidae.

Gorgonia venosa Valenciennes.

Off Madeira, in 25 fathoms, rocks. Dr. Wm. Stimpson.

Leptogorgia cuspidata Verrill, nov. sp.

Corallum broad, subflabelliform, irregularly branching nearly in a plane, the principal branches arising near the base divide above in an irregularly dichotomous manner, forming a rather thick fasciculate clump. Branchlets thick, rigid, nearly straight, tapering to a point. Cells numerous, rather large, rounded, covering the surface of the branchlets except along a narrow median space on each side. Grooves rarely distinct except near the base. Color deep purple; cells yellow; axis black.

Cape St. Lucas, Cal. J. Xantus. (Coll. Smithsonian Institution).

Family, Plexauridæ Gray.

Plexaura friabilis Lamouroux.

Cape of Good Hope. Dr. Wm. Stimpson.

I refer with some doubt to this species, specimens of a large dichotomous Plexaura with long, upright, cylindrical branches, the terminal ones often undivided for a foot or more, and about .3 of an inch in diameter, tapering but little at the ends. The cells are often a little prominent and evenly crowded; the axis dark brown, scarcely compressed, even at the axils; the cœnenchyma very spiculose and friable.

It resembles in form and general appearance P. crassa (Gorgonia vermiculata Lk.) of the West Indies.

Lophogorgia palma Edw. and Haime.

Gorgonia palma Pallas, 1766. Gorgonia flammea Ellis and Solander, 1786.

False Bay, Cape of Good Hope. Not rare in 20 fathoms, rocks, Oct. 1853. Dr. Wm. Stimpson.
One specimen differs from the ordinary form in having a large, very compressed trunk, with the long, subdigitate branches much more flattened than usual; color, in alcohol, light gray.

**Lissogorgia** Verrill.


In this genus the cœnenchyma is very thin, friable and highly spiculose throughout, the spicula conspicuous at the surface and covering the verruciform cells, which are eight-lobed in contraction. Tentacles strengthened at the base by large spicula, which often radiate within the dried cells. Axis horn-like, smooth, usually without visible striations. Type, *L. flabellum* (Antipathes flabellum Auth.)

**Lissogorgia flexuosa** Verrill, nov. sp.

Corallum much branched, subflabelliform, the branches irregularly pinnate, branchlets slender, divaricate, often coalescing; axis soft and flexible, dark brown; cœnenchyma thin, membranous, filled with large fusiform spicula, visible at the surface; polyp cells rather large, rounded, verruciform, covered by numerous elongated and pointed, imbricated spicula. Color, in alcohol, grayish white.

Hong Kong. Dr. Wm. Stimpson.

**Muricea sinensis** Verrill, nov. sp.

*Plate 5, figures 5, 5a.*

Corallum irregularly dichotomous with elongated, subclavate branchlets; polyp cells verruciform, rather large, somewhat prominent, irregularly crowded, surface granulose with crowded spicula; external portion of the cœnenchyma hard and coriaceous, rather thick, the surface thickly covered by small oblong spicula; tentacles strengthened by numerous red spicula. Axis, in alcohol, very soft and flexible near the ends, slender, dark brownish below; color of the cœnenchyma deep red. Height 8 inches, diameter of branchlets .15.

Hong Kong. Dr. Wm. Stimpson.
Corallum low, much branched somewhat in a plane, branchlets slender, elongated, divaricate; covered by the very prominent irregularly crowded, sometimes secund, polyp cells; these are mostly .2 of an inch high and spread abruptly at right angles to the branches, and are somewhat claviform, the summits being enlarged. The coenenchyma is very thin and filled with large, thickened spicula, conspicuous at the surface, producing a granulated appearance; the polyp cells are thickly covered by more elongated, fusiform spicula, which are irregularly arranged, interlaced and conspicuous at the surface, converging at the summit of the cells, which are eight-rayed in contraction. Color, in alcohol, light ash gray, axis light fuscous, soft and flexible. Height three inches.

Hong Kong. Dr. Wm. Stimpson.

Acanthogorgia coccinea Verrill, these Proceedings, p. 152.


Plate 6, figures 7, 7a.

All the specimens observed of this species consist of simple clavate stalks, rising from broadly expanded bases, which, like the stalk, are densely covered with large, open polyp cells, irregularly crowded over the whole surface; the cells are surrounded by numerous, deep red, prominent, imbricated, spines, their outward ends long and sharp, but irregularly branched at their bases, forming thus a cluster of short, secondary spines; axis light brown, slender and flexible. Height of the largest specimens 2 inches, diameter .2. Below each tentacle, imbedded in the external membrane, are two rows of linear, crimson spicula, converging towards each other so as to form a series of V-shaped markings with the apex towards the ends of the tentacles.

Hong Kong, China, in 10 fathoms, attached to dead shells. "The specimens when contracted look like the fruit
of the Sumae of New England (Rhus typhina L.) Color bright red, that of the tentacles and spicula deepest; polyp bodies hyaline, yellowish flesh color.” Dr. Wm. Stimpson.

**Family, Primnoide** M. Edwards, emended.

**Primnoa compressa** Verrill, nov. sp.

Corallum much branched in a plane, flabelliform, consisting of several large branches arising from near the base, which give off, alternately from each side, numerous, long, slender, acute branchlets, which rise at a very acute angle with the main branches and are often again subdivided in the same way; branches and branchlets strongly compressed in the plane of the branches, delicately striated, stony, near the base dark brown, the branchlets yellowish white, their tips setaceous. Height of largest specimen 24 inches; diameter of largest branches .25. Coenenchyma and polyps not observed.

Aleutian Islands. Capt. Gibson.

**Family, Gorgonellide** Valenciennes.

**Juncella levis** Verrill, nov. sp.

Corallum tall, simple, subcylindrical, rather slender, diminishing in size both at the summit and near the base, where the polyps become obsolete; cells appressed, scarcely prominent, arranged in two broad bands, leaving a narrow, median, naked space on each side, along which there is a well marked groove; they are placed alternately at a distance of about .2 of an inch, in about six vertical rows on each side, producing a quincunx arrangement; axis slender, cylindrical, calcareous, white, surrounded by about sixteen longitudinal tubes, two of which are larger and correspond with the lateral grooves, the others to the rows of polyps. Length of the single specimen, imperfect at each end, 20 inches; greatest diameter .25. Color yellowish brown, in alcohol.

Hong Kong, China. Dr. Wm. Stimpson.

*Essex Inst. Proceed. Vol. IV. V.*
VerriU, synopsis of

Family, Iside.

Parisis laxa Verrill, these Proceedings, p. 152.

Corallum flabelliform, loosely branched, openly reticulated, only a few of the branches coalescent; branchlets spreading nearly at right angles, somewhat elongated, curved, obtuse at the ends; papillae rather large, irregularly crowded; cænenchyma thin, roughened by the points of minute spicula; axis slender, consisting of white calcareous joints alternating with shorter dark brown ones of the same thickness, but softer; color, in alcohol, light gray. Height of a small specimen 3 inches; width 3; diameter of branchlets .20.

Off Hong Kong, China, in 15 fathoms, shelly gravel, May, 1854. Color, in life, bright light blue. Dr. Wm. Stimpson.

Mopsella japonica Verrill, nov. sp.

Low, spreading, dichotomous, branching nearly in a plane; branches slender, diverging at an angle of about 45°, obtuse at the ends; cells rounded, papilliform, rather large, crowded. Color, of all the specimens observed, vermillion with yellow polyps.

Simoda, Japan. Dr. Wm. Stimpson.

This species is most nearly allied to M. coccinea (Isis coccinea Ellis and Sol.), but the branchlets do not coalesce as in that species, and spread much less abruptly. The cells, also, are considerably larger.

Suborder, Alcyonacea.

Family, Alcyonide.

Alcyonium rubiforme Dana.

Lobularia rubiformis Ehrenberg.

Arctic Ocean in 35 fathoms. Capt. J. Rodgers. West Coast of Behrings Straits in the Laminarian Zone. Dr. Wm. Stimpson.
POLYPS AND CORALS.

ALCYONIUM, sp.
A specimen badly preserved, and too imperfect for identification.
Hong Kong. Dr. Wm. Stimpson.

ALCYONIUM?
The corallum consists of rounded, glomerate clusters of large, verruciform polyps, striated at the tops. Color, in alcohol, bright red.
Sea of Ochotsk. L. M. Squires.

SARCOPHYTON AGARICUM Verrill.

Alcyonium agaricum Stimpson, L. c. page 375.
This species forms mushroom-shaped disks, which are circular, convex, with entire, revolute margins, and supported on a central pedicel about one-third as broad as the disk. The polyps cover only the upper surface, are rather large, three-tenths of an inch long and an eighth of an inch distant, the surface between them being covered with minute dots. Upper surface of the disk bluish gray, polyps lighter with still paler tentacles; lower surface and pedicel dark cream colored. Diameter of disk 1.5 to 2 inches; of pedicel .5.

Kagosima Bay, Japan, not uncommon in 10 fathoms, sand, January, 1855. Dr. Wm. Stimpson.

NEPHYA AURANTIACA Verrill, nov. sp.
Corallum thyrsoid in form, consisting of a stout naked pedicel, divided above into several short, thick branches, which are covered by small, glomerate clusters of crowded polyps; cells very small, verruciform, much crowded; their bases covered with closely imbricated, red spicula; the bases of the tentacles with golden yellow ones. Height 2 inches; diameter of pedicel .3. Color of pedicel and branches pale pink; polyp cells bright red at base, yellow at summit.
Dr. Wm. Stimpson.
Nephthya thyroidea Verrill, l. c. p. 151.

Plate 6, figures 8, 8a, 8b.

Corallum thyroid, consisting of a pyramidal head of compound, glomerate clusters of polyp cells, supported by a short, thick pedicel. The short branches arise from all sides of the main trunk and spread abruptly, dividing at once into numerous small rounded lobes, which are densely covered by the crowded polyps; cells larger than in the preceding, less thickly covered by the spicula, which are yellowish gray and quite small. Height of the largest specimen, 3 inches, diameter 2, diameter of pedicel .5, length of naked part .75.

False Bay, Cape of Good Hope. "Taken commonly in small clusters, rarely in large ones, in 20 fathoms, rocks, Oct. 1853. Color wine-yellow or light brown; polyps dark purplish just under the tentacles; the latter palish, nearly white; stalks with irregular, transverse, elevated, silvery lines of spicula." Dr. Wm. Stimpson.


Large, paniculately branched; principal branches few and large, covered on all parts by short, thick, glomerate branchlets, which are themselves divided into numerous clusters or small heads of polyps; the polyps are small, not crowded, most of them armed with a bundle of long, white, prominent spines, some with smaller single ones; bases of the tentacles filled with numerous red spicula; the trunk is very open, cavernous, the walls membranous, filled with slender, white spicula; the base divided into root-like expansions. Height 12 inches or more; diameter of trunk, near the base 3; of principal branches 2. Color of trunk, in alcohol, brownish gray; polyps dark red, with conspicuous white spines.

Hong Kong, China, on rocks in 1 fathom, April, 1854. Dr. Wm. Stimpson.
**POLYPS AND CORALS.**


Trunk short and thick, dividing rapidly in a dichotomous manner, forming a broad rounded clump. Branchlets much subdivided, corymbose, the polyps all terminal, small, verruciform in contraction, in rounded clusters of forty or fifty; with these are often intermingled little groups of three or four individuals supported by slender, white spines, one of which is longer than the rest, and considerably exsert, supporting one of the cells on its side. The tentacles and polyp walls are also strengthened by slender white spicula.

Height of a large specimen 4 inches, breadth 5, diameter of polyps about .05.

Hong Kong, China. Dr. Wm. Stimpson.

**Spongodes gracilis** Verrill, nov. sp.

Trunk slender, arborescently branched, the branchlets lax, a little elongated, furcate, the polyps mostly arising singly along their sides in a secund manner, not crowded, scarcely clustered, small but quite prominent, supported by several slender spines, the walls and tentacles strengthened by numerous very slender fusiform spicula of a bright red color. The trunk and branches are open, membranous, diaphanous, filled with long, slender, curved, fusiform spicula of a white color.

General color light pink. Height 2 inches; diameter of trunk .25; of polyps .02.

Loo Choo Islands. Dr. Wm. Stimpson.

**Family, Cornulariæ.**

**Anthelia lineata** Stimpson, l. c. p. 375.

*Plate 6, figures 9, 9a, 9b.*

Polyps elongated, tapering somewhat towards the disk. Tentacles nearly half as long as the body, slender, tapering, with a single series of oblong, somewhat irregular papilla, those near the base of the tentacles shorter and nearly obsolete. Body pale brownish with eight, longitudinal, lead-colored stripes, tentacles bright blue. Length of body about an inch.
Hong Kong. "Abundant on rocks at low-water mark, which it covers with a light bluish scum." Dr. Wm. Stimpson.

**Telesto ramiculosa** Verrill.

*Gornularia aurantiaca* Stimpson, l. c. p. 375. (non *T. aurantiaca* Lamx.)

*Plate 6, figures 10, 10a, 10b.*

Corallum irregularly branching, the branches and corallites straight, subcylindrical (clavate when young) marked with numerous, fine, longitudinal sulcations. The upper portion of the polyps projecting considerably beyond the firmer tubes in expansion, pellucid, somewhat constricted at the junction with the tubes. Tentacles long and rather broad, with a single series of elongated lateral lobes, which are themselves tuberculated. Color pale orange, polyps transparent with a few linear spicula on the sides, stomach crimson. Height 2 inches.

Hong Kong. Dredged sparingly in 10 fathoms, shelly bottom. Dr. Wm. Stimpson.

**Telesto? nodosa** Verrill, nov. sp.

In this species the stalks usually rise half an inch or more and then divide at once into a cluster of twelve to fifteen slender corallites or branchlets, which diverge from one point. By continued growth another leading polyp arises from the cluster and after a short distance produces another similar cluster, thus forming an elongated stalk, densely ramulous along the sides, except where the intervals between the clusters occur, and even there scattered cells often appear. Corallites slender, turbinate, a third of an inch long, the walls very thin, encircled by numerous elevated rings, and finely striated longitudinally.

Height of the largest specimen about three inches.

Loo Choo Islands, in pools at low water. Dr. Wm. Stimpson.

Dry specimens only of this species are in the collection, and therefore its true characters are somewhat uncertain. In many respects, and especially in the transverse rings around the tubes, it resembles some species of *Tubularia.*
Polyps and corals.

Sarcodictyon.

A species of this genus occurs creeping over dead shells. The polyps in alcohol are mostly contracted and form scattered verrucae about a line in diameter and rather more in height, connected by slender, fleshy stolons.

Hong Kong, China. Dr. Wm. Stimpson.

Family, Tubiporidae.

Tubipora rubeola? Quoy and Gay.

Bonin Islands. Dr. Wm. Stimpson.

I refer to this species, with much doubt, a fragment of Tubipora of very light red color, having the transverse plates about .25 of an inch apart; the tubes .1 in diameter. It is too imperfect to be determined satisfactorily, if, indeed, it be possible to determine species of this genus from the dry corals.

Explanation of the Plates.

Plate V.

Figure 1. Pteromorpha expansa Verrill; a polyp enlarged.

Figure 2. Virgularia pusilla Verrill; a polyp much enlarged.

Figure 3. Veretillum Stimpsoni Verrill; a polyp somewhat enlarged; 3a, structure of the surface between the polyps.

Figure 4. Kophobelemnon clavatum Verrill; natural size, with the polyps expanded, front view; 4a, a polyp much enlarged, showing outline of stomach, below which are, apparently, clusters of eggs; 4b, a tentacle much magnified.

Figure 5. Muricea sinensis Verrill; a branchlet, natural size; 5a, one of the contracted cells magnified to show the spicula. This and the next were drawn from nature by Mr. E. S. Morse.

Figure 6. Muricea divaricata Verrill; portion of a branch, natural size; 6a, a contracted cell much magnified, showing spicula.
PLATE VI.

Figure 7. *Acanthogorgia coccinea* Verrill; a polyp much enlarged, showing spiniform spicula at the base and small spicula below the tentacles; 7a, view of a polyp from above.

Figure 8. *Nepthya thyrsoides* Verrill; a cluster of polyps from a branch, slightly magnified; 8a, a polyp partially contracted, much enlarged to show the spicula; 8b, one of the spicula greatly magnified.

Figure 9. *Anthelia lineata* Stimpson; cluster of polyps natural size; 9a, a polyp enlarged; 9b, a tentacle magnified.

Figure 10. *Telesto ramiculosa* Verrill; a group of polyps in contraction, natural size; 10a, an expanded polyp much enlarged; 10b, a contracted polyp somewhat magnified.

Note. Part I of this paper, including a Synopsis of the Classification of Polyps, herein adopted, was published under a somewhat different title in the fifth number of these Proceedings, page 145. Part III, embracing descriptions of the *Actinaria*, will appear as soon as the necessary plates can be completed.
HYATT, OBSERVATIONS ON POLYZOA.

By Alpheus Hyatt.

With nine Plates.

[Communicated October 10, *1864.]

INTRODUCTION.

The investigations recorded in the following pages are the results of observations made on the American species of the Phylactolæmata; with the intention of elucidating the structure of the genera, and of presenting the laws of their structural combination as fully as this can be accomplished within the limits of the present communication.

For this purpose synoptical tables have been given, exhibiting the anatomy of the different divisions, as far as our knowledge of the adult animals would permit.

Had such a plan been possible at the present time, the synopsis would have embraced only the anatomy of the most complicated species of each generic series; and other tables, similarly constructed, illustrating every genus, would have been prefixed, one individual of each species being selected for analysis. But the small number of species now known in each genus not affording material enough for perfecting this system, the tables include only general statements of the characters of each genus, and these are arranged in a linear series in order to show clearly their serial relations. I venture, however, to assert, that, notwithstanding these defects, the results obtained by this mode of procedure are more exact, than if the usual methods of describing the anatomy had been followed.

The advantages of thus analyzing the anatomical features of any natural division are at once apparent. Their organization, as a whole, is rendered plain; and the reader is enabled to trace, throughout the structure of the group, not only the changes of any organ by itself, but even of

*During the proof reading I have embodied in the original text many new facts discovered since the 10th of Oct., 1864, and the communication, therefore, may be considered as covering a period extending from that date to the day of publication.

ESSEX INST. PROCEED. VOL. IV. Z. March, 1866.
the different systems of organs, from their lowest to their highest states.

The laws, also, according to which the changes, or differences in the parts, take place, are better illustrated by such a tabular view, than by any other method.

The manner commonly pursued of describing the minute differences between species, or genera, and of simply generalizing with regard to their anatomical peculiarities, is very unsatisfactory. It does not afford the means for comparing the anatomical composition of the parts of the individual in each species, or genus, which is necessary to a complete understanding of the whole, and the differences are sought for and described, to the neglect of the agreements, that are either passed by, or only casually noticed in the descriptions of the larger divisions. Such errors are avoided by the use of analytical tables, which, besides the advantages before described, set forth the similarities as prominently, as the differences. We thus never lose sight of the initial points of the structure, while the differences, or changes, from time to time appearing, stand out even more vividly against the common background of similarities.

It is far from my intention to underrate the labors of naturalists who devote themselves to the discovery and publication of new forms; their labors are essential to the progress of science. The ordinary mode, however, of prosecuting these investigations is, perhaps, too disconnected, species being habitually regarded in the light of isolated creations, rather, than as allied to others by the larger number of their essential characters. This engenders a habit of always looking for differences, and overlooking agreements, which the study of series of species, or even of series of individuals would correct.

The facts published in these "Observations" have been verified by my own experience, with the single exception of the spermatozoa. These I have not yet seen, my observations having been made, for three successive seasons, principally during the fall and winter months.

The questions involved in the body of the paper, and the difficulties to be overcome in obtaining living European specimens have obliged me to quote extensively from
the works of foreign naturalists. References, however, are always made to the original publications, and the statements used have been, in all cases, sifted of facts that did not correspond with my own researches upon closely allied American species.

The nomenclature of Professor Allman's exhaustive "Monograph of the Fresh-water Polyzoa" has been adopted throughout, with the exception of a few alterations, which become necessary, partly in consequence of some ideas of my own, with regard to the composition of the organs, differing from those of Prof. Allman, and, partly, because I here adopt a new view of the relations of the anterior and posterior poles of the body, originated by my friend Edward S. Morse.* In an article published in these Proceedings he homologizes the parts of the animal in the various classes of the Mollusca, and arrives at the conclusion, as surprising, as it is truthful, that the attached end of a Polyzoon is in reality the anterior, and that the peduncular end of a Brachiopod is the homologue of this, and, also, anterior.

It therefore becomes necessary to alter the commonly received nomenclature, and to denominate the attached end of a Polyzoon the anterior; the free end the posterior; the anal side the dorsal; and the opposite, or so called hæmal side, the ventral.

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NOTE. I am indebted to Dr. Joseph Leidy, of Philadelphia, for identifying my specimens of Fredericella regina with his species, for tracings of all the species described by him, and for other valuable information. I desire, also, to return thanks to Professor H. J. Clark, of Harvard College, Professor A. E. Verrill, of Yale College, Professor Alfred Mayer, of Penn. University, Professor Theodore Gill, of the Smithsonian Institution, Mr. Elliott Smith and Mr. S. I. Smith, of Norway, Maine; to all of whom I am under obligations for important assistance.

My thanks are also due to the Officers of the Smithsonian Institution, of Washington, and the Peabody Institute, of Baltimore, for the use of books which I could not have otherwise obtained.

It is but just that I should also express the feelings of gratitude with which I cherish the memory of my father, Mr. Alpheus Hyatt, of Baltimore, whose long continued generosity, while living, enabled me not only to accomplish this undertaking, but to plan, and prosecute others of a similar kind.

Mr. Edward S. Morse perfected the drawings with the skill of an
The unquestioning manner with which I take up these views may excite some surprise, but they are founded upon facts which calmed all the doubts I at first entertained, and satisfied me entirely of their correctness. Mr. Morse's paper, entitled "A Classification of the Mollusca based on the principle of Cephalization," fully illustrates the homologies, as well, also, as the general plan of that subkingdom.

Mr. Morse has, also, done me the honor of quoting from my manuscript the term Saccata as a new name for the Mollusca. Since it has been so auspiciously introduced to science, and, as such a definitive term seems to be needed to give uniformity and completeness to the nomenclature of the four plans, I shall make no further excuse for its employment in the future.

Bibliography and Classification.

There is no bibliography of the Phylactolaemata, or in fact of the Fresh-water Polyzoa taken together, as far as our own country is concerned, but, in Europe, they have, from the time of Trembley,* their discoverer, attracted much attention, and, as such a definitive term seems to be needed to give uniformity and completeness to the nomenclature of the four plans, I shall make no further excuse for its employment in the future.

accomplished draughtsman, and with all the interest of a zoologist and personal friend. I am indebted to him both for this, and for many other favors that have rendered it possible for me to publish at an early date. In fact, my only regret, in connection with this article, is, that a gentleman of such acknowledged ability, whose time is important to science, should not be able to devote it to his own original investigations.

The lenses employed were made especially for the purpose by Robert B. Tolles, of Canastota, N. Y. The one half inch objective having an angle of 175° and one fifth of an inch working distance was especially well suited for the examination of living animals.

Mr. J. F. Richardson, of Portland, executed the engraving of the plates with the same skill he has shown in other scientific works, and with more than usual care.

The wood cuts are very large for a black ground, and, being printed directly from the wood, required all the skill and patience of Mr. Holland to produce accurate impressions.

* Mémoire pour servir à l'Histoire d'un genre des polypes d'eau douce. 1744.
OBSERVATIONS ON POLYZOA.

man, and Mr. Albany Hancock.* These experienced naturalists surveyed the whole field, and, armed with powerful modern microscopes, they completely disclosed the anatomy and physiology, making nearly all preceding explorations interesting only as matters of history.

Dr. Leidy is the sole authority upon this subject in America.† His observations have given us all the information we at present possess of our native species, besides adding two new and singularly interesting genera, Pectinatella and Urnatella, to the systematic catalogue. Of these two, Pectinatella alone belongs to the Phylactolæmata.

Nothing of a general nature having been published in this country, it may, perhaps, be well, before proceeding with the structural analysis of the Phylactolæmata, to give a sketch of the classification and a description of the different forms of this suborder.

The Polyzoa, for a long time confounded with the Radiata, were first definitely separated by Thompson in 1830, and called by him Polyzoa, thus taking precedence of Bryozoa, the name afterwards given them by Ehrenberg in 1831.‡

In 1834, De Blainville, although still continuing to associate them with the Radiata, set off the genera Cristatella, Plumatella and Aleyonella as a subclass, styling them "Polypiaires douteux."||


PROF. ALLMAN. Monograph of the Fresh-water Polyzoa. Ray Society, 1856.


In 1837, Gervais divided the Polyzoa into two sub-
classes, “Polypiaires hypocrepia,” and “Polypiaires infund-
dibulati.” The first included the genera with lateral arms,
and the second those with round lophophores, among
which he placed Fredericella.*

In 1848, Fredericella was restored to its proper division
by Dumortier and Van Beneden, but they committed the
mistake of uniting it with Paludicella, a genus with a truly
orbicular lophophore, and devoid of an epistome.† These
authors, also, recognized the Hypocrepian division, as limit-
ed by Gervais, separating Fredericella and Paludicella as
a distinct group.

Professor Allman in 1856 instituted the order Phylacto-
læmata, basing it upon the epistome, which is present in
all the genera.‡

He divides the order into two suborders; Lophopea and
Pedicellinea, the former including all the Hypocrepian
forms, and the latter the marine genus Pedicellina. Al-
though differing from Professor Allman in my estimation
of the relations of Pedicellina, I have retained his name
for the Fresh-water genera, from Fredericella to Cristatella
inclusive.

In the Suborder Lophopea, he has two grand groups, or
families, founded upon the characteristics of the cœno-
cium; one the Cristatellidae, for the genus Cristatella with
its locomotive cœneecium; and the other the Plumatellidae,
embracing all the remaining genera, that have rooted
cœnecia.

There is a partial coincidence between Professor All-
man’s classification and the one I advocate. He makes
of his Plumatellidae two groups; one equivalent to my first
family including Fredericella, because of the obsolete
arms, and another including precisely the same genera as
my second family. Thus the classifications virtually agree
in regard to the number of the principal groups, although
not with regard to their relative values.

*Gervais. Recherches sur les Polypes d’eau douce. Annales des
†Dumortier & Van Beneden. Memoirs de l’Acad. Roy. de Bel-
gique. Vol. 21, p. 5. 1848.
‡Allman. Fresh-water Polyzoa. p. 10.
According to this view of their relations, the **Phylactolemata** comprise three families, or subgroups. First; the *Fredericellidae*, founded upon the great differences between the lophophore and nervous system of Fredericella, and the members of the other families. Second; the *Plumatellidae*, which differ from the Fredericellidae in the lophophore and nervous system, and from the Cristatellidae in their coenecial characters. Third; the *Cristatellidae*, whose coenecia and mode of development separate them widely from both the preceding.

The following is a scheme of this classification, enumerating the families and genera by name, and the number of species at present known in America, Europe, India and Australia.

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<th>Families</th>
<th>Genera</th>
<th>No. of species in America</th>
<th>Europe</th>
<th>India</th>
<th>Australia</th>
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<tbody>
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<td><strong>Fredericellidae</strong></td>
<td>Fredericella</td>
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<td><em>Lophopus</em></td>
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<td><em>Pectinatella</em></td>
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</tbody>
</table>

| | | Cristatellidae | 2 | 1 | 1 | 30 |

*Plumatella includes Alcyonella, which is only a variation of the ordinary form of the species.


‖A statoblast, found near Bombay and described by Mr. J. H. Carter in the Ann. and Mag. of Nat. Hist. Vol. 3, p. 381, pl. 8, f. 8-18, 1869, supposed by him to belong to Lophopus crystallinus. It, however, undoubtedly belongs to a new species of Pectinatella, and I therefore propose for this new species, which is remarkable for its spines, furnished with many lateral hooks, growing only from the ends of the statoblast, the name of *Pectinatella Carteri*. 
These are plant-like animals with graceful dendritic forms, common in our brooks and ponds (Pl. 7). They cling, immovably fastened by their ectocyst, to the lower surfaces of submerged stones, or floating boards; and thrive best in the darkest places, often carpeting the dismal recesses, under the loosened bark of dead branches, with their lovely, campanulate corollas.

Nothing can exceed the exquisite beauty of these small "phytozoons"; their symmetrical outlines, the alertness of the motions of the polypides, and the surprising complexity of the internal structure of their transparent bodies richly repay the labors of the microscopist.

Cenæcium. This part of the colony, formed by the tubular dark brown trunk and branches, is made up of lines of little hollow twigs, or cells, each separate cell encasing a single polypide, and opening into the preceding cell, or parent Polyzoon, at the lower end. Thence the cells are generally attached for some distance to the surface, although frequently the entire branch is free, the lowest cell alone being attached. The extremities of the cells bend upwards, and are always free, but vary exceedingly in length. The color is due to the ectocyst, which is a thin gelatinous excretion, soft, and transparent when first deposited, but acquiring with age a dark brown hue and parchment like consistency (Pl. 7, figs. 4, 5, D). This excretion is the product of the cenæcial endocyst, or true body wall of the branches and polypides (Pl. 7, figs. 4, 5, 6, E). The endocyst is continuous throughout the general system of branches or cenæcium, and the latter may, therefore, be regarded as a common tubular cavity, more or less cut up into cells. Some scattered, partial divisions, made by ring-like folds of the endocyst, open in the centre, are found in each colony, but these are not constant, and occur only at rare intervals in the branches.*

Polypide. The free portions of the cells are capped by translucent tubes crowned with thread like tentacles radiating from the periphery of the Lophophore, or floor of the

*Similar to those of Plumatella. Pl. 8, fig. 6.
OBSERVATIONS ON POLYZOA.

205

crown. This is perforated in the centre by the round mouth, overshadowed by the tongue like Epistome (Pl. 7, fig. 5, 'I, 'I"), which is an obtuse, upward fold of the lophophore, opening below into the neural chamber, or cavity. This cavity contains the orbicular nerve-mass suspended immediately under the epistomic opening (Pl. 7, fig. 5, S).

The surface of the tentacles, the oral side of the epistome, the lophophore and the interior of the throat in the vicinity of the mouth are covered by cilia (Pl. 7, figs. 4, H, 5, H"). Constantly vibrating towards the centre of the crown, these cilia create a vortex in the water, at the apex of which lies the mouth, always open and ready to engulf the microscopic plants, or Infusoria, that may be caught by the encircling current, and swept into this liquid trap (Pl. 7, fig. 5, I").

The polypides not unfrequently form a sort of cage, by interlacing the extremities of their tentacles, and imprison the more active of the Infusoria, who would otherwise readily escape. Thus inclosed, however, their strength is expended in fruitless efforts to break through the tentacular bars, until finally exhausted and overcome, by the power of the miniature maelstrom, they are whirled unresistingly downward into the funnel shaped throat.

The tentacles are used not only, as above described, to catch the prey, but for a multitude of other offices. They are each capable of independent motion, and may be twisted or turned in any direction; bending inwards, they take up and discard objectionable matter, or push down into the stomach and clear the oesophagus of food too small to be acted upon by the parietal muscles. They are also employed offensively in striking an intrusive neighbor, and their tactile power, sensitive to the slightest unusual vibration in the water, warns the polypide of the approach of danger.

Between the lophophore and the coenecium, the internal organization is plainly seen, the pellucid wall of the tube offering no obstacle to the eye of the observer.

The alimentary canal hangs from the lophophore, occupying the centre of the polypide, and floating freely in the rapidly moving blood. The yellowish oesophagus, the stomach barred with brown, and the brownish intestine

ESSEX INST. PROCEED. VOL. IV. AA. March, 1866.
compose a deeply colored axis relieving and vivifying the shadowy outlines of the tube and tentacular crest (Pl. 7, fig. 5, K, K', K'O).

All these delicately proportioned members are balanced upon a fold of the endocyst, called the Invaginated Fold (Pl. 7, fig. 5, B), which is retained within the cœnœcial cell by the Retentor muscles (Pl. 7, fig. 4, 5, N, N'). These together with numerous other sets of small muscles will be described hereafter. At present it is only necessary to call attention to the Sphincter (Pl. 7, fig. 6, L), a broad, contractile band surrounding the invaginated fold, and the large retractors (Pl. 7, fig. 4, fig. 8, M, M', M'O), which are in two sets, one on each side of the alimentary canal. They arise apparently from two common bases, but each large trunk subdivides above into many bundles, which may be distinguished from each other according to the location of their attachments and divided into three branches.

The fibres of the first branch, the Gastric Retractor, are distributed to the stomach; those of the second, the Lophophoric Retractor, to the oesophagus and oral region; those of the third, the Brachial Retractor, to the bases of the arms, and to the endocyst along the line of the Brachial Collar. The crest is swayed by these muscles in every direction; or, when alarmed, the polypide may withdraw by their aid into the larger cœnœcial tube below, very much as the finger of a glove may be inverted within the empty palm. This is so quickly done, at times, as to baffle observation, and the fully expanded polypide, with every tentacle stretched to its full length vanishes instantaneously within the cœnœcium. Often, however, the invagination is more slowly performed, and the motions can then be easily followed.

The polypidal endocyst is first turned inwards, folding upon itself, and prolonging the permanently invaginated fold below. The tentacles, arriving at the edge of the cœnœcial orifice, are pressed into a compact bundle by the action of their own muscles, and, together with the lophophore, are dragged into the cell by the continued invagination of the endocyst until they are wholly inclosed and at rest within the sheath formed for them by the inverted walls of the tube. The sphincter muscle then closes the
OBSERVATIONS ON POZYOA.

coenecial orifice above, and the process of invagination is completed.

The polypide in its exserted state is buoyed up and sustained by the pressure of the fluids within. Consequently when invaginated it displaces an equal bulk of these in the closed coencecum, and their reaction, aided by the contraction of the muscular endocyst, is sufficient to evaginate the whole.

The evagination begins with the relaxation of the sphincter, which permits the ends of the tentacles to protrude. These daintily feel about for the cause of the alarm, and, if they fail to detect the proximity of an enemy, the whole fascicle is cautiously pushed out, and the sentient threads suddenly and confidently unfolded.

The polyzoon reasons from the sense of touch inherent in its tentacles, and cannot be induced to expose itself above the coencecum until thoroughly satisfied, by these sensitive feelers, that no danger is to be apprehended. In fact, these plantlike creatures, singly mere pouches with a stomach hanging in the midst, exhibit greater nervous activity and "animality," than we find among the more highly organized Ascidia, or shell-covered Brachiopoda.

PLUMATELLA.

The species of this genus abound near the shores of our ponds, close to the surface, and are generally in company with Fredericella (Pl. 8). They may be found attached to the under sides of flat stones, or floating boards, but do not usually seek the narrow, dark recesses in which Fredericella often occurs. Better fitted to endure the sun's rays, they may, occasionally, be seen in positions exposed to their full influence. I have been so fortunate as to collect specimens of P. Arethusa which were growing from the ends of the long water grasses; their tiny branches, and living, crystalline flowers glittering in the light, and swaying to and fro in the open current without protection from the heat, even at midday.

The coencecum is dendritic as in Fredericella, but the growth is generally more luxuriant, extending over larger surfaces, and the coenecial cells are wider in proportion to
their length. The polypide, also, is capable of more extended protrusion, and its motions, therefore, are less restrained. The arms, previously indicated in the lophophore of Fredericella, are fully developed, and stretch out on the dorsal side just above the anus, giving a crescentic, or horse-shoe shaped aspect to the disk, which is retained throughout the succeeding genera.

The ectocyst may be either transparent or brown in the same species, and the polypides may be widely separated, as in Fredericella, or be closely aggregated, the branches and cells adhering together by means of their gelatinous ectocysts.

LOPHOPUS.

Lophopus introduces us to a new class of characters. The ectocyst, in place of being a thin enveloping sheet, is a thick deposit of clear jelly in which the cœnocium is buried. The branches are lobiform, and the cells even less widely separated, or differentiated, than in the aggregated varieties of Plumatella.

Prof. Allman describes Lophopus crystallinus as attached to the stems of Lemna, and other fresh water plants, but avoiding exposure to bright sunlight.

These positions must necessarily, however, be less shaded than those occupied by the majority of the Plumatellæ.

PECTINATELLA.

The reproductive and vital energies of the group reach their climax in the voluptuous beauty and endless multiplication of the cœnocia in Pectinatella (Pls. 9, 10, 11, 12). The cells of the separate polypides are wholly merged in the lobiform branches, and the gelatinous ectocyst, often several inches thick, is gathered underneath the cœnocia (Pl. 9, fig. 5, D). It affords a common base for all the colonies, and is no longer, as in the preceding genera, confined to one cœnocium.

The tropical aspect and luxuriant growth of the clinging masses, frequently several feet in diameter, investing the summits of submerged stumps, and the branches of
waterlogged timber, are unequalled among the fresh-water, or even among the marine Saccata of our climate.

The communities, assembled in countless profusion upon the gelatinous ectocyst, are crowded together and being compressed become irregularly hexagonal in their outlines. The polypides upon the lobiform branches, adorn the borders of these hexagonal patterns with a dense, glistening fringe, speckled with the scarlet coloring of their oral regions; and the bare coenecial trunk (Pl. 9, figs. 5, 6, 7, A') in the centre shine with a deep, opaline lustre, completing the rich, coralline effect of the fringed outlines.

The protrusion of the polypides is not limited by the invaginated fold, as in the preceding genera, but they roll out nearly the full length of their evaginable endocyst, and resemble columns supported by a simple ovolo and fillet (Pls. 10, 12). The fillet corresponds to the invaginated fold of the preceding genera, and the ovolo-like bend in the endocyst is produced by the contraction of the anterior retractor muscles.

In July and August specimens of Pectinatella magnifica are very abundant in shallows and in the depths of Pen-nissewasse pond, but as the fall advances, those in the shallows die, and in October they can live only upon the logs in deep, cool water, or in shaded situations. These autumnal specimens are old, and being unable to withstand the direct rays of the sun, disappear from all exposed positions, where they grow with impunity as strong and healthy adults earlier in the season. I have found them fifteen or twenty feet below the surface, showing a marked departure in this respect from the preceding genera, whose species seldom occur below two, or three feet, and are almost invariably near the shore line.

CRISTATELLA.

The Cristatellæ are by far the most highly organized, not only of the Phylactolæmata but of all the Polyzoa (Pls. 13, 14).

The coenœcia are neither dendritic, as in Fredericella and the Plumatellæ, or lobate, as in Lophopus and Pectinatella, but naked, depressed sacks, capable of determi-
nate motion; their interior divided by walls of reticulating muscular fibres into numerous radiating cells and tubes. The latter, however, do not meet internally, but leave a vacant space in the centre of the coenoeial trunk unoccupied either by the polypides, or the muscular walls (Pl. 13, figs. 2, 3, A').

The polypides extend to the full length of their evaginable endocyst, and are destitute of an invaginated fold, not even possessing a fillet around the upper edge of the coenoeial orifice as in Pectinatella (Pl. 14, fig. 1). They are disposed in rows upon the borders, inclosing the clear, bare central spaces with an edging not unlike the polypidal fringes of Pectinatella (Pl. 13, fig. 1).

The ectocyst loses the fixed character it still possessed in Pectinatella, and is only a transient, gelatinous excretion, thrown off in great abundance from the common base of the colony (Pl. 13, fig. 3, D).

The communities are not invariably gathered upon a common ectocyst, as in Pectinatella, but are sometimes single, as in Lophopus.

There is, however, a very curious, and remarkable similarity of one species with Pectinatella.

The coenoeia of C. ophidioida herd together within confined boundaries from a few inches to a foot or more in diameter, covering such favorite resorts with a glairy coating accumulated upon the surface by the moving bases of the numerous colonies. The aspect of one of these settlements, supported upon this common ectocyst, is analogous to that of a mass of Pectinatellæ; especially to the old age, or degradational period of the life of a mass of the latter; where a large number of colonies still cling to a thin sheet of gelatine left from the decay of the greater part of the ectocyst.

This similarity may be explained by the fissiparous multiplication of the coenoeia in both genera and the slow progression of Cristatella. The colonies of the last can never wander far from their place of origin, unless floated off by some accident, and, continually multiplying, they soon create a dense population in a comparatively small space.

The distribution of Cristatella is similar to that of Pectinatella, they being generally found together.
Observations on Polyzoa.

Reproduction.

The Phylactolaemata have two modes of reproduction, one by buds, and the other by eggs. The former occurs in two ways; by statoblasts, either fixed or free, and by regular buds, which grow out from the side of each polypide. The first are the founders of new colonies. The last merely increase the number of individuals in each established community. The colonies are, however, sometimes multiplied by other processes, which cannot be classified under either of the above heads. In large specimens of Plumatella Arethusa the polypides on the old trunk die first and the remnants of the coenecia are gradually swept away, leaving the branches as so many independent colonies (Pl. 8, fig. 1). This, also, is not uncommon with Plumatella diffusa, and is, probably, peculiar to all the species of this genus that distribute their branches over a large surface.

I have directed, perhaps, more attention to the old age than to any other period of the growth of the individual, and among the many curious and novel facts, which this comparatively untravelled path of investigation has led me to, there are few more interesting than the above.

Specimens of Fredericella may be often observed attached near the ends of their branches by the soft ectocysts of their younger polypides, the ragged end of the branch floating freely above. These may sometimes have been torn by accident from the parent colony, but in the majority of cases they owe their liberation to the decay of the original stock. In Pectinatella and Cristatella the march of extinction is, also, from within outwards. But, in consequence of the greater width and the common occupation of the coenecium by the polypides, the decay of those in the interior does not affect the vitality of the trunk, and their living coenecia carry both the quick and the dead (Pl. 9, fig. 11).

Thus death, which is an active agent in multiplying the number of independent colonies in Fredericella and Plumatella, is, probably in Lophopus, and certainly in Pectinatella and Cristatella, of no avail; the constrictive power of the endocyst being its functional substitute in the
three last named genera. Although the polypides of the Phylactolaemata never display any marks of fissiparity, the coenecia are multiplied by division. I have seen the lobiform branches of old colonies of Pectinatella divided from the coenecial trunk by constrictions, which, gradually deepening, finally separated them from the latter. The form, the thickness of the ectocyst, and the vast number of coenecia upon every mass, indicate, that this selfmultiplicative mode of propagation is of frequent occurrence among the adults.

Prof. Allman has observed similar phenomena in Cristatella and Lophopus, showing it to be common to all the genera having the thickened gelatinous ectocyst. It appears probable, that this method of multiplying the colonies would also take place in Fredericella and the Plumatellæ, if it were not for the toughness of the ectocyst. The partial divisions continually occurring in the branches of these genera and, apparently, restrained only by the stiffness of the ectocyst from becoming effective and severing the coenecia, wherever they occur, into separate parts, are the homologues of the permanent septa between the cells of Paludicella and of the lateral partitions in the marine Polyzoa. This homology was suggested to me in observing the readiness with which the lobes of Pectinatella were cut off; the constrictions occurring irregularly, sometimes isolating a whole branch, sometimes only a few cells. If the ectocyst was pergameneous in this genus the constrictions would either not take place at all, or form scattered partitions, as in Fredericella and Plumatella. Thus the same function that produces a constant anatomical character in Paludicella, Fredericella, and Plumatella, would seem to be the effective cause of the selfmultiplication of the coenecia in Lophopus, Pectinatella and Cristatella.

Prof. Allman divides the mode of reproduction by buds into two, “non sexual reproduction by gemma, which at once proceed to the full term of their destined development,” and “by statoblasts or gemmæ in which the developmental activity remains for a period latent.”

The statoblasts bud from the funiculus, a cord like pro-

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*Fresh-water Polyzoa. p. 41.
longation of the outer membranes of the stomach, connecting the lower end of that organ with the bottom of the cell in the vicinity of the bases of the retractors.

The researches of Mr. Hancock, upon the early development of the statoblast, which he supposed, in common with other observers of that time, to be a true ovum, and those of Prof. Allman, give an almost complete history of their growth.* The former found them in Plumatella and Fredericella, in the interior of the funiculus, as large nucleated cells; and the latter, apparently beginning his investigation at a later period, as a mass of smaller cells, which must have resulted from the division of the primary cell of Mr. Hancock.

They arise within bead like swellings of the funiculus, and, enlarging slowly, push out to the surface of the chord, and upwards towards the stomach, until finally they hang upon the exterior, arranged alternately on either side, the youngest being at the lower end (Pl. 8, fig. 2, W).

According to Prof. Allman the contents increase in bulk by the formation of new cells, and are enveloped in a cellular membrane (Fig. 1, a) with an outer gelatinous envelope (Pl. 8, fig. 2, W). Between these, two other membranes are secreted, one of which constitutes the horny sheath, and the other the annular ring of the statoblast (Pl. 8, figs. 7, 8, 9, W, W). This sheath and the annulus gradually assume a distinct cellular structure, and a horny consistency; the former at the same time acquiring a deep brown color, and the latter a brilliant golden hue.

The contents of the statoblast are often contracted, and, while in this condition, during the earlier stages of development before the horny casing becomes too opaque, the membranes may be analyzed by the aid of the microscope.

The interior cells are large and colorless. They are surrounded by a thin, homogeneous membrane, which, when the cellular contents are reduced by contraction, seems to be drawn out into numerous, minute, conical projections at the points where it is attached externally to the overlying membrane (Fig. 1, b). I was unable on account

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Essex Inst. Proceee. IV. BB. March, 1866.
of the opacity of the sheaths of the specimens of Fredericella regina, upon which my investigations were principally made, to determine with absolute precision, whether these conical projections were tubes, or partly solid muscular bands connecting the investing membrane with the overlying layer (Fig 1, a).

The cellular contents do not project into the interior of the cones, as they might be expected to do, if the latter were simply hollow continuations of the investing membrane. This fact may be considered as favoring the opinion, that they are partly solid, and, perhaps, muscular, connective bands, or else there must be another membrane interior to the one described, which, also, invests the cellular contents and prevents the cells from flowing into and filling up the conical projections. The overlying layer (Fig. 1, a) is exceedingly thick, and acts, in all respects, like a muscular membrane. It is unconnected with the horny sheath, and either lies closely against the latter, or is separated from it; and may be smooth and of equal thickness throughout, or corrugated and of unequal thickness, as in fig. 1, according to its state of expansion, or contraction.

The horny sheath is composed of flattened, hexagonal cells, the whole surface garnished internally with a thin coating of short, horny, brown colored setæ (Fig. 1, W). This sheath is so exceedingly tough and hard that it is difficult to pierce it with the point of a needle.

The annuli of the statoblasts of Plumatella, and of the other genera in which they are found, are made up of more prominent and larger hexagonal cells than those of the horny sheath.

In Fredericella the annulus is not developed, but in all the other genera it is, and in Pectinatella and Cristatella spines are superadded. These spines apparently arise from the annulus in Pectinatella, as described by Dr. Leidy, but they may be traced by a close
examination of this part, by transmitted light, to their junction with the body of the statoblast. From the edges of the statoblast they pass through the centre of the annulus, coming out on the border of the seam, that divides the upper and lower sides of the annulus.

Prof. Allman describes the statoblasts of Cristatella as surrounded by a ciliated envelope before the spines begin to be developed, and remarks, that these impinge upon this membranous envelope, which gives way before them and disappears. I have been unable to detect any similar ciliated membrane in Plumatella or Pectinatella, and, in this respect, Cristatella probably differs from all the other Phylactokemata. The gelatinous matrix of the statoblast of Pectinatella does not reach its full growth before the spines are produced, but appears to be carried up on their sides as they progress outwards. When the spines are fully developed, the reentrant spaces in the envelope between them become filled out, and they are buried in the gelatine, like those of Cristatella when they first begin to protrude from the horny sheath.

The gelatine is absent from the full grown statoblasts of Fredericella and Plumatella, which are found naked in the coenecial cells, whereas those of Pectinatella and Cristatella are enveloped by it until after the death of the colony; losing it only by decay. In the two first this covering is not essential, and it is absorbed before the bud is floated out of the coenecium, while in the two last it is needed in order to protect the parent from laceration by the pointed hooklets of the spines, and it is, therefore, retained until lost by the exposure of the bud to external influences.

Before the spines of Pectinatella appear, and often, even before the horny casing shows the deeper shades of the brownish coloring that afterwards distinguishes it, the statoblasts are detached from the funiculus. They lie loose in the coenecial cavity from this time until the death and decay of the polypides destroy the upper parts of the cells. Through the openings thus made, being lighter than water, they are readily floated off and pass the winter unprotected by any other covering than their cellular casings, although remaining near the surface, and consequently, in the higher latitudes, imbedded in the ice for several months.
Growth begins at the approach of spring and the edges of the sheath are split apart by the increasing bulk of the polyzoön, which protrudes between them. The opacity of the sheath has hitherto prevented microscopists from ascertaining the early history of the development of the polypide, and we are obliged to be content with such observations as can be made during the later periods of its life, when it is partly exposed.

The organs, when the little animal first makes itself visible, are well advanced in growth and the polypide is already capable of retraction and expansion. For a time it floats freely in the water, wafted about by the cilia, which clothe the whole external surface, and increases in size until the sheaths of the statoblast can no longer contain it; then, in some appropriate locality, the gelatinous ectocyst adheres to the surface, the cilia are absorbed, and the polypide enters upon a new phase of life as the founder of a community.

The sides of the sheath and the annulus, although separated from each other, frequently cling to the bud, and may occasionally be found adhering to its sides even after the colony has attained its full size.

Besides these floating buds, which might be called free statoblasts, there are others, originating in a similar manner, but from the attached or lowermost sides of the cells instead of the funiculus. These remain permanently fixed by their external investment to the endocyst, and, on this account, I have called them fixed statoblasts. They have been described in Plumatella emarginata and Alcyonella (Plumatella) Benedeni by Prof. Allman, and by Dr. Leidy in Plumatella nitida.*

It may be well to remark here, that the location of the free statoblast in Fredericella is different from what it is in all other genera. After dropping in the usual manner from the funiculus they become soldered to the sides of the parent cells, and being of the same size, are indistinguishable from the true, fixed statoblasts.

The fixed statoblasts found in Plumatella are much

larger than the free forms, have no annulus, and in many species the walls of the cells immediately under them become so compact and hard, that they cannot be removed from the surface of the wood or stone to which the cell is attached without considerable exertion.

Certain so called exceptional forms of buds, also, previously noticed by Prof. Allman in Alcyonella fungosa and Lophopus crystallinus, are very abundant in Cristatella, on the interior of the basal membrane* (Pl. 13, figs. 2, 3, 8, 9, 10, 11, 12, X). They are at first small oval bodies near the border, jutting out from the endocyst of the tubes leading to the second or third line of polypides. Their composition is similar to that of the statoblast. They have a thick external membrane and granular contents, but are devoid of a gelatinous envelope, and, also, have a large vacant spot in the interior which is continually varying its shape and position. Simultaneously with them, and continuous with their outer envelope, a long ridge springs up from the endocyst and the outer membrane of the bud, which, becoming membranous, splitting into two portions, and connecting with the upper side of the cœncecum, eventually incloses them in a tube (Pl. 13, figs. 8, 10, 11, Q). This ridge sometimes passes directly over the centre of the bud, and sometimes to one side, but is almost always present. It occasionally retains the cord like embryonic character, and freeing itself from the endocyst, except at the extremities, forms a pseudo-funiculus, suspending the bud in the cœncecial cavity. The thick external membrane becomes in course of time differentiated from the walls or ridges, and acquires the horny consistency of the casing on the free statoblast, but is never so opaque, or deeply colored. As the outer membrane stiffens no change seems to be made in the granular contents, but the more convex face of the envelope sinks, forming an elliptical depression, and the greater number of the buds become free (Pl. 13, fig. 12, W). Prof. Allman found them to be hollow, and described this elliptical depression as an aperture. I was, however, unable to substantiate either of these con-

clusions in Cristatella. The rupture of the sheath and the consequent escape of its contents is not an uncommon occurrence among the fixed statoblasts of Plumatella; and this seems to have been the cause of the emptiness of the specimens described by Prof. Allman. From their mode of development, and the place they occupy in the cœœcium, it is probable that they are the same as the fixed statoblasts of Plumatella. They differ, however, from the fixed statoblasts in being unattached to the endocyst when fully grown, but this not being an invariable character, and the elliptical depression, which is nothing more than the accidental sinking in of one side of the sheath, being quite common, even among the free statoblasts of Plumatella, I see no reason for considering them exceptional forms.

At an early stage of growth, while still floating freely in its native element, the statoblastic polypide begins to multiply by the process of budding. An internal swelling of the endocyst, on the lower side, in the vicinity of the bases of the anterior retentor muscles, first shows the position of the coming polypide. This elongates into a little hollow sack with a thickened rim (Pl. 7, fig. 5, Y), upon the upper edge of which, in the Hypocrepian Polyzoa, a slight notch is formed by the duplication and pushing out of its sides into two loops joined along the centre (Pl. 13, fig. 4, Y). A series of minute folds of the membrane on the upper sides of the loops are the incipient tentacles, and, as they enlarge, the intervening membrane is drawn up with them like a thick web; but this, however, eventually recedes externally and becomes the calyx. The loops growing outward augment their longitudinal diameter at the expense of the transverse, and the inner sides of each, approximating and at last coalescing, make up the lophophore and arms. Preceding the beginning of the tentacles, a transverse constriction of the body of the little sack draws the line between the œosophagus, and the stomach; and the subsequent deepening of this constriction divides off the internal cavity, establishing the cardiac and pyloric valves. The muscles, which become well differentiated at a very early period, are divisible into three pairs: one pair attached to the rim, the Brachial Retractors; one to the region
of the œsophagus, the Æsophageal Retractors; and one to the region of the stomach, the Gastric Retractors. They are active from the first, and appear to drag the polypide inwards, stretching the endocyst of the parent, which is joined to the loops, into a tube. This tube is the future evaginable endocyst of the polypide; and, as the various organs are developing, it is everted little by little, becoming gradually capable of the adult evagination.

The tentacles of Cristatella ophidioidea are not fully grown, nor the arms divaricated, until long after the evagination of the polypide is completed (Pl. 13, fig. 3, Y). At this period the tentacles of the external rows near the mouth are the longest, decreasing regularly to the mere tubercles on the ends of the arms, and the internal tentacles are not separated from each other, exhibiting only two closely appressed lines of tubercles all of about equal length. The division of the arms begins internally, and its progress outwards may be followed by the gradually increasing length of these interior rows, which retain their tubercular character until this division commences (Pl. 9, fig. 14).

The mode of reproduction by true ova, although detected by Dumortier and Van Beneden, was first fully described by Prof. Allman. They are produced from the gemma dot, a bud-like mass on the upper side of the endocyst in the neighborhood of the orifice, which, during the fall, when not filled with ova, becomes opaque and granular.*

The testicle, first described by Dumortier and Van Beneden, arises from the funiculus, resembling in its mode of formation, according to Prof. Allman, a true bud. The

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*Prof. Allman thus describes the earlier periods of the development of the ovum. Monograph Fresh-water Polyzoa p. 33.

"Development of the Ovum.—I have succeeded in tracing the development of the ovum through most of its stages in Aleyonella fungosa.

In this Polyzoön the mature ovum consists of a granular vitellus, surrounded by a very evident vitellary membrane, on whose internal surface the contents appear frequently to be aggregated in a coarse granular layer. It presents a large germinal vesicle, and a very distinct germinal spot. After a time the germinal vesicle and the germinal spot disappear, and the vitellus undergoes segmentation, and after the mulberry-like condition thus induced has in its turn vanished, we find the contents of the egg have assumed the form of a roundish or oval body, richly ciliated on its surface, and provided with a large cen-
nuclei of the cells are of large size and in due time are converted into spermatozoa. These have been observed swimming freely in the perigastric cavity into which the full grown ova are, also, discharged from the ovary.

After the segmentation of the vitellus, the egg appears as a hollow oval body clothed externally with cilia, and it is at this period that most observers have seen and described its peculiarities.

Mr. Albany Hancock, although confounding it with a statoblast which he supposed to be an egg, speaks of one, an undoubted ovum, which, he observed forcing its way through the closed orifice of the cell, rending and destroying the parent polypide in its course.*

I have, also, seen them during this stage in Plumatella

tal cavity, which as yet does not open externally. When liberated from the outer membrane of the ovum, which still confines it, it swims actively through the surrounding water by the aid of the cilia with which it is invested.

As development proceeds, we find the ciliated embryo while still confined within the coverings of the egg, presenting in some part of its surface an opening, which leads into the central cavity; and through this opening an unciliated, hernia-like sac is capable of being protruded by a process of evagination. The unciliated protrusible portion would seem to have been derived by a separation from the walls of the central cavity, and appears therefore to originate by a process of unlining, a true chorization.

Towards the opening, which leads from without into the central cavity, the chorization is incomplete, the membrane as it separates being here still held to the walls of the cavity by irregular transverse bands; these bands check the entire evagination of the membrane, but after a time they disappear, and then the unlining and evagination are perfect. In the interior of the protrusible portion, and before the disappearance of the transverse bands, a polypide is developed.* The further development of this polypide, as described by Prof. Allman, does not differ materially from those produced from the regular buds of the adult cells.

The same authority thus describes the testicle of Alcyonella (Plumatella) fungosa on page 82 of the work above quoted.

"The testicle is composed of a mass of spherical cells, each of which contains within it numerous secondary cells, "vesicles of evolution." The visible contents of the vesicles of evolution consist, at first, of nothing more than a well-defined spherical nucleus, and this is subsequently transformed into a spermatozoal filament, which finally escapes by the rupture of the containing cells. The spermatozoal filaments, in this genus, are simple vibrioid bodies without any terminal enlarge-

Arthusa, squirming in the perigastric cavity, and tossing the stomach of the polypide about, as if it had been a plaything. They certainly, in this species, evinced sufficient power to open a passage through the thin membrane of the polypide, although such did not seem to be their object at the time.

No orifices for the expulsion of the ova have been as yet positively demonstrated. Meyen chronicles the escape of the eggs of Alcyonella (Plumatella) stagnorum from an opening in the vicinity of the anus. But this is, probably, erroneous, since, as observed by Mr. Hancock, "the great size of the egg forbids the possibility of its escape without the destruction of the polypide."

From the preceding account it may be seen that there are four localities, all within the coenecium, devoted to the function of reproduction. These are, the ovary on the dorsal side of the orifice; the free part of the endocyst of the cell on the abdominal side, bringing forth true buds; the attached portion lower down, giving birth only to fixed statoblasts; and the funiculus, generating spermatozoa and free statoblasts. The true buds of Fredericella and Plumatella are numerous, although only one usually matures and prolongs the stem: when two or three mature, at the same time, the lateral branches are produced. These buds grow slowly, forming the ordinary tubular cells. In some varieties of Plumatella, however, the buds mature more rapidly and in greater numbers, while the branch assumes a lobelike form, the polypides, with the cells but half developed, crowding the upper surface. This mode of formation, which is only a variation of the species in Plumatella, is of generic value in Pectinatella, where the polypides are invariably arranged upon lobiform branches. In Cristatella the true buds are more numerous than in any other genus, and they mature until the coenecium is full grown.

The gradual increase in the number of the buds, that reach maturity, coincides with the decrease in the toughness of the ectocyst, and its final obliteration in the higher

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genera; and the absolute number of the buds to the expansion of the bud producing surface. As has been shown in the preceding paragraph, the number of the buds reaching maturity, and their absolute number in each cell of Fredericella, is generally less than in those varieties of Plumatella that have a gelatinous ectocyst; and they are less, in the latter, than in the Pectinatella, which have no ectocyst; and less in the Pectinatellæ than in Cristatella, where the ectocyst is wanting, and where the bud producing surface is of the greatest extent.

Composition of the Endocyst.

In the foregoing remarks the anatomy has been discussed, so far as was necessary, in order to give clearness to the descriptions of the different genera and the subsequent notice of the modes of reproduction. It now remains to consider more fully the composition of the body, together with the relations and functions of the various organs.

The endocyst is made up of four layers: (1) an outer large celled membrane (Pl. 11, fig. 1, E', Pl. 12, fig. 2, E', Pl. 13, fig. 16); (2) an inner one of smaller cells (Pl. 11, fig. 1, E''); (3) one of muscular fibre (Pl. 11, fig. 1, E''''); (4) an epithelial layer lined internally with muscular fibre (Pl. 11, fig. 1, E'''').

(1) The first membrane forms the external surface of the endocyst of the polypide and of the coenœcium. The cells on the coenœciæ of Fredericella and Plumatella are hexagonal containing a large brilliant nucleus and nucleolus (Figs. 3, 5). Their upper sides are depressed by the weight of the superincumbent ectocyst, and their longitudinal diameters are not so long as in the cells of the same membrane on the evaginable endocyst.

When fully expanded on the living coenœcium the cells are closely pressed one against another; but, if treated with alcohol, they contract, and, separating from each other, leave wide intervening spaces (Figs. 2, 4, 5). These spaces have been figured by Prof. Allman under the impression that they were anastomosing channels, perhaps blood channels; my observations, however, have been too numerous to leave any
doubt of their being what I have stated. The larger cells are continually multiplying by division, and there result numbers of small cells which lie scattered here and there in the supposed blood channels. Fig. 3 shows a large cell undergoing the process of division, and below, near the right lower corner of the figure, there are two minute cells, undoubtedly created in a similar manner, occupying the interstices of the membrane. Fig. 5 shows a group of cells taken from a point nearer the orifice than those of fig. 2, and, also, from a different zoöid. These are not so disfigured by contraction and have more angular outlines. Fig. 4 shows a group of five cells, from another zoöid, more highly magnified than either of the above, and more widely separated. When the cells are so dispersed the intervals are usually more or less filled in by minute cells; but, in this instance, the spaces were vacant and the nucleus of immense size, the nucleolus not being visible.

The cells on the cœnœcia of Pectinatella and Cristatella do not differ sensibly in their structure from those of Fredericella and Plumatella. The outer sides, however, being free from the presure of an ectocyst, are more convex; and the longitudinal diameters, instead of being less, are greater than in the cells of the same membrane in the evaginable endocyst. Plate 13, fig. 16, and figures 7, 8, E' present lateral views of the membrane in the cœnœcia of Cristatella and Plumatella: in figure 8 the cellular structure is not given, but the relative thickness of the membranes may be estimated by a comparison of the two figures. The cells of the first membrane of the evaginable endocyst do not vary
essentially from those on the coenecium, except in being greater or less than the latter, as mentioned above, and in having the power of expanding and contracting their parietes. They may swell to twice or three times the normal size, and contract again with considerable quickness, as if they had collapsed after parting with their fluid contents. From the evaginable endocyst they can be followed into the calyx, which, in the adult, is merely a web like fold of the first membranous layer; and from the calyx into the external ciliated membrane of the tentacles.

The cells on the calyx and tentacles are of about the same size as those on the evaginable endocyst, but they are not so distinctly hexagonal, unless contracted. The outer sides are more convex, than those on the coenecium; this peculiarity is, also, shared by the cells of the evaginable endocyst. The nucleus is large and brilliant. The nucleolus was not defined. The cilia are prolongations of the walls of the cells; each cell bearing one long slender hair (Fig. 6).

![Fig. 6, two living cells, with cilia, from near the tip of a tentacle of Fredericella regina.](image)

The vibrations of the cilia are not constant, and, if a tentacle be severed and quickly placed under the microscope, those that are at rest can be viewed without difficulty throughout their entire length.

The cells become smaller on the lophophore, forming a denser layer than on the other parts of the zoöid. There is no break upon the edge of the oesophagus and the cells of the first membrane are continuous with the cells of the innermost layer of the alimentary canal.

(2) The second layer is made up of smaller cells. It is
coextensive with the first, and is the principal membrane of the endocyst. The size of its cells does not vary appreciably within the limits of the group. As a general rule, however, its thickness in the cœnœcium is quite double what it is in the evaginable endocyst, and on the outer side of the tentacles. On the inner side of those organs, and in the lophophore, it becomes as thick as it was in the cœnœcium. In the arms, also, it is thicker than in the evaginable endocyst; but its greatest development in this respect is attained in the region of the sphincter muscles (Fig. 8, E"). This membrane is thicker than the first membrane in the other parts of the cœnœcium of Fredericella and Plumatella, but thinner than the first membrane in the cœnœcium of Pectinatella and Cristatella (Figs. 7, 8, E"").

(3) The third layer is exceedingly contractile. The transverse fibres of which it is composed are loosely and irregularly set, but have considerable muscular power (Figs. 4, 8, E"""). The cœnœcial endocyst of Plumatella is sometimes drawn in by annular constrictions, happening, apparently at will, in any part of the wall where the ectocyst is sufficiently pliable, which are generally referable to the action of this muscular coat. Such annular constrictions can be occasionally traced to rows of small muscles extending across the cavity from the endocyst to the alimentary canal, or to the invaginated fold. These muscles, however, could not have been the cause of the constrictions in the dead Plumatella Arethusa figured in Pl. 8, fig. 10. The most careful observations of this specimen, with a high power, failed in bringing to light any such rows of muscles, and, in this case, all the plications, with the exception of those brought about by the influence of the retentor muscles (Pl. 8, fig. 5), were due to the transverse annular muscles of the third layer.

An involution of this layer aids in forming the base of
the walls in the coenocelium of Cristatella (Fig. 7, E''), but it does not probably extend into their reticulated portion (Pl. 14, fig. 1, Q). Judging from the thinness of the latter, and, from the fact, that all the longitudinal muscles of the body appear to be connected more or less with the fourth or epithelial membrane, it is quite likely that the reticulated portion, or those parts of the coenocelial walls which lie between the junctions of the walls with the upper and lower internal surfaces of the coenocelial endocyst, are composed wholly of longitudinal fibres, encased by the epithelium. Around the invaginated fold of Plumatella the fibres are thickly disposed and form the so called sphincter muscle. This is not a narrow band, as described by Prof. Allman, encircling the lower edge of the fold, but a local development of the transverse fibres, as broad as the fold itself (Fig. 8, E''').

In the evaginable endocyst this layer can be seen, by careful focusing, through the fourth membrane, but only with ease, when more or less contracted.

In the arms and lophophore it is thick, and frequently, in the former, becomes convoluted by the action of muscular bands apparently developed in its substance. I was unable to trace this membrane in the tentacles, but judging from the great thickness of the second tentacular membrane, and the slight increase which takes place in the transverse diameter of those organs when

*Note. Only three membranes are delineated in the coenocelial endocyst of figure 8. This is owing to my want of success in defining the parts of the innermost layer, in the specimen figured, which is undoubtedly made up of two layers, as in the coenocelium of Cristatella (Fig. 7, E'', E''').
drawn in, as they often are, to less than one third of their full length, I have ventured to assume that it also exists there (Pl. 11, fig. 1, E''').

(4) The fourth or epithelial membrane, lines the interior, investing all the muscles and the digestive system. It is ciliated upon the perigastric region, and upon the interior of the arms and lophophore, but not in the tentacles or upon the alimentary canal. On the abdominal side, a double layer, or fold, of this membrane, which I have named the Brachial Collar, constitutes a partial diaphragm reaching about half way round the oesophagus. On the dorsal side it is disconnected from the lophophore, and hangs into the perigastric space, partitioning off the inside of the epistome, and a space below in which the ganglion is suspended. There are numerous fibres upon the inner side of this diaphragm attached to the oesophagus and endocyst, between the bases of the arms, having sufficient contractile power to deeply infold that part of the body wall.

Prof. Allman mentions but two membranes in the endocyst, one, an outer large celled layer, equivalent to my first and second membranes, and another, an inner layer, equivalent to my third and fourth membranes. Throughout its whole extent, the fourth or epithelial layer is lined by muscular fibres. These cross the transverse fibres of the third layer at right angles (fig. 4, E'''). and both were regarded by Prof. Allman as a single inner layer of reticulated muscles. The longitudinal fibres, however, are invariably next to the fourth membrane, and remain attached to it, whenever, as in the neural diaphragm, it parts from the other layers. The transverse fibres, also, never seem to be connected with the longitudinal, wherever a good definition of either has been obtained. No transverse fibres are visible on the neural diaphragm; and on the invaginated fold (Fig. 8), and the oesophagus (Pl. 11), no longitudinal fibres are visible.* In the two latter they are

*Note. Since the printing of the plates, I have, in reviewing these pages, changed my opinion and now estimate the longitudinal fibres, as of equal importance with the transverse, and consider them a fourth layer of muscular fibre, the epithelial becoming a fifth membranous lay-
er. The endocyst is consequently made up of three membranous and two muscular layers; all the specialized constricting muscles of the body being derived from the third layer, and all the longitudinal from the fourth layer of muscular fibre.

The inner and outer tentacular bands, as will be presently shown, are inseparable from the latter layer. The retractors, also, notwithstanding their disc like structure, can hardly be distinguished from the numerous abnormal bands, that occur in some species, connecting the endocyst and alimentary canal. These undoubtedly belong to the fourth layer, and the retractors may, therefore, be looked upon as having the same relation to the fourth layer that the sphincter has to the third.

The peculiar arrangement of the third and fourth layers retains the form of the parts, and gives stability to the entire endocyst. By the contraction of the third and relaxation of the fourth the transverse diameters of the parts may be decreased, and the longitudinal increased; or, by the opposite process, the longitudinal may be decreased, and the transverse increased. During the invagination of the polypide, the fibres of both are in a state of contraction in the evaginable endocyst and in the region of the sphincter; in the coenecium, however, they are relaxed. But as soon as evagination begins, they appear to reverse this condition. The coenecial fibres become contracted and those of the same layers in the polypide are stretched to their full length. By these reciprocal changes they materially assist the compressed fluids of the body in forcing out and expanding the polypide. I have, also, had reason to doubt the existence of a neural diaphragm. In examining a specimen of Fredericella regina from the side and from above, under very favorable circumstances, I was unable to detect the same appearance of an enveloping membrane just below the nerve mass, that led me to the conclusion mentioned; nor have I had any opportunity of verifying my first observations on Pectinatella, which, however, were faithfully made with one of Tolle's one half inch objectives. Until therefore, Fredericella is shown to be exceptional in this respect by further observations on other genera, it is, perhaps, best to regard the existence of a neural diaphragm as doubtful.

[To be continued in Vol. V.]
INDEX

To Communications, Vol. IV.

Acanthogorgia coccinea, 152, 188
Acipiter Cooperii, 51, 92, 95, 98
Actinaceae, 148
Actinaria, 147
Actinidae, 148
Actiturus Bartramius, 78
Actodromas Bonapartii, 77, 87, 95
Actogaleus melodus, 86, 93, 96
Alcyonacea, 148, 190
Alcyonella, (note) 203
Alcyonium? agaricum, 191
Aglaope, 31, 33
Aix sponsa, 79, 93, 96
Alypia, 23

Ammonactis, nov. gen., 150
rubricollum, 151
Ampelis cedorum, 66, 92, 95
garrulus, 66, 93, 96
Anas boschas, 78, 95
obscura, 78, 93
Anatolmis, nov. gen., 45
Grotei, nov. sp., 47
Ancylochelus subarquata, 87, 94
Anorthura byemalis, 68
Anser erythrops, 88
Gambellii, 87, 94
hyberboreus, 87, 94
Ansetus, 159
Antax morio, 127
ornata, 128
Anthella lineata, 193
Antherophagus, (Byturus) 104, 108
Antherophagus, 128
ochraceus, 128
Anthophorabia, notes on a new species of, 133
Larva of, 137
megachilis, nov. sp., 134
Pupa of, 136
Anthus ludovicianus, 58, 94
Antipathacea, 147
Antipathes flabellum, 187
Antipathidae, 148
Antrostomus vociferus, 53, 92, 95
Apathus, 104, 106, 118
Ashtoni, 118
Aquila canadensis, 81, 93
Archibuteo lagopus, 51, 93
Sancti-Johannis, 51, 93
Ardea herodias, 76, 93, 96
Ardetta exilis, 76, 93, 96

ESSEX INST. PROCEED. IV. DD. May 28, 1866.
INDEX.

Arquatella maritima, 87, 94
Arvicola riparia, nest of, used by Humble Bees, 99
Astragalinus tristis, 93
Astreacca, 146
Astrelae, 147
Astur atricapillus, 50, 93,
Aythya americana, 79, 88, 95
B.
Balanophyllia capensis, nov. sp., 149
Balch, D. M., on native grapes, 140
on the Sodalite at Salem, 3
Bartramia laticauda, 78, 93, 96
Bees, Humble, notes on the habits of, 98
of New England, 107
Bee, Leaf-cutting, notes on, 105
Bergida, 147
Bernicla brenta, 78, 95
canadensis, 78, 95
Hutchinsii, 87, 95
leucopsis, 88, 96
Birds, accidental and irregular visitors, 96
catalogue of, found at Springfield, Mass., 48
list of, in Mass. not observed at Springfield, 80
resident species, 93
spring and autumn visitors, 94
supplemental notes to Mr. Allen's catalogue, 97
summary of Mass. species, 97
summer visitors, 95
that regularly breed in the State, (Mass.) 91
winter visitors, 93
Bombus affinis, 118
bimaculatus, 117
fervidus, 98, 99, 110
impatiens, 114
pennsylvanicus, 104, 111
perplexus, 117
separatus, 99, 101, 114
ternarius, 99, 116
terricola, 112
vagans, 98, 115
virginicus, 99, 101, 113
Bonasa umbellus, 76, 98
Botaurus lentiginosus, 76, 93, 96
Brachyotus Cassinii, 52, 92, 93
Briaride, 148
Bryozoa, 201
Bubo virginianus, 51, 92, 93
Bucephala albeola, 49, 73, 94
americana, 73, 94
Buteo borealis, 51, 92, 93
lineatus, 51, 92, 95, 98 [98
pennsylvanicus, 51, 92, 95, 96
Butorides virescens, 76, 93, 96
Byturus, (Antherophagus), parasite in Nests of Humble Bees, 104, 108
C.
Calidris arenaria, 95
Camptolemus labradorius, 88, 94
Cardinalis virginianus, 85, 96
Carpodacus purpureus, 48, 69, 92, 96
Caryophyllide, 147
Castinares, 21
Castula, 22
Cataractes lonvia, 91, 94
ringvia, 91, 94
troille, 91, 94
Cathartes atratus, 81, 96
aura, 81, 96
Centrophanes lapponicus, 70, 84, 94, 96
Centurus carolinus, 48, 53, 96
Cerianthid, 148
Cerianthus orientalis, nov sp 151
Certhia americana, 68, 92, 93
Ceryle alcyon, 54, 92, 93, 95
Chactura pelasgia, 53, 92, 95
Chalcis sp., 133
Charadrius virginicus, 77, 94
Chauliulus streperus, 79, 95
Chondestes grammaca, 84, 96
Chordelles poppete, 54, 92, 95
Chrecocephalus atricilla, 90, 94
Philadelphia, 80, 94
Chrysomitis pimus, 70, 92, 93
tristis, 69
Circus hudsonius, 51, 92, 93
Cistothorus paivistris, 83, 92, 96
stellaris, 68, 83, 92, 96
Cnidaea, 145
Coccoanus americanus, 48, 52, 92, 95
erythrophthalmus, 52, 92, 95
Colaptes auratus, 53, 92, 95
Collyrio borealis, 66, 93
Colymbus arcticus, 91
septentrionalis, 80, 94
torquatus, 80, 93
INDEX.

Conops, 108, 123
rufipes, 124
Contopus borealis, 54, 92, 95
virens, 54, 92, 95
Corallide, 148
[181]
Corals, description of new species, of the North Pacific Exploring Expedition, 181
Cornularia australiaca, 151, 194
Cornularidae, 148, 193
Corvus americanus, 75, 92, 93
carnivorus, 48, 75, 96
osifragus, 85, 96
Coturniculus Huenslowii, 48, 71, 92, 96
collaris, 71, 84, 92, 96
Cotyle riparia, 65, 92, 95
Cristatella, 203, 209
figure of cecocelial wall, 225
ophidioidea, 210
Cristatellidae, 203
Ctenucha, 33
americana, 33
Cressonana, 33, 35
Larva, 36
Latreilia, 33
Pupa, 38
scindiaaphana, 33
virginica, 33, 36
virgo, 33
Cupido catipo, 85, 93
Curvirostra americana, 70, 93
leucoptera, 70, 93, 96
Cyanospiza cyanca, 73, 92, 96
Cyanura cristata, 75, 93
Cyathaxonidae, 146
Cyathophyllidae, 146
Cyclolitidae, 146
Cystiphyllidae, 146
D.
Daufia acuta, 79, 94
Dendroica aestiva, 63, 64, 92, 95
Blackburne, 62, 64, 92, 95
canadensis, 62, 64, 92, 95
castanea, 62, 64, 94
corolata, 64, 85
coronata, 62, 64, 94
discolor, 64, 92, 95, 97
maculosa, 63, 64, 94
palmam, 63, 64, 94
pennsylvanica, 63, 64, 95
plumus, 65, 64, 92, 95
striata, 63, 64, 94
tigrina, 48, 63, 64, 94
virens, 61, 64, 92, 95
Dipterous larvae in nest of Humble Bees, 104
Dolichonyx oryzivorus, 74, 92, 96
Duck Hawk, habits of, 153
eggs of, 153
Dytes cornutus, 80
E.
Ectopistes migratorius, 75, 93, 96
Edwardsia brevicornis, 151
clayata, 150
collairs, 150
rubricollis, 151
Elselolite, analysis of, 5
Emerson, George H., on Magnetite and an unknown mineral at Nahant, 6
Empidonax acadicus, 54, 92, 95
flaviventris, 55, 94
minimus, 54, 92, 95
Traillii, 54, 92, 95
Eremophila cornuta, 69, 93
Eremnetes pusillus, 87, 95
Erismatura rubida, 79, 94
Encryrus varicornis, 133
Endrias, 24
gata, 27
Larva, 27
Pupa, 29
unio, 27
Eupsammia Stimpsonii, nov. sp., 150
Eupsammidae, 147
Eusmilidae, 147
Euspiza americana, 84, 96
Entilyps canadensis, 65, 92, 94
Falco anatum, 50, 92, 93, 153
candicans, 81, 96
peregrinus, 153
Florida corulea, 86, 96
Fredericella, 203, 204
Regina, figure of stato-
bias, 214
figure of living cells with cilia, 224
Fredericellidae, 203
Fulica americana, 78, 93
Fulix affinis, 88, 95
collars, 88, 95
marlia, 88, 95
Fungacea, 146
Fungidae, 146
Galeoscoptes carolinensis, 68, 92, 96
Gallinago Wilsonii, 77, 93, 96
INDEX.

Gallinula galeata, 87, 96  
martinica, 87, 96
Gambetta flavipes, 77, 95  
melanoleuca, 77, 95
Garzetta candiddissima, 85, 96
Gemmillioides, 147
Geothlypis Philadelphia, 59, 94  
trichas, 59, 92, 95
Gerardiae, 148
Gorgonacea, 148, 186
Gorgonellidae, 148, 189
Gorgonia flammea, 186  
palma, 186
venosa, 186
Gorgonidae, 148, 185
Graculus carbo, 89, 94  
dilophus, 89, 94
Grapes, native, 140  
amalysis of, 142
Guiraca coerulea, 84  
ludoviciana, 73, 92, 96
H.
Hæmatopus palliatus, 86, 96
Haltæus leucoccephalus, 51, 92, 93
Holocampa brevicornis, 151
Harelda glacialis, 49, 79, 95
Harporhynchus rufus, 68, 92, 96
Harrisina, nov. gen., 31  
Sanborni, nov. sp., 32
Helminthophaga celata, 48, 60, 94  
chrysoptera, 61, 82, 94
peregrina, 48, 61, 94
pinus, 61, 82, 94
ruficapilla, 59, 61, 92, 95
Helmithus Swainsonii, 82, 94, 95  
vernivorus, 61, 82, 92, 95
Helospiza Lincolini, 72, 94, 96  
palustris, 73, 92, 96
Herodias egretta, 76, 96
Heterocathus alternata, n. s., 149
Heteropus ventricosus, 139
Himantopus nigricollis, 86
Hirundo bicolour, 48, 65, 92, 95  
horreorum, 65, 92, 95
junfrons, 65, 92, 95
Histrionicus torquatus, 88, 94
Humble Bees, habits of, 98  
additional notes on, 104
of New England, 107
parasites of, 107
Hyatt, Alpheus, on Polyzoa, sub-
order Phylactolemata, 197
Hydrochelidon lissipes, 91, 95

Hydrochelidon plumbea, 91
Hylotomus pileatus, 82, 92, 93 [98
Hypotrachis columbarius, 50, 94
I.
Ibis Ordii, 86, 96
Icteria viridis, 48, 59, 92, 95, 96, 98
Icterus Baltimore, 74, 92, 96
spuris, 75, 92, 96
Ilyanthide, 148
Isisæ, 148, 190
Ixoreus nevius, 82
J.
Janucella laws, nov. sp., 189
Janco hyemalis, 71, 92, 94
K.
Kophebolemnon clavatum, 152, 185
L.
Lanivireo flavigrons, 67  
solitarius, 67
Larus argentatus, 80  
delawarensis, 90, 94
leucopterus, 90, 94
marinus, 90, 94
Smithsonianus, 80, 94
Leaf-cutting Bee, notes on, 105
Leioptilum, 182
undulatum, nov. sp., 182
Leptogorgia cupulata, n. s., 186
Limosæ fedoa, 87, 95  
hudsonica, 87, 95
Lissogorgia, 187
flabellum, 187
flexuosa, nov. sp., 187
Lithophyllideæ, 147
Lobularia rubiformis, 190
Lophodytes cucullatus, 80, 94
Lophogorgia palma, 186
Lophophanes bicolor, 83
Lophopus, 203, 208  
scrystalinus, 208
Lophoserdiceæ, 146
Lycomorpha, 43
Pholus, 45
M.
Meeandrinideæ, 147
Macrorhamphus griseus, 86, 94
Madreporaceæ, 147
Madreporaria, 145  
perforata, 147
rugosa, 146
Madreroporidae, 147
Magnette at Nahant, 6
Malthaca perlitcula, 32
Mareca Americana, 79, 95
INDEX.

233

• Mareca Penelope, 88, 96
  Megachile, notes on, 103
centuncularis, 106
  Melanerpes erythrocephalus, 58, 92,
  Melanetta velveta, 49, 79, 94 [95
  Meleagris gallopavo, 85
  Meloe, 108
  angusticollis, larva of, 129
  Melospiza Lincolnii, 48, 72
  melodia, 72, 92, 93, 96
  palustris, 78
  Mergellus albellus, 89
  Mergulus ale, 91, 94
  Mergus americanus, 79, 93
  serrator, 89, 93
  Merulinidae, 146
  Metridium imbricatum, nov. sp., 150
  Microgaster, 122
nephotericis, nov. sp., 122
  Micropalama himantopus, 95
  Minus carolinensis, 68
  polyguttus, 48, 67, 92, 96
  Mineral, unknown, at Nahant, 6
  Minyiade, 148
  Mites in nests of Humble Bees,
  Malloittia varia, 59, 92, 95
  Mollusca, classification of, 162
  Molothrus perciris, 74, 92, 96
  Monodontomerus, 133
  Mormo arctica, 91, 94
  Mopsella japonica, nov. sp., 190
  Morse, E. S., on the classification
  of the Mollusca, 162
  Muricea divaricata, 188
  sinensis, nov. sp., 187
  Myiarchus crinitus, 54, 92, 95
  Myiodyctes canadensis, 65
  minutus, 83
  mitratus, 83
  Myopa atra, 124
  Myrmarides, new genus of, 133
  N.
  Nepholteryx, 120
  Edmandsii, nov. sp., 120
  Larva, 121
  parasite in nests of Bombus, 104, 108
  Pupa, 121
  Nephthya aurantiaca, nov. sp., 191
cocinea, 152, 188
  thysolidea, 151, 192
  Nettion carolinensis, 79, 95
crecca, 88, 96
  Numenius borealis, 87, 95
  Numenius hudsonius, 87, 95
  longirostris, 87, 95
  Nyctale acadica, 52, 92, 93
  Richardsonii, 48, 52, 93, 96
  Nyctea nivea, 52, 93, 97
  Nyctiadea Garreati, 76, 93, 96
  O
  Ochthocharax Wilsonii, 86, 96
  Oculuidae, 147
  Oldemia americana, 89, 94
  Opornis agilis, 59, 82, 94
  Ortyx virginianna, 76, 93
  Osmia, 107
  Otus americana, 51, 92, 93
  Wilsonianus (note), 51
  Oxyechus vociferus, 77, 93, 96
  P.
  Packard, Jr., A. S., Humble Bees
  of New England and Parasites; with notices
  of a new species of An-
  thophoracia, and a new
  genus Proctotropli-
  de, 107
  on the Family Zygaenidae, 7
  Pandion carolinensis, 51, 92, 94
  Parasites in nests of Humble
  Bees, 104
  Parisis laxa, nov. sp., 152, 190
  Parula americana, 59, 92, 95
  Parus atricapillus, 69, 92, 93
  Hudsonicus, 83, 93, 96
  Passerculus savannia, 70, 92, 96
  Passerella iliaca, 73, 94
  Pavonaridae, 149, 184
  Pectinatella, 203, 208
  Carteri (note), 203
  magnifica, 209
  Pedeteretheya Holbewill, 80
  Pellecanus erythrorhynchus, 89
  Pellsina americana, 77, 94
  Pelionetta perspicillata, 89, 94
  Pennatula tena, 183
  Pennatulacea, 149, 181
  Pennatulidae, 149, 181
  Peregrine Falcon, eggs of, 153
  habits of, 153
  Phalaropus fulicarius, 86, 94
  hyperboreus, 86, 94
  Wilsonii, 86, 94
  Phellia clavata, 150
  collaris, 150
  Philohela minor, 77, 93, 96
  Philorus, 33
Phylactolamata, Bibliography and Classification of, 200
Comp. of Endocyst, 222
Reproduction of, 211
species in America, 203
species in Australia, 203
species in Europe, 203
species in India, 203
Picoides arcticus, 48, 52, 93, 96
hirsutus, 82
Picus pubescens, 52, 92, 93
villosus, 52, 92, 93
Pinicola canadensis, 69, 93
Pipilo erythrophthalmus, 74, 92, 96
Plectrophanes lapponicus, 70
nivalis, 70, 94
Plexaura friabilis, 186
Plexauridae, 148, 186
Plumatella, 203, 207
Arethusa, 207
diffusa, figure of invaginated fold of, 226
vitrea, figure of groups of cells of, 223
Plumatellidae, 203
Podiceps cornutus, 80, 94
cristatus, 80, 94
griseigena, 80
Hobbiillii, 80, 94
Podilymbus podiceps, 80, 95
Polioptila cerulea, 69, 93
Polypli, 145
Polyps, classification of, 145 [181
description of new species,
new species of, 149
of the North Pacific Exploring Expedition, 181
Polyzoa, 197
Bibliography and classification of, 200
Pococetes gramineus, 70, 92, 96
Poridte, 147
Porzana carolina, 78, 93, 96
novacobarcensis, 78, 87, 95
Primnoa compressa, nov. sp., 189
Primnoide, 148, 189
Procellaria glacialis, 89, 95
Procris, 31
americana, 31
Progne purpurea, 66, 92, 95
Pteratomen, nov. gen., 137
Putnamii, nov. sp., 138
Pteromorpha expansa, nov. sp., 181
Ptilosarcus, 183
Gurneyi, 182
Puffinus anglicorum, 89, 94
fuliginosus, 89, 94
major, 89, 94
Putnam, F. W., Notes on the habits of humble bees, 98 [105
Notes on Leaf-cutting Bee
Pygoma aestiva, 83, 96
rubra, 65, 92, 95
Pyromorpha dimidiatula, Q.
Querquedula discors, 79, 95
Quiscalus major, 85, 96
versicolor, 75, 92, 96
R.
Palus crepitans, 87, 96
virginianus, 78, 93, 96
Recuivrostra americana, 86
Regulus calendula, 58, 94
satrapa, 58, 93
Renillidae, 149
Rhyncophilus solitarius, 77, 95
Rissa tridactyla, 90, 94
S.
Saccata, a new name for the Mol-lusca, 163, 178
Sarcodictyon, 195
Sarcophyton agaricum, 191
Sarcoptilus Gurneyi, 183
Sayornis fuscus, 54, 92, 95
Scops, 33, 40
fulvicollis, 33, 43
Scolceoglossus ferrugineus, 75, 94
Scops asio, 51, 92, 93
Setophaga ruticilla, 65, 92, 95
Stalha sialis, 58, 92, 95
Sittar canadensis, 69, 93
carolinensis, 69, 92, 93
Seiurus aurocapillus, 61, 92, 95
Sceps, 33, 40
ludoviciana, 61
novacobarcensis, 61, 92, 95
Sodalite at Salem, 3
analysis of, 4
Somateria mollissima, 89, 94
Spectabilis, 89, 94
Spatula clypeata, 88, 95
Sphytopus varius, 53, 92, 95
Spizella monticola, 72, 92, 94
pusilla, 72, 92, 96
socialis, 72, 92, 96
Spongodes capitata, 193
gigantea, 192
gracilis, nov. sp., 193
INDEX.

235

Squatarola helvetica, 93, 96
Stauracae, 146
Stauridae, 146
Stercorarius cephus, 90, 94
parasiticus, 90, 94
Stercorarius pomarinus, 90, 94
Sterna aranea, 90, 96
caspia, 91
frenata, 90, 95
fuliginosa, 90, 96
hirundo, 90, 93, 96
macroura, 90, 93, 94
paradisea, 90, 96
Trudeauii, 91
Stephanoseris lamellosa, n. s., 149
Strepsilas interpres, 86, 94
Strix americana, (note) 51
Sturnella magna, 74, 92, 96
Stylinidae, 147
Stylophoridae, 147
Stylops, 108, 139
Childreni, 130
Sula bassana, 89, 94
Surnia ulula, 81
Symphemia semipalmata, 77, 93, 96
Symnes cinereum, 52, 81, 93, 96
nebulosum, 52, 92, 93
T.
Tachina, 128
Telesto anrantiaca, 151
nodosa, nov. sp., 194
ramiculosa, 151, 194
Telmatodytes palustris, 68, 83
Tetrao canadensis, 85, 94, 96
Thalassianthidae, 148
Thalassidromus Leachii, 80, 93
pelagica, 89
Wilsoni, 89
Tinmunculus sparerius, 50, 92, 93
Trichodactylus, 189
Tringa alpina var. americana, 77
Bonapartii, 87
canutus, 86, 94
maculata, 77
maritima 87
Wilsoni, 77
Tringoides macularius, 77, 93, 96
Tryngites rufescens, 78, 95
Trochilus colubris, 53, 92, 95
Troglydotes edon, 68, 92, 96
americanus, 68
hyemalis, 68, 93
Tubipora rubeola, 195
Tubiporide, 148, 195
Turds Aliciae, 48, 56, 57, 58, 94
fuscescens, 56, 57, 92, 95
migratorius, 58, 92, 93, 95
mustelinus, 55, 56, 92, 95
Pallasii, 56, 58, 92, 94, 97
Swainsonii, 49, 56, 58, 94
Tyrannus carolinensis, 54, 92, 95
U.
Unknown mineral at Nahant, 6
Urla arra, 91
gryile, 91, 94
Utmania torda, 91, 94
V.
Veretillidae, 149, 184
Veretillum baculatum, n. s., 152, 185
claratum, 152, 185
Stimpsonii, n. s., 152, 184
Verrill, A. E., Classification of Polyps, 145
Polyps and Corals of the North Pacific Exploring Expedition, 181
Vireo flavifrons, 67, 92, 95.
gilvus, 67, 92, 95 [95
novaboracensis, 67, 92, 95
olivaceus, 66, 67, 92, 95
philadelphicus, 67
solitarius, 67, 94
Vireosylvia olivacea, 66
Virgularia pusilla, nov. sp., 184
Volucella, unknown larva allied to, 126
W.
Wilsonia minuta, 83, 95
mitrata, 64, 83
pusilla, 64, 94
X.
Xena Sabinii, 90
Xenidae, 148
Z.
Zenadura carolinensis, 75, 93, 96
Zoanthacea, 147
Zoanthidae, 147
Zonotrichia albicollis, 71, 94
leucoprys, 71, 94
Zygema exulans, 20
[7
Zygeniidae, notes on the family of,
Larva, 19
Pupa, 20
Zygeniae, 29
PLATE 7.

**FREDERICELLA REGINA** Leidy, Mss.

Fig. 1.* One colony, life size, with all the branches attached. (Gorham, Me.)

Fig. 2. Two branches of one colony: one attached and one free. (Cambridge, Mass.)

Fig. 3. Attached branch of one colony. (Gorham, Me.)

Fig. 4. Magnified view of one adult zozid. (Norway, Me.) D, ectocyst; E, endocyst; V, funiculus; M, gastric retractors; M', lophophoric retractors; M'', brachial retractors; N, anterior retentors; N', posterior retentors; F, brachial collar; G, calyx; H, tentacles.

Fig. 5. † Section of a young specimen, showing the internal structure and the limited extent of the invaginated fold. (Cambridge, Mass.) D, ectocyst; E, endocyst; B, invaginated fold; Y, bud; N, anterior retentors; K, oesophagus; H'', cilia; K''', oesophageal valve; K', stomach; K''', position of intestinal valve; K'', intestine; K, anus; I, lophophore; I', epistome; I'', mouth; H, tentacles; F, brachial collar; S, nerve mass.

Fig. 6. † Lateral view of an invaginated specimen, showing the shape of the coenoecial orifice. A''', orifice; L, region of the sphincter; D, ectocyst; E, endocyst.

Fig. 7. View of the same from above.

Fig. 8. Front view of a zooid, showing the incipient arms and the relative positions of the muscles. M', lophophoric retractors; M'', brachial retractors; I', epistome.

*This figure was drawn and presented to me by Mr. Mcrse.

†This figure is part of a study drawing made by Prof. H. J. Clark, and obligingly placed at my disposal by him.

‡All figures with no locality mentioned must be referred to the habitat last named; thus in Pl. 7, Figs. 6, 7 and 8 are all from the same locality as Fig. 5.
PLATE 8.

Plumatella Arethusa Hyatt.

Fig. 1. General view of one colony, life size, with most of the polypides retracted. (Norway, Me.) Three apertures in the ectocyst of the main trunk indicate the former positions of as many living polypides, and show this colony to have been a branch of a much larger colony, from which it has been separated by the death and disappearance of the original stock.

Fig. 2. One polypide evaginated, with a younger polypide from the same cell invaginated. D, ectocyst; E, endocyst; Y, bud; M, gastric retractors; M', lophophoric retractors; M'', brachial retractors; M', trunks of the retractors. F, brachial collar; V, funiculus; W, statoblasts; W''', gelatinous envelope; N, anterior retentors; N', posterior retentors; A'''', concccial orifice; L, region of the sphincter.

Fig. 4. View of the concccial orifice of fig. 2, from above, showing the four broad plications of the invaginated fold. The crenulations on the border are produced by the contraction of the sphincter, and do not indicate cellular structure.

Fig. 5. Special view, showing the arrangement of the retentor muscles around the invaginated fold of the evaginated zooid in fig. 2. The five anterior rows of the posterior retentors are contracted, and have drawn the external wall into five slightly crenulated folds. N, anterior retentors; N', posterior retentors; L, region of the sphincter.

Fig. 6. View of the partial division between the cell of fig. 2 and the preceding polypides, formed by an infolding and thickening of the endocyst. D, ectocyst; E, endocyst.

Figs. 7, 8, 9. Upper and lower sides and profile view of the statoblast. W', horny sheath; W'', annular sheath; W''', gelatinous envelope.

Fig. 10. View of a dead and half decayed specimen, showing the peculiar constrictions of the cell occasioned by annular muscular bands. D, ectocyst; E, endocyst; H, tentacles; L', mouth; L, region of the sphincter; K', stomach; M, trunk of the retractors.

Plumatella diffusa Leidy.

Fig. 11. An old colony of life size, with but few living polypides. (Cambridge, Mass.)

Fig. 12. Enlarged lateral view of a branch from a younger colony, showing different degrees of invagination. First cell on the left has even the upper pliable part of the ectocyst drawn in; second cell is vacant, the polypide and softer parts having entirely decayed; third, fourth and sixth cells show different degrees of invagination.

Fig. 13. Enlarged view of another variety of this species with all the polypides retracted.

Fig. 14. Enlarged ventral view of the expanded crest of a polypide from fig. 13. M', lophophoric retractor; M'', brachial retractors.
PLATE 9.

PLUMATELLA VITREA Hyatt.

Fig. 1. Enlarged view of five groups on one branch, corresponding to the first five on the left of the branch below, fig. 2. (Cambridge, Mass.)

Fig. 2. View of one branch, natural size.

Fig. 3. Shows the great extent to which the polypide is often evaginated. D, ectocyst; E, endocyst; B, invaginated fold; K', stomach.

PECTINATELLA MAGNIFICA Leidy.

Fig. 4. Outline of a mass gathered on the stump of a dead branch. (Norway, Me.) The outline of the branch where it is covered by the mass, is indicated by a dotted line. This figure shows the general aspect of the mass, the great thickness of the ectocyst, and the general arrangement of the colonies. A, outlines of ccencecia; D, ectocyst.

Fig. 5. The outline of a colony, natural size, from a large mass, showing the radiating and tripartite character of the lobes. A', ccencecial trunk; A'', ccencecial lobes, divided into three minor lobes.

Fig. 6. Ideal transverse section of the same, with the polypides expanded. W, statoblasts; A', ccencecial trunk; C, polypide.

Fig. 7. The colony represented in the outline of fig. 5, after being treated with alcohol. C', dead and retracted polypides; A', ccencecial trunk; A'', ccencecial lobes; W, statoblasts.

Fig. 8. Younger colony, showing the central polypide.

Fig. 9. Young colony, showing the genesis of five polypides, the progenitors of an equal number of branches; from the central polypide.

Fig. 10. A young colony enlarged, showing the arrangement of the polypides. (Cambridge, Mass.)

Fig. 11. A very old colony; the ccencecial trunk occupied by numerous statoblasts, and the half absorbed remains of dead polypides. W, statoblasts; C', dead polypides.

Fig. 12. Ventral view of a closely retracted polypide, showing the positions and relations of the three pairs of retractors. (Norway, Me.) K', bottom of the stomach; K, part of the oesophagus; M, gastric retractors; M', lophophoric retractors; M'', brachial retractors; N, anterior retentors.

Fig. 13. Lateral view of a retracted polypide, showing the aspect of the fourth membrane and of the retractors during the process of invagination. J''', fourth membrane of the alimentary canal; M, gastric retractors; M'', brachial retractors; V, funiculis; K, oesophagus; K', stomach; K'', intestine; I, lophophore; H, tentacles.

CRISTATELLA OPHIDIOIDEA Hyatt.

Fig. 14. View from above of the lophophore of an immature polypide. The arms are still joined near the extremities, and the tentacles and calyx along the line of the juncture remain undeveloped. (Norway, Me.)
PLATE 10.

PECTINATELLA MAGNIFICA Leidy.

Fig. 1. Enlarged view of one polypide situated at the end of a lobe. (Norway, Me.) The full adult growth of the terminal tentacles is not yet attained. They become about one-third longer in the adult. A', cavity of the coenecial lobe; D, common ectocyst; E, endocyst of the coenecium and polypide; J, hepatic folds; M', lophophoric retractors; M'', brachial retractors; N, anterior retentors; N' posterior retentors.

Figs. 2, 3, 4. The upper and lower side, and profile of the statoblast. W', horny sheath; W'', annular sheath; W''', spines.
PLATE 11.

PECTINATELLA MAGNIFICA Leidy.

Fig. 1.* Enlarged longitudinal section exhibiting a portion of the left arm and the left side of the body, of a polypide. The ganglion, however, is from the right side of the body, towards the observer, and is supposed to be pressed inwards, and away from the observer, in order to show its relation to the neural partition and the polypidal nerve. (Norway, Me.) H, tentacles; H', tubular interior of the tentacles; G, calyx; H", cilia; O, bases of the outer tentacular bands; O', fibres of the inner tentacular bands, seen from the outside; I', epistome; P, one-half of the median muscle of the epistome; P', left lateral muscle of the epistome; R, parietal fibres, probably abnormal, enveloped by the fourth membrane; I, lophophore; I", mouth; E' the first, E", the second, E"', the third, and E"'', the fourth membrane of the endocyst; F, brachial collar; F' neural partition; K, oesophagus; K', stomach; K", intestine; K"', oesophageal valve; K'''', intestinal valve; K', anus; J', the first, J", the second, J'''', the third, and J''''', the fourth membrane of the alimentary canal; S', right ganglion; T, right lophophoric nerve trunk severed near the base; T', right epistomical nerve trunk; T", right brachial nerve trunk severed near the base; T'''', right polypidal nerve trunk.

Fig. 2. Enlarged ganglion of another specimen from the same colony as fig. 1, showing the extreme variability of the ganglia and nerve trunks. T, right lophophoric nerve trunk; T', right epistomical nerve trunk; T", right brachial nerve trunk; T'''', right polypidal nerve trunk.

Fig. 3. Shows the same ganglion contracted, the nerve trunks indicated by the same letters.

*This figure is composed from numerous drawings of different individuals. The number of the membranes in the tentacles, as has been explained in the text, was inferred but not observed.
PLATE 12.

PECTINATELLA MAGNIFICA Leidy.

Fig. 1.* Front view of a polypide much enlarged, with the arms removed, showing the under side of the lophophore. (Norway, Me.) E, endocyst; B, invaginated fold; H', tubular base of the tentacles; Z, clear spaces in the endocyst; L', brachial contractors; M, position of the lophophoric flexor; I', outline of the epistome; S, nerve mass; T, lophophoric nerve trunks; T'', brachial nerve trunks; T''', polypidal nerve trunks; K, oesophagus; K''', oesophageal valve; K', stomach; K'''''', intestinal valve; K''', intestine; K, anus; M', lophophoric retractor; M'', brachial retractors; F, brachial collar; N, anterior retentors; N', posterior retentors.

Fig. 2. Lateral view of a portion of the inside of one of the arms, showing the fibres of the inner and outer tentacular bands. H, bases of the tentacles; Z, clear spaces in the endocyst; I, lophophore; E', the first, E'', the second, E''', the third, and E'''''', the fourth membrane of the endocyst; O, bases of the outer tentacular bands; O', fibres of the inner tentacular bands. The third membrane, E'''''', is lifted from the second, E'''', by the action of the lower fibres of the brachial contractor, which also form the knee-like ridge at L'.

*This figure is composed from numerous drawings of different individuals.
A. Hyatt, from Nat. E. S. Morse, on Wood. J. F. Richardson, Portland, Eng. A. Holland, Boston, Printer.
PLATE 13.

Cristatella ophidioidea Hyatt.

Fig. 1. A colony of natural size in its natural position. The polypides are figured at the ends only, the outline of the colony between them being indicated by dotted lines. (Norway, Me.)

Fig. 2. Enlarged view of the underside of one-half of a young colony with the ectocyst and endocyst removed from a portion of the base, disclosing the stomachs of the polypides and the bases of the muscular walls. On the border are the buds attached to the upper side of the endocyst, and in the centre is the inverted cone formed by the interior edges of the muscular walls. On the left, the uncovered portion, the white lines show the positions of the muscular walls, but on the right, the covered portion, they show only the temporary external folds of the endocyst caused by the contraction of the coencecium. The relations and positions of all these parts are best explained by reference to the ideal section of this colony, as depicted in fig. 3, the lettering being the same in both; with the exception of K', stomachs of adult polypides partially retracted, and †, stomach of an evaginated polypide in fig. 2; and D, ectocyst in fig. 3.

Fig. 3. E, endocyst; C, stomach of polypides wholly retracted; Q, muscular walls; Y, buds; Y', immature polypides, capable of evagination; † X, fixed statoblasts; A', coenoecial trunk.

Fig. 4. View from above of a portion of the border of the same colony when expanded to about twice the vertical height of fig. 3. Lettering same as in preceding figures, with the exception of A'', coenoecial tubes, and A''', coenoecial orifices. Some of the latter are closed, and some, indicated by dotted lines, are open; the polypides, however, are omitted from the latter, in order to give a better view of the coencecium.

Fig. 5. Enlarged coenoecial cell of the first row, the orifice closed over the invaginated polypide. A''', coenoecial orifice; Q, attachments of the muscular walls of the cell; N, anterior retentors.

Fig. 6. Transverse section of the same, viewed from the ventral side. A''', coenoecial orifice; Q, muscular walls; N, anterior retentors; H, tentacles.

Fig. 7. View of a fully invaginated polypide of the first row, from below, with the endocyst removed from that side. The gastric and part of the lophophoric retractors, have been entirely omitted. A''', coenoecial orifice; Q, muscular walls; M, trunk of retractor muscles; K', stomach.

* When this figure was drawn, I had, as I supposed, observed three rows of full grown polypides on the coencecium as in fig. 2. This, however, is probably erroneous, and I doubt whether at any time of the life of the colony, there are more than two living rows of fully grown polypides and one row of immature polypides. In this section, therefore, the innermost rows should have been represented in a retracted condition, the polypides dead and partly absorbed.

† For a magnified view of crest from above, see Pl. 9, fig. 14.
Fig. 8. A tube isolated and viewed from the lower side. Y, bud attached to the upper endocyst; X, young, fixed statoblast attached to the lower endocyst; Q, coæcal walls; Q, base of membranous ridge; E, endocyst.

Fig. 9. Two figures of the same statoblast, showing the variations in the form and position of the vacant spot in the statoblast of fig. 8.

Fig. 10. View of the same from the upper side, showing the membranous ridge crossing the statoblast and apparently connecting with the endocyst on the upper side.

Fig. 11. An older specimen, in which the ridge has formed a tube.

Fig. 12. A still older specimen, from the interior of the coæcum, showing the elliptical depression in the horny sheath.

Fig. 13. View of the lophophore from above, with the tentacles and calyx removed, showing the distribution of the nerves. H, bases of the tentacles; G, calyx; M, lophophoric flexor; U, lophophoric nerve branches; U', tentacular nerve branches; I', epistome; I'' mouth.

Fig. 14. Epistome isolated and viewed from above, showing the muscles. P, median muscle; P', lateral muscles.

Fig. 15. Lateral view of a portion of the interior of one arm with the lophophore removed, showing the outer and inner tentacular bands, and the membranes of the endocyst in an alcoholic specimen. O, outer tentacular bands; O', inner tentacular bands.

Fig. 16. Direct and profile views of a group of cells from the first membrane of the coæcal endocyst of fig. 2.

PLATE 14.

CRISTATELLA OPHIDIOIDEA Hyatt.

Fig. 1. Magnified view of an adult polypide in its cell. E, endocyst; Q, muscular walls of the cell; M, gastric retractors; M', lophophoric retractors; M'', brachial retractors; N, anterior retentors; Z, clear spaces in the endocyst between the bases of the outer tentacular bands; O, bases of outer tentacular bands.

Figs. 2, 3, 4. Upper and lower side, and profile view of statoblast. W', horny sheath; W'', annular sheath; W''' spines. Of the last, there are in nature twenty-two short, and thirty-two long ones.

Fig. 5. View of the anus, showing its oblate form, and also the great breadth of the intestine, when compared with the oesophagus and the upper part of the stomach in the back ground; K, oesophagus; K', stomach; K'', intestine; K, anus.

Fig. 6. Section of stomach, showing the hepatic folds. J, hepatic folds.

Fig. 7. Oblique view of the tip of a tentacle, showing the fan-shaped attachments of the tentacular bands.