PROCEEDINGS

OF THE

BOSTON SOCIETY OF NATURAL HISTORY.

TAKEN FROM THE SOCIETY'S RECORDS.

Annual Meeting, May 6, 1868.

The President in the chair. Forty-six members present.

Mr. S. H. Scudder presented the following Report of the Custodian for the past year: —

During the year now brought to a close, the work of construction, partially sketched in my last report, has been carried successfully forward, and to-night for the first time, we hold our anniversary in the lecture hall, which has proved for eight months so well adapted to its purpose. In addition, two exhibition rooms have been fitted up, new cases built in several departments, and galleries constructed for the cabinets which will soon be required; the working apartments have been doubled in number and increased in efficiency; a second library room has been furnished and occupied; a printing office added to the establishment; and, on sanitary grounds, the Janitor's apartment entirely remodeled.

The completion of the lecture room has enabled us to carry out a long cherished plan of giving public courses of popular lectures on natural history—an experiment which the Society in its younger days was one of the first to inaugurate; the Council has not yet fully perfected its plans and two courses only have been given; the first, by Mr. E. S. Morse, Curator of Mollusks, upon the natural history of Shell Fish, a series of six lectures, at which about sixty persons were present; the second, by Mr. Horace Mann, Curator of Botany, upon the structure of Plants, a series of eight lectures, attended by about one hundred persons.

Twenty general meetings of the Society, seven of the Section of Microscopy, and nine of the Section of Entomology have been held during the year. The average attendance at the general meetings has been nearly forty, and at each of the Sections a little more than nine.

At these meetings, eighty-six communications — nearly double the number of the previous year—have been presented by thirty-nine individuals, viz., fifty-six communications by thirty-one individuals at the general meetings; four communications by two individuals at the meetings of the Section of Microscopy; and twenty-six communications by eight individuals at those of the Section of Entomology, under the following titles:—

A. Agassiz. On the position of the sandstone of the southern slope of a portion of Keweenaw Point, Lake Superior. *June*, 5, 1867.

Prof. L. Agassiz. Remarks upon the antiquity of man. *October* 16, 1867.

Remarks upon Dr. Wilder's paper, on the want of symmetry in leaves. *November* 6, 1867.

Comparison of the aurochs of Europe with the bison of America. *November* 6, 1867.

Remarks on the age of certain rocks in Scotland, formerly referred to the Old Red Sandstone. *November* 20, 1867.

Remarks upon the Rev. Mr. Perry's paper, on the Red Sandstone of Vermont. *December* 18, 1867.

Observations upon the classification of the Siluroid fishes. *December* 18, 1867.

T. T. Bouvé. Notice of new localities of minerals. *May* 1, 1867.

A. S. Bickmore. Some notes of a short journey on the Island of Yesso, and remarks on the Ainos. *December* 4, 1867.

Sketch of a journey through the interior of China from Canton to Haukow. *February* 19, 1868.

On the Ainos, or hairy men, of Yesso, Saghalien and the Kurile Islands. *March* 4, 1868.

Dr. T. M. Brewer. Defence of the house sparrow from the destructive habits attributed to it. *February* 5, 1868.

W. T. Brigham. Remarks on the form of volcanic craters. *November* 20, 1867.

Dr. E. P. Colby. Notice of the capture of Coccinella similis Rand. *November* 27, 1867.

J. Curtis. Notice of a stone image found in a cave near Knoxville, Tenn. *May* 15, 1867.

A. M. Edwards. Note on a point in the habits of Diatomaceæ and Desmidiaceæ. *January* 8, 1868.

Prof. Gamgee. On the use of carbonic oxide gas for the preservation of meat in large quantities. *April* 1, 1868.

Dr. John Green. On binocular vision. *July* 3, 1867.

Dr. H. Hagen. The Odonat-fauna of the Island of Cuba. *September* 25, 1867.

Remarks on a species of Chelifer found attached to the legs of a fly. *November* 27, 1867.

Lachlania abnormis, a new genus and species of Ephemerina from Cuba. *January* 22, 1868.

Remarks on some American species of Psocus. *January* 22, 1868.

Description of an apterous Termes from Japan. *February* 26, 1868.

Extracts from newspapers and private letters concerning a meteor seen in Prussia. *March* 18, 1868.

Notice of an orthopterous insect which deposits its eggs in the stems of the cotton plant. *March* 25, 1868.

On the Pseudoscorpions of America. *March* 25, 1868.

E. D. Harris. Remarks upon the character and habits of various breeds of domesticated pigeons. *January* 3, 1868.

J. L. Hayes. The Angora goat; its origin, culture and products. *March* 18, 1868.

W. Hoxie. Notice of a peculiar habit of blue jays. *June* 19, 1867.

Dr. C. T. Jackson. Analysis of fossil guano from the neighborhood of Charleston, S. C. *February* 19, 1868.
Recent methods for the preservation and coloration of wood. *April* 15, 1868.

Dr. B. Joy Jeffries. On the deceptive appearance which lines present when they meet at certain angles. *March* 18, 1868.

Dr. S. Kneeland. On the relation of the plumage of birds to their modes of nidification. *November* 20, 1867.

Dr. G. Lincecum. Notice of the destructive grasshoppers of Texas. *March* 25, 1868.

T. Lyman. Remarks on the artificial reproduction of the shad. *January* 3, 1868.
On methods used in hatching the spawn of the shad. *February* 19, 1868.

H. Mann. Remarks on the fruit of Cyclanthera explodens. *September* 18, 1867.

J. C. Merrill, Jr. Notice of the occurrence of Pieris rapæ in Vermont. *September* 25, 1867.

E. S. Morse. Remarks on the principle of cephalization applied to the classification of Mollusca. *September* 18, 1867.
Remarks on the shell-heaps of Casco Bay. *September* 18, 1867.
Remarks on the probable age of the shell-heaps of Casco Bay. *October* 2, 1867.
On the mode of growth of a new entomostracous Crustacean. *March* 4, 1868.

W. H. Niles. Remarks on the principle of cephalization applied to the classification of Echinoderms. *September* 18, 1867.

Dr. A. S. Packard, Jr. On the development of a species of Diplax. *January* 22, 1868.

Remarks on insects which live, during their earlier stages, in brine or salt water. *January* 22, 1868.

On the structure of the ovipositor and of the parts in the male insect homologous to it. *February* 26, 1868.

Rev. J. B. Perry. Queries on the Red Sandstone of Vermont, and its relations to other rocks. *December* 18, 1867.

E. N. Riotte. Description of a new mineral, stetefeldtite. *May* 1, 1867.

F. G. Sanborn. Remarks on some interesting insects. *November* 27, 1867.

S. H. Scudder. Additional notes on the Odonata of the Isle of Pines and the White Mountains of New Hampshire. *September* 25, 1867.

Notes on the stridulation of some New England Orthoptera. *October* 23, 1867.

Remarks on the stridulation of Orthoptera. *November* 6, 1867.

Notice of a curious specimen of Diapheromera. *November* 27. 1867.

Remarks on Dr. Packard's paper, concerning the development of Diplax. *January* 22, 1868.

Considerations drawn from the study of Mole-crickets. *January* 22, 1868.

Supplement to a list of the butterflies of New England. *January* 22, 1868.

On the rank of the families of Orthoptera. *February* 5, 1868.

Notice of some new butterflies from Iowa. *February* 26, 1868.

Remarks on two new fossil insects from the carboniferous formation in America. *February* 26, 1868.

On an orthopterous insect which deposits its eggs in the stem of the cotton plant. *March* 25, 1868.

Description of a new species of butterfly, Thecla Juanita. *March* 25, 1868.

C. Stodder. Description of Navicula carassius Ehr. *October* 9. 1867.

Remarks upon the resolution of Nobert's test lines. *December* 11, 1867.

On soundings made off the coast of Maine, near Mt. Desert Island. *April* 8, 1868.

Dr. D. H. Storer. Notice of his history of the fishes of Massachusetts. *November* 6, 1867.

Dr. E. L. Sturtevant. Note on the occurrence of Pinus strobi in a peat bog in Framingham, Mass. *February* 19, 1868.

L. Trouvelot. On some parasites of the common rabbit. *March* 25, 1868.

P. R. Uhler. Some remarks upon the Odonata of Hayti. *September* 25, 1867.

G. L. Vose. On the distortion of pebbles in conglomerates; with illustrations from Rangely Lake, in Maine. *January* 3, 1868.

Rev. R. C. Waterston. On the changes undergone by feathers in a pillow-case long in use. *June* 5, 1867.

Tribute to Mr. Thomas Bulfinch. *June* 19, 1867.

W. Wickersham. On the travelling of rocks. *July* 3, 1867.

Dr. B. G. Wilder. Description of a new method of collecting and arranging information. *May* 15, 1868.

Remarks on the so-called gorilla and "what is it" in Barnum's Museum. *October* 16, 1867.

Remarks upon the want of perfect symmetry in the leaves of elms and hop-hornbeams. *November* 6, 1867.

Dr. J. Wyman. Notice of a shell-heap in Salisbury, Mass. *May* 15, 1867.

On symmetry and homology in limbs. *June* 5, 1867.

Notice of the propensity of female spiders to destroy their mates. *September* 18, 1867.

Description of the shell-heaps of Mt. Desert. *September* 18, 1867.

Remarks on a collection of flint implements from Norway and the Island of Rügen. *October* 2, 1867.

On the former occurrence of the great auk in Maine. *October* 16, 1867.

Notice of a visit to the Dighton Rock. *October* 16, 1867.

On the position of the foramen magnum in the different races of men. *November* 20, 1867.

Résumé of observations on the shell-heaps of New England. *December* 4, 1867.
On the after-impression of objects. *March* 18, 1868.
Observations upon crania. *April* 15, 1868.

We have elected during the past year one Honorary Member, two Corresponding and forty Resident Members. Of the latter, thirteen have not yet ratified their election by complying with the requirements of the Constitution; two of the thirteen have paid their entrance fee but have not yet signed the Constitution; while eleven have neither signed the Constitution nor paid the initiation. By a recent change in the By-Law regulating admission to the Society, persons elected to resident membership are required to comply with specified conditions within six months or forfeit the opportunity of fellowship; and, by a vote of the Council, those who were elected previous to 1867 and neglected to respond within a definite time to a recent, special request to ratify their election to membership, were dropped from the list. Lists of members will hereafter be printed annually and the confusion and mistakes of former years avoided.

There has been no essential change in the subscription list of our Publications; a few names have been withdrawn and a few more added.

Early in the year we issued the second part of our Memoirs, containing papers by Dr. Coues, on the Osteology and Myology of the Colymbus torquatus; by Mr. Scudder, on two fossil insects from the carboniferous formation of Illinois, with a discussion of the importance, for classification, of characters drawn from the neuration of the wing; by Mr. Hyatt, on the occurence of features characteristic of old age among Cephalopods, at the period of the decadence of that group; and by Dr. Packard, on the glacial phenomena he had observed in Labrador and Maine, together with a review of the recent invertebrates of Labrador. Within a few weeks, the third part of the Memoirs has been published and the printing of the fourth and concluding part commenced. The third part contains two papers; one by Prof. Clark, giving the description and history of many species of sponges, for the purpose of proving their animality; the other, by Mr. Brigham, embracing both his own and all previous observations upon the volcanoes and volcanic phenomena of the Hawaiian Islands.

We have completed the eleventh volume of the Proceedings, issued the Annual Report for 1867, and published a small edition of the supplement to Prof. Hentz's Araneides of the United States, extracted from the eleventh volume of the Proceedings. A new edition of six signatures of the eighth volume of the Proceedings has been printed and copies of the complete volume can now be had. In the twelfth volume some improvements in typography will be introduced. About sixty pages of the Entomological Correspondence of the late Dr. T. W. Harris (mentioned in the last Report) are in type; the book will be issued during the coming summer or autumn as the first of a series of independent works, to be entitled Occasional Papers of the Boston Society of Natural History. The first Annual of the Society, containing its Charter and Constitution, a sketch of its history, catalogues of the officers and members with their addresses and other similar lists, may be expected in a few days. It will be published every May, and furnished gratuitously to any member who will keep the Secretary informed of his correct address.

The establishment of a printing office within the Museum has enabled us not only to print an unusual amount apart from our regular issues, but the Proceedings themselves have advanced so rapidly that we have ready for delivery all the printed Records of the Society up to this evening's report. A comparison of the dates of the meetings for the past ten years, with those of the signatures of the Proceedings in which the records occur, will show that on an average, six or eight months have elapsed between the reading and the publication of a paper; we now propose to maintain the position we have gained and print every article with the utmost promptness.

By exchanges with correspondents we have sent away 270 parts of the Memoirs, 110 parts of the old Journal (half of which were imperfect), 66 complete volumes of the Proceedings, unbound sheets which would more than double the amount, and 41 copies of the annual Reports. The Smithsonian Institution, by its transmission of these publications to all parts of the world, free of expense, has laid us under renewed obligations.

In response to our requests we have received from the following Societies many early volumes of their Transactions:

Société des Sciences Naturelles	Neuchâtel.
Journal de Conchyliologie	Paris.
Entomological Society	London.
Senckenbergische naturforschende Gesellschaft	Frankfurt a. M.
Naturhistorisch-medizinischer Verein	Heidelberg.
Imper. Russkoe Geographitsheskoe Obshtshestvo	St. Petersburg.
Obshtshestvo Seljskago Khozjaistva Joujnoi Rossii	Odessa.
Naturhistorische Gesellschaft	Nürnberg.
Zeeuwsch Genootschap der Wetenschappen	Middelburg.
Académie Impériale des Sciences, Arts et Belles-Lettres.	Dijon.
Société des Sciences Physiques et Naturelles	Bordeaux.
Académie Royale des Sciences, des Lettres et des Beaux-Arts de Belgique	Bruxelles.
Naturforschende Gesellschaft	Bern.
Naturhistorischer Verein	Augsburg.
Deutsche geologische Gesellschaft	Berlin.
Royal Society	Edinburgh.
Hollandsche Maatschappij der Wetenschappen	Haarlem.
Naturforschende Gesellschaft des Osterlandes	Altenburg.
Liverpool Geological Society	Liverpool.
Glasgow Philosophical Society	Glasgow.
Société Royale de Botanique de Belgique	Bruxelles.

We must especially thank the Academy of Dijon, the Geological Society of Berlin, the Royal Society of Edinburgh, the Society of Sciences at Haarlem and the Natural History Society of Altenburg, which have favored us with very extensive series of their publications, long needed in our library.

We have now upon our lists the names of three hundred and fourteen corresponding institutions, fifteen of which have been added during the year, viz:—

State Agricultural Society	Albany.
Société d'Émulation du Doubs	Besançon.
Werner-Verein zur geologischen Durchforschung von Mähren und Schlesien	Brünn.
Société Malacologique de Belgique	Bruxelles.
Journal of Anatomy and Physiology	Cambridge, Eng.
Association Zoologique du Léman	Genève.
Verein für siebenbürgische Landeskunde	Hermannstadt.
Société d'Agriculture, Sciences, Arts et Commerce du Puy	Le Puy.
Journal of Travel and Natural History	London.
American Athenæum	New York.
Revue de l'Horticulture	Paris.
Landes-ober-Realschule und Real-Gymnasium . .	St. Pölten.
Neues Jahrbuch für Mineralogie, Geologie und Palaeontologie	Stuttgart.
Société d'Agriculture, Sciences, Arts et Belles-Lettres du Département d'Indre-et-Loire	Tours.
Scientific Association of Trinidad	Trinidad.

One topic, connected with the general interests of the Society, demands our attention. During the life of our late honored Vice President, Dr. A. A. Gould, the Legislature of Massachusetts authorized the republication of his valuable work on the Invertebrates of Massachusetts, with additional text and illustrations; a small edition of twelve hundred copies was provided for, at an expense of $4000; two hundred copies of the work were to be placed in the hands of the author, and about four hundred distributed among the members of the legislature and officers of the Commonwealth; the disposition of the residue was left to a future legislature. Dr. Gould, as you all know, died before the completion of the work, and the Governor very appropriately commissioned Mr. W. G. Binney to finish the task. Owing to the loss of the original copperplates and the advanced price of labor and material, Mr. Binney was obliged to ask for a double appropriation; the request has just been granted, and, at the same time, a further distribution of the edition determined on, by which each member of the present legislature and every public library in the Commonwealth will be provided with a copy, and the remainder—not fifty copies at the most—placed for distribution in the hands of the Trustees of the State Library. Anxious that a work so important, and so creditable to the State should be widely circulated among scientific institutions, the Council of the Society petitioned for an extension of the edition and a supply of five hundred copies to be sent abroad through its agency. The request was acknowledged to be reasonable and more important to the State than to the Society, but was denied upon the ground of its expense (about $1500). The meagre edition provided for, will thus be almost exclusively distributed among those who will value it little for its scientific merits; and, since neither the text is to be stereotyped nor the plates preserved, it is improbable that another edition will ever be printed. It will be known in Europe, only by a few copies in the large libraries, and before many years we shall hear unjust complaints of the negligence of European authors to give due credit to American writers.

The following table gives a summary of the additions to the Library by volumes, parts of volumes, pamphlets and maps or charts.

	Octavo.			Quarto.			Folio.			Maps and	
	vls	pts	ph	vls	pts	ph	vls	pts	ph	Ch'ts	To'l
Books presented by individuals . .	57	8	101	33	3	13	19	1		8	243
" " " Publishing Com.		14	4		1	2					21
" purchased	17	14	205	5	24	6	2	21	1		295
" deposited in Binney library .	27		3	3			2				35
" " by the Republican Institution	20										20
" received in exchange . . .	241	476	72	61	158	17		56		2	1083
Total .	362	512	385	102	186	38	23	78	1	10	1697

As an additional room has been fitted up for the library, much of the time needed for the completion of unfinished work, mentioned in former reports, has been used in arranging and numbering the books in the new apartment and rearranging those in the front library. Temporary assistance has, however, been granted during the past few months, and some progress effected. The alcove catalogue of the front library is nearly completed, the pamphlets have been newly classified and their cataloguing commenced. A few months ago the Council appropriated several hundred dollars towards binding serial works, and we are pleased to announce that it has recently authorized the employment of a binder in the building; in a short time the appearance of the library will be greatly improved, few books having been bound during the past five years.

The gallery of the front library is now devoted to the transactions of societies and the Lloyd library of the Republican Institution. The floor is occupied by works on general anatomy and natural history, vertebrates, botany, local faunæ and floræ, geology, mineralogy, travels and voyages. The rear library contains the Bailey library of microscopy, works on insects, mollusks and radiates, scientific journals, encyclopædias, bibliographical works, and other volumes on miscellaneous topics. We have also provided a cabinet of portfolios and sliding shelves for the imperial folios, cases for the books recently received and additional closets for the publications.

Four hundred and sixty-four books have been borrowed from the Library by seventy-five persons.

The additions to the Museum are estimated at 115,000 specimens received in one hundred and thirty-nine lots; the most important are the following; the North American birds' eggs and the series of humming birds and nests, selected in Europe by the late Dr. Henry Bryant, and presented by Mrs. Bryant; the collection of rock specimens, minerals and fossils, received from Dr. C. T. Jackson, and the Guatemalan animals purchased of Dr. Van Patten.

Under the joint auspices of the Smithsonian Institution and this Society, Col. Grayson has successfully explored the natural history, and especially the ornithology, of the island of Socorro, one of the Revillagigedos, situated off the west coast of America, in latitude 19° N. The birds obtained, although not very numerous, prove of peculiar interest; they are nearly all new to science, and distinct from the species, either of the neighboring continent, or of the Tres Marias, islands still nearer the coast. The manuscript notes of Col. Grayson, together with the animals obtained, are in the hands of Professor Baird, who will furnish a memoir upon them, for our publications.

Besides the work of construction already referred to, we have opened in the Museum a geological room, together with the botanical room in its rear, which had been closed during the preparation of the former. Storage, packing and spirit rooms have been fitted up in the basement, and the elevator rendered more serviceable by its removal to the opposite side of the building. About a year ago, the Council secured temporary aid for the arrangement of the Mollusks, and in the month of January, engaged Mr. F. G. Sanborn as permanent assistant. In addition, a new system of labelling the collections has been lately introduced, which will add much to their unity, attractive appearance and ready usefulness, and the cases have been numbered, as a preliminary step to the preparation of a Visitor's Guide Book.

The number of visitors to the museum has probably increased, but the demand upon the Janitor's time during the work of construction has rendered his enumeration very imperfect; by count there have been 34,625 visitors during the year. The museum has been open to the public one hundred and five days; on Thursdays, to ticket holders, fifty-three days; the average attendance on public days has been three hundred and nineteen; the greatest number of visitors, during any one day, eight hundred and forty, on the second of November. The facilities of approach to the museum offered by the new line of horse cars, will doubtless augment these numbers in the future.

The additions to the department of Mammals and Comparative Anatomy during the year, are as follows: skeletons, 1; parts of skeletons, 1; skulls, 6; skins of mammals, 9; mammals in spirits, 4; miscellaneous, 2; total 23. The most important of these is a collection of skulls from Arizona, given by Dr. J. W. Merriam, and a fresh skin of a male caribou, two years old, received from Messrs. J. H. and C. D. Presho. About two hundred unmounted skins have been c refully examined, poisoned and packed away in glazed cases, where they will remain in safety until they can be mounted. The horns of ruminants, which were taken down during the construction of a gallery in the room devoted to skeletons and skulls, have been replaced in position, and newly labelled. Other additions have been made to this department by purchase, and through the favor of Drs. G. H. Brown, J. B. S. Jackson, W. M. Ogden, Messrs. W. T. Brigham, J. W. Clarke, W. W. Goodhue, J. R. Johnson, J. C. Little, Jr., S. J. Mixter, J. Norton, F. G. Sanborn, C. A. Stearns and the Smithsonian Institution.

Two cases have been added to the Bird cabinets by closing up windows on the southwesterly side of the square rooms, and new skylights constructed, which throw a much better light upon the specimens; by the removal of the reptiles from the main hall, the whole of the first gallery has been devoted to birds, thus partially relieving the crowded condition of certain cases, and enabling the Curator to make some progress toward a special collection of Massachusetts birds; specimens of the latter are solicited, either in the fresh state or in skins. The following list of desiderata has been furnished by the Curator:—

Sparrow Hawk.	Solitary Vireo.
Marsh "	Cat-Bird.
Hairy Woodpecker.	Brown Thrush or Thrasher.
Yellow-bellied "	Common Wren.
Ruby-throated Humming-bird.	Brown Creeper.
Whippoorwill.	Chickadee.
Night Hawk.	Goldfinch. (♀)
King-bird.	American Crossbill. (♀)
Least Flycatcher.	White-winged " (♀)
Acadian "	Bay-winged Finch.
Traill's "	Yellow-winged Sparrow.
Wood Thrush.	Blue Snow-Bird.
Blue-Bird.	Chipping Sparrow.
Ruby-crowned Wren.	Fox-coloured "
Golden-crested "	Black-throated Bunting.
Mourning Warbler.	Baltimore Oriole. (♂)
Connecticut "	Crow.
Worm-eating "	American Bittern.
Nashville "	Night Heron.
Black-throated Green Warbler.	Willet.
" " Blue "	Dusky Duck.
Blackburnian "	Pintail.
Prairie "	King Eider.
Scarlet Tanager. (♀)	Common Tern.
Bank Swallow.	Arctic "
Great Northern Shrike or Butcher-Bird.	Roseate "
Warbling Vireo.	Least "
	Red-throated Loon.

Most valuable additions have been made to this department during the year. Besides the rich and varied series of humming birds, embracing over seven hundred specimens, and perhaps three hundred species—the gift of Mrs. Bryant—a collection of more than two thousand Guatamalan birds was purchased from Dr. Van Patten. For other additions we are indebted to Mrs. H. F. Chase, Messrs. G. A. Boardman, J. E. Cabot, C. Cowing, E. C. Derby, J. Ennis, C. Q. Hill, P.

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R. Hunt, F. Perrin, J. Ritchie, S. H. Sylvester and the Smithsonian Institution.

The department of the Nests and Eggs of Birds has been enriched by the collection of eggs presented by Mrs. Bryant, numbering 1500 specimens of more than 350 species; the greater part are from North America, and were chosen by Dr. Bryant himself, as a first selection from the duplicates of the Smithsonian Institution. A suite of nests, 75 in number, accompanied the collection of humming birds, already mentioned as the gift of Mrs. Bryant. A number of nests and eggs of American birds have been received from the Smithsonian Institution, and a few other donations from Rev. J. M. Hubbard and Messrs. W. T. Brigham and D. F. Carlton.

The law permitting scientific museums to obtain alcohol free of excise, enabled us to purchase a large quantity at a low price;[1] as a sufficient number of glass jars has also been procured, the restrictions formerly resting on the Curators of reptiles and fishes, are now wholly removed; a room has been furnished for their special use, and the public will soon be invited to witness the progress which has been made in these departments.

The dry specimens of Reptiles have been carefully poisoned and prepared for exhibition, and the wet specimens examined, separated and placed in a safe condition. The collection will soon be transferred to new cases, where the American and foreign specimens are to be arranged separately by orders. The Curator reports eight hundred specimens in this department, to three hundred and thirty-three of which localities are attached. About fifty of these localized specimens are dry; of the alcoholic specimens, 155 are North American and 128 exotic; the former comprise 29 Ichthyodi or tailed batrachians, 20 Anura or tailless batrach-

[1] Unfortunately the law has been recently rescinded, and much of what we had obtained is already consumed.

ians, 65 Ophidians or serpents, 34 Saurians or lizards, and 7 Chelonians or turtles; the foreign specimens number 6 Ichthyodi, 15 Anura, 61 Ophidians, 43 Saurians, and 3 Chelonians, — most of the localized specimens representing as many different species. Where the locality of specimens is unknown (and this unfortunately includes more than half of the collection, although many of them are duplicates), the specimens are divided as follows: 51 Ichthyodi, 68 Anura, 285 Ophidians, 164 Saurians, and 10 Chelonians. These can only be used for anatomical purposes, or as illustrations of the different groups; in view of their great number, the Curator wishes to remind donors of the comparatively slight value of a specimen where the locality is unknown, and to express his regret that some of the donations of the past year have been deficient in this respect. Sixty-one specimens have been added to the department, the most valuable being a small collection of foreign species from Mr. W. T. Brigham, and a few reptiles from the Guatemalan collection purchased of Dr. Van Patten; for the rest we are indebted to Mrs. D. D. Hughes, Drs. G. H. Brown, and E. P. Colby, and Messrs. W. T. Brigham, R. C. Greenleaf, A. Reynolds and F. G. Sanborn.

As the Fishes have been stored for a long time, many of them in kegs and cans, they will require much preparation before they can be exhibited; yet the Curator hopes to open the room to the public within a few weeks, and to complete the arrangement of the collection during the present season. The most interesting additions to the department have been obtained by purchase; they comprise a series of specimens of small fish, collected by Mr. J. A. Allen, from small streams on either side of the "great divide" in central Iowa, separating the waters of the Mississippi and Missouri, and a few Guatemalan fish purchased of Dr. Van Patten. Drs. G. H. Brown, and J. Homans, Capt. N. E. Atwood, and

Messrs. E. Bicknell, N. H. Bishop, W. T. Brigham and P. R. Hunt, have made small donations during the year.

The meetings of the Section of Entomology have been remarkably sustained, often proving as full of interest as the general meetings of the Society; almost every month several papers have been read. By the construction of a working-room, the insect cabinets, formerly scattered through various parts of the building, have been brought together; during their storage in inaccessible places, some injury resulted from the ravages of Anthreni, and, although these pests have been carefully eradicated, only constant vigilance, which the centralization of the collection will now permit, can ensure its safety. Over forty trays have been arranged and placed on exhibition. The collection of Guatemalan insects, purchased of Dr. Van Patten, is very rich in duplicates, and enables us not only to effect exchanges with museums and individuals, but affords an opportunity, seldom enjoyed, of studying the variation of tropical species. With the assistance proffered by Mr. P. S. Sprague, about one thousand Coleoptera have been selected from this collection, set and arranged, while Mr. Sanborn has spread and displayed half as many Guatemalan Lepidoptera. The following persons have presented specimens to the department: Miss Lucy Brewer, Rev. I. F. Holton, Drs. G. H. Brown, S. Kneeland, I. T. Talbot, and C. E. Ware, Capt. Lewis, Messrs. E. N. Abbott, F. W. Brewer, W. S. Brewer, W. T. Brigham, J. W. Brooks, E. Burgess, E. C. Cabot, R. C. Greenleaf, C. Q. Hill, S. Hubbard, D. M. King, A. A. Kingman, T. Lyman, J. C. Merrill, Jr., A. Reynolds, S. H. Scudder and L. Wetherell.

The Lower Articulates remain in the condition reported a year ago; a few purchases have been made, and donations received from Drs. G. H. Brown, and J. B. S. Jackson, and Messrs. N. H. Bishop and W. T. Brigham.

At the time of the last annual meeting the Curator of Mollusks was engaged to devote three consecutive months to the arrangement of that collection; but mechanics were at work so long in the exhibition room and laboratory devoted to the department, that he could only commence his task a month after the expiration of the specified time; other engagements made it impossible for him to renew the agreement, but every day that could be spared since then has been given up to the collection. The labor has necessarily been of a preliminary character; boxes have been unpacked, complete suites separated from the Bartlett Florida collection, the old collections rearranged in the new room, and many of the specimens removed to new trays. Much time has been given to the Pratt collection, and the Massachusetts shells which it contains are all disposed in window cases, permanently mounted on fresh tablets with new labels; the arrangement of the collection will proceed as fast as possible, and a portion of the new room soon be open to the public. We are indebted to Mrs. Henry Bryant for a valuable collection of mollusks, mostly terrestrial, from the Bahamas and other parts of the West Indies, collected by Dr. Bryant. They have been placed for examination in the hands of Mr. Thomas Bland, of New York, who has made the land shells of the West Indies his special study. We have recently purchased an interesting collection of Hawaiian shells labelled by Mr. W. Harper Pease, and donations have been received from Mrs. Winslow, Drs. F. H. Brown, J. Homans and B. J. Jeffries and Messrs. W. T. Brigham, J. H. Huntington, C. A. Stearns and R. C. Stone.

The collection of Radiates is now in a satisfactory condition, so far as its safety and value for scientific study are concerned; the catalogue is nearly completed, the alcoholic collections have been placed in new jars, and many labels written. Much time must be expended in mounting the corals in their natural upright condition, and in making the collection generally interesting to the public. The additions have been few; we have received in exchange from the Museum of Yale College a selection of forty-eight corals and Echinoderms of twenty-one species, nearly all new to the collection, and in great part types of species from Panama and Peru, recently described by the Curator. Capt. Daniel H. Hutchinson has presented us with an exquisite specimen of sponge, the Euplectella speciosa or Venus flower basket, from the Island of Zebu, Philipines, and a few specimens have been received from Drs. G. H. Brown and J. B. S. Jackson, Capt. N. E. Atwood and Mr. F. A. Andrews.

A new room has been assigned to the department of Microscopy, and the rough material of the Bailey collection transferred to it. According to the provision of Professor Bailey's will, the mounted material, letters, and manuscripts have been placed, with the books, in a case constructed for that purpose in the rear Library. Instruments from the Boston optical works, and mounted specimens from the Essex Institute microscopical works have been exhibited at almost every meeting of the Section, and have added greatly to the general interest. Mr. C. P. Dillaway has presented specimens of soundings from Maine and Louisiana.

An additional cabinet has been constructed for the Herbarium, the herbarium itself partially rearranged and a new disposition made of the larger objects on exhibition. The Curator has devoted much time and labor to the extensive collection of Algæ bequeathed by Professor Bailey, and hopes to complete his work in a few weeks. A large collection of full-size paintings of Brazilian fruits, deposited in the botanical room by the artist, Mr. W. Ingalls, has attracted much attention. Donations have been received from Miss Lydia B. Felt, Drs. S. A. Bemis, S. Green, J. B. S. Jackson, B. J. Jeffries, S. Kneeland, E. L. Sturtevant and C. E. Ware and Messrs. L. Baker, H. D. Barnes, W. T.

Brigham, C. C. Frost, L. Hills, F. G. Sanborn, S. H. Scudder and C. A. Stearns.

The Curator of Palæontology reports that his department is in much the same condition as at the last annual meeting; previous to April, other duties prevented him from working upon the collections, but the first step toward a rearrangement has been made and the old plaster trays and colored labels will soon give place to new tablets and etiquettes. It is hoped that another year will see changes throughout nearly all of the collection. The most interesting addition has been the recent gift, by Mr. C. H. Dalton, of a suite of specimens from the lacustrine dwellings of Switzerland, illustrative of the food, implements, and dress of the prehistoric inhabitants; the most extensive donation was that of Dr. C. T. Jackson, consisting of several hundred fossils from various localities. The names of other donors are the Hon. David Sears, Dr. F. Müller, and Messrs. G. Barry, J. H. Huntington, A. A. Kingman and C. A. Stearns.

The Geological department has greatly progressed. As we promised in the last report, the collection was thrown open to the public soon after the annual meeting, and received its fair share of attention from visitors. It is already quite rich in volcanic products, and has been increased by a valuable donation of many thousand specimens, from Dr. C. T. Jackson; the unpacking and cleaning of this large accession, and the task of separating the fossils and minerals from the rocks, has occupied much time; the labelling will demand much more, but the Curator hopes the result will soon be seen on the shelves. A number of relief-maps of volcanic craters have been procured, and the Council has authorized the purchase of several hundred specimens of rocks, named by Dr. Krantz, of Bonn. The department has received donations from the Hons. Albert Fearing and David Sears, Drs. B. J. Jeffries and S. Kneeland and Messrs. H. P. Bowditch, J. C. J. Brown, J. W. Clarke, R. C. Greenleaf, J. H. Huntington, C. K. Landis, C. A. Stearns, G. L. Vose and D. Wellington and the Smithsonian Institution.

The Mineralogical collection is in good condition, but many changes of arrangement will doubtless be required on the publication of the new edition of Dana's Mineralogy. New floor cases have been provided for the metallurgic and economic department, in place of the old table cases so ill-suited to the exhibition of specimens, and the rearrangement of this division has progressed so rapidly that its completion is anticipated within a few weeks. The change will add greatly to the instructive character of the collection as a whole, and render it much more interesting to visitors generally. About 2,500 minerals are now on exhibition. Donations have been received from Miss L. Blaikie, Drs. F. H. Brown, C. T. Jackson, J. B. S. Jackson and J. W. Merriam and Messrs. B. W. Baldwin, D. F. Carleton, J. W. Clarke, G. C. Lane, W. H. Logan, J. J. May, O. S. Presbrey, C. J. Sprague and C. A. Stearns.

In closing, I wish to call your attention to a point of great importance, connected with the administration of the museum. The Annual of the Society, which will be placed in your hands in a few days, contains a short sketch of the history of the Society, showing from what slight beginnings the present Institution has arisen. The small collections, received at first, had a certain charm of novelty which attracted the lovers of nature, and were undoubtedly a principal means of sustaining the interest of its members; but the times have greatly changed; for, while the number of members who give their personal attention to the care of the collections is scarcely greater than in former years, the collections have increased an hundred fold, and the ratio of increase does not seem to lessen. Now it is manifestly impossible for such a state of things to continue, if the museum is to maintain an appearance creditable to the name and honor of the Society. On this account, several years ago, a regular Custodian was appointed; for the same reason, the Council found it necessary, within a few months, to engage the services of a permanent assistant, whose labors have already been felt in nearly every department. On similar grounds, I believe that, in a short time, the services of many assistants will be indispensable; indeed, I am convinced that at least one or two more are needed at the present moment, and that, from this time forward, the greater part of the work of the museum should be done by regular salaried assistants, under the direction of the officers. I am by no means singular in these views; they are shared by many, if not the majority, of the Council, and have recently found support in the very pertinent expressions of Mr. Bentham, the learned President of the Linnean Society of London.

In his last address before that body, he reviews the operations of the American Societies of Natural History, and, referring in the sequel directly to our Institution, says:—

"In America, as in Europe, almost every Natural History Society, small or large, begins by contemplating the formation of a museum, undefined as to limits; contributions are invited, and donations thankfully received from every quarter, without reference to value or practical utility. At first, whilst the Librarian, Secretary, or other manager, takes a personal interest in the arrangement and exhibition of the objects received; when donors can bring their friends to see their contributions displayed on shelves or in glass cases, with their own names paraded on the cards; when most of the members of the Society have the new feeling of a personal share in the ownership of the collections; when the number of specimens received is blazoned forth as a matter of pride and gratification;—these incipient museums may have considerable influence in stimulating collectors and observers of nature. But after a time these collections outgrow the Society's means; the specimens which may be required for study or comparison are encumbered by a mass of trash presented by persons who do not know what else to do with it, or who have attached a false value to the fruits of their own labors; the permanent officer can no longer have time to select for exhibition what is worthy of it, nor to arrange those which might be available for reference; and the Society cannot afford to maintain the necessary staff of keepers, even if they have a building large enough for the purpose. Packages and specimens are, however, still received, exhibited at meetings to elicit formal thanks, and then consigned to oblivion and decay in cupboards and garrets, the members generally taking no further interest in what they can make no further use of. If afterwards attention is called to this state of things, it may be felt that something must be done; the gratuitous aid of patriotic members is called in, and the museum may be more or less purged of trash, and partially arranged. But gratuitous aid, like voluntary subscriptions, is generally given on the spur of the moment, and can never be depended on for long-continued and ever-increasing demands; the collections relapse into a condition worse than the previous one, till at last the Society is obliged to dispose of them as a clog on, instead of an aid to, their operations. Such is the history of many a museum I could name, on the continent and at home, including our own; and such seems destined to be the career, on a large scale, of the Boston Society, notwithstanding its large invested funds, if something is not done to give it a permanent independence of individual, disinterested efforts. It is now in the gratuitous aid period; but when its present stores are doubled or quadrupled, when the thirteen or fourteen unpaid Curators must not only give their whole time to it, but require, each of them, one or more assistants to do the work usefully, it will not be done at all; and unless the Society receives that extensive support which can only be expected from the State, stowage, neglect, and destruction must ensue."

To these forcible words, no addition of my own is needed. I can only beg that, at an early day, they may receive the attention which their importance demands.

LETTERS RECEIVED

DURING THE YEAR ENDING APRIL 30, 1868.

From Dr. J. W. Dawson, Montreal, December 26th, 1867, in acknowledgment of his election as Honorary Member.

From Dr. G. L. Goodale, Saco, Me., March 5th, 1867; Rev. T. Coan, Hilo, Hawaii, March 15th, 1867; Dr. Carl Ritter von Scherzer, Vienna, November 5th, 1867; Mr. Andrew Murray, London, September 28th, 1867; Mr. Sanford B. Dole, Boston, April 22d, 1868, acknowledging their election as Corresponding Members.

From Mrs. E. B. Bryant, Boston, April 9th, 1868, in acknowledgment of the special act of the Council, electing her minor son a Life Member of the Society.

From Mr. W. H. Dall, St. Michaels, Russian America, August 1st, 1867, concerning his scientific labors in that region.

A circular from the Universitas Carolina Lundensis, March 9th, 1868, inviting the Society to attend the celebration of its two hundredth anniversary, in June.

A circular from the Portland Society of Natural History, accompanying one from the Quekett Microscopical Club, and offering to aid in carrying out the objects of the club.

From the Kongelige Danske Videnskabernes Selskab, Kjöbenhavn, July 1st, 1865; the Royal Society of Edinburgh, January 1st, 1866; Universitas Lugduno-Batava, August 3d, 1866; Bataafsch Genootschap der Proefondervindelijke Wijsbegeerte te Rotterdam, August 21st, 1866; Société Royale des Sciences à Upsal, September 15th, 1866; Naturforschender Verein in Brünn, November 4th, 1866; Académie Royale des Sciences à Amsterdam, October 11th, 1866; Kaiserliche Akademie der Wissenschaften in Wien, November 15th, 1866; Superintendent of the Geological Survey of India, Calcutta, November 22d, 1866; Naturwissenschaftlicher Verein in Hamburg, December 1st, 1866; Director of the Ober-Realschule und Realgymnasium, St. Pölten, December 15th, 1866; Senckenbergische naturforschende Gesellschaft, Frankfurt am Main, December 20th, 1866; Akademie der Wissenschaften, St. Petersburg, December, 1866; Verein der Freunde der Naturgeschichte in Meklenburg, Neubrandenburg, January 5th, 1867; Smithsonian Institution, Washington, January 25th, 1867; St. Gallische naturwissenschaftliche Gesellschaft, St. Gallen, February, 1867; Naturhistorischer Verein der Preussischen Rheinlande und Westphalens, March 21st, 1867; Naturforschende Gesellschaft in Bern, March, 1867; Utrecht Society of Arts and Sciences, April 15th, 1867; Massachusetts Institute of Technology, May 7th, 1867; Kongelige Danske Videnskabernes Selskab i Kjöbenhavn, May 15th, 1867; Linnean Society, London, June 20th, 1867; Société Impériale Géographique de Russie, St.-Pétersbourg, July 10th, 1867; Mittelrheinischer geologischer Verein

Darmstadt, July, 1867; Regents of the University of the State of New York, Albany, August 2d, 1867; Massachusetts Horticultural Society, Boston, August 3d, 1867; Royal Society of London, August 13th, 1867; New York State Agricultural Society, Albany, August 29th, 1867; Literary and Philosophical Society of Manchester, September 5th, 1867; Verein der Freunde der Naturgeschichte in Meklenburg, Neubrandenburg, September 26th, 1867; New York State Agricultural Society, Albany, September 7th, 1867; K. K. Geographische Gesellschaft, Wien, September 10th, 1867; Royal Institution of Great Britain, London, September 11th, 1867; Leeds Philosophical and Literary Society, September 17th, 1867; K. K. geologische Reichsanstalt, Wien, September 23d, 1867; Philosophical Society, Glasgow, September 24th, 1867; Naturhistorisch-medizinischer Verein in Heidelberg, September 24th, 1867; Royal Society of Northern Antiquaries, Copenhagen, September 28th, 1867; Smithsonian Institution, Washington, September 28th, and October 8th, 1867; K. Bayerische botanische Gesellschaft, Regensburg, two letters, September 28th, 1867; Naturforschende Gesellschaft in Emden, October 9th, 1867; Naturforschende Gesellschaft, Basel, October 18th, 1867; Royal Physical Society of Edinburgh, October 31st, 1867; Académie Royale des Sciences à Amsterdam, October 12th, 1867; Massachusetts Institute of Technology, October 21st, 1867; Essex Institute, Salem, Mass., October 25th, 1867; Academy of Sciences, Chicago, October 28th, 1867; Société d' Agriculture, etc., du Département de la Lozère, Mende, October, 1867; Société d'Histoire Naturelle de Colmar, November 1st, 1867; Société d'Agriculture, etc., du Département de la Lozère, Mende, October, 1867; H. Crosse, Paris, November 1st, 1867; Senckenbergische naturforschende Gesellschaft, Frankfurt am Main, November 1st, 1867; Connecticut Academy of Arts and Sciences, New Haven, November 4th, 1867; Finska Läkare-Sällskapet, Helsingfors, November 7th, 1867; Prof. Hyrtl, Vienna, November 8th, 1867; Deutsche ornithologische Gesellschaft, Halle, November 8th, 1867; Real Academia de Ciencias, Madrid, November 12th, 1867; Kaiserliche Akademie der Wissenschaften, Wien, November 12th, 1867; Zoölogical Society of London, November 15th, 1867; Naturforschende Gesellschaft des Osterlandes zu Altenburg, November 15th, 1867; Institut National Genevois, Genève, November 17th, 1867; Ausschuss des Vorarlberger Landesmuseums, Bregenz, December 11th, 1867; Royal Society of Edinburgh, December 19th, 1867; Société Helvetique des Sciences Naturelles, Berne, 1867; Zoologisch-Mineralogischer Verein, Regensburg, two letters; Société Hollandaise des Sciences à Harlem, January 18th, 1868; Essex Institute, Salem, Mass., January 20th, 1868; American Entomological Society, Philadelphia, February 1st, 1868; Essex Institute, Salem, Mass., February 10, 1868; Smithsonian Institution, Washington, February 12th, 1868; Natural History Society of New Brunswick, St. John, February 18th, 1868; Essex Institute, Salem, Mass., March 28th, 1868; Lyceum of Natural History, New York, April 7th, 1868; Société Entomologique Suisse, Genève, acknowledging the receipt of the Society's publications.

From the Société des Sciences, des Arts et des Lettres du Hainaut, Mons, Belgium, May 26th, 1866, Comité Scientifique de la Marine Impériale Russe, St.-Pétersbourg, December 8th, 1866; K. K. Central-Anstalt für Meteorologie und Erdmagnetismus in Wien, December 31st, 1866; Società Italiana di Scienze Naturali, Milan, January 1st, 1867; Naturforschende Gesellschaft, Freiburg, February 1st, 1867; K. Gesellschaft der Wissenschaften zu Göttingen, February 16th, 1867; Massachusetts Horticultural Society, March 8th, 1867; Museum at Bergen, Norway, March 9th, 1867; Société d'Agriculture, Sciences et Arts de la Sarthe, Le Mans, March 23d, 1867; Société des Sciences Physiques et Naturelles, Zurich, March 31st, 1867; Madras Literary Society, April 6th, 1867; Société des Sciences Physiques et Naturelle de Bordeaux, April 8th and 29th, 1867; K. Böhmische Gesellschaft der Wissenschaften, Prag, May 10th, 1867; Société Entomologique de Russie, St.-Pétersbourg, May 4th, 1867; K. Böhmische Gesellschaft der Wissenschaften, Prag, May 25th, 1867; Société Linnéenne de Bordeaux, June 6th, 1867; Académie des Sciences, Arts et Belles Lettres de Dijon, June 16th, 1867; Verein für vaterländische Naturkunde in Württemberg, July 1st, 1867; Naturwissenschaftlicher Verein für das Fürstenthum Lüneburg, July 3d, 1867; Entomological Society, London, September 20th, 1867; Naturforschender Verein in Brünn, September 25th, 1867; Liverpool Geological Society, November 1st, 1867; Société Impériale des Naturalistes de Moscou, November 4th, 1867; Verwaltungs-Ausschuss des Ferdinandeums zu Innsbruck, November 10th, 1867; Verein der Aerzte in Steiermark, Graz, November 20th, 1867; K. Bayerische Akademie der Wissenschaften, München, December 1st, 1867; Naturhistorischer Verein in Augsburg, December 10th, 1867; Société Royale de Botanique de Belgique, Bruxelles, December 21st, 1867; Naturhistorischer Verein für Anhalt, Dessau, January 31st, 1868; Naturwissenschaftlicher Verein für das Fürstenthum Lüneburg, February 3d, 1867; Société Hollandaise des Sciences à Harlem, acknowledging the receipt of the Society's publications and presenting their own.

From the Naturforschende Gesellschaft in Danzig, April 12, 1867, acknowledging the receipt of the Society's publications, and regretting that certain of their own asked for are out of print.

From the K. Gesellschaft der Wissenschaften zu Göttingen, October 10th, 1867, acknowledging the receipt of the Society's publications and promising to supply certain of their own if possible.

From the Naturwissenschaftlicher Verein, Hamburg, August 1st, 1866; Société Royale des Sciences à Upsal, two letters, October 1st, 1866; Naturforschender Verein in Brünn, October 27th, 1866; K. Akademie der Wissenschaften, Wien, October 30th, 1866; Superintendent of the Geological Survey of India, Calcutta, November 22d, 1866; K. Preussische Akademie der Wissenschaften, Berlin, December 10th, 1867; Senckenbergische naturforschende Gesellschaft, Frankfurt am Main, December 10th, 1866; Naturhistorische Gesellschaft, Nürnberg, two letters, December 31st, 1866; Société Provinciale des Arts et Sciences à Utrecht; Verein für siebenbürgische Landeskunde, Hermannstadt, January 12th, 1867; K. Bayerische Akademie der Wissenschaften, München, January 30th, 1867; K. Akademie der Wissenschaften, Wien, February 20th, 1867; Directeur du Musée publique de Buenos Aires, March 1st, 1867; Société Entomologique de France, Paris, May 7th, 1867: Society of Rural Economy of Southern Russia, Odessa, March 15th, 1867; K. Leopoldino-Carolinische Deutsche Akademie der Naturforscher, Dresden, April 1st, 1867; Naturforschende Gesellschaft in Danzig, April 4th, 1867; Utrecht Society of Arts and Sciences, April 15th, 1867; Naturforschende Gesellschaft in Bern, April 1867; Société Entomologique der Pays-Bas, Leide, May 5th, 1867; Société Hollandaise der Sciences à Harlem, May 25th, 1867;

Société des Sciences de Finlande, Helsingfors, June 13th, 1867; Société Impériale Géographique de Russie, St-Pétersbourg, July 23d, 1867; Société Linnéene de Lyon, July 1st, 1867; Curateurs de l'Université de Leyde, July 3d, 1867; K. Akademie der Wissenschaften, Wien, July 2d, 1867; Société de Physique et d'Histoire Naturelle de Genève, July 15th, 1867; K. Oeffentliche Bibliothek, St. Petersburg, July 18th, 1867; Royal Geographical Society, London, July 20th, 1867; Société d'Histoire Naturelle de Colmar, August 1st, 1867; Académie Impériale des Sciences, etc., de Lyon, August 1st, 1867; Société Impériale d'Agriculture, d'Histoire Naturelle, etc., de Lyon, August 1st, 1867; Naturforschende Gesellschaft, Freiburg, August 3d, 1867; K. Leopoldino-Carolinische Deutsche Akademie der Naturforscher, Dresden, August 3d, 1867; Société d'Histoire Naturelle de Colmar, August 5th, 1867; Mannheimer Verein für Naturkunde, August 20th, 1867; Schlesische Gesellschaft für vaterländische Cultur, Breslau, August 20th, 1867; Universitas Carolina Lundensis, August 23d, 1867; Académie Royale des Sciences, etc., de Belgique, Bruxelles, September 5th, 1867; Naturforscher Gesellschaft, Dorpat, September 12th, 1867; Société Scientifique de la Zélande à Middelbourg, October 20th, 1868; Senckenbergische naturforschende Gesellschaft, Frankfurt am Main, November 1st, 1867; Société Linnéene de Lyon, November 10th, 1867; Société des Sciences Naturelles de Neuchâtel, November 20th, 1867; K. Akademie der Wissenschaften, November 20th, 1867; K. Sächsische Gesellschaft der Wissenschaften, Leipzig, November 29th, 1867; Société d'Agriculture, Sciences, etc., du Puy, Le Puy, 1867; Société Hollandaise des Sciences à Harlem, January 12th, 1868; California Academy of Natural Sciences, San Francisco, January 13th, 1868; K. Gesellschaft der Wissenschaften zu Göttingen, February 16th, 1868; Akklimatisations-Verein in Berlin, February 18th, 1868; Cercle Artistique, Littéraire, et Scientifique d'Anvers, February 24th, 1868; Chicago Academy of Sciences, March 23d, 1868, presenting their various publications.

From the Verwaltungs-Ausschuss des Museums Francisco-Carolinum, Linz, December 21st, 1866; Historischer Verein, Ansbach, April 20th, 1867, presenting their publications, and requesting an exchange.

From the Deutsche geologische Gesellschaft, Berlin, May 18th, 1867, presenting its publications, and asking for the first volume of the Society's Proceedings.

From the Verein von Alterthumsfreunden im Rheinlande, Bonn, May 14th, 1867, Royal Danish Society, Copenhagen, May 14th, 1867; Naturhistorischer Verein, Dessau, January 10th, 1867, accepting the proposal to exchange, and sending their publications to the Society.

From the Society of Rural Economy of Southern Russia, Odessa, March 15th, 1867, accepting a proposal to exchange publications, and giving an account of that Society.

From the Philosophical and Literary and the Geological and Polytechnic Societies of Leeds, September 17th, 1867, promising deficient numbers of their publications to complete the Society's sets, as far as possible.

From the Société Impériale des Sciences Naturelles de Cherbourg, October 19th, 1867, asking for certain numbers of the Society's publications.

From Prof. Zantedeschi, Padova, November 28th, 1867, presenting a work, of which he is the author, entitled, *Intorno alla elettricità indotta o d'influenza negli strati aerei dell' atmosfera, che a forma di anello circondano una nube risolventesi in pioggia, neve o grandine.*

ADDITIONS TO THE LIBRARY

DURING THE YEAR ENDING APRIL 30, 1868.

The Intracranial Circulation. By Thomas Dwight, Jr. 8vo. Pamph. Cambridge, 1867. *From the Author.*

Human Cestoids; an Essay. By F. R. Sturgis. 8vo. Pamph. Cambridge, 1867. *From the Author.*

A Handbook to the Birds of Australia. By John Gould. Prospectus. 8vo. Pamph. *From the Author.*

The Great Crevasse of the Jordan and of the Red Sea. By Rev. Lyman Coleman, D.D. 8vo. Pamph. Easton, Pa., 1867. *From the Author.*

The Fruit-bearing belt of Michigan. By Prof. Alex. Winchell. 8vo. Pamph. Ann Arbor, 1867. *From the Author.*

A third study of the Icteridæ. By John Cassin. 8vo. Pamph. Philadelphia, 1867. *From the Author.*

Synopsis of the species of Starfish in the British Museum. By John Edward Gray. 4to. Pamph. London, 1866. *From the Author.*

Enumeration of Hawaiian Plants. By Horace Mann. 8vo. Pamph. Cambridge, 1867. *From the Author.*

Monographie de la Classe des Fougères, par J. E. Bommer. 8vo. Pamph. Paris, 1867. *From the Author.*

Notes on the Radiata in the Museum of Yale College, with descriptions of New Genera and Species. By A. E. Verrill. 8vo. Pamph. New Haven, 1867. *From the Author.*

Contributions to Chemistry and Mineralogy from the Laboratory of Harvard College. By Josiah P. Cooke, Jr. 8vo. Pamph. New Haven, 1867. *From the Author.*

Catalogue of Paintings of Fruits. etc., of the Valley of the Amazon, and other parts of Brazil. Executed in 1864-6. 8vo. Pamph. By W. Ingalls. *From the Author.*

A History of the Fishes of Massachusetts. By David Humphreys Storer, M.D. 4to. Cambridge, 1867. *By the Author.*

Conchological Memoranda, No. 2. By R. E. C. Stearns. 8vo. Pamph. San Francisco, 1867. *From the Author.*

The West Coast Helicoid Land Shells. By J. G. Cooper, M.D. 8vo. Pamph. San Francisco, 1867. *From the Author.*

Verzeichniss der paläontologischen Sammlungen des Prof. Dr. H. R. Göppert. 8vo. Pamph. Görlitz, 1867. *From the Author.*

De Amplitudine Doctrinae Botanicae qua praestitit Fridericus Caesius Michaelis Angeli Poggioli, Commentatio Josephi Filii cura et studio nunc primum vulgata. 8vo. Pamph. Romae, 1865. *From the Author.*

On the Discovery of a new Pulmonate Mollusk in the Coal-Formation of

Nova Scotia. By J. W. Dawson, L L.D. With a Description of the Species. By Philip P. Carpenter. 8vo. Pamph. London, 1867. *From the Author.*

Paris Exposition, 1867. Minerals of the United States of America. Group 5. Class 40. Catalogue compiled by Henry F. Q. d'Aligny. 8vo. Pamph. Paris, 1867. *From the Author.*

The Fossil Cephalopods of the Museum of Comparative Zoölogy. By Alpheus Hyatt. 8vo. Pamph. Cambridge. *From the Author.*

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Descriptions of new species of shells from the Australian Seas, etc. By Arthur Adams. 8vo. Pamph. London, 1863.

On the Species of Pyramidellinæ found in Japan. By Arthur Adams. 8vo. Pamph. London.

Mollusca Japonica. By Arthur Adams. 8vo. Pamph. London, 1860.

On the Species of Muricinæ found in Japan. By Arthur Adams. 8vo. Pamph. London, 1862.

On a supposed new genus and on some new species of Pelagic Mollusca. By Arthur Adams. 8vo. Pamph. London, 1861.

On some new species of Cylichnidæ, Bullidæ, and Philinidæ, from the Seas of China and Japan. By Arthur Adams. 8vo. Pamph. London, 1862.

On some new species of Mollusca from Japan. By Arthur Adams. 8vo. Pamph. London, 1862.

Descriptions of a new genus and some new species of shells from the collection of Hugh Cuming, Esq. By H. Adams. 8vo. Pamph. London, 1861.

Description of a new genus and species of Mollusk. By Henry Adams. 8vo. Pamph. London, 1860.

Descriptions of new species of Cyrena, Corbicula and Sphærium. By Temple Prime. 8vo. Pamph. Philadelphia, 1861.

Paper on fresh water shells. By Mr. Lea. 8vo. Pamph. Philadelphia, 1842.

Description of twelve new species of Uniones. By Isaac Lea. 8vo. Pamph. Philadelphia, 1843.

Memoir of Charles B. Adams, late Professor of Zoology in Amherst College, Massachusetts. By Thomas Bland. 8vo. Pamph. Philadelphia, 1865.

On the Family Proserpinacea. By Thomas Bland. 8vo. Pamph. New York, 1863.

Remarks on the Origin and Distribution of the Operculated Land Shells which inhabit the Continent of America and the West Indies. By Thomas Bland. 8vo. Pamph. Philadelphia, 1866.

Publications of Isaac Lea on Recent Conchology. By George W. Tryon, Jr. 8vo. Pamph. Philadelphia, 1861.

Synonymy of the Species of Strepomatidæ. By George W. Tryon, Jr. 4 parts. 8vo. New York.

Report on the present state of our knowledge with regard to the Mollusca of the West coast of North America. By Philip P. Carpenter. 8vo. Pamph. London, 1857.

Illustrations Conchyliologiques. Siliquaria. Folio. Pamph.

A Revision of the History, Synonymy, and Geographical Distribution of the recent Terebratulæ. By Lovell Reeve. 8vo. Pamph. London.

Description de deux espèces nouvelles. Par M. Deshayes. 8vo. Pamph. Paris, 1861.

Observations sur les Aminaux de quelques genres de Mollusques Acéphalés. Par G.-P. Deshayes. 8vo. Pamph. London, 1853.

Anatomie comparée de divers types de Mollusques attribués au grand genre Hélice. Par M. G.-P. Deshayes. 8vo. Pamph. Paris, 1830.

American Conchology; or description of the Shells of North America. Illustrated by coloured figures. No. VIII. 8vo. Pamph.

Catalogue of Australian Land Shells. By James C. Cox, M.D. 8vo. Pamph. Sydney, 1864.

A Catalogue of the Mollusca of Northumberland and Durham. By Joshua Alder. 8vo. Pamph. Newcastle upon Tyne, 1848.

Observations on the Terrestial Pulmonifera of Maine. By Edward S. Morse. 8vo. Pamph. Portland, 1864.

On the Mollusca of Peconic and Gardiner's Bays, Long Island. By Sanderson Smith. 8vo. Pamph. New York, 1859.

Description of a new species of Amphioxus from Borneo. By J. E. Gray. 8vo. Pamph. London.

Notice sur la genre Neaera, Gray. Par M. H. Nyst. 8vo. Pamph. Anvers, 1860.

Catalogue of the Miocene Shells of the Atlantic Slope. By T. A. Conrad. 8vo. Pamph. New Haven.

Researches upon the Hydrobiinæ and allied forms. By Dr. William Stimpson. 8vo. Pamph. Montreal, 1865.

Mr. Broderip's descriptions of Mr. Cuming's Shells. 8vo. Pamph. London.

Verzeichniss der Conchilien-Sammlung des verstorbenen Herrn Consul Gruner. 8vo. Pamph. Bremen, 1857.

A Monograph of the Helices of the United States. By Amos Binney, M.D. No. 1. 8vo. Pamph. Boston, 1837.

Expedition Shells. By Augustus A. Gould. 8vo. Pamph. Boston, 1846.

Nucula. 8vo. Pamph.

Review of the Northern Buccinums. Part 1. By Dr. William Stimpson. 8vo. Pamph. Montreal, 1865.

Introduction to the Mollusca of the U. S. Exploring Expedition. By Augustus A. Gould, M. D. 4to. Pamph.

A Flora and Fauna within living animals. By Joseph Leidy, M. D. 4to. Washington, 1851.

Researches on the Foraminifera. By William B. Carpenter. Parts 1–2. 4to. London, 1855–6.

Description des animaux sans Vertèbres découverts dans le Bassin de Paris. Par G.-P. Deshayes. 30 Livraisons in 15. 4to. Paris, 1857–8.

A Monograph on the Fossil Lepadidæ, or, Pedunculated Cirripedes of Great Britain. By Charles Darwin. 4to. London, 1851.

A Monograph on the Fossil Balanidæ and Verrucidæ of Great Britain. By Charles Darwin. 4to. London, 1854.

Conchological Papers, by Couthouy, Lea and others. 4 vols. 8vo.

Zoological Papers, by Agassiz, Bachman and others. 2 vols. 8vo.

Geological Papers, by Lyell, Dana, and others. 2 vols. 8vo.

Contributions to Conchology. By C. B. Adams. 1 vol. 8vo.

Berichte über die Versammlung deutscher Naturforscher und Ærzte. Breslau, 1833; Jena, 1836; Prag, 1837; Gratz, 1843. 4to.

Archiv für Anthropologie. Bänd. I–II. 4to. Braunschweig, 1866–8.

Annals and Magazine of Natural History. 3d Series, Nos. 67, 95, 112. 8vo. London, 1863.

Photographs of Dr. T. W. Harris.

A Synopsis of the Classification of British Palæozoic Rocks, by the Rev. Adam Sedgwick. With descriptions of Fossils, by Frederick McCoy. Fasc. II. 4to. London, 1852.

Dr. Heinrich Berghaus' Physikalischer Atlas. 2 vols. Folio. Gotha, 1852.

Manual of the Botany of the Northern United States. By Asa Gray. 5th Edition. 8vo. New York, 1868. *By Purchase.*

Manual of the Practical Naturalist. 8vo. Boston, 1831.

The Naturalist's and Traveller's Companion. By John Coakley Lettsom, M. D. 8vo. London, 1799.

Dictionnaire raisonné, étymologique, synonymique et polyglotte, des Termes usités dans les Sciences Naturelles. Par. A.-J.-L. Jourdan. 8vo. 2 Tomes. Paris, 1834.

Histoire des Progrès des Sciences Naturelles, depuis 1789, jusqu'à ce jour. Par M. le Baron G. Cuvier. 2 Tomes. 8vo. Bruxelles, 1837–8.

Three Physico-Theological Discourses. By John Ray. 8vo. London, 1732.

Micrographia; or some Physiological Descriptions of Minute Bodies made by magnifying glasses. By R. Hooke. Folio. London, 1667.

History of the Cotton Manufacture in Great Britain. By Edwards Baines, Jr. 8vo. London, 1835.

Reports of the first, second and third meetings of the Association of American Geologists and Naturalists. 8vo. Boston, 1843.

Description des Coquilles Fossiles de la Famille des Rudistes qui se trouvent dans le Terrain Crétacé des Corbieres (aude). Par Oscar Rolland du Roquan. 4to. Carcassonne, 1841.

Scrap-book belonging to Dr. Amos Binney. 4to.

The Canadian Naturalist. By P. H. Gosse. 8vo. London, 1840.

Aristotelis Historia Animalium ex recensione Immanuelis Bekkeri. 8vo. Berolini, 1829.

Onomasticon Zoicon, Plerorumque Animalium Differentias et Nomina Propria pluribus Linguis exponens. Autore Gualtero Charletono. 4to. 1868.

Werner's Nomenclature of colours, with additions arranged so as to render it highly useful to the Arts and Sciences. By Patrick Syme. 8vo. Edinburgh, 1821.

The Revolt of the Bees. 3d Edition. 8vo. London, 1839.

On the causes, Cure and Prevention of the Sick-Headache. By James Meade, M.D. 8vo. Philadelphia, 1832.

Catalogues of the Animals and Plants of Massachusetts. With a copious Index. 8vo. Amherst, 1835.

Zoological Survey of the State. Report on the Quadrupeds. By Ebenezer Emmons, M.D. 8vo. Cambridge, 1840.

Reports on the Herbaceous Plants and on the Quadrupeds of Massachusetts. 8vo. Cambridge, 1840. (2 copies.)

Report of the Engineer and Geologist, in relation to the New Map, to the Executive of Maryland. 8vo. Annapolis, 1836.

Catalogue des Mollusques Terrestres et Fluviatiles, observés dans les Possessions Françaises au Nord de l'Afrique, par M. Terver. 8vo. Pamph. Paris, 1839.

Prospetto Sistematico-Statistico dei Molluschi Terrestri e Fluviali viventi nel Territorio di Lugano dell' ab Guiseppe Stabile. 8vo. Pamph. Milano, 1859.

Traité Elementaire de Conchyliologie, avec l'Application de cette Science à la Géognosie. Par G.-P. Deshayes. 8vo. Paris.

Paléontologie Française. Par Alcide d' Orbigny. 2 Tomes. 8vo. Paris, 1847.

Des Microscopes et de leur Usages. Par Charles Chevalier. 8vo. Paris, 1839.

The Civil and Natural History of Jamaica. By Patrick Browne, M.D. Folio. London, 1789.

Description of the Hydrarchos Harlani. By Doctor Albert C. Koch. 8vo. Pamph. New York, 1845. *Deposited in the Binney Library.*

Frederick the Great and his Family. An Historical Novel. By L. Mühlbach. Translated from the German by Mrs. Chapman Coleman and her Daughters. 8vo. New York, 1867.

Hardwicke's Science Gossip; an illustrated Medium of Interchange and Gossip for Students and Lovers of Nature. Edited by M. L. Cooke. 1865, 1866. 8vo. London.

Homes without Hands. Being a description of the Habitation of Animals, classed according to their principle of Construction. By Rev. J. G. Wood. 8vo. New York, 1866.

The Herring, its Natural History and National Importance. By John M. Mitchell. 8vo. Edinburgh, 1864.

Critical and Miscellaneous Essays. By T. Babington Macaulay. Vols. I–V. 8vo. Philadelphia, 1854.

Origin and History of the Books of the Bible. By Prof. C. E. Stowe, D.D. 8vo. Hartford, 1867.

Life and Times of Frederick Perthes. 8vo. New York, 1867.

The early years of His Royal Highness the Prince Consort. Compiled under the Direction of Her Majesty the Queen, by Lieut.-General the Hon. C. Grey. 8vo. New York, 1866.

Life of Josiah Quincy of Massachusetts. By his Son, Edmund Quincy. 8vo. Boston, 1868.

A Journey in Brazil. By Professor and Mrs. Louis Agassiz. 8vo. Boston, 1868.

Letters and Journals relating to the War of the American Revolution. By Mrs. General Riedesel. 8vo. Albany, 1867.

The Life and Teachings of Confucius, with Explanatory Notes. By James Legge, D.D. 8vo. Philadelphia, 1867.

Sound. By John Tyndall, LL.D. 8vo. New York, 1867.

Three English Statesmen. By Goldwin Smith. 8vo. New York, 1867.

Life and Letters of Madam Swetchine. By Count de Falloux. 16mo. Boston, 1868. *Deposited by the Republican Institution.*

ADDITIONS TO THE MUSEUM

DURING THE YEAR ENDING APRIL 30, 1868.

May 15, 1867. Marl from the West Jersey Company's pits, Glassboro, N. J. by Mr. C. K. Landis. Section from the charter oak of Hartford, Ct., by Mr. S. H. Scudder. Nuts from China, by Dr. S. Green. Two specimens of oxide of manganese by Hon. Albert Fearing. Specimens of ochre and the rock in which it occurs from Lexington, Mass., by Dr. S. Kneeland.

June 5. A bird from Wellfleet, Mass., by Mr. C. Cowing. A golden-crowned thrush from Brookline, Mass., by Mr. J. E. Cabot. Skin of common sheep; seeds and seed-vessels of mahogany, etc.; stalk of sugar cane and asphaltum from Barbadoes; *Vellela* and crustaceans from the N. Atlantic, by Dr. J. B. S. Jackson. A pair of elk horns, fossil wood and pebbles from Columbia River, Oregon; bark and foliage of *Wellingtonia gigantea* from Colmesos Grove, Cal.; cinnabar from New Almaden mines, Cal.; black oxide of manganese from San Francisco Bay, Cal.; soap plant and indian implement from California; silver ore from Virginia City and Egon Cañon, Nevada; copper ore from Colorado River, Arizona; *siempre viva* and shells from Acapulco, Mex.; and Indian implements from Maine, by Mr. C. A. Stearns. Ore from the Cheever ore bed, Port Henry, N. Y., by Mr. O. S. Presbrey.

June 19. Auriferous and argentiferous galena and quartz, black blende, automatite, auriferous copper pyrites, gold quartz and talco-micaceous slate, from Bridgewater, Vt., by Dr. C. T. Jackson.

July 3. A collection of Japanese Lepidoptera and a specimen of *Saturnia ceanothi* Behr and its cocoon from San Francisco, Cal., by Mr. Samuel Hubbard. Horned toad, reptiles and insects preserved in alcohol, by Mr. A. Reynolds. Tree frog from Hempstead, Long Island, by Mr. F. G. Sanborn.

September 18. Dendrites and egg of cow bunting from Dorchester, Mass., by Mr. D. F. Carlton. A flying fish from the South Pacific, by Dr. J. Homans. Amianthus from Brookline, Mass., by Miss Blaikie. *Philampelus satellitia* from Beverly, Mass., by Mr. T. Lyman. An hemipterous insect from Boston, by Dr. Talbot. Luminous larvæ of Coleoptera from Brookline, by Mr. E. C. Cabot. *Tenthredo* from Boston, by Mr. L. Wetherell. A mounted loon, by Mr. S. H. Sylvester. Post pliocene fossils from the mouth of the Kennebec River, by Mr. A. A. Kingman. Model of the "Old Man of the Mountains," Franconia Notch, N. H., by Mr. R. C. Greenleaf. A white mouse from Framingham, Mass., by Mr. James W. Clark. Florida gallinule, from Easton's Pond, Newport, R. I., by Mr. John Ennis.

October 2. Iron ore from Franklin Fall, Franklin Co., N. Y., by Mr. Gordon

C. Lane. Salamanders, tree frog and mice from Fire Island beach, Long Island; pickerel from Andover, by Mr. F. G. Sanborn. Calamites from Olive Quarry, St. John, N. B., by Mr. G. Barry. Rod of granite, by Dr. B. Joy Jeffries. Larvæ of dragon flies from the stomach of a trout, taken in Profile Lake, White Mts. N. H.; green snake from Needham, Mass., by Mr. R. C. Greenleaf.

October 16. Fungus from White Mts., N. H., by Dr. S. A. Bemis. Larva of an insect from Cohasset, by Dr. S. Kneeland. Minerals from Arrowsic Island off Bath, Me., by Mr. C. J. Sprague. Double butternut from Grafton, Mass., by Mr. W. T. Brigham.

November 6. Spatangoid from West Indies, by Mr. Frank A. Andrews. Cast skin of a black snake from Michigan, by Mrs. D. D. Hughes. *Diapheromera femorata* from Winchester, Mass., by Captain Lewis. Fourteen birds and a pipe fish from Madras, India, by Mr. P. R. Hunt. Body of an African goat from Cape Palmas, by Mr. W. W. Goodhue. White owl from South Weymouth, Mass., by Mr. E. C. Derby. Malformed bone of a chicken, by Mr J. L. Little, Jr. Centipede, by Mr Chas. Q. Hill. Snail by Dr. J. Homans, Jr. Birds nest from Calcutta, and lizard, by Mr. W. T. Brigham. Skull of Apache Indian, *Canis atrans*, *Lepus*, skins of prairie wolf, rattle of rattlesnake, stone axe head used by Apache Indians and minerals from Arizona; ores from California and Mexico, by Dr. J. W. Merriam. Iron ores and glass sandstone from Sylvania, by Mr. J. W. Clarke.

November 20. Flamingo from Madras, India, by Mr. P. R. Hunt. Fossil wood from Australia, by Dr. F. Mueller. Prepared skull of human fœtus, by Dr. W. M. Ogden. An extensive collection of nests and eggs of birds, chiefly American, by Mrs. Dr. Henry Bryant. Fruit of Osage orange, by Mr. W. T. Brigham. Lignite from Martha's Vineyard, by Mr. J. C. J. Brown, Jr. Model of the "welcome nugget" of gold, and Relief Maps of Vesuvius, Etna and Bourbon, by purchase.

December 4. Specimens of a *Lachnus* from the linden trees in Boston, by Mr. S. H. Scudder. *Saturnia Polyphemus* found on Arbor vitæ, by Mr. J. C. Merrill, Jr. Rock specimens from Jonesport, Me., by Mr. D. Wellington. Nest of squirrel made in the nest of a catbird from Middleton, Mass., by Rev. J. M. Hubbard. Spine of a ray from Cape Charles, Chesapeake Bay, by Mr. J. R. Johnson.

December 18. Quicksilver from California, by Mr W. H. Logan. Mammals from Germany, by Mr. Jacob Norton. Bitter oranges from New Orleans, by Dr. S. Kneeland. Crystals of mica from Buckfield, Me., by Mr. J. J. May.

January 3, 1868. Soundings from a depth of ten and twenty-five fathoms, off Mt. Desert Island, Me.; deposit of Salt Spring, and specimens of the mudlumps of the delta of the Mississippi, by Mr. C. P. Dillaway. Building stones of the public buildings in Washington, by the Smithsonian Institution. Shells from near Capetown, Africa, by Mrs. Winslow. Birds from New Brunswick and Maine, by Mr. G. A. Boardman. Variegated clays from Martha's Vineyard, by Mr. J. C. J. Brown, Jr. Insects from various localities, by Miss Lucy Brewer.

January 15. Relief maps of Palma and Teneriffe, by purchase. Lichen from

St. Stephen, N. B., by Miss Lydia B. Felt. A collection of six hundred and fifty fishes from various small streams in central Iowa, forty-four reptiles, forty-three Insects, twenty-nine Crustacea, one hundred and eighty-two Mollusca and thirty worms from Iowa, by purchase. Woody bodies from bark of white pine in Templeton, Mass., by Mr. Lucas Baker. Skin of bald eagle, from vicinity of Boston, by Mr. James Ritchie. Land shells from Kahlenberg, near Vienna and salt from mines near Hallstadt, by Dr. F. H. Brown. A wasp's nest from Wilton, N. H., by Mr. E. N. Abbot.

February 5. Fragment of oak enclosing stone, Sutton, Mass., by Mr. H. D. Barnes. A flying fish from near Bermudas, blind fish and craw fish from Mammoth Cave, Ky., by Mr. N. H. Bishop. A collection of seventy-five nests, one hundred and seventy eggs, forty-four skins and four heads of North American Birds and skin of *Lepus campestris* from Fort Anderson, by the Smithsonian Institution. An owl from Westboro', Mass., by Mr. Frank Perrin.

A collection of about one hundred thousand insects in alcohol, six thousand butterflies, two thousand three hundred birds, three hundred mollusca, seventy-five reptiles, seventy-five fish and five mammals from Guatemala, by purchase.

February 19. A mouse, twenty-three lizards, six fishes, one hundred larvæ and pupæ of insects, one hundred other insects of various orders, besides one hundred and fifty spiders and myriapods, thirty crustacea, and fifty mollusca from Punahou, Hawaiian Islands; Orthoptera from Hong Kong and fourteen insects from Calcutta, by Mr. W. T. Brigham; one hundred Odonata from Plymouth, N. H., Waterbury, Vt., Quincy and Cambridge, Mass.; Orthoptera from Mass. and N. H., by Mr. J. C. Merrill, Jr. Cocoon of *Samia Cecropia* from Boston, by Mr. S. H. Scudder. Gills of sword-fish from the Atlantic, by Mr. Edwin Bicknell. An ant's nest found in an herbarium, and other insects from South Malden, Mass., by Rev. I. F. Holton. Flying fish with barnacles attached, taken in latitude 27°, longitude 26° 20′, by Capt. N. E. Atwood. Fossil or submarine guano from near Charleston, S. C., by Dr. C. T. Jackson. Cones of *Pinus strobi* from peat bogs in Framingham, Mass., by Dr. E. Lewis Sturtevant; a mouse with diseased head from Boston, by Mr. J. L. Little, Jr.

March 4. A collection of over seven hundred humming birds and seventy-five nests of humming birds, and a large collection of West Indian Mollusca, by Mrs. Dr. Henry Bryant. A bat, reptiles, fish, insects, crustaceans, mollusks and echinoderms from Saba, Netherland West Indies, and of reptiles, fishes and mollusks from the Island of Testegus, by Dr. G. H. Brown.

March 18. Fungi and specimens of wood from North Wrentham, Mass., by Mr. Luther Hills. Red Squirrel with a white tail from Hardwick, Mass., by Mr. S. J. Mixter. Skin and bones of a caribou from Moosehead Lake, Me. by Messrs C. D. and J. H. Presho. Two living specimens of *Belostoma* from Milton, Mass., by Mr. J. W. Brooks. Cocoon of *Samia cecropia* from Boston, by Mr. A. A. Kingman. Wood of a tree showing the annual growth and cocoon of the bee moth, by Dr. C. E. Ware. Fossil shells from the middle of the boundary line between Illinois and Indiana, by Mr. R. C. Stone. *Cicada* from Bridgewater, Mass., by Mr. D. M. King. *Epeira*, by Mr. R. C. Greenleaf. Fossils from Sumner Co., Tenn., shells from Natchez Bluff, Miss., and concretions from Tennessee, by Mr. J. H. Huntington.

April 1. A gnarled root of spruce from Mt. Washington N. H., by Mr. F. G. Sanborn. Fossil plant from Newport, R. I.; rock salt from the island of Petit Ance, Vermilion Bay, Bayou Têche, La., by Hon. David Sears. A series of specimens from the lacustrine deposits in Robenhausen near Zurich, Switzerland, by Mr. C. H. Dalton.

April 15. Photograph of a bent grave stone in Philadelphia, by Mr. G. L. Vose. A collection of New England *Characeæ* and of Vermont *Boleti*, by Mr. C. C. Frost. Specimens of Coquina from near St. Augustine, by Dr. H. P. Bowditch. A specimen of *Euplectella speciosa* from the Island of Zebu, Philippine Islands, by Capt. Daniel H. Hutchinson.

April 22. Six nests of ants, of four species, from Hingham, Mass., by Messrs F. W. and W. S. Brewer.

Mr. Edward Pickering presented the following report of the Treasurer for the past year:—

The Receipts and Expenditures for the year have been as follows :

Receipts.			
Dividends and Interest			$9,091.66
Annual Assessments			1,090.00
Admission Fees			210.00
Life Membership			100.00
Walker Fund Income (one half.)			1,233.15
Courtis " "			600.00
Pratt " "			570.00
Paschal P. Pope bequest			18,800.00
H. Harris "			5,000.00
W. J. Walker "			10,000.00
Total			$46,694.81
Expenditures.			
New Building, Furniture, Cases, &c.		$24,152.68	
Repairs of Building		1,080.61	
Cabinet		2,653.36	
Library		465.19	
Memoirs and Proceedings	$3981.16		
Less amount of subscription and sale	530.21		
		3,450.95	
Salaries and wages		4,837.00	
Gas		114.88	
Fuel		385.00	
Insurance		493.75	
Lectures	$266.38		
Less received from sale of tickets	152.00		
		114.38	
General Expenses		1,413.54	$39,161.34
Excess of Receipts over Expenditures			$7,533.47

The following is a statement of the Property of the Society, exclusive of the Cabinet and Library.

New Building.		
Cost of Building and Furniture, per last Report . .	$112,441.46	
Expended during the year	23,588.73	$136,030.19
Bulfinch St. Estate Fund.		
Note secured by mortgage	$15,000.00	
U. S. 5-20 Bonds, $7,550, costing	7,629.00	22,629.00
Courtis Fund.		
St. Louis City Bonds, $10,000		10,000.00
Walker Fund.		
Notes secured by mortgage	$41,105.00	
U. S. 5-20 Bonds, $3,850, costing	4,179.41	
Cash	27.15	45,311.56
H. F. Wolcott Fund.		
U. S. 5-20 Bonds, $5,400, costing	$5,429.50	
Cash	15.51	5,445.01
S. P. Pratt Fund.		
N. Y. Central Railroad Bonds, $10,000		10,000.00
General Fund.		
17 Shares Bates Manufacturing Co.	$2,975.00	
35 " Everett Mills	4,900.00	
30 " Hamilton Woollen Man. Co.	10,500.00	
1 " Lawrence Man. Co.	925.00	
80 " Washington Mills	13,600.00	
12 " Cocheco Man. Co.	7,200.00	
2 " Lowell Man. Co.	1,800.00	
4 " Laconia Man. Co.	5,000.00	
3 " Pepperell Man. Co.	3,750.00	
11 " Neptune Ins. Co.	2,486.00	
18 " Boston Ins. Co.	2,430.00	
114 " Vermont and Canada R. R. Co. . . .	11,400.00	
50 " Michigan Central R. R. Co.	5,662.75	
$10,000 Bonds, Vermont & Canada and Vermont Central R. R. Co.	10,350.00	
$10,000 Bonds, Albany 6's	9,350.00	
$10,000 Bonds, Chicago & N. Western R. R. Co., 10's .	10,000.00	
$5,000 Bonds, Cook Co. (Illinois) 7's	4,750.00	
$300 U. S. 5-20 Bonds, $300, costing	322.50	
Note Receivable secured by mortgage	3,000.00	110,401.25
Miscellaneous.		
Unsettled Accounts	$38.76	
Cash on hand	855.02	$893.78
Total		$340,710.79
Value of Property May 1, 1867		294,453.41
Increase of value May 1, 1868		$46,257.38

A large portion of the stocks constituting the General Fund were received from the estate of the late Dr. W. J. Walker, and stand upon the books at the value at which they were then appraised. Some of them have since fallen in value, but the depreciation is believed to be in most instances temporary. The Library and Collections are not included in the above statement, not being susceptible of accurate valuation; and the value of the building is assumed to be increased by the amount expended in completing and furnishing it during the past year.

All which is respectfully submitted,

E. Pickering, Treasurer.

Mr. T. T. Bouvé, on behalf of the Trustees, presented the following report on the Trust Funds of the Society for the past year: —

Dr. THOS. T. BOUVÉ, CHAS. J. SPRAGUE AND EDWARD PICKERING, TRUSTEES, IN ACCOUNT WITH THE COURTIS FUND OF THE BOSTON SOCIETY OF NATURAL HISTORY. Cr.

1867.	To Cash received of Treasurer, amount due from the Society	$8,339.71	1867.	By Cash paid for City of St. Louis Bonds, $10,000	$8,158.33
	" received for Coupons from Bonds	6.01		" paid for $150 5-20 Bonds	164.25
	" Interest on Note of $3,000	180.00		" " " " " "	158.25
	" received for Coupons on St. Louis Bonds	600.00		" " to Edward Pickering, Treasurer, for general purposes	600.00
			1868. April 20.	By Balance of Cash, transferred with other property to the General Fund of the Society, by vote of the Trustees (see note below)	44.89
		$9,125.72			$9,125.72

Errors Excepted. Boston, April 30, 1868.

THOS. T. BOUVÉ,
CHAS. JAS. SPRAGUE, } TRUSTEES.
E. PICKERING,

April 30, 1868.	The Property of this Fund has recently consisted of the following:	
	Note of	$3,000.00
	U. S. Bonds $300, cost	322.50
	Cash on hand	44.89
	City of St. Louis Bonds $10,000, cost	8,158.33
		$11,525.72

By a vote of the Trustees of the Society, all the above property except the City of St. Louis Bonds has been transferred to the General Fund, and the St. Louis Bonds will be estimated as worth $10,000, which they are for permanent investment. This is done because it is not thought desirable to have more than $10,000 in this Fund, which sum will be realized from the Bonds. The Property will therefore consist of City of St. Louis Bonds, valued at . . . $10,000.00

Dr. THOS. T. BOUVÉ, CHAS. J. SPRAGUE AND EDWARD PICKERING, TRUSTEES, IN ACCOUNT Cr.
WITH THE WALKER PRIZE FUND OF THE BOSTON SOCIETY OF NATURAL HISTORY.

1867. April 30.	To Balance of Cash on hand on date	$1.21
July 1.	Received for U. S. 7 3-10 Bonds, sold in exchange for 5-20's of same amount	2,600.00
	Cash received for Interest on above	121.00
Sept.	" received from Trustees of the Walker Fund, one half amount of Interest paid them on date	375.00
Oct.	" received from Trustees of Walker Fund, one half amount Interest collected by them on date	241.57
1868. Jan.	" received for Interest, Coupons	130.17
March.	" received from Trustees Walker Fund, one half amount of Interest paid them on date	375.00
April 7.	" received from Trustees Walker Fund	241.57
		$4,085.52
April 30.	To Balance of Cash on hand on date	$27.15

1867. July.	By Cash paid for U. S. 5-20 Bonds, received in exchange for 7 3-10's, sold as per opposite	$2,600.00
Sept.	" paid for U. S. 5-20 Bonds $450	492.75
Oct.	" " " " " " 200	215.50
1868. Jan.	" " " " " " 150	157.87
March 1.	" " " " " " 350	376.25
April 7.	" " " " " " 200	216.00
April 30.	By Balance of Cash to new account on date	27.15
		$4,085.52

Errors Excepted. Boston, April 30, 1868.

THOS. T. BOUVÉ,
CHAS. JAS. SPRAGUE, } TRUSTEES.
E. PICKERING,

April 30, 1868.	The Property of this Fund on date consists of	
	Cash on hand	$27.15
	U. S. Bonds $3,950, which cost	4,179.41
		$4,206.56

DR. THOS. T. BOUVÉ, CHAS. J. SPRAGUE AND EDWARD PICKERING, TRUSTEES, IN ACCOUNT WITH THE WALKER FUND OF THE BOSTON SOCIETY OF NATURAL HISTORY. CR.

1867. Sept.	To Cash, Interest, six months, on Mortgage Note of P. Hubbell and J. A. Turner	$750.00	1867. Sept.	By Cash paid to Treasurer, one half of amount received on date for Interest on Note ($750)	$375.00
				" paid to Trustees of Walker Prize Fund	375.00
Oct.	" Interest, six months, on W. Mountfort's Note	483.15	Oct.	" paid to Treasurer, one half of amount received on date	241.58
				" paid to Trustees of Walker Prize Fund, one half of amount received on date	241.57
1868. March 1.	" Interest, six months, on Mortgage Note of P. Hubbell and J. A. Turner	750.00	1868. March 1.	" paid to Treasurer, one half of amount received on date	375.00
				" paid to Trustees of Walker Prize Fund . -	375.00
April 7.	" Interest, six months, on W. Mountfort's Note	483.15		" paid to Treasurer, one half amount received on date	241.58
				" paid to Trustees of Walker Prize Fund, one half amount received	241.57
		$2,466.30			$2,466.30

Errors Excepted. Boston, April 30, 1868.

THOS. T. BOUVÉ,
CHAS. JAS. SPRAGUE,
E. PICKERING,
} TRUSTEES.

April 30, 1868. The Property of this Fund on date, consists of Mortgage Notes amounting to	$41,105.00

Dr. Thos. T. Bouvé, Chas. J. Sprague and Edward Pickering, Trustees, in account Cr.
with the Bulfinch Street Estate Fund of the Boston Society of Natural History.

1867.			1867.		
Apr. 30.	To Balance of account on date . . .	$118.21	July.	By Cash paid for $6,050 5-20 U. S. Bonds, received in exchange for 7 3-10's, sold as per opposite . . .	$6,050.00
July.	Cash received for $6,050 U.S. 7 3-10 Bonds, exchanged for 5-20's same amount	6,050.00		" paid for $800 5-20 U. S. Bonds .	842.48
	" received, Interest on above . .	286.46	1868.		
1868.	" " " 6 months on J. B. Smith's note for $15,000 . .	450.00	Jan.	" paid for $700 " " " .	736.75
Jan.	" received for Interest, Coupons .	274.33			
	" " Interest 6 months on J. B. Smith's note	450.00			
Apr. 30.	Balance due to the Trustees on date .	23			
		$7,629.23			$7,629.23
			1868. Apr. 30.	By Balance due the Trustees on date . .	.23

Errors Excepted. Boston, April 30, 1868.

THOS. T. BOUVÉ,
CHAS. JAS. SPRAGUE,
E. PICKERING,
} Trustees.

April 30, 1868.	The Property of this Fund on date consists of	
	Mortgage Note for	15,000.00
	U. S. Bonds $7,550, which cost	7,629.23
		$22,629.23
	Less due the Trustees	.23
		$22,629.00

Dr. Thos. T. Bouvé, Chas. J. Sprague and Edward Pickering, Trustees, in account with the Wolcott Fund of the Boston Society of Natural History. Cr.

1867. July.	To Cash received for U. S. 7-30 Bonds, sold	$5,000.00	1867. July.	By Cash paid for U. S. 5-20 Bonds, received in exchange for same amount of 7 3-10 (sold as per opp. entry)	$5,000.00
	" " Interest on Bonds . .	236.75		" pai for U. S. 5-20 Bonds $200 .	219.00
1868. Jan.	" " " " U. S. Bonds .	208.26	1868. Jan.	" " " " " " $200 .	210.50
					$5,429.50
			Apr. 30.	Balance to new account	15.51
		$5,445.01			$5,445.01
Apr. 30.	To Cash balance on hand on date . .	15.51			

Errors Excepted. Boston, April 30, 1868.

THOS. T. BOUVÉ,
CHAS. JAS. SPRAGUE, } Trustees.
E. PICKERING,

April 30, 1868.	The Property of this Fund on date consists of U. S. 5-20 Bonds, $5,400, which have cost	$5,429.50
	To Cash on hand	15.51
		$5,445.01

DR. THOS. T. BOUVÉ, CHAS. J. SPRAGUE AND EDWARD PICKERING, TRUSTEES, IN ACCOUNT WITH THE PRATT FUND OF THE BOSTON SOCIETY OF NATURAL HISTORY. CR.

1867. Oct. 26.	To Cash received, three per cent. on $10,000 New York Central Railroad Bonds, less Tax . . .	$285.00	1867. Oct. 26.	By Cash paid to the Treasurer towards fitting up the cases in the conchological room, and for the services of E. S. Morse in arranging the collection of shells for scientific exhibition	$285.00
1868 April 30.	" " received, three per cent. on $10,000 New York Central Railroad Bonds, less Tax . . .	285.00	1868. April 30.	" " paid the Treasurer for above purposes	285.00
		$570.00			$570.00

Errors Excepted. Boston, April 30, 1868.

THOS. T. BOUVÉ,
CHAS. JAS. SPRAGUE,
E. PICKERING,
} TRUSTEES.

April 30, 1868. The Property of this Fund consists on date of 10 New York Central Railroad Bonds, $1000 each, six per cent.	$10,000.00

The Nominating Committee reported the following list of officers for the ensuing year, and they were elected :—

PRESIDENT,

JEFFRIES WYMAN, M.D.

VICE-PRESIDENTS,

CHARLES T. JACKSON, M.D., THOMAS T. BOUVÉ.

CORRESPONDING SECRETARY,

SAMUEL L. ABBOT, M.D.

RECORDING SECRETARY,

SAMUEL H. SCUDDER.

TREASURER,

EDWARD PICKERING.

LIBRARIAN,

SAMUEL H. SCUDDER.

CUSTODIAN,

SAMUEL H. SCUDDER.

CURATORS,

THOMAS T. BOUVÉ,	MINERALS.
THOMAS M. BREWER, M.D.,	BIRDS; (NESTS AND EGGS).
	MAMMALS AND COMP. ANATOMY.
SAMUEL H. SCUDDER.	INSECTS.
FREDERIC W. PUTNAM,	FISHES.
B. JOY JEFFRIES, M.D.,	MICROSCOPY.
ALPHEUS HYATT,	PALÆONTOLOGY.
A. S. PACKARD, JR., M.D.,	CRUSTACEANS.
ADDISON E. VERRILL,	RADIATES.
HORACE MANN,	BOTANY.
BURT G. WILDER, M. D.,	REPTILES.
WILLIAM T. BRIGHAM,	GEOLOGY.
J. ELLIOT CABOT,	BIRDS.
EDWARD S. MORSE,	MOLLUSKS.

The Committee announced that Dr. J. C. White declined a reëlection to the office of Curator of Mammals and Comparative Anatomy, which he had held for many years. They had not yet been able to find a substitute.

On motion of Rev. R. C. Waterston, the thanks of the Society were voted to Dr. White, for the faithful and acceptable manner in which he had served the Society.

Dr. B. Joy Jeffries exhibited specimens of the *Euplectella speciosa*, or Venus Flower Basket, presented to the Society by Mr. H. U. Jeffries of Manila.

He also read extracts from the accounts of its structure given by Professor Owen and Dr. Gray. The sponge, which is siliceous and attached by its expanded base to some marine body, is supported by a tubular skeleton, made up of numerous elongated fibres; these fibres consist of fascicules of very slender spicules, and are crossed by similar fascicules, forming together an elaborate network; other fibres produce concentric and oblique ridges across the outside of the tube, and the tube itself is finally covered with a network lid formed of bundles of shorter spicules; the processes of spinning and weaving appear to be simultaneous.

Many of the specimens have a crustacean in the base of the tube, which has given rise to a popular belief that the case is spun by this animal, and larger prices are demanded by the dealers for specimens containing the crustaceans. The first specimen taken to England was sold for thirty pounds; but they have since become more common, and can now be obtained for a few shillings.

Mr. W. T. Brigham presented by title a communication on *Hesperomannia arborescens*, a curious Labiatiflora, discovered by Mr. Horace Mann on Lanai, one of the Hawaiian Islands, and described by Dr. Gray as a new genus.[1] which he named in honor of the discoverer. This curious Composita was found at an elevation of twenty-three hundred feet, and only one tree was seen. This was about twenty feet high, divaricately branched, and bearing several flowerheads at the end of the branches.[2] The flowers are of a brilliant yellow, with a tawny pappus. This new genus is especially interesting as the only arborescent Composita known on the Polynesian Islands. Hesperomannia does not occur on the elevated plateau of Hawaii, a region abounding in Compositæ, but it is probable that it may be found on Molokaì and Máui, islands closely adjoining Lanai, and not yet fully explored. A plate accompanied the communication.

[1] Proceedings American Academy, VI, p. 554.

[2] Enum. Hawaiian Plants, Proceed. Amer. Acad. VII, p. 176.

May 20, 1868.

The President in the chair. Twenty-two members present.

The following paper was read:—

FURTHER ENUMERATION OF NEW ENGLAND FUNGI. BY CHAS. C. FROST, BRATTLEBORO', VT.

In the Proceedings of the Boston Society of Natural History, March 5, 1856, is a list of Fungi, prepared by Mr. Chas. J. Sprague, of Boston, "as a commencement of an enumeration of that class of plants in New England," comprising about three hundred and fifty species. After farther researches, he published another list, in the Proceedings of January 6, 1858, increasing the number to six hundred and seventy-eight species. In 1860, Mr. Sprague, having relinquished his labor in this direction, transferred to me his remaining material, and desired that I should carry out his plans by making farther additions to his contributions. The following list is in accordance with that desire:—

I. HYMENOMYCETES.

Agaricus strobiliformis Fr.
" rubescens Pers.
" mastoideus Fr.
" cepæstipes Sow.
" equestris L.
" albo-brunneus Pers.
" Russula Schæff.
" miculatus Fr.
" personatus Fr.
" fumosus Pers.
" geotropus Bull.
" subinvolutus Batsch.
" cyathiformis Fr.
" platyphyllus Fr.
" fusipes Bull.
" dryophilus Bull.
" clavus Bull.
" atratus Fr.
" pelianthus Fr.
" citrinellus Pers.
" rosellus Fr.

Agaricus lacteus Pers.
" alcalinus Fr.
" filopes Bull.
" corticola Schum.
" pyxidatus Bull.
" camptophyllus Berk.
" Fibula Bull.
" mitis Pers.
" porrigens Pers.
" cervinus Schæff.
" repandus Bull.
" mutabilis Schæff.
" melinioides Fr.
" mollis Schæff.
" pulvinatus Pers.
" squamosus Fr.
" æruginosus Curt.
" fascicularis Huds.
" fimiputris Bull.
" semi-adhærens B. & C.
" papilionaceus Bull.

Agaricus candidissimus B. & C.
" barbatulus B. & C.
" Leainus B. & C.
" Blakeii B. & C.
Coprinus niveus Fr.
" atramentarius Fr.
" plicatilis Fr.
Bolbitius titubans Fr.
Cortinarius caperatus Fr.
" cyanopus Fr.
" tabularis Fr.
" violaceus Fr.
" Spragueii B. & C.
Hygrophorus eburneus Fr.
" pratensis Fr.
" virgineus Fr.
" cœrulescens B. & C.
Gomphidius roseus Fr.
" glutinosus Fr.
Lactarius zonarius W.
" uvidus W.
" deliciosus Fr.
" aridus Fr.
" Indigo Schwein.
" Hygrophoroides B. & C.
" subdulcis Bull.
" theiogalus Fr.
" rufus Scop.
" flexuosus Fr.
Russula emetica Fr.
" nigricans Fr.
" furcata Fr.
" adusta Fr.
" fragilis Fr.
Marasmius peronatus Fr.
" perforans Fr.
Lentinus lepideus Fr.
Boletus mitis Krombh.
" alveolatus B. & C.
" cyanescens Bull.
Paxillus flavidus Berk.
" panuoides Fr.
Polyporus ovinus Fr.
" cuculatus B. & C.
" varius Fr.
" cervinus Nees.
" vaporarius Fr.
" favillaceus B. & C.
" incrustans B. & C.
" gilvus Schwein.
Trametes lactineus B.
Merulius hœdinus B. & C.
" patellæformis B. & C.
" Corium Fr.
Hydnum septentrionale Fr.
" diffractum Berk.
" strigosum Fr.
" amplissimum B. & C.
" fusco-atrum Fr.
" gelatinosum Scop.
" ferrugineum Pers.
" niveum Pers.
Grandinia granulosa Fr.
Odontia fimbriata Fr.
Irpex pityreus B. & C.
Radulum molare Fr.
Craterellus lutescens Fr.
Thelephora sebacea Fr.
" giganteum Pers.
" umbrina A. & S.
Stereum myosiusculum B. & C.
Corticeum acerinum B. & C.
" olivescens B. & C.
" alutarium B. & C.
" arachnoideum Bull.
" colliculosum B. & C.
" Martianum B. & C.
" Sambuci Pers.
" scutellare B. & C.
Cyphella fulva B. & Rav.

Sparassis crispa Fr.
Clavaria botrytis Pers.
" pyxidata Pers.
" arachnoideum Berk.
" subtilis Pers.
" crispula Fr.
" stricta Pers.

Clavaria ligula Fr.
Pterula durissima B. & C.
Calocera palmata Schum.
Tremella enata B. & C.
Dacrymyces stillatus Nees.
" deliquescens Duby.
" chrysosperma B. & C.

II. GASTEROMYCETES.

Melanogaster rubescens Tul.
Phallus impudicus L.
Cynophallus caninus Fr.
Geaster fimbriatus Fr.
Bovista plumbea Pers.
" circumscissa B. & C.
Lycoperdon saccatum Vahl.
" pusillum Fr.
" calvescens B. & C.
Diderma globosum Fr.
Physarum musciolum Pers.

Angioridium sinuosum Grev.
Diachea elegans Fr.
Licea minima Lk.
Trichia fallax Pers.
Splanchnomyces roseolus Corda.
Ptychogaster albus Corda.
Leptostroma litigiosum Desm.
Pilobolus crystallinus Tode.
Phoma cæspitosa B. & C.
" brunneitinctum B. & C.
" porphyrogena B. & C.

III. CONIOMYCETES.

Leptothyrium Fragariæ Lev.
" Celastri B. & C.
Sphaeropsis ocellata B. & C.
" phomatospora B. & C.
" Viticola B. & C.
Vermicularia Liliaceorum Schw.
Discosia grammita B. & C.
Septoria Polygonorum Desm.
" Ulmi Fr.
" Dianæ B. & C.
Cytispora aurea B. & C.
" rubescens Fr.
Coryneum disciformis Kunze.
" microstichum B. & Rav.
Pestalozzia unicolor B. & C.

Næmaspora Rhoidis B. & C.
Glœosporum orbiculare B.
Bactridium flavum Kunze.
Sporidesmium epicoccoides B. & C.
Coniothecium toruloideum B. & C.
Uromyces scutellata Schlecht.
Uredo Ruborum Dec.
" graveolens B. & C.
" Polygonorum Dec.
" Rubigo Dec.
" Phaseoli Strauss.
Ustilago utriculosum Fr.
Puccinea mesomagale B. & C.
Lecythea populina Lev.
" Lini Lev.

IV. HYPHOMYCETES.

Stilbum vulgare Tode.
" Spragueii B. & C.
Phycomyces nitens Kunze.
Phymatostroma leucosporium Cord.
Tuberculаria granulosa Pers.
" nigricans Lk.
Dactylium macrosporium Fr.
Fusarium Nectroides B. & C.
Fusarium Berenice B. & C.
Polythrincium Trifolii Kunze.
Cladosporium cabosporium B. & C.
Mystrosporium ventricosum B. & C.
Botrytis infestans Mont.
Aspergillus cimmerius B. & C.
" maximus Lk.
Sepedonium cervinum Fr.

V. ASCOMYCETES.

Helvella ephippium Lev.
Geoglossum difforme Fr.
Solenia candida Pers.
" ochracea Hoff.
Peziza acetabulum L.
" flexella Fr.
" cupularis L.
" rimosa Sow.
" succosa Berk.
" sordescens B. & C.
" humosa Fr.
" Spragueii B. & C.
" molliscoides Schwein.
" ferruginea Schwein.
" clavus A. & S.
" alphitodes B. & C.
" cinerea Batsch.
" omphalodes B. & C.
" pallescens Pers.
" buccinea Pers.
" glumarium Desm.
" vinosa A. & S.
" sanguinea Pers.
Leotia chlorocephala Schwein.
Patellaria recisa B. & C.
" rhabarbarina Berk.
Tympanis alnea Pers.
Rhytisma Solidagineus Schwein.
Hysterium commune Fr.
" pulicare Pers.
" lineare L.
" flexuosum Schwein.
Glonium stellatum Fr.
Cordiceps Caroliniana B. & Rav.
Hypocrea Richardsonii B. & Mont.
" læta B. & C.
Hypoxylon xanthocreas B. & C.
" Morseii B. & C.
Dothidea Rosæ Fr.
" Sambuci Fr.
" Berberidis B. & Mont.
Nectria Murraii B. & C.
" aglœthela B. & C.
" Ribis Fr.
" sinopica Fr.
Diatrype ceratosperma Schw.
Valsa nivea Fr.
Sphæria nebulosa B. & C.
" brachytheca B. & C.
" macrospora B. & C.
" Tiliæ Pers.
" Saubenetii Mont.
" leioplaca Fr.
" millegrana Schwein.

Sphæria citrina Pers.
Uncinula spiralis B. & C.
" Wallrothii Lev.
Erysiphe Mors Uvæ B. & C.
Onygena faginea Fr.

Section of Entomology. May 27, 1868.

Mr. F. G. Sanborn in the chair. Nine members present.

The following paper was presented :—

Description and History of a New Species of Erirhinus, E. juniperinus. By Francis G. Sanborn.

Reddish testaceous, covered with short fulvous pubescence ; head, rostrum, club of antenna and abdomen beneath, except apical segments, dark brown. A slight longitudinal impression between the eyes, which are prominent and coarsely granulate. Prothorax distinctly punctured, slightly broader than long. Elytra with deeply punctured longitudinal furrows, a curved semi-fascia behind the middle, convex before and narrowest at suture, extending from the sutural to the fifth interstitial line, dark chestnut and almost devoid of pubescence (this marking, viewed as a common spot, resembles an arrow-head of obtuse angle, directed toward the apex of the elytra); scutellum and vicinity, suture and external margins of elytra frequently deeper in color. Length from tip of rostrum .12 to .15 in., rostrum .04 in. Twenty-eight specimens examined.

This little weevil is frequently found in Eastern Massachusetts during the month of May, depositing its eggs in the beautiful epiphytous fungus, *Podisoma juniperina*, upon the succulent flesh of which its larvæ feed in numbers, and within which it undergoes its transformations. I have reared the imago in April from the dried fungi collected the previous October. Its habits remind one of those of the plum-weevil, *Conotrachelus nenuphar* Herbst, which frequently uses the *Sphæria morbosa* as a nidus.

June 3, 1868.

The President in the chair. Thirty members present.

Mr. W. T. Brigham announced a new and most remarkable eruption of Mauna Lòa on the Hawaiian Islands.

The outbreak commenced on the 27th of last March, on the southwestern slope of the mountain, and while all former eruptions which have been recorded have taken place without earthquake shocks, the seismic effects have at the present time been most remarkable. On the 28th one hundred shocks were felt, and during the two weeks previous to April 13th, no less than two thousand are said to have occurred, culminating in intensity on April 2d. At Honolulu, more than a hundred and fifty miles distant from the centre of vibration, the clocks were stopped. In the district south of Hualalaì and Mauna Kéa, the ground was most violently agitated, chasms were opened, precipices broken and hills overthrown, and so sudden were the shocks that a man on horseback found himself on the ground and his horse lying by his side, before he had thought of an earthquake. At Hìlo, eighty miles distant, the ground cracked, and the streams ran mud ; but north of Mauna Koháła, a tall chimney of the Kohála sugar-mill was not overthrown. Churches and storehouses in the district of Ka-ù were destroyed, and a tidal wave, similar to that of 1837, rushed up the southwestern coast, causing great destruction of life and property.

When the lava reached the surface near the summit of Mauna Lòa, the shocks still continued, and a shower of light-colored ashes fell. The lava then broke out much lower down, and flowed rapidly in several streams into the sea, destroying a fine herd of cattle on its way.

Smoke was emitted in great volumes, so that it extended several hundred miles from land, and poisonous, probably sulphurous, vapors were poured out from the numerous cracks. Kilauéa had been very active for some time previous, and the lava is said to have broken through into one, or both, of the small lateral craters. The lava in the main crater now sank some two hundred feet, escaping by some as yet unknown path, probably through the southeastern rent of 1840. Kilauéa is below the source of lava on Mauna Lòa.

The accounts received of this most extensive and remarkable eruption that has been known on the Hawaiian Islands, are as yet very incomplete, owing to the constant fear and anxiety of the people, and the absence of any geologist or scientific man.

Dr. B. Joy Jeffries stated that he had followed out the experiment in regard to the projection of after-pictures, spoken of by the President at a previous meeting.

The projection, for instance, of a circle, will be a right angled cone, its apex at the nodal point and its base in space. All surfaces cutting this projected cone at an angle to the perpendicular give conic sections, thus explaining the after-picture of a circle appearing as an ellipse, of a square as a lozenge, etc. Dr. Jeffries, in continuing the experiments, had found them very interesting, as showing the mentality of the eye; for, notwithstanding he projected against a surface at an angle to the line of vision, yet by mental effort he could recall the circle as if against a surface at right angles to the line of vision, or again let the ellipse be formed. A certain degree of excited sensibility of the retina, so favorable to all after-pictures, assisted the experiments; but whether the circle or ellipse was seen, seemed to depend upon intentness of mental action, somewhat as we recall or suppress the picture in either eye, when using the monocular microscope or ophthalmoscope. Dr. Jeffries said that his colleague, Dr. Hay, in testing the experiment, saw the circle *through* or *beyond* the surface, cutting the line of vision at an angle. The President stated that this was also the case with himself. Dr. Jeffries, however, saw the circle touching with its edge the inclined surface, therefore in front of it. He exhibited the disks and circles used in experimenting, white, black, and some of the primitive colors, in order to have a complementary colored circle or ellipse, as better contrasted with the first, in the after-picture. He made some remarks in regard to after-pictures, stating that he could not find mention of the above experiments in any optical treatises or physiologies. He explained how after-pictures are produced and suppressed, and by means of diagrams, illustrated the theory of projection. Such experiments, however simply curious they might seem, often lead to important and valuable discoveries. These after-pictures had quite recently been employed by Dr. Giraud-Teulon, to obtain necessary data in regard to the contraction of the field of vision in a case where the latter was of great diagnostic value.

Dr. C. T. Jackson presented some specimens of Petrosilex and Porphyry from Melrose, on behalf of Mr. Wm. B. Shedd. The following analysis of the green Petrosilex was read:—

Silica	86.00
Ox. Iron and Alumina	2.00
Lime	1.12
Magnesia	1.10
Water	1.50
Alkalies diff.	8.28
	100.00

Captain N. E. Atwood presented a buoy or float, made of the inflated stomach of a black-fish; it was attached to a line, and used in harpooning whales. He also exhibited a large drawing of a sperm whale, and offered some remarks upon the habits of this cetacean.

The sexes differ greatly in size; the males are much the largest, and yield from fifty to one hundred barrels of oil, and sometimes even a greater quantity; a specimen of the lower jaw of a sperm whale, in the Museum of the Society, was taken from an animal that yielded one hundred and forty-six barrels. The females are small, yielding ordinarily from eight to twenty-five, occasionally as many as forty, barrels of oil. A great proportion—on an average one-third—of the oil of the sperm whale is found in the head; the oil from this part, and from the flukes, differs from that obtained from other parts of the body, and was formerly considered more valuable, but since the introduction of petroleum, both kinds are rated alike.

From the east of the Grand Banks toward the Azores, and from that line northward, the whales are mostly males, and are frequently seen alone, while in the neighborhood of the West Indies, or anywhere within the tropics, females abound, and large schools are sometimes met with, composed wholly of females; at other times a few males are found with them. Unlike the humpback whale, the affection of the cow sperm whale for its young is not very strong, for if the calf is harpooned, the mother takes flight. Whalers believe that sperm whales know when one of their species is harpooned, even if it is miles away, for they are at once seized with a panic.

When they go down they remain from twenty minutes to an hour, then return to the surface and blow from twenty to fifty times, during which time the top of their backs may be seen above the water. If they are harpooned when they first come to the surface they are killed with but little trouble, sometimes going but a few fathoms below the surface, but if they are harpooned after having spouted several times, they are apt to go down before they can be killed. Captain Atwood stated that he had been engaged in killing a large sperm whale which went down seven times, each time with more than four hundred fathoms of line.

The Secretary read a paper by Mr. J. A. Allen, upon the birds of Iowa and Illinois, in which the author discussed some points connected with the migrations of these animals.

Mr. Allen believed that the geographical limits of the different provinces and faunæ among birds must be based upon their range during breeding season; at other times migratory birds are rarely localized for any considerable period and cannot be termed inhabitants of a region through which they merely pass; even where they do remain for a short time, a species is represented, not by the same individuals, but by a succession of earlier and later birds. Migrations consist of a general swaying to and fro of all the representatives of a species — southward in winter and northward in summer; those birds whose limits of migration are the most extended pass nearly two-thirds of their lives in journeying, seldom pausing, except in the breeding season, for long intervals, but beginning slowly to retrace their steps almost as soon as they have reached their southern limits; their breeding country is their only true home.

We need therefore something more than bare catalogues of the species which occur in any locality to determine the laws which regulate the distribution of birds. Dana, Forbes, and others, have pointed out how greatly the distribution of marine animals depends on temperature. Verrill has also shown the close coincidence of the boundaries of some faunæ with the lines of equal mean temperature for the months of April, May and June; other influences, such as humidity and vegetation, have, of course, their place, but these, too, are plainly the result of climatic causes. A comparison of the birds breeding in the Alleghanian fauna with those in the Canadian and Louisianian faunæ, shows that the Alleghanian differs from the others in having few, if any species,, peculiarly its own, thus forming, as it were, a transitional ground. Here, too, as we pass northward, we notice more conspicuously that the species fade out at frequent intervals.

June 17, 1868.

The President in the chair. Eighteen members present.

The President read the following letter from Prof. W. P. Blake of San Francisco:—

I have been very much interested in the perusal of the two articles by Mr. Bickmore in the last number of the Journal of Science upon the Ainos, or hairy men of Yesso.

Ever since I first saw and travelled among that strange people in the interior of Yesso, in 1862, I have been very desirous of gaining more satisfactory information regarding their race and origin. Mr. Bickmore's conclusion, that they are not Mongolian or Turanian, is entirely in accordance with my convictions. They have no physical resemblance to the Mongolians; and they have always seemed to me to more closely resemble the Turks and Hungarians than any other part of the human family that I have seen. The general and the minute descriptions of them given by Mr. Bickmore and other travelers are in the main accordant with my observations. I can bear testimony particularly to the kindness and gentleness of this strange people, and their evident pleasure in meeting men with moustaches and flowing beards like their own. They seemed to recognize me as of a kindred race, for they would stroke their beards and then point significantly to mine. It seemed to give them great delight to find bearded men treated with ceremony and distinction by the Japanese.

In one of the expeditions into the gold regions, among the mountains of the interior, the superior sagacity and skill of the Ainos in mountain traveling was constantly shown. They are much more disposed to penetrate the interior and to hunt in the forests, than the Japanese are. The latter spread along the ocean beaches, and rely upon fish and marine products for their sustenance, rather than upon game, but the Ainos are fond of hunting, and of fishing in the rivers. Their perceptions are quicker, and they observe more closely than the Japanese. In riding along the beach with Aino men running alongside, they would often instantly detect a pebble or shell upon which my sight was directed, and would stop and pick it up for me; but with the Japanese attendants it was almost impossible to make them understand what was wanted under similar circumstances.

The physical peculiarities which were most striking to me were their enormous beards, the moustache usually covering the mouth; the "squareness," or horizontal line of their foreheads over the eyes; the depth of the orbits, or rather the eyes deeply set in the head, and without any obliquity, as in the Japanese and Chinese; their well-developed muscles, particularly of the arms and legs, and their medium stature. The extreme hairiness of the body should have been mentioned. This hair is thickest upon the outer side of the arms and legs, and extends down upon the fingers, and upon the feet. It is black, and often *very* thick, and, if I remember rightly, from three-fourths of an inch to an inch, or an inch and a quarter in length. I am writing without my notes, but my recollection is distinct that their mouths are large, and their lips rather thick. The forehead, which is rather narrow below, across the eyes, widens rapidly above, and their heads seemed to me to have this as a *common* or general character. I was not aware of the ethnological value of measurements of the body, but I took some trouble to obtain accurate outlines of their heads. For this purpose I had a frame made, carrying a great number of long movable needles, which could be pressed in upon the scalp through the thick mass of hair. The results, together with some outlines of heads of the Japanese for comparison, I will be happy to show you if I can find them among my papers on this side of the continent.

Although, recognizing the close affinity of this race with ours, I am disposed to regard it as totally independent in origin, and as perhaps indigenous to those islands, and as having had a language totally distinct from any other.[1] The great development of hair upon the body; the abundance of long straight black hair upon the head, the broad noses, peculiarly depressed between the eyes; the thick lips, and the smallness of stature, appear to me to make them radically different from any other race.

Mr. S. H. Scudder gave a brief account of the migratory grasshoppers of the United States.

Two species are known, both belonging to the genus *Caloptenus*; one *C. femur-rubrum* Burm., is found in nearly all the country east of the Mississippi and in the States bordering it upon the west. It has seldom been known to migrate or to ravage the country to any alarming

[1] I have, or had, a vocabulary of Aino words among my notes, which may be of some service in any investigation of their language.

extent. The second, and perhaps the most destructive, *C. spretus* Uhl., has frequently devastated the whole of the region lying west of the Mississippi as far at least as the Rocky Mountains and extending from Texas on the south to the Saskatchawan River on the north It cannot be an alpine insect, as suggested by Walsh, since the young are readily killed by the cold and it has bred year after year as far south as the State of Texas ; the natural limits of its distribution are as yet unknown. A third species, whether belonging to the same genus or not is still uncertain, has invaded at different times nearly all the country lying within the boundaries of the United States between the Rocky Mountains and the Pacific Ocean.

Dr. C. T. Jackson communicated a description of the great beds of Apatite, or Phosphate of Lime, which he had recently visited in Canada West, and referred to the specimens which he had recently presented to the Cabinet of the Society.

Near Perth, on the northwest side of Ottey Lake, in the township of North Burgess, the principal quarries now worked are located. From one of these quarries not less than one thousand tons of very pure phosphate of lime, containing from eighty to ninety per cent. of the pure phosphate, had been sent during the past year to England, where it is used in the manufacture of super-phosphate of lime for agriculture, and also in the manufacture of Delft ware, and for the lining of iron kettles with a sort of porcelain. The phosphate of lime is found in a metamorphic rock supposed to be derived chiefly from altered Potsdam Sandstone. The beds run nearly northeast and southwest and are almost vertical in dip.

Their width varies from a few inches to five or six feet, and the walls of the beds are true and well-defined, indicating persistence in their downward continuity. Indeed, their width, as shown in the mine worked by the English Company, has increased considerably in a depth of thirty feet; and solid blocks of compact or massive phosphate of lime are now extracted, which weigh several tons each. Associated with the phosphate of lime, magnesian mica or phlogopite, in regular six-sided prisms, is abundant, and is a constant concomitant, so much so as to be regarded as the unfailing indication of the apatite, whether crystallized or massive. Calcareous spar of various colors, orange-yellow and Venetian red, is also found in some of the mines, and is especially abundant and beautiful in the locality on Rideau Lake, where the large beryl-like crystals of apatite are found. This locality is in North Burgess, and has been worked by the American Mining Company of New York. Upwards of one hundred tons of broken crystals now lie upon the wharf near the mine, and beautiful beryl-like crystals, from four to eight inches in diameter, and from a foot to eighteen inches in length, are seen imbedded in the red calcareous spar in the mine. Some of these crystals are of a fine sea-green, others are red, and some are parti-colored, with mixtures of green, yellow and red. Some of the calcareous spar is of a rich orange color, and imbeds beautiful and remarkably well defined crystals of green apatite, and hexagonal crystals of phlogopite, some of which are a foot in diameter.

The extent of the phosphate range is over forty miles, although the beds are not continuous to that distance; but they frequently recur, as may be seen in Elmsley, and from thence to Bedford. The smaller crystals of apatite are generally well defined, while the larger ones are very frequently marked with deep erosions, as if they had been partially dissolved by the calcareous spar after they had become solid crystals.

Not the slightest trace of any organic remains has ever been found associated with these phosphate beds, nor even in the including rocks. Not even a *Lingula* has ever yet been discovered in them, even by the industrious local geologist of Perth, Dr. Wilson, who has a fine cabinet of all the rocks and minerals of that region. Therefore it seems idle to imagine that the phosphate of lime had an organic origin, for no proof of such an origin has ever yet been discovered.

It is more probable that this phosphate of lime is one of the primary or original ingredients of this planet, and all analogy points to such an origin; for phosphate of lime exists in variable, though small quantities in all, even in volcanic and other rocks of known igneous origin, and phosphorus is an element common in meteoric stones and meteoric iron, proving its cosmic origin beyond a doubt.

There appears no more reason for asserting an organic origin for the phosphate of lime, than there would be for that of the magnesian mica, or phlogopite, which is its constant associate in Canada.

In addition to the minerals above described, we find in the same rocks crystals of Egeran, in the gneissoid rocks, veins of sulphate of Baryta, and in the limestone an abundance of graphite, or plumbago, of the foliated variety, and huge crystals of pyroxene or augite, one of which measures six inches in length and three inches in diameter, and is well terminated at one extremity.

The President announced that members of the Society would hereafter be permitted to invite the attendance of ladies on the second meeting of every month.

Section of Entomology. June 24, 1868.

Mr. L. Trouvelot in the chair. Twelve members present.

Mr. Francis G. Sanborn read the following description of the larva and pupa-case of *Microdon globosus* Fabr.

A singular brownish object of an oval hemispherical form, has often excited the curiosity of the field student of Entomology, while prying off the bark from decaying stumps, and raising mossy stones in the outskirts of some grove. Its form, unlike any familiar shape of in-

Fig. 1. Pupa case.
s. Spiracular tubercles.
v. Vent.

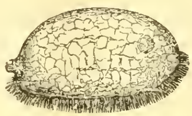


Fig. 2.
Larva just before pupation.

Fig. 3. Anterior view of pupa case.

sect's cocoon, tempts him to throw it over to the tender mercies of those versed in Crustacean or Molluscan lore, but its vacant interior and its curiously reticulated structure, together with its extreme delicacy and unvarying regularity, gives his entomological conscience a sharp twinge, whether he places it among the *res ignotae* of his cabinet, or discards it as being neither bug, beetle, nor good hymenopteron. Its general form is that of a somewhat elongated hemisphere, a little over .4 in. in length, and .3 in. in breadth, of a warm reddish-brown, surrounded by a fringe of short ciliæ at its base. Its surface is covered with minute tubercles arranged in irregular, intersecting, longitudinal lines, connected by short transverse ones, giving it a reticulated appearance, while the interstices, which are larger on the lateral disks, are smooth, but not polished.

The tubercles composing the three lower lines on each side, and the seven highest, are rather larger than the others, giving these localities a more prominent appearance. The under surface resembles a thin membrane tightly stretched, and is of a lighter shade than the rest. The vent is prominent, subconical, situated about .05 in. above the row of cilia, and darker in color.

The living larva differs only from the pupa-case in color, being of the transparent white of the garden shrub called snowdrop, with the exception of the reddish-brown tubercles, vent, and ciliated border, and in the mobility of the under surface by which it progresses in a precisely similar manner to the larvæ of the Limacodidæ. The head is visible only as a minute retractile pair of black mandibles, under a strong magnifier. The last three to five days before its pupation two darker round spots appear under the transparent skin opposite, and a little above the level of the vent; when the insect is fairly in the pupa stage, each spot has taken the form of a little conical cluster of tubercles, slightly protruding from the surface. These organs appear to serve as spiracles during the pupa stage, communicating by delicate tubes with the body of the enclosed insect between the head and prothorax. The imago effects its exclusion by separating the anterior third of the pupa-case into three divisions, the upper forming two comma-shaped pieces, each containing a spiracle, and the lower a single vase or salver-shaped piece. The insect belongs to the family Syrphidæ, genus *Microdon* of Meigen, *Aphritis* Latreille, and the species was named *globosus* by Fabricius. His description was very brief, and has been apparently transferred word for word by all subsequent authors.

Mr. L. Trouvelot offered the following observations on the comparison of young larvæ of insects.

It is quite interesting to compare together, in the early stage of life, lepidopterous larvæ belonging to different species of the same genus; the resemblance is sometimes so striking that it is not an easy matter to separate one species from another.

I think a comparative study of recently hatched larvæ, belonging to the same genus, would lead the entomologist to the knowledge of the degrees of relationship which exist between different species of the same genus; and then, to the degree of relationship between genera. Insects, and particularly Lepidoptera and some Hymenoptera, seem to be better adapted for this comparative study than any other class of animals, since the larval stage is only the animal in a yet undeveloped or embryonic state, and as this embryo is easily reared and plainly visible, — not concealed beneath the shell of an egg, or in the womb of the mother, it is easy to observe, and would, I think, give more certainty to classification. I have compared the young larvæ of *Papilio Turnus*, *P. Troilus* and *P. Asterias;* they resemble each other greatly, especially *P. Turnus* and *P. Troilus; P. Asterias* does not resemble the others quite so much, and consequently is not so nearly related to either of them.

It seems to me that by this comparative study of the young larvæ or embryos, the original type of a genus, if still existing, could be found with certainty.

He also spoke of an interesting habit of the larva of *P. Turnus.*

Every one knows that this larva, when at rest, remains upon the middle of the upper part of a leaf; for this purpose a carpet of silk is spread upon the leaf by the larva. This leaf, by means of the silk, is made to curve a little. On one rainy morning I observed one of these young larvæ upon a lilac bush in my garden. I certainly thought that the invention of resting in the hollow of a curved leaf on a rainy day was a very poor one, for since the bent leaf performed the office of a gutter, the water must flow through this channel, the larva be inundated and inevitably drowned, if the rain lasted but a few hours. I soon found that there were more brains in the small head than I had supposed. The larva began to move; it spun some silk from one edge of the leaf to the other, and by adding many fibres to make it strong, each new fibre shorter than the preceding, the leaf was soon made to curve more and more. I then began to understand what this laborious work was for, and I thought that sometimes small people might give lessons to larger ones. After about an hour the larva ceased to work, a real bridge was built over the torrent, and upon it laid motionless and out of danger the little larva. Would you call such an act instinct, or would you call it reason? If you call it instinct, I would say that this instinct is very reasonable.

Mr. Trouvelot further indicated the following points of analogy between Limacodes and some Hymenoptera: —

1. When the larva of Limacodes is disturbed, it rolls itself like hymenopterous larvae.

2. In eating, the larva lies upon the top of the leaf like those of hymenopterous insects.

3. The cocoon is very much like those of Hymenoptera.

4. Like the Hymenoptera, the larva of Limacodes remains all winter in the pupa state.

5. Like the Hymenoptera again, the legs, wings, antennæ, etc., are free, not enclosed in a general envelope like other lepidopterous pupae.

6. In emerging, the perfect insect does not soften the cocoon, but, like the Hymenoptera, cuts a door in it. I am curious to know what instrument the insect possesses to make this excision.

7. And finally, the perfect insects of some species, and especially the male sex, have diaphanous wings.

Mr. Sanborn exhibited larvæ and pupæ of *Colymbetes (Cymatopterus) sculptilis* Harris, found just above the water's edge at Lawrence, Mass., under stones. Also a cluster of eggs of *Heterocerus fatuus* Kiesenwetter? from the mud flats at Coney Island, N. Y. The eggs are laid by the parent, about one-eighth of an inch or less beneath the surface; the insect burrows on that level, raising a slight elevation similar to that of the mole-cricket.

Mr. Sanborn also exhibited Cecidomyian larvæ of a reddish orange hue, about one-fourth of an inch in length; they feed in companies of thirty or forty in the pitch exuding from wounds in the bark of the *Pinus rigidus*; whether they were the prime cause of the injury to the tree was not plainly apparent.

July 1, 1868.

The President in the chair. Twenty-four members present.

Professor William H. Brewer of New Haven, Conn., was elected a Corresponding Member.

Messrs. Roland F. Alger, John L. Hayes, Ephraim H.

Jenks, C. S. Minot and Roger Wolcott, were elected Resident Members.

Dr. B. Joy Jeffries made the following remarks upon the principle of the Thaumatrope: —

Mr. A. Claudet, F. R. S., about a year ago reported to the Royal Society a new fact in regard to binocular vision, deduced from the thaumatrope. If we print on each side of a card the alternate letters of a word, and attaching a string to either end, twirl it around on its axis, the letters on the two sides of the card, owing to the continued retinal impression, are apparently seen at the same time. This experiment, carried out in a variety of ways, such as a bird on one side and a cage on the other, in which it seems to be, forms a popular scientific toy, called the *thaumatrope*, from two Greek words, meaning "wonder" and "turn."

Mr. Claudet's observation is this: Let us attach the strings by knots at the ends, to prevent their slipping through our holes in the card. Let the two knots be on one side of the card, and now when we twirl it the card turns in the axis of the opposite side of the card. Pulling the strings through, of course reverses the axis to the other side. With binocular vision, the letters on the side away from the observer, *i. e.*, where the knots are, seem further off, and more indistinct. Reversing the knots we reverse the phenomenon. Placing our eye fifteen inches from the card, and supposing the thickness of the card to be $\frac{1}{80}$ of an inch, the difference between the distances of the two surfaces of the card is not more than $\frac{1}{1200}$ of the whole distance (fifteen inches). The card I use is about $\frac{1}{60}$ of an inch, making $\frac{1}{900}$ of the whole distance at fifteen inches. Although there is but this minute difference, yet the phenomenon is evidently due to it, as the experiment readily shows, even to an eye not trained to optical experimentation. This is a new fact in binocular vision, and I admit it as such without hesitation. To my eyes, however, the phenomenon is not simply *binocular*, but *monocular*, also, although in less degree, as binocular is better than monocular vision. This, with another point I will bring up, seems to me to destroy Mr. Claudet's theory of the cause of the above phenomenon. He says, "the effort to obtain distinct vision and the effort to obtain single vision act in unison, for it is impossible not to admit that the two muscular processes by which both the angle of convergence is directed to the object, and the focus of the eyes is adapted to its distance, for the double purpose of having at once single and distinct vision of every object, are two actions necessarily simultaneous and inseparably connected. They are therefore both, each in its way, criteria of the distances of objects; but they give rise to certain indirect and additional criteria for other distances, in two ways: one, the more important, is the double images of the objects situated before and behind the point of convergence; and the other, but only in a subsidiary way, the degree of confusion of the objects situated before and behind the point of convergence, and which are not in focus." This latter, as he says, "being monocular also, should perhaps be left out in considering binocular vision. Therefore it is particularly the sensation of the double images, the degree of their separation, and their respective positions, either outside or inside from the centres of the two retinæ, which indicate more powerfully the exact distance of the object from the point of single vision, either before or behind. When we look fixedly on a point of one surface of the revolving card, that point appears single, and we see at the same time another point on the other surface which appears double, although we hardly feel that we notice its doubleness; and from the position or distribution of the double images, either on the right or on the left of the central point, we have at the same glance the perception of the respective distances. Therefore to judge of the distances of certain objects in the direction of the line of vision, we are not absolutely obliged to alter constantly the angle of convergence. This is proved by our perception of the two distances of the surfaces of the card while it is revolving; for it would be impossible that we should alter the angle of convergence to adapt it alternately to the two surfaces while they are turning so rapidly. The same angle of convergence kept on one or the other surface is no impediment to our seeing both in a sufficiently distinct manner." My diagram illustrates this as Mr. Claudet puts it.

However, I get this effect or difference of plane with one eye, heightened by binocular vision. To me it seems, therefore, that it must depend on accomodation rather than on change of convergence. I admit the intimate relation of these two muscular efforts, though the researches of Prof. Donders show that they can be dissociated more than we should gather from Mr. Claudet's remarks. I am aware how much the muscular effort for convergence tells us in regard to distance, to prove which I know of no more striking experiment than that of Meyer's (Vide Archiv für Opth. Bd. 2, 1856), with the series of strings in different planes, as I have shown to the Society.

But if this effect of the letters, appearing in different planes with the thaumatrope, is a monocular phenomenon, then we do not need Mr. Claudet's explanation in reference to difference of convergence and eccentric double images. I would allow that this might help to produce the effect, were it not that the arc on the retina, subtended by the angle between the lines from the two surfaces of card (that is, $\frac{1}{80}$ apart, and but $\frac{1}{1200}$ of whole distance from the eye, fifteen inches), is, as I make by rough calculation, about $\frac{1}{1000}$ of a millimetre, and Tobias Meyer, E. H. Weber, Volkman and others, agree that two points *to be seen as such*, must subtend an arc on the retina from $\frac{2}{1000}$ to $\frac{4}{1000}$ of a millimetre. Moreover, recent experimentation has shown more and more conclusively the large part accommodation takes in judging of distances within its "range." When I print the alternate letters of a name, for instance, L, N, O, N, on a card, and the others, I, C, L, on pieces of the card, and paste them between the first, they will vary in distance from my eye just the thickness of the card, in my experiment $\frac{1}{60}$ inch, or $\frac{1}{900}$ of whole distance to my eye, fifteen inches. With the exception of the *alternate presentation* and *after impression*, this gives me just what I have when the letters are on the two sides of the card, and it is twirled by the strings. Yet placing the letters as above, I get, in but a feeble degree, this effect of difference of plane compared with the thaumatrope experiment. I am not prepared to explain to my own satisfaction this new fact of Mr. Claudet, yet I desire to call attention to what seems a misinterpretation of its cause, as every discovery in binocular vision, now being studied and experimented upon so carefully, should be thoroughly tested by many observers before being admitted as a point of departure for further investigation.

Mr. Luther Hills stated that he had found a new locality for minerals on the Boutwell Farm, Auburn, Me., about twelve miles southeast of Mt. Mica in Paris; the composition of the rock is the same as that of Mt. Mica. Abundance of feldspar and lepidolite occurred; also graphic granite, rose quartz, red and black tourmaline, and green tourmaline of an emerald tint, differing from any found in the neighboring localities in Hebron and Paris. Some of these were exhibited.

September 16, 1868.

The President in the chair. Twenty-one members present.

At the request of the President, Prof. O. C. Marsh, of Yale College, gave an account of some observations which he had recently made on the metamorphosis of *Siredon* into *Amblystoma*, two genera of tailed Batrachia, usually regarded as belonging to distinct families.

During an excursion to the Rocky Mountains, in August last, Prof. Marsh obtained at Lake Como, a small brackish sheet of water in Wyoming Territory, several specimens of *Siredon lichenoides* Baird. On bringing them to New Haven, one of them soon began to show indications of a change, similar to that recently noticed by Duméril in the second generation of the Mexican Axolotls, kept in the Muséum d'Histoire Naturelle in Paris.

The first phase observed in the transformation was the appearance of dark spots on the sides of the tail, and, soon after, the membrane along the back, and especially that below the tail, began to disappear by absorption. Next the external branchiæ began to be absorbed, and the animal came more frequently to the surface of the water for air. As the change went on, the spots gradually extended over the rest of the body; the external branchiæ, as well as the branchial arches, became absorbed, and the openings on the neck closed by the adhesion of the opercular flap.

The body also diminished in size; the head changed in form, becoming more rounded above, and more oval in outline; and the eyes became more convex and prominent; the opening of the mouth became larger, and the tongue increased considerably in size. Important changes also took place in the teeth, and in other parts of the structure, and finally the animal escaped from the water as a true *Amblystoma*, not to be distinguished from *A. mavortium* Baird, according to Prof. Cope's recent definition of the species. Subsequently, several other Siredons went through the same metamorphosis, during which, various experiments showed that the rapidity of the change was greatly affected by variations in light and temperature, the specimens most favorably situated in these respects, having undergone apparently their entire transformation in about three weeks. Whether the species ever changes in Lake Como, which is about seven thousand feet above the sea, is uncertain, but it probably breeds in the Siredon state, like the Axolotls from the table lands of Mexico. This interesting metamorphosis, which has apparently never before been observed, renders it extremely probable that all Siredons are merely larval salamanders; and it also leads to the suspicion that some, at least, of the other so-called Perennibranchiates (by no means a natural division of the Batrachia) may also prove to be the undeveloped young of well-known species.

Section of Entomology. September 22, 1868.

Mr. P. S. Sprague in the chair. Ten members present.

Mr. F. G. Sanborn exhibited a specimen of *Tramea lacerata* Hagen, taken at Chelsea Beach, of *Myrmeleon obsoletum* Say, captured at Salem, by Dr. E. P. Colby, of *Myrmeleon abdominalis* Say, at Milton, by Mr. J. Schofield, and a bred specimen of *Meleoma Signoretii* Fitch, with its cocoon and subimago-case, obtained in Andover; none of these species have been hitherto recorded from Massachusetts. He also drew attention to the following curious specimens: a *Musca harpyia* Harr., impaled upon the point of a spire of *Carex (?)*, which penetrated the body from beneath, between the anterior coxæ, backward, without reappearing above; the specimen was otherwise uninjured. An *Ammophila gryphus* Smith, clasping a small oak twig with its mandibles and feet, the body elevated one-fourth of an inch above the twig and the head directed toward its extremity.

Mr. C. S. Minot stated that there were three broods of *Chrysophanus americanus*, one appearing early in May, the second in July, and the third the last of August. The insects of the first brood differed from those of the other two in wanting the row of red spots on the underside of the secondaries.

Mr. S. H. Scudder gave the results of some experiments he had made during the summer, upon the reproduction of lost limbs in the Walking-Stick, *Diapheromera femorata.*

If a leg is cut off beyond the trochanto-femoral articulation, the parts remaining outside of this joint are dropped before the next moult, and are then renewed, either by a straight short stump, in which the articulations are already observable, or by a miniature leg, the femur of which is straight, and the tibia and tarsi curved into a nearly complete circle; if the former, the leg assumes, at the next moult, the appearance it would have had in the second case; the latter form is always changed at the succeeding moult into a leg resembling the normal limb in every respect, excepting size and the absence of the fourth tarsal joint. If the leg is removed anterior to the trochanto-femoral articulation, the limb is never replaced.

The growth of the limb takes place, as in the uninjured limb, during the moult; a leg, of the full size attained during any one stage, is drawn directly out of a pellicle representing the size of the leg in the previous stage; the same thing occurs when the animal leaves the egg; in the egg the mesothorax and metathorax are scarcely larger than the prothorax, thus enabling the femora, which are widely separated in the escaped insect, to lie close together, as in other insect embryos; but by the time the young insect has fairly emerged from the egg, the thoracic segments have attained the normal proportions of the adult animal.

Mr. Scudder also stated that he had recently obtained from a cluster of eggs of *Œdipoda carolina*, a considerable number of Chalciditans of a species apparently undescribed. He believed this to be the first recorded case of parasites living in the eggs of an Acrydian.

October 7, 1868.

The President in the chair. Forty-one members present

Messrs. William E. Endicott of Canton, George E. Hatton of Dedham, William M. Snow of Cambridge, and Charles

F. Folsom and Edward A. Samuels of Boston, were elected Resident Members.

The following papers were read:—

ON A THREAD WORM (*Filaria anhingæ*) INFESTING THE BRAIN OF THE SNAKE-BIRD, (*Plotus anhinga* LINN.). BY JEFFRIES WYMAN, M.D.

Plotus anhinga is generally called "snake-bird" in the States bordering on the Gulf of Mexico, but on the St. John's River in East Florida, where our observations were made during the months of February and March in 1861 and 1867, is more commonly known as the "water-turkey." There they are seen in large numbers, perched upon the dead trunks or projecting limbs of trees which overhang the river or the lakes and lagoons connected with it. On much travelled routes they are shy and wary, and when danger threatens, either fly quietly away or drop head-foremost into the water, and sink almost noiselessly beneath the surface. When they rise again they swim with the head just seen, and when no longer afraid soon show the whole body. With the alligator and loon they seem to have the faculty of quietly raising or sinking their bodies in the water without apparent effort. They seek their food beneath the surface, and, as far as our observations go, live largely on fish, a species of bream (*Pomotis*) being the one most commonly found in their capacious œsophagus and gizzard, and often in such large quantities that one is prepared to accept Mr. Audubon's statement as to the voracity of the *Anhinga*. He also informs us that their food is quite varied, and that they do not hesitate to swallow insects, eggs of frogs, tadpoles, crawfish, shrimps, young alligators, and even small water-snakes. These facts are important in connection with the question as to the source of the parasites with which they are infested.

Mr. Nuttall places the *Anhingas* near the Divers, and Mr. Audubon near the Cormorants, which last they very nearly resemble in many outward characters, as well as in the details of the structure of their skull. They however differ from both the Divers and Cormorants in their long, snake-like neck, in which respect, as well as in the form of their bills, they resemble the herons. In the dissection of them we were much struck with the peculiar structure of their gizzard. Audubon has given a good figure of the exterior form of this, but has overlooked two remarkable peculiarities:—

1st. The œsophagus has numerous longitudinal folds in its mucous membrane allowing of large dilatation, but has no glandular portion, nor is there any distinct pro-ventriculus. The gastric follicles are all included in a separate, pear-shaped pouch about thirty m. m. in length, and somewhat less in breadth. This does not open into the œsophagus, but directly into the gizzard proper, through the cuticular lining of its upper portion, by a mouth only four or five millimeters in diameter. The follicles are oblong, flask-shaped, the largest of them forming the thickest part of the walls of the pouch, which is near its widest portion, and have a length of five or six millimeters.

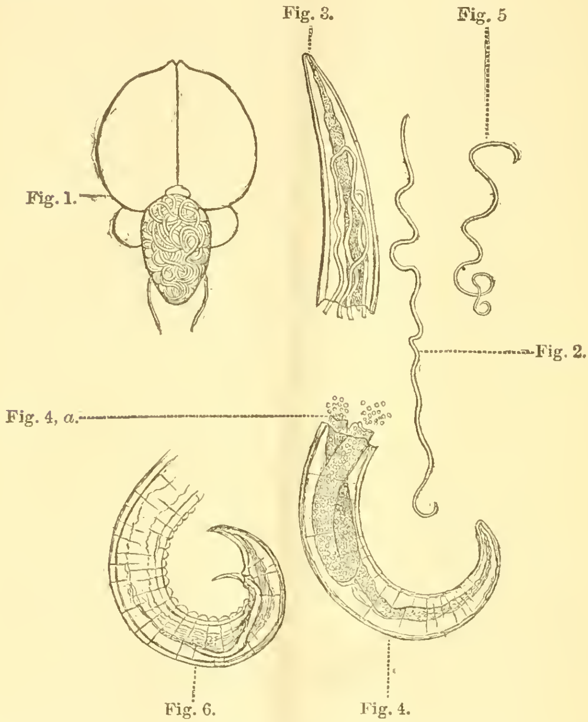
2d. The pyloric portion forms another pouch about seventeen millimeters in diameter, and, like the first, is an appendage to the gizzard. Its whole cavity is densely packed with slender, flexible, horny filaments, seven or eight millimeters long, attached around the entrance of the duodenum, the free ends pointing towards the cavity of the gizzard. Any pressure upon them from this last direction would cause them to overlap each other. Whatever the function of these strange structures may be, they must act as a filter, and could not fail to prevent the passage of all solid particles, unless of very minute size, from the stomach into the intestine.

The cavity of the gizzard, as well as that of the glandular pouch, contained large numbers of parasites, which correspond very nearly, if they are not identical with, the *Eustrongylus papillosus*, Diesing, found by Natterer in the *P. anhinga* from Brazil.[1] While some of them simply adhered to the mucous membrane, others had their heads thrust deeply in, or their bodies were almost concealed by being buried in, the gastric follicles. They are about seventeen millimeters in length, and their oviducts contained an abundance of eggs.

Cranial parasites. The parasites from within the skull which will be described here, were found in every instance coiled up on the back of the cerebellum (Fig. 1), just behind the cerebral lobes, and confined to the texture between the arachnoid and pia mater, but whether originally in the vessels or the meshes of the connective tissue, was not determined. In those cases where the number was large, the parasites were undoubtedly in the latter. The number varied from two to six or eight, or even more, and the two sexes were always present, though not always in equal numbers; in one bird three males and one female, and in another one male and two females were noticed. After a careful search, the parasites were not detected either in other parts

[1] Diesing, Syst. Helminth, Vol. II, p. 326.

of the body or of the brain, than the one indicated. In one instance the mass of worms was such as to produce by pressure a deep indentation of the cerebellum.



The *female* (Fig. 2, natural size) is readily distinguished by being much larger, measures sixty-five millimeters in length, and when fully distended with eggs, has diameter of 0.5 millimeter. The mouth (Fig. 3) is terminal, without lips or papillæ, the intestine passes in a straight direction to the opposite end of the body, and if it opens at all does so at the point of it, though the opening itself was not distinctly seen (Fig. 4). Several loops of the oviduct are easily observed through the integuments, and one much larger than the rest is seen at the hinder part of the body (Fig. 4, *a*). The genital pore was not found, but is probably in the middle portion of the body, as near the two ends only loops of the oviduct are seen, and these nowhere connected with the walls.

The *male* (Fig. 5, natural size), is only about one-half the linear dimensions of the female, and the hinder portion of the body is always more closely coiled (Fig. 6). The intestine has the same arrangement as in the female. Near the hinder end of the body, and on the concave side of the last half coil, is a papilla from which in one case we saw the male organ protruded, having the form of a slightly recurved spine. The base of this was buried beneath the surface, and in close relation to the end of the spermatic tube.

Eggs and Young. In almost every instance the oviducts were largely distended with ova in different stages of development, and with hatched young. The eggs are of an oval form, their long diameter being about 0.02 millimeter. Those least advanced contained simply granules (Fig. 7, *a*), and others had the embryo roughly

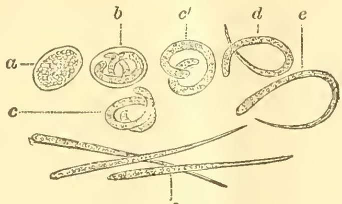


Fig. 7.

sketched by the arrangement of the whole mass of granules in the form of a coiled cylinder of uniform diameter throughout, slightly rounded at the two ends, and invested with a thin membrane (Fig. 7, *b*). It is while in this stage that the embryo leaves the egg, and vast numbers of them were seen without coverings, but still closely coiled (Fig. 7, *c*, *c′*). As they descend towards the lower part of the oviduct they begin to straighten themselves, and at the same time undergo a slight change of form (Fig. 7, *d*, *e*). As the body uncoils, one end enlarges, and the whole tapers regularly towards the hinder part, and forms an extremely elongated cone (Fig. 7, *f*). When perfectly straight they measure about 0.15 millimetres in length. We were unable to detect any internal organs, if such existed, at any stage of development observed; but, on the contrary, saw nothing but granules, filling the integuments as in the first formation of the embryo.

Parasites have occasionally been found infesting the brain or its membranes in man and animals, but far less frequently than the other regions of the body. The number of species thus far observed is quite small, and are chiefly referable to the genera *Tænia*, *Filaria*, *Trichina* and *Diplostomum*, and confined almost wholly to man and domesticated animals, such as the sheep, reindeer, dromedary, horse and ox, and among wild animals to the chamois, roe-buck, and a few others. That they have not been more frequently seen in the wild species, is without doubt due to the fact that the brains of these have been so seldom examined for the purpose of detecting them.

As soon as attention was directed to the brain of the Anhinga as the seat of parasitism, every opportunity was improved for further examination, and the result is, that the presence of worms in the cranial cavity was proved to be what might be called the normal condition of this bird, since they were detected in seventeen out of nineteen cases. They are found in one single locality, viz.: just behind the cerebral lobes and on the cerebellum, and not elsewhere; they are viviparous and immensely prolific. Their earlier stages are unknown, but the analogy of the Gordiaceous and other worms leads to the supposition that the parasite of the brain of *Anhinga* is one of the migratory kinds, and that a part of its life, at least, is passed in a locality quite different from that in which it was detected. The manner in which the transfer of the embryos is effected outwardly to some other animal, or the water, and then back to another *Anhinga*, is wholly unknown.

Synopsis of the Birds of South Carolina. By Elliott Coues, M. D.

The following list is believed to contain all the species occurring in the State, whether as residents, migrants, summer or winter visitants, or of casual appearance. Care has been taken to determine, as far as possible, in every case, to which category the species belongs. The ascertaining of the species that winter in the State is a matter of especial interest in determining the range of migrants; and has therefore been taken into particular consideration. An excellent idea of the distribution of birds along the Atlantic States may be gained by comparison of the present list and those mentioned in the accompanying foot note.[1] A good list of Floridan birds would be an acceptable contribution.

[1] Catalogue of the Birds found at Norway, Maine. With a list of the Birds

The birds of South Carolina, with few exceptions, are the same as those of the South Atlantic and the Gulf States at large (exclusive of certain Texan birds). These exceptions are the Florida Jay, and the several species, not strictly North American, which visit the peninsula of Florida alone, mostly from the West Indies. It is not probable that South Carolina is the terminus of the autumnal migration of any Northern species. The lower swampy parts of Virginia rather represent such terminus; and any species which passes this boundary is likely to be found in winter any where in the South Atlantic States, exclusive, of course, of such species as pass entirely beyond the United States. And, although the Carolinas, in a general way, limit the northward extension of the few typical species of the South Atlantic States, the boundary may be more definitely placed in Virginia, along the line where the swampy changes to the higher country, which, as we have just seen, limits certain Northern species in coming South.

Regarding the distribution of species within the State, it may be said, in general terms, that the topography of the country has great influence in determining the presence or absence of species in particular districts. Many birds that abound in the low swampy regions, never reach the upper country; and the converse of this is also true, though by no means of so extensive application. Some birds that occur high up only in summer, are resident throughout the year in the warmer parts; where, doubtless, certain Northern species, that come South in winter, are rarely, if ever, found. These and some analogous facts that might be cited, are independent of those circumstances of distribution arising from the natural proclivities of species; as e. g., the restriction of marine species to the coast, etc. As to the true migrants,—those birds that neither breed nor pass the winter in the State,—it may be stated that they appear a little earlier in the spring, and later in the fall in the low swampy parts, than in the upper country.

found in Maine not observed at Norway. By A. E. Verrill. Proceedings of the Essex Institute, III, 1862, p. 136.

Catalogue of the Birds of Springfield, Mass., with a list of Birds found in Massachusetts not observed at Springfield. By J. A. Allen. *Ibid*, IV, 1864, p. 48.

Catalogue of Birds observed on New York, Long and Staten Islands, and adjacent parts of New Jersey. By George N. Lawrence. Annals of the Lyceum of Natural History of New York, VIII, 1866, p. 279.

List of Birds ascertained to inhabit the District of Columbia, etc. By Elliott Coues and D. Webster Prentiss. Annual Report of the Smithsonian Institution, for 1861, p. 399.

The non-resident birds of South Carolina, that pass through the State during their migrations, appear, I think, fully two weeks earlier in spring, and as much later in the fall, than they do at Washington, D. C. The same is true of those species, common to the two localities, that breed or pass the winter in the State. This is, of course, to speak only of the general average.

The only article that I have been able to find bearing directly upon the subject in hand, is a list in the appendix of Tuomey's Report on the Geology of South Carolina, published in 1848. This appendix, entitled "Catalogue of the Fauna of South Carolina," was prepared by Professor Lewis R. Gibbes, of the Charleston College. The list of the birds, as the author states, is simply a compilation from Audubon's Synopsis. The writer enumerates 271 species; among which Haliaëtus Washingtoni, Vireo Bartrami, Ammodramus Macgillivrayi, and Cygnus buccinator should, in all probability, not have been admitted. The occurrence of one or two other species contained in the list is extremely problematical. Prof. Gibbes indicates, in the instances of the majority of the species, whether the bird is resident, or a summer or winter visitant. The letter (G.) in the following list indicates my indebtedness to Prof. Gibbes; in other cases, the statements made are the results of my own investigations, chiefly conducted at Columbia during the past two years.

NOTE.—I use the following abbreviations;—*Res.*, resident; *sum.*, summer, and *win.*, winter—both as either verb or noun; *spr.*, spring; *aut.*, autumn; *migr.*, migrant, migrate, migratory, migration, according to context; *ab.*, abundant; *com.*, common; *N.*, north; *S.*, south: the usual contractions for names of months. Species characteristic of the South Atlantic and Gulf States are preceded by an asterisk. The classification made use of is the modification of Prof. Lilljeborg's recently adopted by the Smithsonian Institution; the nomenclature is, in general, that of Baird's "Birds of North America."

PASSERES—(OSCINES).

Fam. 1.—TURDIDÆ.

1. *Turdus mustelinus.* Wood Thrush. Com.; res.; the greater number go further N. to breed, and further S. to win.

2. *T. Pallasii.* Hermit Thrush. Com.; win., from Oct. to Mch.; not known to breed.

3. *T. fuscescens.* Wilson's Thrush. Not ab.; chiefly spr. and aut. migr.; some probably win.

4. *T. solitarius.* Olive-backed Thrush. As the preceding.

5. *T. migratorius.* Robin. Ab.; win. from Oct. to Apr., particularly during Nov. and Feb.; a few doubtless sum.

In addition to the preceding, *T. Aliciæ* probably occurs, as a migrant.

6. *Harporhynchus rufus.* Thrasher. Com.; res.

7. *Galeoscoptes carolinensis.* Catbird. Ab.; res.

8. *Mimus polyglottus.* Mocking-bird. Very ab.; res. Although the Mocking-bird sometimes strays even to New England, it is not common north of the lower parts of Virginia. In some parts of the Carolinas it is perhaps the most abundant bird. It raises two or three broods each summer; young birds may be found from April until September; four eggs are oftener laid than either three or five. The early broods are reputed to make the finest singers, and also to be reared artificially with less trouble than those hatched later. The birds sing more or less all the year; and, particularly during the breeding season, at any hour of the night.

Fam. 2. — Saxicolidæ.

9. *Sialia sialis.* Bluebird. Ab.; res.; but most numerous in win., from Oct. to Apr.

Fam. 3. — Sylviidæ.

10. *Regulus satrapa.* Golden-crested Kinglet. Com.; win.; from Oct. to Apr.

11. *R. calendula.* Ruby-crowned Kinglet. Ab.; win.; from Oct. to Apr.; but most numerous in Nov. and Mch.

12. *Polioptila cærulea.* Blue-gray Gnatcatcher. Com.; chiefly migr., Mch. 15 to Apr. 15, and during Oct.; some breed; none known to win.

Fam. 4. — Paridæ.

13. *Lophophanes bicolor.* Tufted Titmouse. Com.; res.

14. *Parus carolinensis.* Carolina Chickadee. Com.; res.

Fam. 5. — Sittidæ.

15. *Sitta carolinensis.* White-bellied Nuthatch. Com.; res.

16. *S. canadensis.* Red-bellied Nuthatch. Rare; res. (G.)

17. **S. pusilla.* Brown-headed Nuthatch. This species is not so common as one would be led to infer from the fact that it is one of the characteristic birds of the South Atlantic States. Its habits are

the same as those of its better known congeners; its notes, however, differ from those of *S. carolinensis*, and greatly resemble those of *S. pygmæa.* The birds are generally found in open pine woods, usually in small straggling companies.

Fam. 6. — CERTHIIDÆ.

18. *Certhia americana.* Brown Creeper. Not ab.; res.

Fam. 7. — TROGLODYTIDÆ.

19. *Thryothorus ludovicianus.* Carolina Wren. Com.; res.

20. *T. Bewickii.* Bewick's Wren. Rare; res.?

21. *Troglodytes ædon.* House Wren. Probably res.; but chiefly migr. from Mch. 15 to Apr. 15, and during Oct. Prof. Gibbes omits this species, giving, perhaps in place of it, *T. americanus.* The latter I do not venture to include in the list.

22. *Anorthura hyemalis.* Winter Wren. Not com.; win., from Oct. to Apr.

23. *Cistothorus stellaris.* Short-billed Marsh Wren. Win. (G.)

24. *Telmatodytes palustris.* Long-billed Marsh Wren. Com. in certain situations; res., but the greater number pass N. to breed.

Fam. 8. — MOTACILLIDÆ.

25. *Anthus ludovicianus.* Titlark. Ab.; win., from Nov. to Mch.; sometimes till Apr.

Fam. 9. — SYLVICOLIDÆ.

26. *Mniotilta varia.* Black-and-white Creeper. Com.; chiefly migr., Mch. and Oct., but some breed; not known to win.

27. *Parula americana.* Blue Yellow-backed Warbler. Ab.; migr., during Apr. and Oct.

28. **Protonotaria citrea.* Prothonotary Warbler. Rare; sum. This is properly a bird of the South Atlantic States, though in the interior it goes as far north as Kansas and Missouri; and it has even been found (in one instance) in Maine. At Washington, D. C., I never saw but one individual during several years' collecting. It winters in the extreme South, as well as in Central America and some of the West Indies.

29. *Helminthophaga celata.* Orange-crowned Warbler. Either the distribution of this species is very irregular, or we do not understand it very well It is a common and regular migrant in the

Western Territories; but east of the Mississippi it is believed to be rare or casual. Audubon gives it as a common summer resident in New England; but more recent ornithologists differ with him in opinion. Mr. J. A. Allen, however, has lately found it at Springfield, Mass. (Proc. Essex Inst. IV, 1864, p. 60; ibid. V, 1868, p. 271.) Nuttall attests its abundance in Florida. Prof. Baird records it from Wisconsin and Georgia. Prof. Gibbes marks it "win." in his list. I have myself never met with it except in Arizona and California. It is known to breed in Arctic America, and to winter in Mexico.

30. *H. ruficapilla.* Nashville Warbler.

31. *H. pinus.* Blue-winged Yellow Warbler.

32. *H. chrysoptera.* Golden-winged Warbler.

33. *H. peregrina.* Tennessee Warbler.

These four species are all migrants, with much the same times of arrival and departure; neither of them is abundant.

34. **H. Bachmani.* Bachman's Warbler. Very rare; sum.; chiefly confined to the coast, and not recorded N. of S. Car. Prof. Lambeye gives it as a bird of Cuba.

35. **Helmitherus Swainsoni.* Swainson's Warbler. Very rare; sum. This is another highly characteristic species, also occurring in Cuba.

36. *H. vermivorus.* Worm-eating Warbler. Not uncom.; most numerous during its migr., in Apr. and Oct.; sum.

37. *Perissoglossa tigrina.* Cape May Warbler. Rare; migr.

38. *Dendrœca pinus.* Pine-creeping Warbler. Very ab.; res. This is perhaps the most common warbler, and is the only resident one. It breeds very early; I have seen fully fledged young before the middle of April. It is found in all situations, but shows a preference for the forests from which it takes its name; and is generally seen in straggling companies, associating with Chickadees, Nuthatches, Kinglets, etc.

39. *D. coronata.* Yellow-rumped Warbler. Very ab.; win.; from latter part of Oct. until May; most numerous in Nov. and Mch.

40. *D. palmarum.* Yellow Red-poll Warbler. Com.; win. from Oct. until late in Apr.

41. *D. æstiva.* Summer Warbler. Com.; sum.; but most ab. during its migr., as by far the greater number pass N.; not known to win.

42. **D. dominica* (*pensilis* s. *superciliosa*, auct.). Yellow-throated Warbler. Com.; sum. This species should have the asterisk, as it is

essentially a southern one; but still it has been found at Washington, D. C., (Coues and Prentiss, Smiths. Rep. for 1861, p. 408; Baird, Rev. Am. Birds, p. 209), and at Cleveland, Ohio, (*l. c.*). It is more abundant in some parts of the State than is generally supposed. I have seen several in one day in the streets of Columbia. It winters very far south.

43. *D. virens.* Black-throated Green Warbler.

44. *D. cœrulescens.* Black-throated Blue Warbler.

45. *D. Blackburniæ.* Blackburnian Warbler.

46. *D. castanea.* Bay-breasted Warbler.

47. *D. pennsylvanica.* Chestnut-sided Warbler.

48. *D. striata.* Black-poll Warbler.

49. *D. cœrulea.* Cœrulean Warbler.

50. *D. maculosa.* Black-and-yellow Warbler.

51. *D. discolor.* Prairie Warbler.

The foregoing nine species are all migrants, passing through chiefly in April and Oct.—*D. striata* being rather the latest. *D. cœrulea* is the rarest; *D. discolor* probably next most so; the other seven are common.

52. *Seiurus noveboracensis.* Water Wagtail. Not ab.; chiefly migr. Some probably breed.

53. *S. aurocapillus.* Golden-crowned Wagtail. Com.; migr.; some doubtless breed.

54. *S. ludovicianus.* Large-billed Wagtail. Rare; migr.; some doubtless breed. Dr. Prentiss and I found it to be quite common at certain seasons about Washington, D. C. (Smiths. Rep. for 1861, p. 407.) It is recorded by Mr. Lawrence from New York (Ann. Lyc. Nat. Hist., N. Y., VIII, 1866, p. 284), and by Prof. Baird from Pennsylvania and Michigan. (Rev. Am. Birds, p. 217.)

55. *Oporornis agilis.* Connecticut Warbler.

56. *O. formosus.* Kentucky Warbler.

These two species are rare migrants. I have found *formosus* in Kansas, in May. This is, I believe, its most western United States record. Both species proceed as far north, at least, as Southern New England.

57. *Geothlypis trichas.* Maryland Yellow Throat. Com.; sum.; most numerous during its migr., in Apr. and Oct.

58. *G. philadelphia.* Mourning Warbler. Very rare; migr.

59. *Icteria viridis.* Yellow-breasted Chat. Com.; sum.; but most numerous during its migr.

60. *Myiodioctes mitratus.* Hooded Warbler. Rare; migr.; some

breed? This is rather a Southern species, whose range just reaches the extremity of New England. It is known to winter in Central America and the West Indies.

61. *M. canadensis.* Canada Warbler. Com.; migr.; Apr. and Oct.

62. *M. pusillus.* Wilson's Black-capped Warbler. Not com.; migr.; Apr. and Oct.

63. *Setophaga ruticilla.* Redstart. Com.; migr.; Apr. and Oct.

Fam. 10.—HIRUNDINIDÆ.

64. *Progne subis.* Purple Martin. Ab.; sum., from early in Apr. through part of Oct. This is the most abundant bird of the family about Columbia.

65. *Hirundo bicolor.* White-bellied Swallow.

66. *H. horreorum.* Barn Swallow.

These two species are chiefly migr. latter part of Mch., Apr. and Oct., but some breed. I do not know of the occurrence of *H. lunifrons*, but there is reason to believe that it may pass through during its migrations.

67. *Cotyle riparia.* Bank Swallow. Com.; chiefly migr.; Apr. and Oct.; "sum." (G.)

68. *Stelgidopteryx serripennis.* Rough-winged Swallow. "Sum." (G.)

Fam. 11.—VIREONIDÆ.

69. *Vireo olivaceus.* Red-eyed Vireo. Com.; sum.; but the greater number pass N. in Apr., and return in Oct.

70. *V. gilvus.* Warbling Vireo. Not ab.; migr. in Apr. and Oct.; few, if any, breed so far south.

71. *V. flavifrons.* Yellow-throated Vireo. Com.; sum.; Apr. to Oct. 15.

72. *V. solitarius.* Blue-headed Vireo. Rare.; migr.

73. *V. noveboracensis.* White-eyed Vireo. Com.; sum.; but the greater number go further N.

V. philadelphicus should undoubtedly be included in the list; but I have no authority for so doing. Prof. Gibbes gives a certain "*Vireo Bartrami* Sw."; I do not know to what species he refers under this name. (Examine, in this connection, Baird, Rev. Am. Birds, I., 1866, pp. 334, 343.)

Fam. 12. — Ampelidæ.

74. *Ampelis cedrorum.* Cedar Bird. Res.; but most numerous in win., from Nov. to Mch., during which months it is exceedingly abundant at times and in certain places, in large, straggling, erratic flocks. I have seen it in flocks through May.

Fam. 13. — Laniidæ.

75. **Collurio ludovicianus.* Loggerhead Shrike. Res.; ab., particularly in the lower parts of the State. A species highly characteristic of the South Atlantic and Gulf States, being only known from North Carolina to Louisiana (in the Gulf States only in winter, according to Audubon), and also being rarely, if ever, found in mountainous districts.

Audubon says (Orn. Biog. I, p. 301): "I have never seen it attack birds, nor stick its prey on thorns, in the manner of the Great American Shrike." Against this negative evidence I can bear positive testimony, so far as the latter part of the statement is concerned. At Columbia, where the Loggerhead is a very common bird, frequenting the weedy streets and waste fields of the city, I have observed it on numerous occasions, and once witnessed the following: a Loggerhead was busily foraging for insects in the Capitol yard; from its observatory on the top of a tall bush, it pounced upon a large grasshopper and carried it to a tree near by, which was full of small, sharp twigs. Firmly planting itself upon one of these, with the insect in its beak, the bird thrust the grasshopper upon a twig, pushing the latter quite through the insect's body by repeated forcible movements. After the grasshopper had been transfixed to the bird's satisfaction, the latter hopped to another part of the tree, where it remained for some minutes, apparently enjoying the writhings of the impaled insect, or at least waiting to make sure that it was firmly secured. This being evidently the case, the bird at length flew off, resumed its former station, and commenced to hunt for more grasshoppers. Within the next few minutes I saw it capture several more, all of which it ate upon the spot.

I have not seen any satisfactory explanation of this strange habit of the Shrikes; nor am I prepared to offer any. Writers have drawn largely upon their imagination in treating of the trait. The facts at our command are conflicting, and do not furnish the basis for any very consistent theory as to the why or wherefore, or, particularly, the *cui bono* of such proceedings on the part of the bird. The commonly received doctrine, to the effect that Shrikes providently lay up in this way a store for future emergencies, is hardly tenable. In the case narrated above, the bird did not return to feast upon the grasshopper; for I purposely passed that way several days afterward, and saw the unfortunate insect still sticking there. Why did the bird impale it at all? It was evidently hungry at the time, for, as above stated, it at once recommenced foraging, and captured and devoured several more insects on the spot; and, moreover, the thousands of live grasshoppers that there were within a radius of as many yards, rendered such special pains in securing that one on a twig quite unnecessary. It may be as well to confess that we do not know the reason of this habit of the Shrikes; we can only say that it is "a way they have."

Swainson long ago pointed out the remarkable similarity between Shrikes and Mocking-birds—a resemblance not confined to physical characters, though very striking in these respects, but also extending to some points of habit, general appearance in life, etc., and amounting to strong analogy, if not actual affinity. I have frequently seen Shrikes and Mocking-birds playing together, and can affirm that it is very difficult to tell the two birds apart at a little distance, without very attentive observation. The Shrike is the smaller of the two and is more heavily built, thick-set, with shorter neck, larger head and heavier bill. Its motions are ordinarily less lively and varied; its usual attitude, when perched, is stiffer; there is less of the quivering, tremulous motion of the wings and tail; the flight is less buoyant and graceful, more firm and direct, and accompanied by a peculiar jerking of the body at each beat of the wings. These remarks, however, do not apply to the spirited, dashing forays of the Shrike, when in pursuit of its prey. But, ordinarily, the tournure of the Shrike has that about it which gives an impression best expressed by the word "top-heaviness."

The Great Northern Shrike, *C. borealis*, may occasionally stray, in winter, as far south as Carolina, but I have no record of its occurrence beyond Washington, D. C.

Fam. 14. — Tanagridæ.

76. *Pyranga æstiva*. Summer Red-bird. Ab.; sum.

77. *P. rubra*. Scarlet Tanager. Com.; sum.; but chiefly migr. in Apr., Sept. and early Oct.

Fam. 15. — ALAUDIDÆ.

78. *Eremophila cornuta.* Shore Lark. Com.; in flocks, Nov. to middle of Mch.

Fam. 16. — FRINGILLIDÆ.

Such hordes of sparrows enter the Carolinas in October, and pass the winter, that one is almost tempted to believe that these States form their winter quarters. The small streaked and spotted species—the sparrows *par excellence* — mostly associated together, and are sometimes seen in flocks to be numbered by thousands. During the winter they frequent old corn, rice, and cotton fields, briery tracts, hedgerows, etc. In the spring, for a few weeks before the great body of them depart, they scatter in smaller companies through the woods and feed extensively upon buds of trees, as well as insects. The extent to which our small conirostrals feed upon these articles in spring, is perhaps hardly recognized, except in the cases of such birds as the *Carpodaci*, etc.

79. *Carpodacus purpureus.* Purple Finch. Com.; win.; from Oct. until all the buds have expanded; stragglers at least through greater part of Apr.

80. *Chrysomitris tristis.* Gold Finch. Ab.; res.

81. *C. pinus.* Pine Finch. Not com.; irregular; win. Nov. to Apr.

We have no record of the occurrence of either Snow Buntings, Crossbills, or Redpolls, so far south; but they may possibly occasionally stray to the Carolinas in severe winters, as even the Snowy Owl is known to do.

82. *Passerculus savanna.* Savannah Sparrow. Very ab.; Oct.—Apr., in large flocks, with other species. In coming S. in the fall, most of these birds do not stop short of the Carolinas, though a few pass the winter at Washington, D. C. None breed so far S.

83. *Poocætes gramineus.* Grass Finch. Extremely ab.; win., Oct.—Apr.; a few possibly breed. The Grass Finches are particularly fond of cotton fields; I have met with flocks of many hundreds in such situations. When such a flock is startled from the ground, the shadowy gray forms, inextricably confused in erratic flight, and the continuous whirr of numberless wings conspire to a scene not easily forgotten. The little birds soon after their arrival become extremely fat, and when in this condition there are no more delicious morsels to be found for the table.

84. *Coturniculus passerinus.* Yellow-winged Sparrow. Com.; res.; most numerous during the migr.

85. *C. Henslowi.* Henslow's Sparrow. Rare; res.? "win." (G.) The known range of this rather Southern species has been recently extended by its record in New England.

86. *Ammodramus caudacutus.* Sharp-tailed Finch.

87. *A. maritimus.* Sea-side Finch.

Prof. Gibbes gives these two species as resident. They are probably confined to the immediate vicinity of the coast, and are more numerous in winter than in summer, as they scatter along our shores to New England during the breeding season. "*A. Macgillivrayi*," No. 110 of Prof. Gibbes' list, is now well known to be the young of *maritimus*.

88. *Zonotrichia leucophrys.* White-crowned Sparrow. Not ab.; win.; Oct. through part of Apr. I believe that most individuals of this species do not come quite so far south to pass the winter. Its migrations appear less regular and well defined than those of the following species. The birds probably scatter indiscriminately over the greater part of the Atlantic States in winter; at least, I know of no special localities that are indicated, by the abundance of the species, as the favorite winter quarters of the great number that breed in Labrador, etc.

89. *Z. albicollis.* White-throated Sparrow. Very ab.; win.; Oct., through most of Apr. These birds sing more or less all winter; and for a month before they leave in spring, the woods and fields are vocal with their mellow music. Many hundreds pass the month of March, and part of April, in the gardens in the city of Columbia; during the winter the birds mostly reside in thickets and fields, in company with several other species.

90. *Junco hyemalis.* Snowbird. Very com., though rather less ab. than in localities further N.; arrives latter part of Oct. (the time varying somewhat, according to weather), and remains until Apr.; stragglers may be seen through part of this month.

91. *Spizella monticola.* Tree Sparrow. Win.; Nov.—Mch.; not common, as the greater number winter in the Middle States, Maryland, Virginia, etc., and some as far north as New England.

92. *S. socialis.* Chipping Sparrow. Res.; but the numbers that breed are insignificant compared with those that win. from Oct. to Apr. They begin to flock upon their arrival, and remain in com-

panies, sometimes numbering hundreds of individuals, until the greater part pass north to breed.

93. *S. pusilla.* Field Sparrow. Very com.; res.; most numerous in win., and particularly in Nov. and Mch.

94. *Melospiza melodia.* Song Sparrow. Very ab.; res.; but most numerous in win., as great numbers pass N. to breed.

95. *M. palustris.* Swamp Sparrow. Com.; chiefly win.; perhaps res., but the greater number breed further N. This is perhaps the shyest and most retiring of our sparrows, the *Ammodrami*, even, not excepted; and one that easily eludes observation. It is to be found usually in such situations as the Song Sparrows frequent in winter; but I have never found a locality where its numbers bear any proportion to those of the latter. *M. melodia* is one of our most commonly observed species, particularly when it is flocking.

M. Lincolni ought to occur in winter; but it has not, to my knowledge, been observed in the State.

96. **Peucæa æstivalis.* Bachman's Finch. This, the only characteristic sparrow of the Southern States, I have not been so fortunate as to meet with. My friend, Prof. LeConte of the South Carolina University, informs me that it occurs about Columbia, and elsewhere in the State, frequenting open pine woods, old dry fields, etc. Prof. Gibbes gives it as summering. It appears to be more abundant in Georgia than elsewhere.

97. *Passerella iliaca.* Fox Sparrow. Com.; win.; Nov. to Apr.; less numerous than most of the sparrows properly so called.

98. *Euspiza americana.* Black-throated Bunting. "Sum." (G.) It is an abundant summer resident at Washington, D. C.; a few reach Southern New England. It must be a rare bird in the State. Audubon says that it is "rarely observed to pass over South Carolina," which statement accords with my own observations. Audubon's further remark, concerning its partiality for particular localities, is well founded. Does this species winter anywhere in the United States?

99. *Guiraca cærulea.* Blue Grosbeak. Not uncom.; sum.

100. *G. ludoviciana.* Rose-breasted Grosbeak. Rare; migr.

101. *Cyanospiza cyanea.* Indigo Bird. Com.; sum.

102. **C. ciris.* Painted Bunting. "Sum." (G.) This species is probably confined to the lower country, and appears to be rare even there. I have not met with it about Columbia. The Carolinas limit its northern range

103. *Cardinalis virginianus.* Red Bird. Res.; com.

104. *Pipilo erythrophthalmus.* Towhee Bunting. Ab.; chiefly migr.; many win.; a few possibly breed in mountainous districts. It is most numerous in Nov. and Mch.

Fam. 17.—ICTERIDÆ.

105. *Dolichonyx oryzivorus.* Reed or Rice Bird. Win.; but most abundant during the migr.

106. *Molothrus pecoris.* Cow Bird. Probably res.; but chiefly win., and most numerous in spring and fall.

107. *Agelæus phœniceus.* Red-winged Blackbird. Com.; res., but most numerous during the migr.

108. *Sturnella magna.* Meadow Starling. Com.; res.

109. *Icterus Baltimorensis.* Baltimore Oriole. Sum.; not. ab., as the greater number pass N.

110. *I. spurius.* Orchard Oriole. Rare; chiefly migr.; some probably breed.

111. *Scolecophagus ferrugineus.* Rusty Grackle. Not uncom.; in win. in flocks, from Nov. to Mch.

112. *Quiscalus versicolor.* Purple Grackle. Com.; res.; but the greater number pass N. to breed.

113. **Q. major.* Boat-tailed Grackle. Res.; chiefly confined to the lower country. This is essentially a southern bird, though it is said to stray as far north as Massachusetts.

Fam. 18.—CORVIDÆ.

114. *Corvus carnivorus.* Raven. "Res." (G.) If really a resident of the State at present, it must be an exceedingly rare bird. I am under the impression that I once saw an individual at Columbia, but cannot speak positively.

115. *C. americanus.* Crow. Com.; res.

116. *C. ossifragus.* Fish Crow. Res. Chiefly confined to the lower country.

117. *Cyanura cristata.* Blue Jay. Very ab.; res.

PASSERES—(CLAMATORES).

Fam. 19.—TYRANNIDÆ.

118. *Tyrannus carolinensis.* Kingbird. Com.; sum., Apr. 1st, through part of Oct.; but the greater number go further N.

119. *Myiarchus crinitus.* Great crested Flycatcher. Com.; sum. Apr, 15 to Oct.; but the greater number go further N.

120. *Sayornis fuscus.* Pewee. Probably res., most numerous in Feb., Mch., Oct. and Nov. This bird is to be found so late in the fall, and so early in the spring, that I have little doubt it passes the winter in some parts of the State. The majority go further N. to breed.

121. *Contopus virens.* Wood Pewee. Com.; sum.; middle of Apr. to middle of Oct.

122. *C. borealis.* Cooper's Flycatcher. Inserted on Prof. Gibbes' authority; I have never met with the species. It is probably a migrant only. Its distribution is not very clearly defined.

123. *Empidonax Traillii.* Traill's Flycatcher.

124. *E. acadicus.* Acadian Flycatcher.

125. *E. flaviventris.* Yellow-bellied Flycatcher.

126. *E. minimus.* Least Flycatcher.

These four species occur as migrants in April and September; *acadicus* probably breeding. The latter is the only one contained in Prof. Gibbes' list.

STRISORES.

Fam. 20.—ALCEDINIDÆ.

127. *Ceryle alcyon.* Kingfisher. Com.; res.

Fam. 21.—CAPRIMULGIDÆ.

128. *Chordeiles popetue.* Nighthawk. Com.; sum.; but most abundant in Apr., Aug. and Sept.

129. *Antrostomus vociferus.* Whippoorwill. Com.; sum.; Apr. to Oct.

130. **A. carolinensis.* Chuckwillswidow. Rare; sum. (G.) This species is not known to occur north of the Carolinas. Audubon gives it from Texas.

Fam. 22.—CYPSELIDÆ.

131. *Chætura pelasgia.* Chimney Swift. Ab.; sum.; Apr.—Sept.

Fam. 23.—TROCHILIDÆ.

132. *Trochilus colubris.* Humming-bird. Com.; sum.; Apr.—Sept.

ZYGODACTYLI.

Fam. 24. — Cuculidæ.

133. *Coccygus americanus.* Yellow-billed Cuckoo. Com.; sum.; Apr. to Oct.

134. *C. erythrophthalmus.* Black-billed Cuckoo. Rare; sum.; but chiefly migr., Apr.—Sept., as the greater number breed further N.

Fam. 25. — Picidæ.

135. *Campephilus principalis.* Ivory-billed Woodpecker. Res.; rare, and chiefly confined to the lower country.

136. *Hylatomus pileatus.* Pileated Woodpecker. Res.

137. *Picus villosus.* Hairy Woodpecker. Res.; not ab.

138. *P. pubescens.* Downy Woodpecker. Res.; com.

139. **P. querulus.* Red-cockaded Woodpecker. Res. (G). This species is hardly known to occur north of the Southern States; and though it be the *borealis* of Vieillot,—which is doubted by some—the latter name is geographically inaccurate.

140. *Sphyrapicus varius.* Yellow-bellied Woodpecker. Res.; ab.

141. *Centurus carolinensis.* Red-bellied Woodpecker. Res.

142. *Melanerpes erythrocephalus.* Red-headed Woodpecker. Res.; ab., particularly in sum.

143. *Colaptes auratus.* Yellow-winged Woodpecker. Res.; ab.

Fam. 26. — Psittacidæ.

144. *Conurus carolinensis.* Paroquet. This species is given in Prof. Gibbes' list, and appears to have been in former times a common bird; but its occurrence has not been noted of late years. It is scarcely entitled to a place in the list.

ACCIPITRES.

Fam. 27. — Strigidæ.

145. *Strix pratincola.* Barn Owl. "Sum." (G.) Res.?

146. *Bubo virginianus.* Great Horned Owl. Res.

147. *Scops asio.* Screech Owl. Res.

148. *Otus Wilsonianus.* Long-eared Owl. Res.

149. *Brachyotus palustris.* Short-eared Owl. Res.

150. *Syrnium nebulosum.* Barred Owl. Res.

151. *Nyctale acadica.* Acadian Owl. Res.

152. *Nyctea nivea.* Snowy Owl. Win. There are several authentic instances of the occurrence of this species in winter. Prof. Gibbes includes it.

Fam. 28. — FALCONIDÆ.

153. *Falco anatum.* Peregrine Falcon. Win. (G.)

154. *F. columbarius.* Pigeon Hawk. Win.; perhaps res.

155. *F. sparverius.* Sparrow Hawk. Res.; com.

156. *Accipiter Cooperi.* Cooper's Hawk. Res.

157. *A. fuscus.* Sharp-shinned Hawk. Res.; com.

158. *Buteo borealis.* Red-tailed Hawk. Res.; com.

159. *B. lineatus.* Red-shouldered Hawk. Res.; com.

160. *Elanus leucurus.* Black-shouldered Hawk. Sum.; rare. The Carolinas limit the northward extent of this species in the Atlantic States.

161. *Ictinia mississippiensis.* Mississippi Kite. Sum. Along the Atlantic coast this species has much the same range as the preceding.

162. *Nauclerus furcatus.* Swallow-tailed Kite. Sum. With much the same distribution, in general, as the preceding, this species is more apt to stray northward. It has occurred in Pennsylvania, Wisconsin, Missouri, etc.

163. *Circus hudsonicus.* Marsh Hawk. Res.; ab.

164. *Haliætus leucocephalus.* Bald Eagle. Res. Prof. Gibbes also gives "*H. Washingtonii.*" I do not know what this can be, unless possibly he means the Golden Eagle, *Aquila canadensis.*

165. *Pandion carolinensis.* Fish Hawk. Res.; com.

In addition to the foregoing *Falconidæ*, two others, *Buteo pennsylvanicus*, and *Archibuteo lagopus* probably occur, but I have no evidence that such is the case.

Fam. 29. — VULTURIDÆ.

166. *Cathartes aura.* Turkey Buzzard.

167. *C. atratus.* Black Vulture.

These two species are common, and resident. *C. aura* is more generally distributed over the State, *atratus* being mostly confined to the lower country; but both are, in most localities, found together. At Charleston, *atratus* is by far the most numerous; at Columbia the reverse is the case. The two kinds associate freely together, upon terms of perfect accord, and, as they often circle about in each other's company, the observer has an excellent opportunity of noticing the radical differences which exist in their mode of flight, and in the outline of the body and wings.

PULLASTRÆ.

Fam. 30. — Columbidæ.

168. **Chamæpelia passerina*. Ground Dove. Res.; but mainly confined to the lower country. I have never seen it as far inland as Columbia.

169. *Zenædura carolinensis*. Turtle Dove. Res.; very ab.

170. *Ectopistes migratorius*. Wild Pigeon. Of irregular occurrence.

GALLINÆ.

Fam. 31. — Meleagrididæ.

171. *Meleagris gallopavo*. Wild Turkey. Res.; and still common in certain sections.

Fam. 32. — Tetraonidæ.

172. *Bonasa umbellus*. Ruffed Grouse. Res. (G.)

Fam. 33. — Perdicidæ.

173. *Ortyx virginianus*. Quail. "Partridge." Res.; very ab.

GRALLÆ.

Fam. 34. — Charadriidæ.

174. *Charadrius virginicus*. Golden Plover. Win.; chiefly during its migr.

175. *Squatarola helvetica*. Black-bellied Plover. Win.; chiefly during its migr.

176. *Aegialitis vociferus*. Kildeer Plover. Res.; but most numerous during its migr. This species migrates chiefly by night; and,

particularly in April, when passing north, its loud cries constantly break the stillness of the night.

177. *A. Wilsoni.* Wilson's Plover. Res. This is essentially a Southern species; but many reach, in summer, the coast of the Middle States, and some stray into New England. Exclusively maritime.

178. *A. semipalmatus.* Ring Plover. Win.; from Sept. to Apr.; com. on the coast.

179. *A. melodus.* Piping Plover. As the preceding.

Fam. 35. — HÆMATOPODIDÆ.

180. *Hæmatopus palliatus.* Oyster-Catcher. Win. (G.) Only on the coast.

181. *Strepsilas interpres.* Turnstone. Win. (G.) Only on the coast.

Fam. 36. — SCOLOPACIDÆ.

182. *Philohela americana.* Woodcock. Res.

183. *Gallinago Wilsoni.* Snipe. Win., but most numerous in spring and fall.

184. *Macrorhamphus griseus.* Red-breasted Snipe. As the preceding. *M. scolopaceus* probably also occurs.

185. *Tringa canutus.* Knot. Coast in win.; not ab.

186. *Calidris arenaria.* Sanderling. Coast in winter.

187. *Ancylocheilus subarquata.* Curlew Sandpiper. (G.)

188. *Micropalama himantopus.* Stilt Sandpiper. (G.)

I have no personal knowledge of the occurrence of these two species; both are given by Prof. Gibbes without comment. They are probably rare winter visitors.

189. *Pelidna americana.* American Dunlin. Coast in win.

190. *Ereunetes pusillus.* Semipalmated Sandpiper. Coast in win.

191. *Actodromas maculata.* Grass Snipe. Win.

192. *A. Bonapartei.* ("*Tringa Schinzii*" of Gibbes' list) White-rumped Sandpiper. Coast in win.

193. *A. minutilla.* Least Sandpiper. Win.

These four species are most numerous during the migrations which take place in Apr. and Sept.—Oct.

194. *Symphemia semipalmata.* Willet. Res.

195. *Gambetta flavipes.* Yellow-legged Tatler. Win.

196. *G. melanoleuca.* Tell-tale. Win.

197. *Rhyacophilus solitarius.* Solitary Tatler. Migr.; perhaps win. Prof. Gibbes gives it as resident; this I scarcely credit.

198. *Tringoides macularius.* Spotted Sandpiper. Res.; but the greater number pass N. to breed.

199. *Actiturus Bartramius.* Bartramian Sandpiper. Migr.

200. *Tryngites rufescens.* Buff-breasted Sandpiper. Migr.

201. *Limosa hudsonica.* Hudsonian Godwit. Win.

202. *L. fedoa.* Marbled Godwit. Win.

203. *Numenius hudsonicus.* Hudsonian Curlew. Win.

204. *N. borealis.* Esquimaux Curlew. Win.

205. *N. longirostris.* Long-billed Curlew. Res.

Three species of *Phalarope* may be expected to occur in winter, but I have no authority for their insertion.

Fam. 37.— Recurvirostridæ.

206. *Recurvirostra Americana.* Avoset. Res.?

207. *Himantopus nigricollis.* Stilt. Sum. (G.)

Fam. 38. — Gruidæ.

208. *Grus americanus.* Whooping Crane. Win. (G.)

Fam. 39. — Ardeidæ.

209. *Demiegretta ludoviciana.* Louisiana Heron. Sum.

210. *Garzetta candidissima.* Little White Heron. Sum.

211. *Florida cœrulea.* Little Blue Heron. Sum. This species is more generally distributed than the preceding, not being confined to the lower country. It is the commonest heron about Columbia toward the close of summer.

212. *Ardea herodias.* Great Blue Heron. Res.; com.

213. *Herodias egretta.* Great White Heron. Sum.; com. in the lower country.

214. *Ardetta exilis.* Least Heron. Res.

215. *Botaurus lentiginosus.* Bittern. Win.; probably res.

216. *Butorides virescens.* Green Heron. Sum.; perhaps res.

217. *Nyctiardea gardeni.* Night Heron. Sum.

218. *Nyctherodius violaceus.* Yellow-crowned Heron. Sum.

Fam. 40. — Tantalidæ.

219. *Tantalus loculator.* Wood Ibis. Res.

220. *Ibis Ordii.* Glossy Ibis. Sum.

221. *Ibis alba.* White Ibis. Sum.

The *Tantalidæ* are confined to the lower country.

Fam. 41. — PLATALEIDÆ.

222. *Platalea ajaja.* Roseate Spoonbill. Sum. (G.)

Fam. 42. — RALLIDÆ.

223. *Rallus elegans.* Fresh Marsh Hen. Res.

224. *R. crepitans.* Salt Marsh Hen. Res.

225. *R. virginianus.* Virginia Rail. "Res." (G.), but chiefly in spring and fall.

226. *Porzana carolina.* Sora Rail. Migr.; very ab.

227. *P. noveboracensis.* Yellow Rail. Migr.

228. **P. jamaicensis.* Black Rail. Sum. This is essentially a Southern species, but sometimes strays at least as far north as Washington, D. C. (See Coues and Prentiss, Smiths. Rep. 1861, p. 416.)

229. *Gallinula galeata.* Gallinule. Res.

230. *G. martinica.* Purple Gallinule. Res.

This and the preceding species sometimes stray into the Middle States, and even to New England.

231. *Fulica americana.* Coot. Win.; very com.

Fam. 43. — PHŒNICOPTERIDÆ.

232. *Phœnicopterus ruber.* Flamingo. Rare or accidental, in summer? Inserted on Prof. Gibbes' authority.

LAMELLIROSTRES.

Fam. 44. — ANATIDÆ.

233. *Cygnus americanus.* Swan. Coast in win. Prof. Gibbes gives "*C. buccinator*, sum."; but presumably upon erroneous data.

234. *Anser hyperboreus.* Snow Goose.

235. *A. Gambeli.* White-fronted Goose.

236. *Bernicla canadensis.* Wild Goose.

237. *B. brenta.* Brant Goose.

These geese occur in winter, chiefly along the coast. *A. cærulescens* may very likely be also found. Prof. Gibbes gives the Canada Goose as summering.

238. *Anas boschas.* Mallard.
239. *A. obscura.* Black Duck.
240. *Dafila acuta.* Pintail.
241. *Nettion carolinensis.* Green-winged Teal.
242. *Querquedula discors.* Blue-winged Teal.
243. *Spatula clypeata.* Shoveller.
244. *Chaulelasmus streperus.* Gadwall.
245. *Mareca americana.* Widgeon.

These *Anatinæ* are all winter visitants, both in the interior and along the coast, arriving in Oct., upon an average, and remaining until April. Most of them are abundant; the Mallards and Widgeons especially so; the Shovellers and Black Ducks are less numerous.

246. *Aix sponsa.* Summer Duck. Res.; ab.
247. *Fulix marila.* Big Black-head.
248. *F. affinis.* Little Black-head.
249. *F. collaris.* Ring-neck.
250. *Aythya americana.* Red-head.
251. *A. vallisneria.* Canvas-back.
252. *Bucephala americana.* Golden-eye.
253. *B. albeola.* Buffle-head.
254. *Harelda glacialis.* South Southerly.
255. *Pelionetta perspicillata.* Surf Duck.
256. *Oidemia americana.* Scoter.
257. *Melanetta velvetina.* Velvet Duck.

These *Fuligulinæ* occur only in winter; the first seven are of common and regular occurrence; the last four are rare or casual so far South.

258. *Erismatura rubida.* Ruddy Duck. Coast in win.
259. *Mergus americanus.* Sheldrake. Coast in win.
260. *M. serrator.* Merganser. Coast in win.
261. *Lophodytes cucullatus.* Hooded Merganser. Coast in win.

STEGANOPODES.

Fam 45.—PELECANIDÆ.

262. *Pelecanus erythrorhynchus.* White Pelican. "Win." (G.)
263. *P. fuscus.* Brown Pelican. Res. (G.)

Fam. 46. — SULIDÆ.

264. *Sula bassana.* Gannet. Win. (G.)
265. *S. fusca.* Booby. Res. (G.)

Fam. 47.— TACHYPETIDÆ.

266. *Tachypetes aquilus.* Frigate Bird. Sum. (G.)

Fam. 48. — PHALACROCORACIDÆ.

267. *Graculus dilophus.* Double-crested Cormorant. Coast in win. Perhaps also *G. floridanus.*

Fam. 49. — PLOTIDÆ.

268. **Plotus anhinga.* Snake Bird. Sum. (G.)

LONGIPENNES.

Fam. 50. — PROCELLARIIDÆ.

269. *Æstrelata hæsitata.* (*Procellaria meridionalis* Lawr.) This species must certainly occur off the coast, as it goes as far north as New York.
270. *Oceanites oceanica.* Wilson's Stormy Petrel. Off the coast.
271. *Puffinus major.* Greater Shearwater. Off the coast.
272. **P. obscurus.* Dusky Shearwater. Off the coast. Sum. (G.)

Fam. 51. — LARIDÆ.

273. *Larus marinus.* Black-backed Gull. Coast in win.
274. *L. delawarensis.* Ring-billed Gull. Coast in win.
275. *L. smithsonianus.* Herring Gull. Coast in win.
276. *Chrœcocephalus atricilla.* Laughing Gull. Coast in sum.
277. *C. philadelphia.* Bonaparte's Gull. Coast in win.
278. *Gelochelidon anglica.* Marsh Tern. Sum.
279. *Sterna hirundo.* Common Tern. "Sum." (G.)
280. *S. Forsteri.* ("*S. Havelli*, Aud.," of Gibbes' list.) Win.
281. *S. antillarum.* Least Tern. Migr.; sum.?
282. *S. paradisea.* Roseate Tern. Coast in sum.
283. *Thalasseus acuflavidus.* Cabot's Tern. Migr. ?
284. *T. regius.* Royal Tern. Coast in sum.

285. *Hydrochelidon fissipes.* Black Tern. Sum.
286. *Rhynchops nigra.* Black Skimmer. Coast in sum.

PYGOPODES.

Fam. 52. — Colymbidæ.

287. *Colymbus torquatus.* Loon. Win.
288. *C. septentrionalis.* Red-throated Diver. Win.
289. *C. arcticus.* Black-throated Diver. Win. (G.)

Fam. 53. — Podicipidæ.

290. *Podiceps holboëlli.* American Red-necked Grebe. Win.
291. *P. cristatus.* Crested Grebe. Win.
292. *P. cornutus.* Horned Grebe. Win.
293. *Podilymbus podiceps.* Dabchick. Win.

Fam. 54. — Alcidæ.

294. *Pratercula arctica.* Puffin. Win. (G.) I insert this species on Prof. Gibbes' authority; but South Carolina is much beyond its ordinary range.

The Secretary read a letter from Mr. N. B. Moore of Minneapolis, Minn., stating that he had taken a pebble of considerable size from the stomach of a common night-hawk, shot in Iberville Parish, Louisiana. The writer considered this to be an interesting fact, because the bird is of insectivorous habits, and feeds while on the wing. He also remarked upon the increasing distribution of the same bird.

Mr. Audubon, in his "Birds of America," states that this species is seen in Louisiana only during its migratory passage, chiefly in spring. They now breed there, though, so far as I know, hardly so far south as the parish named; yet even there I saw, last spring, some symptoms indicating a disposition to breed; and I am convinced that these birds are now accustomed to breed in localities unfrequented by them for that purpose, when Audubon resided in Louisiana, thirty-five or forty years ago.

Mr. Shaler presented the following paper: —

On the Nature of the Movements Involved in the Changes of Level of Shore Lines. By N. S. Shaler.

Accurate observations on the changes of position of the earth's surface at different points have been thus far limited to the lines where the sea and land meet.

Nowhere away from shores are there means by which alterations of elevations can be detected by easily made comparisons. The habits of men cause the slightest changes of the sea level to be immediately noticed, so that all modifications of the shore line meet with attention, while alterations of far greater extent, at points remote from the sea, would pass unregarded. Nor can we expect, in the present imperfect method of determining the contour of inland irregularities of surface, much more accurate data from which to decide whether any region maintains over its whole surface the same relative level during considerable periods of time. Even the most trustworthy methods of determining relative levels of points remote from shores are so liable to accidental errors, that it is doubtful whether unquestionable observations are to be attained. Being thus limited to the shore line for our accurate data concerning elevations and depressions of the land, it becomes a matter of first importance to determine what are the valid deductions which can be made from the observations we may obtain there. We should ascertain how far the upward and downward movements indicated by the unerring water level can be attributed to the general area in which the shore lies, before the true value of these movements as indices of geological changes can be determined. At first sight it would seem an unnecessary labor to examine a question which appears so perfectly clear in all its bearings; it certainly looks unlikely that elevation or subsidence of the shore could indicate anything but the general rising or sinking of the land area to which it belongs, yet, on examination, it will be easily seen that these indications are far from being as decisive as would at first be supposed.

Before entering upon the question of the cause of those movements of the solid surface of the earth, which result in the changes of level at the shore line, it is necessary to attend to some of the more general facts deducible from the phenomena. The most important result of the observations which have been made, is that the movements are in no case local, that is, no portion of shore of a mile, or even a few tens of miles in extent, is to be found in rapid process of change of level adjacent to immovable lines of shore; on the contrary, the movements, while they may vary in force, and fade away in any direction, do so with a regularity which shows that the force is very widespread and uniform in its action. Another important feature is, that an upward movement on one portion of a coast may gradually diminish and pass into a subsidence on the same coast line. Looking still further, we perceive some very peculiar features in the distribution of the changes of level which are still going forward, or which have taken place since the close of the glacial period. All those regions which exhibit distinct evidence of the former existence of the ice envelope, show also unquestionable proofs of elevatory action, since the passing away of the glacial condition. A still more intimate connection between glaciation and change of level is exhibited in the increase in the elevation of ancient sea margins, as we go from the regions where the ice had its southern limits, towards those points where there is any evidence to convince us that it attained the greatest thickness. Although our information wants the precision which can make accurate comparison possible, there is no doubt that the increase in thickness of ice was attended by something like a proportionate augmentation in the submergence of the land. The brief period during which these changes of level have been subjected to careful investigation, has shown no case where the same point has been alternately under the influence of elevatory and depressive actions, but from the study of the record of such movements since the glacial period, we have abundant reason to believe that such alternations are very frequent, and that it is the exception, rather than the rule, that the same point on the shore has continued under the influence of either elevatory or depressing forces during the whole of the present period.

Upward and downward movements, with long intervals of rest, during which beaches were formed, and precipices excavated by centuries of incessant wave action, are shown along all the coasts lying within the glacial zone.

The great length of the shores on which we find evidence of the rising or sinking of the land, and the prevailing uniformity of movement over great areas, and in great lengths of time, require us to suppose that a great thickness of the earth's crust partakes of the motion, and that the forces producing the change are constantly in action, and not of that instable and transitory character which belongs to ordinary volcanic agencies. At the same time, we have the perplexing facts of alternation of elevation and subsidence to reconcile with this uniformity in other regards, and no hypothesis which fails to account for this extreme variability in the character of the movement with the equability of the action over wide areas, will be entitled to consideration.

Our evidence shows us sea lines of thousands of miles in length, which have, during the present period, been undergoing a tolerably uniform upward movement. Are we to suppose that the extension of this movement on lines at right angles to the shore has been as great, or are we rather to suppose that the action of elevation acted along one line, and that this line, for some reason or other, has coincided with the shore? This question leads us to search for the nature of the cause of these shore oscillations of level.

If we assume that the great folds of the earth's crust, termed continents, are the result of the accommodation of the outer envelope to a diminished interior, then it follows that in such movement the sea furrows would be steadily lowered, and the continental folds correspondingly elevated above the shore line as contraction went on. The author has elsewhere briefly stated some reasons for believing that through the deposition of sedimentary matter, and the consequent rising in the isogeotherms in the strata beneath, the ocean floors would always bend downward, and the land areas bend upward, as the shrinking of the interior of the earth went on. Be this as it may; the result of the sinking of the ocean bottom and the elevation of the land, would necessarily be the movement of the segment of the crust from the centre of the continents to the centre of the sea, with the axis of rotation or fulcrum point, near the shore line. If the continents and sea basins owe their origin to wrinkling of the crust, this conclusion seems to be necessary. Admitting such a rotation about a line near the shore, then it follows that one of three conditions may prevail. It is possible that the point of rotation may be precisely at the shore, to the seaward of the shore, or some distance from the water on the surface of the land. It will be easily seen from inspecting the accompanying diagram, (Fig. 1,) that in the former case, very extensive actions of subsidence and elevation might take place without affecting the position of the shore line in the least, unless in the changes of level the holding capacity of the sea basin was greatly modified; any such effect would necessarily be very slight, as it would be equalized by the waters of all the oceans. In the third condition (Fig. 1), that where the pivot point was to the landward of the shore, there could be no other result than the apparent sinking of the shore, and the advance of the sea line towards the land.[1] The remaining condition (Fig. 2) would be always accompanied by the apparent elevation

[1] In the diagrams 1 and 2, similar letters denote corresponding points.

In figures 1 and 2, the straight lines A, B, A′, B′ are diagrammatic expressions for sections extending across the shore. For convenience of delineation, the action of the movement of the small segments of the crust represented is supposed to be like that of a rigid bar.

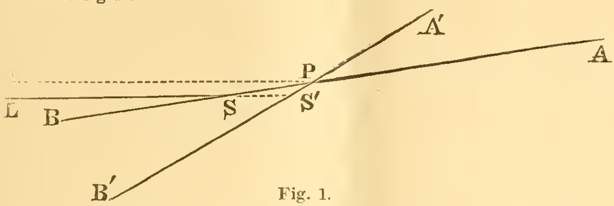


Fig. 1.

In Fig. 1, the pivot point, P, is to the landward of the shore, S, the line A, B, indicating the surface of the continent near the coast. Let the depression of the sea floor and the elevation of the land go on until the continental surface is in the position indicated by the lines A′, B′, and the shore will be removed to the point S′, and the sea gains. S, L indicates the sea level. If we suppose, however, that the dotted line P, L′, denotes the sea level, then the pivot point will fall just at the shore line, and all the changes in the position of the line A, B, will not affect the position of the water lines.

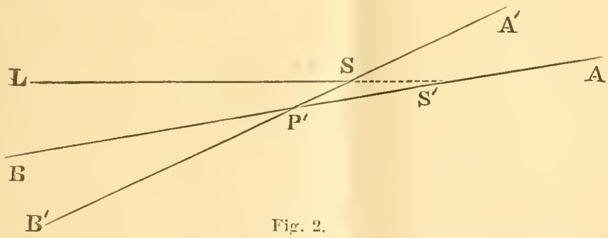


Fig. 2.

In Fig. 2, the pivot point is the seaward of the shore line A, B, indicating the original position of the continental surface, and A′, B′, the position of the change. Inspection will show that in this diagram the change has caused the shore to move seaward, and the land gains.

Fig. 3 represents a shore line with an axis of rotation, A, B, cutting it in such a

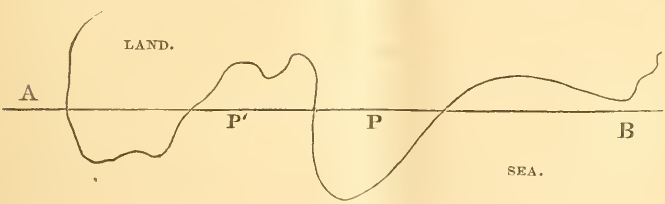


Fig. 3.

of the shore, and the gain of the dry land on the sea. Thus we see that the relative position of the pivotal point to the shore line may produce such apparently contradictory actions as rise and fall of the land. It is evident that the precise position of the pivotal point must be very much a matter of accident. Trifling causes may effect its removal to such a distance, that in a comparatively brief time, the same region of shore may be just upon the fulcrum point, or to the seaward or landward of it, and thus experience the three conditions of permanence, subsidence or elevation.

The line of no movement, or axis of rotation, would, on account of the great rigidity of the crust, tend to have a rectilinear direction, or at least far fewer curves than usual on shore lines; assuming that it is for limited regions in effect a straight line which may have a considerable angle to the general trend of coast, we perceive at once that the resulting movements at different points may be very varied.

All one extremity of a coast may have a movement in one direction, the middle portion may be stationary, and the other extremity be affected by a movement in the opposite direction. Where a shore is deeply indented, the extremity of a cape or promontory may be to the seaward of the axis of rotation, and be on that account sinking, while the main land may be within the axis of movement, and exhibit evidences of elevation. Inspection of the diagrams will show how far the relation of the shore line to the axis of rotation can complicate the evidences of movement of different points.

It must not be supposed that this hypothesis requires that the sections of the crust from the centre of the sea to the centre of the continents, move as a rigid mass, for on such a supposition we would be obliged to suppose that a movement of a few inches at the shore, near the pivot point, must indicate a movement to the extent of thousands of feet in the central regions of the oceans or continents. It is likely that, as the earth loses heat and contracts, the sea floors subside, and the land areas rise at something like the same rate over their whole surfaces. The general form of both continents and ocean bottoms makes this supposition seem very probable.

Without considering the proof of the validity of this hypothesis which would be beyond the author's purpose at present, it may be noticed that there are many phenomena better explicable on this view than by any other hypothesis which has been presented. First among

manner that the points P and P′ may be taken for the pivot points of the diagrams 1 and 2, respectively. All that portion of the shore line to the right of the straight line would be sinking; all to the left rising.

these are the alternations of elevation and subsidence, so frequently observable in shore deposits of the present and former geological period. There is no way by which these actions are so easily explicable as on the supposition of a change in the position of the pivot point of such a movement of the earth's crust, as we have described. The hypothesis demands the supposition of a constantly subsiding ocean floor, or at least the absence of any general elevation of the central regions of any ocean. This view is in accordance with geological evidences. At all times in the earth's history we have evidence of continued subsidence of ocean floors, taking place by a movement so gradual that the deposition kept pace with the sinking, so that thousands of feet of strata were laid down in an ocean which remained always shallow.

If we could accept the theory so ably presented by Mr. James Crool, which assigns as the cause of the subsidence of the shores within the glacial limits, the accumulation of ice about the pole, and the consequent change in the position of the earth's centre of gravity, then we might easily refer all the upward movements indicated by raised beaches to such action, and remove them from the purview of the hypothesis we have just discussed. But as much doubt exists as to the validity of Mr. Crool's hypothesis, it may not be out of place to notice some facts which seem to militate against it. If his view were correct, we should expect to find in regions of the same latitude something like an equal amount of depression indicated by the raised beaches, and other marks of littoral action. This does not seem to be the case. The beach lines of the glacial period are much higher on the North American than the European coast. At Brooklyn, in about the latitude of Naples, there are evidences of the sea at one hundred feet above the water level. On Lake Champlain, on the parallel of Cape Finesterre, at a height of about five hundred feet, we have well defined littoral phenomena. The comparison might be carried still farther with a prevailing result, that the North American continent received a deeper submergence than the European shore evinces. A comparison of regions near at hand affords us similarly strong grounds for questioning the probability of equal submergence of regions of the same latitude. Nowhere along the coast of Maine have we shore lines more than two hundred feet above the present level of the sea. Within the same parallels in Vermont the subsidence was quite double that depth.

It is true that all such evidence is of a negative character, and it may be argued that if we had precise knowledge of the highest point to which the sea attained in different regions, it might, with allowance for recent alterations of level, show an equality of submergence of all shores under the same parallel. But until such conjectures are proven, we cannot accept the comparative elevation of ancient shore lines in different latitudes, as evidence of Mr. Crool's hypothesis. A further objection is to be found in the irregularities in the movements in high Northern regions. If the formation of a large ice cap about the pole was the cause of the subsidence of Northern regions, then we would expect something like uniformity in the action of the sinking; but in Scandinavia and elsewhere, we have evidence of repeated alternations of elevation and subsidence, which could be explained in no other manner than by the unsatisfactory conjecture, that for some unknown reason the ice cap was subject to sudden alternations of level. The changes of level now going on on Northern shores, seem to be but a continuation of the modifications which have left their traces in the ancient littoral phenomena of those regions, and yet all these movements are not elevatory; part of the shore of Scandinavia is indeed rising, but another portion is subsiding, and a large part of the west shore of Greenland is undoubtedly undergoing a gradual depression.

If any value whatever is to be given to the theory of Mr. Crool, there would still remain very important coöperative actions, which would have to be understood before the whole of the phenomena could be explained. On consideration, it will appear probable that important effects on the position of the land surfaces would be exercised by the rise in the isogeothermals from the non-conducting power of the ice cap of the glacial period.

The accumulation of seven thousand feet of ice upon any one portion of the earth's crust must, it would seem from its great non-conductive power, exercise as great an effect upon the temperature of the rocks below, as would the addition of an equal thickness of ordinary sedimentary nature; that is to say, the lines of equal heat would move outwards from the centre to the extent of three thousand feet. This increased temperature of the deeper portions of the earth's outer crust, would necessarily be attended by an expansion of the materials composing such crust. If the substance thus affected by heat, had the coefficient of expansion belonging to granite, and the diameter of the region affected be supposed to be one thousand miles, then the amount of this expansion would be about thirty-seven hundred feet. Now inasmuch as the uppermost part of the crust, i. e. the ice sheet, would not partake of this increase of temperature, and would not have its bulk affected by the movement of the isogeothermals, we would have one portion of the crust affected by a movement, while the remainder was at rest. In this case there can be no doubt but there would exist a great tendency of the area thus affected to bend downward.[1] If the condition of the deeper portions of the earth was such as to admit of the outer crust obeying this tendency to bend downward, as given by the expansion of the beds below, arising from the accumulation of glacial material, there would seem to be no difficulty in the way of our finding an explanation of most of the phenomena of subsidence connected with glacial action. It is not to be denied that all the evidence goes to show that we can no longer retain that theory of the earth's structure which supposes a hardened outer crust resting upon a fluid or viscid nucleus. But there are many reasons for believing that though the deeper regions of the earth are as rigid as the superficial portions, there exists, nevertheless, a zone not far from the surface where a considerable portion of matter still remains in a sufficiently softened state to admit of considerable movement in the hardened crust which rests upon it. But without attempting to discuss here the question of the nature of the means by which movements of the crust take place, we may safely assume that the conditions do now, and always have admitted a considerable up and down motion of the crust of the earth. How far the glacial sheet may have served to bring about these changes of level, or in what way the ice has operated, are questions which cannot well be discussed until our knowledge of the facts connected with glaciation and submergence is more complete. It does not seem to be too hazardous, however, to venture the assertion, that the extent of glacial submersion will be generally found to be proportionate to the depth to which the glacial accumulation attained. Not that any fixed ratio will be discoverable, but that where the glacial sheet was great, the subsequent subsidence was also considerable, and that where the glacial mass attained to no great depth, the subsidence was also slight. If this correspondence should be sufficiently verified, we shall be driven to suppose that the phenomena of glaciation and subsidence stand to each other in the relation of cause and effect, and that the ice sheet operates not in a general way by the change in the centre of attraction, rising from the circumpolar accumulation, but

[1] Under these circumstances, the behavior of the coast would be exactly illustrated by the action of a bar composed of two metals having different coefficients of expansion soldered together (as in the thermometer of Bréguet). On the application of heat the bar will be bent, the arc *pointing* in the direction of that portion of the bar having the greatest coefficient of expansion.

directly through the means of forces brought into action by, and proportionate to, the thickness of the glacial sheet. It is difficult to imagine any other way in which the ice could so operate except by the change in the position of the isogeothermal lines.

It should be remarked, however, that the view of the agency of ice in producing subsidence, does not seem to the author by any means conclusive; but only sufficiently probable to warrant its suggestion to those students whose special knowledge of thermodynamics better fits them for the discussion of such questions.

Count Pourtales exhibited some specimens obtained by dredging, at a depth of from two hundred to five hundred fathoms, between Cuba and the Florida Keys.

The dredging was undertaken last winter for the United States Coast Survey, and revealed an unexpected abundance of life at extreme depths; many of the forms obtained were quite new to science, and among them some interesting Crinoids; other species, heretofore only rarely discovered, were found in great abundance. Bones of the Manatee were dredged from the greatest depths, and their occurrence in such a place was a perplexing problem, since the animal is not supposed to venture out to sea, and no currents are known which could carry them to this locality.

Mr. N. S. Shaler made some remarks on the disappearance of the cane from the central part of the Ohio valley.

The western and central portions of the United States afford an excellent field for the observations of the naturalist upon the modifications of the fauna and flora, effected by the introduction of civilized man. Among those effects, probably the most remarkable is the complete extinction of the cane, *Arundinaria macrosperma* Mich., from an extensive area, where, half a century ago, it was one of the most common and characteristic plants. The first white settlers in the region now occupied by the southern parts of the States of Ohio and Indiana, and the northern part of Kentucky, found a great part of the alluvial lands, and much of the more fertile uplands, covered with a thick growth of this plant. Generally it was that form known as the "small cane," thus separated by the old hunters from the larger and possibly specifically distinct plant, called the "tall cane." Within half a century, without any purpose on the part of man to destroy the plant, it has disappeared in the whole of Southern Ohio and Northern Kentucky, and, if still remaining in Southern Indiana, has become limited to certain localities where it is not readily found. The phenomenon is to be attributed in great part to the cultivation of the more fertile parts of this region, and also to the fact that cattle will, at certain seasons, feed upon it. But the observer easily perceives that these causes alone will not account for the disappearance of the plant. Other influences have driven it away from large tracts of land favorably situated for its growth. It seems but reasonable to regard its disappearance as a consequence, not of the direct action of man, nor of the animals he brought with him, but as one of those changes induced most probably by the effect of cultivation of the soil upon the climate of the Western country; by changing the conditions of moisture, and possibly of heat, he has compelled a southward movement of the northern limit of this species. There are some indications of the operation of similar forces upon the higher plants; the box elder, *Negundo aceroides* Mœnch, for example, seems to be rapidly disappearing from this same region, where it was formerly quite common. It is much to be regretted that few carefully made, local lists of plants of the Ohio River valley have ever been compiled.

Mr. Luther Hills presented some specimens of the work of the beaver, and explained the structure of a beaver dam from three hundred to four hundred feet long, near Rangely Lake, in Maine. They can still be seen in other localities in the same State, such as Kennebago and Moosetucmaguntic Lakes and Kupsuctic River.

A letter was read from Mrs. E. B. Bryant, making a further donation of birds from Central and South America. The Corresponding Secretary was directed to convey the thanks of the Society for the gift.

By unanimous vote, the latter clause of the fourth article of the first Section of the By-Laws was altered so as to read:

"Any member, who shall neglect to pay his regular assessments for two successive years, upon receiving due notification from the Treasurer, shall have his name erased from the roll of members."

The Secretary read a letter from Dr. B. G. Wilder, resigning his position as Curator of Herpetology, on account of removal. The resignation was accepted, and the presentation of the name of a new Curator referred to the Committee of Nomination.

October 21, 1868.

The President in the chair. Twenty members present.

Professor Robert von Schlagintweit, who was present as a visitor, exhibited and discussed some minerals, called Nephrite, from Turkistan.

While travelling with his brothers in Central Asia, over a route never before trodden by Europeans or Americans, he discovered large quarries of this mineral, which were but little worked and could be leisurely examined. They lay in a place called Gulbagashen, in the Karakash Valley, at a height of more than twelve thousand feet above the sea; though inferior in character, this mineral is held at high prices, on account of its rarity in commerce. It is a silicate of magnesia, containing about fifty-nine parts of silica, and twenty-two parts of magnesia, and is almost destitute of water; it is wrongly stated to be found in Europe, and occurs only in Asia, New Zealand (where the stone is of inferior quality), and possibly in South America. By the inhabitants of Turkistan it is named Yashem, and by the Chinese, Tschoo. When quarried, it is so soft that it may be scratched by the finger nail, but afterwards grows to be excessively hard. It is manufactured, while soft, into amulets, mouth pieces of pipes, etc. The interesting feature in the discovery of the origin of nephrite, is the fact that tools of this material have been found in the lacustrine habitations of Switzerland, proving either that these ancient races of the stone age migrated from Central Asia, or else, which is less probable, that traffic in those times must have been very extensive.

The President announced that the winter series of lectures would begin with a course by Dr. B. Joy Jeffries, on the Eye and Optical Phenomena, to be given on successive Wednesdays, commencing October 28th.

Section of Entomology. October 28, 1868.

Mr. E. Burgess in the chair. Eight members present.

The Secretary read the following communication which he had received from Dr. Hagen, in rectification of a paper by the latter upon *Hodotermes japonicus*.[1]

I have compared the insect described by me as *Hodotermes japonicus* with the *Forficula* communicated by you. I have doubtless been in error; my type is a *Forficula*, with the last abdominal segment injured. I think it is an immature female, as it does not possess the carinated elevation on the sides of the second to the fourth abdominal segments. It is probably *Forficula (Brachylabris) maritima*, which is found all over the world, and has been described from Japan by De Haan and Dohrn.

This error is the more interesting to me from its bearing on the classification of Orthoptera. I think it proves that the wide separation of the Labidura or Dermaptera from other Orthoptera, so often insisted upon, is not founded in nature; and that the three families, *Termitina, Blattina and Forficulina*, are coördinated, and very nearly allied.

The following paper was read:—

A Century of Orthoptera. Decade I.—Gryllides. By Samuel H. Scudder.

1. Tridactylus major. Pale dull yellow, with dull brownish blotches on the front of the head, on the base and tips of the tegmina, and just beyond the middle of the hind femora; intermediate tibiæ crossed by one stripe, and femora by two stripes; the wings extend a little beyond the abdomen; the fore tibia is dilated, especially toward the extremity, where it is armed with very short spines; the hind tibiæ are armed with three laminæ, and protected at the tip by two flattened elongated spines, after the manner of *Rhipipteryx*; there are no other appendages to the hind tibiæ, although the sculpture of the pleura of the pronotum is like that of *Tridactylus*, and not that of *Rhipipteryx*. Length .4 in. Bengal.

2. Trigonidium pacificum. Dark fuliginous, mouth parts paler; large basal joint of antennæ fuliginous; second joint blackish;

[1] See these Proceedings, Vol. XI, p. 399.

third luteous; beyond growing dusky; pronotum smooth, shining, nearly destitute of hair; tegmina fully as long as the abdomen, the central field with prominent, irregular, longitudinal veins; wings none; legs dark luteous; anal cerci brownish, very long and slender; ovipositor reddish-brown, blackish along the middle, falciform, upper surface elevated slightly at the middle, apical half broader than basal half, tip produced to a sharp point. Length of body .21 in.; of hind tibiæ .15 in.; of anal cerci .15 in.; of ovipositor .09 in. One ♀ from the Hawaiian Islands, given me by Mr. B. P. Mann.

3. Hapithus quadratus. This species differs from its more northern ally in having the prothorax scarcely broader behind than in front, and in having, in the ♀, longer tegmina, which cover the entire abdomen and do not divaricate at the tip; the hind legs also seem to be longer and stouter, and, in the ♂, the tegmina differ slightly in venation from those of *H. agitator*, and are also furnished with little brown spots along the outer border of the upper surface. In size it resembles *H. agitator*. Dr. Gundlach sent me one specimen from Cuba; another, collected on the same island by Mr. Wright, was given me by Mr. Uhler, and two others were received from Central Texas, collected by Mr. Belfrage.

4. Eneoptera annulata. Of a nearly uniform, sombre, dusty brown; summit of the frontal tubercle blackish; a reddish-black, narrow stripe across the face, uniting the bases of the mandibles; pronotum with a small blackish spot in the middle of both the anterior and posterior border; and a black dot on either side of the middle of the dorsum; tegmina extending beyond the body, nearly to the middle of the hind tibiæ, dull luteous brown, with a small, humeral, blackish spot and many of the cross-veins, especially along the sides of the dorsal field, edged with brownish; wings reaching beyond the tegmina, almost to the tip of the hind tibiæ; hind femora at the tip annulate with brown; hind tarsi paler than tibiæ; ovipositor straight, black, edges of the sheath chestnut; anal cerci pale. Length of body .6 in.; of tegmina .76 in.; of hind tibiæ .38 in.; of anal cerci .28 in.; of ovipositor .27 in. One ♀ from Central America, communicated by Mr. P. R. Uhler.

5. Eneoptera unicolor. Uniform luteous brown throughout, the hind femora with some slight reddish-brown, inconspicuous dashes; hind tibiæ dusky; first joint of tarsi yellowish, armed at the tip with two large, scarcely divergent, brown spines; fore tarsi dilated; ovipositor straight, chesnut color, tipped with black and with a fine longitudinal black line along the middle of either side; anal cerci long and slender, pale yellowish, slightly dusky toward the tip; tegmina longer than the abdomen, when at rest almost reaching the middle of the hind tibiæ; wings overreaching the tegmina and extending to the apical fourth of the hind tibiæ. Length of body .44 in.; of tegmina .48 in.; of hind tibiæ .26 in.; of anal cerci .16 in.; of ovipositor .14 in. One ♀ from Manila.

6. Eneoptera obscura. Head dark brown; prothorax black, varied, especially posteriorly, with dark brown; anterior legs fuscous; tegmina blackish, varied with obscure fuscous; ovipositor mahogany color, with a central, longitudinal, black line; the tegmina are broad. and extend beyond the body in the dried specimen; perhaps they do not surpass it when living; the wings, at rest, reach just beyond the tegmina; the ovipositor is scarcely shorter than the body, straight for twice or thrice its length, and then curved slightly downward; it is slightly enlarged and obliquely docked above at the tip; the form of the ovipositor, the shape of the fore femora, which are strongly incrassated at base, and the presence of a conspicuous but narrow prominence on the front of the head between the eyes, ought properly to separate this species from the genus in which I place it. Length of body .33 in.; of tegmina .31 in.; of ovipositor .28 in. Old Calabar, Mr. Andrew Murray.

7. Platydactylus bicolor. Whole upper surface, including upper third of eyes, upper portion of frontal prominence, tegmina and exposed portion of folded wings, very pale yellowish-brown; all other parts of the body, including all the appendages except the antennæ, dark brown; the latter are luteous near the base and dark brown toward the tip; summit of head flecked with blackish dots; dorsum of pronotum furnished with fewer blackish dots; some larger ones are found along an indented line parallel and contiguous to the hind border; a semicircular dusky spot is situated upon the hind border; a few minute black dots are scattered about upon the tegmina; lateral field of the tegmina with oblique blackish veins, the cross-veins pale; tegmina surpassing a little the tip of the abdomen; wings straight, extending far beyond the tip of the tegmina; legs throughout flecked with inconspicuous pale dots; terminal tarsal joint of each of the legs furnished with a broad central annulation of yellowish-brown; terminal hind tarsal joint guarded at base by two spines, the inner three or four times longer than the outer. Length of body, .8 in.; of tegmina, .7 in.; of wings beyond tegmina, .5 in.; of hind tibiæ, .66 in.; anal cerci broken. One ♂ from Bogota, P. R. Uhler.

8. **Mogoplistes occidentalis.** Nearly uniform chestnut-brown, slightly banded with brownish fuscous. It differs conspicuously from the European species, by its much greater size and the proportionally greater length of the ovipositor; my specimens are imperfect and are almost entirely deprived of scales. Length of the body .42 in.; of the ovipositor, .32 in. Mr. Uhler sent me two ♀ from Cape St. Lucas, Lower California.

Cycloptilum nov. gen.

Allied to *Ornebius*. Head very small, well and evenly rounded, produced anteriorly; eyes of medium size, subpyriform, the larger end directed upward, but little prominent; antennæ very long and slender, distant at their insertion, the basal joint large, the remaining joints nearly equal; labrum bifid; maxillary and labial palpi apparently similar, the terminal joints a little enlarged and obliquely truncated at the tip. Prothorax very large, nearly as long as the abdomen, greatly broadened and produced posteriorly, the posterior border well rounded, forming nearly a semicircle; pleura shallow and incurved, posteriorly wanting; tegmina almost entirely concealed by the expansion of the pronotum, but with the dorsal field as broad as the pronotum in its widest part, the tips well rounded, like the prothorax, and covering half of the abdomen; the lateral field is also well developed, embracing the abdomen; wings nearly or quite abortive in the single species known to me; legs short, simple; hind femora greatly dilated; hind tibiæ and first joint of tarsi furnished with apical spines. Abdomen depressed, nearly equally broad throughout, slightly tapering at the extremity; anal cerci tapering, more than half as long as the abdomen; whole body, in the single species known to me, covered with scales.

9. **Cycloptilum squamosum.** Head and prothorax yellowish-brown; a dark brown or blackish band behind the eyes, extending to the anterior part of the pronotum, with a scarcely perceptible median carina; pleura of the pronotum covered with whitish scales; tegmina extending three one-hundredths of an inch beyond the prothorax, pellucid, with a few pinkish veins on posterior border; legs pale yellowish, covered with brownish scales, least conspicuous on the hind femora; basal half of abdomen covered with whitish scales, apical half with blackish ones; anal cerci whitish, a few long and distant hairs on the pleura of the pronotum, the femora and the anal cerci. Length of body .25 in.; of pronotum .13 in.; of hind femora .14 in.; of antennæ .5 in.; of anal cerci .1 inch. One ♂. Texas, Belfrage.

10. Nemobius circumcinctus. Top of head and pronotum yellowish-brown, marked with blackish-brown, the pronotum edged anteriorly and posteriorly with pale yellow; pleura of pronotum (except lower edges) and front of head, blackish-brown; abdomen black above, pale yellowish-brown beneath; first and second joints of palpi dark brown, third joint dark brown without and whitish within, fourth and fifth joints white; antennæ dark brown; legs and anal cerci brownish-yellow, flecked with blackish spots; the tibiæ and tarsi more dusky; the portions of the tegmina, exposed when at rest, black, the dorsal field with black, the lateral field with luteous veins; entire outer and posterior margin of the dorsal surface of the folded tegmina bordered narrowly—more broadly at the shoulder—with a pale yellow band; concealed portion of tegmina translucent, colorless; tegmina broad, ovate, a little shorter than the abdomen; upper surface flat; wings apparently wanting; hind tarsi composed of only two joints, the outer smaller and not more than half as long as the first. Length of body, .37 in.; of tegmina, .23 in.; of hind tibiæ, .25 in. One ♂, from Orizaba, Mexico, received from Professor Sumichrast.

November 4, 1868.

The President in the chair. Forty-five members present.

The President, in a few appropriate words, announced the death of Octavius Pickering, Esq., a member of the Society, and one of the founders of the "New England Society for the Promotion of Natural History," from which the present Society sprung.

Mr. W. H. Dall offered some remarks upon the natural history of Alaska, where he had spent several years in explorations.

Mr. Dall said that although the specimens collected by him in that country had not yet been carefully examined and compared, still certain facts of great interest might be considered as pretty definitely settled.

The observer cannot but have noticed that in most physico-geographic maps of North America, the Rocky Mountain range is prolonged in a straight line, corresponding to the general trend of those mountains, to the Northern Ocean. This is an error. About lat. 64° the Rocky Mountains trend to the westward, and meet the Coast Range in a confused, high rolling country, the distinctive characters of both ranges being lost. These mountains, however, soon appear to merge in one high volcanic range, trending to the westward, and afterwards to the southward, and forming the backbone of the peninsula of Aliaska. A gap occurs to the northward, between the Mackenzie and Porcupine Rivers, filled with low rolling hills. Along the shores of the Northern Ocean from the mouth of the Mackenzie westward, a separate range exists, following the trend of the shore, nearly parallel with the southern volcanic range, and terminating in a few high peaks near the mouth of the Colville River. This range has long been marked as the Romanzoff Mountains, being a landmark for whalers who pass Point Barrow. For the southern volcanic range Mr. Dall suggested the name of the Alaskan Mountains.

The gap before mentioned between the two ranges leads to unexpected faunal differences. The West Coast fauna is bounded on the north by the Alaskan Mountains, while the valley of the Youkon possesses a northern and eastern fauna. Birds, like *Colaptes auratus*, *Ampelis garrulus*, etc., abound, the western or midland faunal types of *Colaptes (hybridus* or *mexicanus)* being wanting.

White bears in large numbers are reported on a solitary island, St. Matthews.

One species of frog, the solitary reptile, is found all over the country.

The fish are principally white fish, salmon, pike, catfish (losh), and a large species of sucker. The cod abounds in millions about the Aleutian islands and Kodiak.

Land shells of the genera *Helix*, *Pupilla* and *Succinea* ; fresh water shells, such as *Planorbis*, *Lymnea*, *Valvata*, *Pisidium*, *Sphærium* and *Anodon* ; and the usual northern marine forms are found north of the islands.

The country, except on the extreme sea coast, is heavily timbered with spruce, poplar (2 sp.), birch (2 sp.), willow (? sp.), alder and larch. The most northern pines on the Youkon are found at Fort Selkirk, in the Hudson Bay Company's Territory, two thousand miles from the sea.

The inhabitants are of two races. The "Eskimo," so called, or coast tribes, are a fine, athletic, intelligent race, tall and well formed, and totally different from the commonly received idea of Eskimos. They are, without a shadow of doubt, of the same stock as the Greenland, East and North Coast Eskimo, and with the Aleüts and coast tribes of the West Coast as far as Sitka, and possibly much further south. This is proved by the language, which is in all respects similar, and in many identical, in the tribes above mentioned, and also in the tribes of Tchukchees in Northeastern Siberia. They invariably keep near the coast.

The North American Indians are found everywhere in the interior, and are of the original American stock, as is proved by their dialects, which have been carefully collected. They are totally distinct from the Eskimo, have no intercourse with them except by trade, and are in many respects the inferiors of the coast tribes.

North of Nounivak Island, the Behring Sea in winter is ice-bound. Every river freezes up about the 15th of October, and opens about the 1st of June, although the ice does not leave the sea till near the end of June.

The country north of the Alaskan Mountains has been carefully explored for traces of glacial action. Thus far, not one boulder, no trace of striation or polishing of the rocks, which are of the most flinty character, nor a case of transportation of material or deposited moraine, has been observed. South of the Alaskan Range, in the fiords and inlets for which the coast is remarkable, there are many local glaciers. These occur on the peninsula and along the coast, even as far south as Vancouver's Island. North of that range none have yet been observed, nor, as stated above, any traces of general glacial action. The mountains are low, varying from two to three thousand feet, excepting the volcanic peaks of the Alaskan Mountains, and a few, probably not volcanic, in the Romanzoff Range.

The rocks of the Youkon valley are principally quartzose, surmounted by fossiliferous sandstones and tertiary clays, with lignite and vegetable remains.

Gold has been found near Fort Youkon, coal in many localities, but neither of them in quantities of economic value. Amber exists at the Youkon mouth, and spinel on the island of St. Georges.

Mr. N. S. Shaler presented the following considerations concerning the absence of distinct evidences of glacial action in the valley of the Yukon River in the northern part of Alaska.

In the preceding communication, Mr. Dall has called attention to the fact that throughout the valley of the Yukon River, and the regions lying to the northward, there is a marked absence of all those indications which, in corresponding latitudes in other portions of the northern and southern hemispheres, afford such unquestionable evidence of extensive glaciation during the preceding geological period. He assures us (and we cannot but believe that his evidently painstaking observations are quite trustworthy) that he failed, with careful search, to find a trace of glacial striation, or any such accumulations of gravel and boulders as characterize the southern portion of the eastern half of the glaciated area of this continent. There seems the more probability of the correctness of the observations of this energetic explorer, when we consider the fact that a number of geologists have denied the existence of all glacial deposits throughout Siberia; and the merit of these observers is so great that it would seem that we must accept the want of these evidences throughout this great area as one of the facts to be explained by any theory of the nature and cause of glacial periods. Mr. Dall's observations, should they prove to be well founded, will only compel us to conclude that the region of scanty evidence of glaciation was not confined to the Asiatic continent, but extended under the same parallels into North America.

The existence of these remarkable apparent exceptions to the continental extension of the ice sheet during the glacial period, makes it the duty of the geologist to consider, with much care, the nature of the evidences of glacial action, and to determine how far the theory of the conditions existing during that period requires to be modified to suit these seeming exceptions.

Within four years the theory of the glacial period has made important advances. The insufficient hypothesis which referred the whole of the changes of climate to alterations in the distribution of sea and land, together with variations in the height of the continents, has been partly abandoned; while the old suggestions of Sir John Herschell, that the change in the eccentricity of the earth's orbit might have a great influence upon the climatic conditions in either hemisphere, has been again called into notice, submitted to careful examination by several competent physicists and mathematicians, and put in such shape as to claim recognition as the only theory, yet devised, which is competent to supply the forces required to account for the glacial period.

Accepting this theory, we are at once provided with better means of accounting for the successive occurrence of ice sheets at many stages in our earth's development, than we could otherwise have; and the difficulties which it thereby removes renders it by far the most valuable and best supported hypothesis which has yet been applied to the phenomena. There can be no doubt that it is reasonable to make it the basis of any considerations we may apply to the phenomena of the glacial period.

This hypothesis requires us to suppose that each hemisphere in succession has been submitted to alternating periods of heat and cold, each period extending over many tens of thousands of years. The diminution in the duration of the summer heat prevented the melting of the glacial accumulations of the winter season so that the ice sheets gradually grew wider while they enwrapped the mountain chains, and finally buried much of the continents beneath continuous ice. The reduction of temperature would be necessarily about the same, in all regions beneath the same parallels. The isothermals would probably be pushed southward without any radical alteration of the curves which now characterize them. The ocean and atmospheric currents probably have been enlarged so that the relative heat of different regions of either hemisphere would not probably be much influenced by the change from the period of extreme heat to extreme cold.

It will be seen by the inspection of a map of the northern hemisphere, which gives the isothermal lines, that the isothermal of 30° Fahr., which passes through the valley of the Yukon River, passes close to the southeastern coast of Greenland, north of Iceland, and touches the European continent at the northernmost point of the Scandinavian peninsula. It is quite beyond question that, during the last glacial period, the whole of Labrador, Greenland and Scandinavia, and the land for many degrees to the southward, were subjected to glacial conditions ; nearly every great valley being the seat of gigantic glaciers, and much of the surface buried to the depth of many thousands of feet. Now, it is impossible to understand how conditions affecting the whole northern hemisphere equally, could have carried the ice line so far south, that near Harrisburg, Penn., in about 41° of latitude, the ice sheet was over one thousand feet deep, while at the mouth of the Yukon River, in about 68°, there should have been no glacial accumulation whatever. The question then arises, shall we suppose that although the temperature of the region may have been such as to admit of glaciation, there was a want of precipitation of water so great as to prevent the formation of glaciers, or are we to suppose that although the region was covered with glacial accumulations from some cause or other, the ordinary evidences of the ice sheet failed to be produced by the glacial mass which covered the region. The first of these suppositions does not seem probable; the rainfall of the valley of the Yukon and of Siberia is great enough to produce considerable rivers, and must, even during the glacial period, have been quite as great as that of Scandinavia, which bears almost precisely the same relation to those sources of moisture, ocean streams and currents of moistened air. It seems far more likely that the latter supposition is true, and that local circumstances have prevented the formation of as distinct evidences of glaciation as at other points. It is important to consider that all the phenomena of erosion and transportation of ice by glacial masses depend upon the ability of the base of the sheet to slide over the surface on which it rests, and upon the existence of considerable areas of uncovered rock to supply the materials to be transported. If the circumstances do not favor these conditions, then the ice sheet may exist for any time and in any magnitude, produce all its effects upon organic life, and yet leave few traces of its former existence. The whole of the Alaskan peninsula is bordered on the south by an elevated mass of mountains which would present an insuperable barrier to the escape of a glacial mass in that direction; to the east there could be no outlet. To the north there probably exists a similar mountain barrier, but even if there were not, we cannot suppose an outlet in that direction. The only course in which a movement of the base of the glacier would be possible is to the westward into the basin of the sea of Kamtschatka. It seems, however, exceedingly probable that, at this time, the whole of this apparently shallow sea was filled with glacial accumulations to such an extent that no escape in that direction would have been possible. Were this the case, no movement of such a nature as would leave traces in scored and scratched rock surfaces would be possible. Accumulation might go on until the general surface of the ice sheet overtopped the barrier to the southward, when there might be sufficient escape to prevent farther increase in the thickness of the mass. But this movement could not affect the base of the sheet; that portion would necessarily remain unchanged, except by the melting of the ice, and the wearing of the rock by the streams thus produced.

In the same way in Siberia, the want of outlet to the southward would prevent the movement of the glacial envelope, which is manifestly the first condition of the formation of striated surfaces. Thus we may, without any great difficulty, account for this local deficiency in the evidence of glacial erosion.

Concerning the absence of transported materials in these regions, there is no explanation required if we suppose there was little motion to the mass. But as there must have been some outlet if there was any accumulation going forward, we may find a better explanation in the fact that it is only where a considerable portion of the surface of a country remains uncovered by the ice sheet, that any large quantity of erratic material can be formed. The surface covered by moving ice cannot yield much material for transportation in the shape of large erratics. Most of the material removed is borne away in the condition of mud and sand. The few considerable masses which are torn up from the glaciers' bed are continually grinding against the rock, and are soon reduced to powder. In the Alpine glaciers comparatively few fragments emerge at the extremity of the stream, and those generally of small size, by far the greater part having been ground to mud. Of twenty tons of fragments which find their way to the base of the glacier, probably not one ton emerges at the terminal moraine. It is chiefly the masses which have been carried on the surface of the stream which build up the terminal moraine. And of the fragments constituting such accumulations, probably not the fiftieth part has been torn from the bed over which the stream grinds its way. The material eroded at the base of the glacier passes away in the almost impalpable mud which whitens the stream that bursts through the terminal moraine of every glacier.

The fiord zone, one of the most unquestionable evidences of glacial erosion, is as clearly indicated, at least on the southern part of Alaska, as upon any portion of the eastern coast of North America. To make the case still clearer, the heads of these fiords are at some points still occupied by the remains of those glaciers which excavated their channels.

Is it to be believed that the glacial sheet of the last geological period descended to the Pacific between the parallels of fifty and sixty of north latitude, while the region beneath the next ten degrees to the northward, was not glaciated at all? Is it not more reasonable to regard the want of evidence as explicable on the hypothesis above presented?

Mr. A. Hyatt remarked that the absence of drift material and of glacial scratches or grooves in the territory under consideration, especially for thirteen hundred miles in the great valley of the Yukon, as stated by Mr. Dall, would certainly seem to be overwhelming evidence against the assumption of the former existence of any extensive terrestrial sheet of ice similar to that which once covered New England. All the positive evidence in favor of the glacial theory must necessarily be confined to the presence of these two kinds of "ice-marks," and, according to Mr. Dall, both the drift and the scratches are absent. Mr. Shaler's observations, that the detrital matter was derived from the sides of hills rising above the upper surface of the glacier, would not hold as a general rule. The drift material so plentifully scattered throughout New England, has evidently been derived in great part from rocks which have been broken off by the under surface of the ice sheet, and transported often to considerable distances.[1] The general formation of the hills, their gradual northern and steep, rugged southern slopes and their rounded summits, as well as slight elevation, would seem to sustain this view.

The surface drift of the vicinity of Salem and Cambridge has been derived from, and in many instances the boulders may be traced to rocky ledges, at greater or less distances to the northward. And these rocky ledges, which at the most are only a few hundred feet high, must have underlain the glacier, or else their summits would not now present such an accurate copy of the *roches moutonnées*, but would be ragged or serrated.

Mr. W. T. Brigham called the attention of Mr. Shaler to the actual motion of rocks imbedded in the bottom of a glacier. To be reduced to mud, rocks or boulders must be dragged along; in other words, glaciers tear up and transport on their under surface as well as on the upper surface or in the mass. It is difficult to imagine a layer of ice a thousand feet thick, melting *in situ*, as it must have done according to Mr. Shaler's theory, without leaving some of the so-called glaciation marks. If the sheet was formed by "repeated congelation of aqueous precipitation," the summits of the hills must have remained uncovered last, and when the melting commenced, have first appeared above the sea of ice, giving an admirable opportunity for debris to be deposited on the surface of the retreating ice-sheet, and we should have had deposits in concentric circles around the conical hills.

The presence or absence of striation does not determine the existence of glaciers, for in valleys of the Hawaiian Islands, striæ and

[1] Fragments of rock from Lake Telos have been found on the sides of Mt. Katahdin, fourteen miles distant, and three or four hundred feet above the general surface.

scratchings, which would delight the eye of one determined to see only the agency of moving ice in such records, are often to be seen in the actual process of formation in a temperature some 30° above the freezing point.

Mr. S. H. Scudder observed that even the comparatively few boulders which Mr. Shaler admitted to emerge from beneath the glacier at the terminal moraine, were really so numerous that they ought not to escape the eye of the careful observer; and that so vast a body of ice as this theory rendered necessary — however slowly it might move—would, by its own weight, irrespective of any enclosed masses of rock or gravel, polish and round the surface over which it passed.

Section of Microscopy. November 11, 1868.

Dr. B. Joy Jeffries in the chair. Six members present.

Mr. Charles Stodder laid upon the table, for the inspection of the members, photographs of Nobert's test plate of nineteen bands, taken by Dr. Curtis, under directions from Dr. Woodward, at the Army Medical Museum in Washington, D. C.

These bands are very beautifully photographed, showing up to the sixteenth perfect lines that can be counted through the whole width. Their instruments failing to resolve, or rather to photograph the four finer bands, sixteen, seventeen, eighteen and nineteen, Dr. Woodward infers that the last four bands have not been resolved.

Mr. Stodder remarked that in his opinion the claim to have resolved the finer bands, advanced by Mr. Greenleaf and himself, was not disproved by this failure to photograph them. The condition of the microscope for photographing (without an eye piece) is so different from its condition for vision, that he considered the failure to photograph lines of such exceeding delicacy no proof that the lines could not have been seen, and more than that, that the failure of one operator to photograph with a certain instrument, is not to be accepted as a proof that another observer with another instrument and other manipulations failed to see. This subject was further discussed by Drs. Jeffries and Curtis.

Mr. R. C. Greenleaf showed a specimen of *Amphipleura pellucida*, mounted dry, on which he claimed to show the markings. As this has been one of the most difficult of the diatoms to resolve, and perhaps the one about the resolving of which there has been the most dispute, Mr. Greenleaf proposed leaving the matter open for further examination and discussion.

Dr. Rufus King Browne of New York, being present, spoke of the difficulty of perfectly resolving the markings on this form; he considered the markings as granules or tubercles, which appear as lines or *puncta*, according to the light thrown upon them, and that the markings were not as fine or close as claimed by Microscopists.

November 18, 1868.

The President in the chair. Twenty-five members present.

After the reading of the Records, the President announced the recent death, after an illness of short duration, of Mr. Horace Mann, Curator of Botany.

The feeling of the Society was expressed by Mr. William T. Brigham, who spoke as follows: —

It is sad to speak publicly of our private sorrows, but when those sorrows touch all alike who reverence the good, admire the brave, rejoice over victories in the noble struggle of light against darkness, knowledge against ignorance, or who mourn over great efforts uncompleted, then must we lay aside all thoughts of personal loss, and speak each with all of our common grief.

The youngest officer of this Society has left us never to return. Were years alone the test of usefulness and manhood, we might count over the few that Horace Mann numbered in his earthly life, regret they were so few, and from the full-grown and ripened lives still with us, look for his successor. But vainly should we look; where should we find in all the years the best of our number could show, a single year so full of hard work, conscientious, unselfish, self-sacrificing struggle that the world might know more, and the cause of science be advanced?

In his earliest youth Horace Mann drew in from his father's careful teachings the love of Nature, which has since been his constant joy. Often would he softly open the door of his father's study, and come silently to his father's side, waiting for the leisure which would give him some of the marvellous stories about the earth and its inhabitants, which in his mind took the place of the unrealities of fairyland so dear to most children.

Chemistry was the delight of his boyhood, and his father's house contained a laboratory, in which he spent many an hour, often to the great anxiety of his family, who dreaded the usual results of boyish experiments with powerful re-agents. Inanimate matter did not satisfy him, and after much thought, although opposed by most of his friends, who wished him to receive a collegiate education, he determined to devote himself to the study of Nature, entering Professor Agassiz' school as a student of zoölogy and geology. This was at the time when the present Museum was recently built, and the hard manual labor of moving and arranging heavy specimens, which he so readily undertook, seriously affected his health. He was at this time also deeply interested in conchology, and most especially in botany, and it was from this latter interest that the companionship and friendship commenced, which for the last four or five years have so closely united us. When Dr. Asa Gray was told that I was soon to visit the Hawaiian Islands, he asked me to collect the very peculiar flora of that group, and suggested the propriety of asking Horace Mann to accompany me. It was a short notice, but his friends advised him to go, and he joined me in California. From that time, for more than a year we were constant companions, and many a long ride, many a weary walk, did we share. For more than six months we kept house together in Honolulu, and from the first day to the last he was the same modest, retiring, hard-working, unselfish, conscientious man. Thoroughly alive to all the beauties and wonders of Nature there surrounding him, he often wrote home that he enjoyed every moment, and often indeed have I seen him in perfect ecstasy over the discovery of some new plant after a hard climb up some island precipice.

With his rich collections he returned to Cambridge, and was soon appointed Dr. Gray's assistant, and afterwards Instructor in Botany in Harvard College. Besides the work of arranging the Thayer Herbarium and constantly aiding Dr. Gray in preparing material for his classes, and revising proofs of his two botanical manuals,—a work more than enough for a common man, a work indeed that no common man could do,—he worked steadily in his spare hours, often late into the night, on his Hawaiian collections. The many thousand specimens were determined and labelled and partly distributed; his "Enumeration of Hawaiian Plants," which has given him a good botanical reputation, was published by the American Academy of Arts and Sciences, (of which he was unanimously elected a fellow on the very evening of his decease); a most complete Flora of the islands was published in part by the Essex Institute; several other botanical memoirs were in hand, and you all know that his labor here in our herbarium and in our work as a Society, was not light.

His interest in this Society never waned. Often on shipboard, lying on deck at night, have we talked over this matter, and he was full of suggestions, many of which have since been carried out; others, such as a permanent door-keeper for the Museum on exhibition days, guide-books to the various collections, and a fire-proof floor for the main story of this building, will be perhaps in time. He was always present at the Council meetings, and his advice was always sensible and respected.

As a result of our Hawaiian explorations, five new genera were added to the flora, one of which was dedicated to him under the name of *Hesperomannia*, and has been engraved for the next part of our Memoirs, while of new species of flowering plants, no less than sixty-seven or more than twelve per cent. of the entire phænogamous Hawaiian flora were discovered. His published works, besides a number of reviews in the American Naturalist, were: —

On some Hawaiian Crania and Bones. [Proc. Bost. Soc. Nat. Hist., Vol. X, p. 229.]

On the present condition of Kilauéa and Mauna Lòa. [*Ibid.* Vol. X, p. 229]

Denudation on the Hawaiian Islands. [*Ibid.* Vol. X, p. 232.]

Revision of the Genus Schiedea and some of the Rutaceæ. [*Ibid.* Vol. X, p. 309.]

Description of the Crater of Háleakala. [*Ibid.* Vol. XI, p. 112.]

Enumeration of Hawaiian Plants. [Proc. Amer. Acad. Arts and Sciences, Vol. VII, p. 143.]

Flora of the Hawaiian Islands. [Proc. Essex Institute, Vol. V.]

The last has not been completed, and a number of other valuable and interesting memoirs remain unfinished.

Early in October the severer symptoms of what he had considered a mere cold, compelled him most unwillingly to give up his college classes, temporarily, as we all hoped; but the worst form of pulmonary complaint had gone too far to be stopped, and although his friends all hoped for his recovery, he passed away peacefully on the evening of November 11th, after some days of great pain and anguish.

Sad as it seems to us, in our blind interpretations of Providence, that a life so full of promise, so pure, so true, a life so short and yet so full of results, should be cut short, yet the example of this life, called so closely to view by the angel of death, cannot but animate and encourage many others; and the nobly proportioned column, whose base and lower shaft alone we see on earth, yet raises its capital above the veiling clouds, a monument and beacon we may well follow.

Prof. Albert S. Bickmore exhibited a few of the birds which he had collected in the eastern part of the East Indian Archipelago, especially on the Island of Buru.

The most remarkable family for their variety and the brilliancy of their plumage was that of the doves, of which specimens of eight species were secured on that island alone. The next noticeable family was that of the parrots, of which six species were collected. For a part of the time that Mr. Bickmore was on Buru, a tree larger than our oak was filled with bright scarlet flowers, and whole groves of these trees were frequently seen. In the branches of these trees hundreds of the scarlet Luri, *Eos rubra* Wagl., and the green and red parakeet, *Trichoglossus cyanogrammus* Wagl., would gather in the early morning and poise themselves with their wings while they tore in pieces the richly colored flowers. The largest of the parrot family, the *Tanygnathus affinis* Wall., seemed to be partial to the fruit of the teak tree, and also came to feed in the morning and evening. When one was shot its cries always brought back its mate, and sometimes the whole flock would return as if desirous to render assistance. The richly colored *Eclectus puniceus* Scop. only perches in the tops of the highest trees, and therefore is one of the most difficult of the parrots to shoot. The richest of all the gaily-plumaged parrot family in that region is the *castori rajah*, or "Prince parrot," as it is called by the Malays. These brilliant birds always fly in pairs, and it is most startling and delightful to the naturalist to see them dart by him and instantly disappear into the dark jungles.[1]

Mr. Bickmore also spoke of the difficulty of making a collection of birds where there is a continuous rainy season for half the year, and especially on account of the swarms of ants that eat up almost everything but arsenic. His collection had remained packed up for two years and a half, and yet the sheen and brilliancy of the plumage was unimpaired. He had himself searched, and employed many natives to search also, for birds' eggs, but he had not been able to procure any on that island, except those of the *Megapodius Wallacei*, each of which is fully one-third of the size of the bird's body. Mr. Bickmore also exhibited a pair of the large bats of that region. The wings of the male measured four feet and four inches from tip to tip, and that of the female four feet and eight inches.

[1] For a more detailed account of the habits of these birds, see "Travels in the East Indian Archipelago," by Albert S. Bickmore, A. M.

Prof. Bickmore exhibited a *Nautilus pompilius* in alcohol, which is the only specimen ever brought to this country.

It was obtained at Amboina, the chief island of the Moluccas or Spice Islands. Only the second day that he was on that island this mollusk was brought to him by a native; and though he remained for five months in those seas, and many natives were employed in the search for a second specimen, the one exhibited was the only one he was able to obtain. The interest in regard to this specimen is not so much on account of its great rarity, as because it is one of the only two living representatives of a group of Cephalopods that were very abundant in former geological times.

The animal was alive when it was brought to Mr. Bickmore, and was at once put into arrack, and has been perfectly preserved, the mantle not having been chafed, nor even the edge of the shell notched. It was taken in what the Malays call a *bubu*, which is a barrel-shaped basket made of bambu for taking fish. The ends or heads of the barrel are inverted cones, and at the apices of these cones are holes. A piece of bait is suspended from within, and the whole lowered on a coral reef.

In this case it happened that one of the holes was unusually large, and the nautilus crawled into the bubu, where it was found by a Malay. It has been commonly believed that the nautilus occasionally rises to the surface, and "setting its sails, floats over the sea." This was first reported by Rumphius, but Mr. Bickmore, after making continued and careful inquiries, satisfied himself that there is no reason to suppose that the animal ever rises from the bed of the sea. The natives frequently reported to him that they had found empty shells floating on the sea, but no one had seen the enclosed animal before. In regard to the distribution of this cephalopod, he remarked that while at Kupang, a port near the southern end of the island of Timur, he found great quantities of the shells at a Malay village, and the natives assured him that they had collected them for food on the shores of the small island of Rotti, which lies south of Timur. Shells were also found at Bencoolen, on the southwestern coast of Sumatra, and a fine one was given him at that place, which had been brought from the island of Engano, where they are said to be frequently found. These shells had probably been drifted from the vicinity of the island of Rotti, as the animal probably does not live so far west as Engano.

The specimen is the property of Mr. Bickmore and Mr. J. Warren

Merrill, and they have presented it to Dr. Wyman, on the condition that he shall prepare a memoir on it for the Society.

Mr. W. T. Brigham spoke of the results of Mr. Mann's study of the Hawaiian Flora.

From the time of Captain Cook's visit to the Hawaiian Islands, the vegetable productions of this group have attracted the attention of botanists. Menzies, Chamisso, Gaudichaud, Macrae, Douglas, Brackenridge, Pickering and Remy, have made collections at various times during the last fifty years, and the few results published by these botanists indicated a very peculiar flora, which Mr. Mann's study of our joint collections has developed to a great extent.

The grasses have not yet been published, but number about fifty species; the ferns, including *Lycopodiaceæ*, as at present determined, number thirty genera and one hundred and thirty-four species; they however require farther examination, and the number of species will probably be increased; lichens forty-two genera and one hundred and thirty species. It was to lichenology that Mr. Mann paid special attention, and the collection was made almost entirely by him.

Of the flowering plants, the most remarkable family is the *Lobeliaceæ*, represented by six genera, five peculiar to the Hawaiian Islands, and thirty-five species, all endemic. Many of these, indeed almost all, are arborescent, and some of great interest. Our explorations added ten new species and one very remarkable genus (*Brighamia*) to this family. The *Compositæ* hold an important place, as will be seen by the accompanying table, and of these the new genus *Hesperomannia*[1] and four new species were collected.

Remy endeavored to divide the island flora into five zones, but with indifferent success; three are tolerably distinct,—the alluvial plains, the valleys and the mountain region. The alluvial plains are on the shores, where most of the introduced plants are found. The valleys, which have generally been long the residence of man, and have been cultivated and cleared, are more tropical, and because better watered than the plains, and of richer soil than the mountains, are filled with a much more luxuriant vegetation; in this region are found most of the introduced fruits, as the orange, lime, tamarind, avocado pear, banana, guava, as well as the Eugenia, many Leguminosæ, ginger and the all-important kalo. The third, or mountain region, extends from the grass lands which usually occupy the lower slopes of the moun-

[1] See Memoirs of this Society, Vol. I, p. 527, pl. xx.

tains as high as eight hundred or a thousand feet, almost to the limit of vegetation, and this point is determined by the aspect; on the windward side of Mauna Kéa it is at a height of nearly twelve thousand feet, while on the lee of Mauna Lòa it is no higher than eight thousand. There is no truly alpine zone; the trees and shrubs of the lower regions become stunted and finally disappear, and the upper regions are wholly destitute of vegetable life. Dodonæa, Sophora, Osteomeles, Vaccinium, Gouania (*G. orbicularis*), are found near the upper limits. The timber of the forest is largely Metrosideros and Acacia (*A. koa*) while the Aleurites is abundant. It is in the dense woods of the lower slopes (three thousand to four thousand feet) that the tree ferns, especially that bearing the *pulu*, which is so important an article of commerce, and lower still the Lobeliaceæ, the Labiatæ and the *Cordyline* or ki of the natives are found.

The regions yielding the richest harvest of species lie between fifteen hundred and six thousand feet above the sea. *Drosera longifolia* is found at an elevation of eight thousand feet, many thousand miles from its nearest known habitat. There are but few showy flowers, and still fewer fragrant ones, in the Hawaiian Flora. The genera Hibiscus, Gardenia, Byronia, Brighamia, Metrosideros, Eugenia, Scævola, Cyrtandra, Phyllostegia, with a few Compositæ, Convolvulaceæ and Leguminosæ, comprise nearly all the showy or beautiful flowers. In the coloring, white or greenish white is predominant, and yellow and pink follow at a respectful distance. There are very few blue flowers. *Strongylodon lucidum* is a rich crimson, and some other leguminous plants are violet, but the various and brilliant coloring of the Californian plants is wholly absent.

It is a matter of great interest to ascertain the indigenous fruits. The coconut, pandanus, cordyline, breadfruit and kalo, are in the present list regarded as belonging to this class, although many have supposed the natives transplanted them in their migrations, or that oceanic currents drifted them upon the shores. To the former hypothesis the objection presents itself, that the breadfruit grows on the island only by cuttings, which could not be preserved for so long a voyage as would be required to come from the nearest land,[1] and the kalo does not possess much persistent vitality; to the latter the existing currents would prove an obstacle, as these strike the Hawaiian Group from the northeast, bringing huge pine logs from Oregon, but no tropical fruits.

[1] See S. B. Dole, Voyages of the Ancient Hawaiians. Hawaiian Club Papers, 1868, p. 4.

	Genera.	Species.	Endemic.		Genera of endemic species only.	Families of endemic species only.	Introduced species.		New genera.	New species.
			Genera.	Species.			Aboriginal?	Recent.		
Amaranthaceæ	5	9	2	3						
Anacardiaceæ	1	1								
Apocynaceæ	4	5		4	3			1		1
Araliaceæ	6	7	3	7	2	*			1	2
Aroideæ	2	2								
Basellaceæ	1	1					1			
Begoniaceæ	1	1	1	1		*				
Bixaceæ	1	1		1	1	*				
Borraginaceæ	3	4						1		
Capparidaceæ	2	2		1						
Caryophyllaceæ	3	14	2	14	1	*			1	6
Celastraceæ	1	1		1	1	*				
Chenopodiaceæ	2	5		1						
Commelynaceæ	2	2						2		
Compositæ	24	59	6	46	5			10	1	4
Convolvulaceæ	6	13		5	3		1			
Cruciferæ	3	4		2	1			2		1
Cucurbitaceæ	3	6	1	4			2			1
Cyperaceæ	14	40	2	22	6			1		4
Dioscoreaceæ	2	2					2			
Droseraceæ	1	1								
Ebenaceæ	1	2		2	1	*				
Epacridæ	1	2								
Ericaceæ	1	2		2	1	*				
Euphorbiaceæ	7	14		8	2		2	3		2
Gentianaceæ	1	1		1	1	*				
Geraniaceæ	2	6		4	1			2		
Gesneriaceæ	1	14		13	1	*				4
Goodeniaceæ	1	6		5	1					
Guttiferæ	1	1					1			
Halorageæ	1	1		1	1	*				
Hydrophyllaceæ	1	1		1	1	*				
Ilicinæ	1	1	1	1		*				
Iridaceæ	1	1		1	1	*				1
Juncaceæ	2	2		1						
Labiatæ	4	29	2	28	1					4
Lauraceæ	2	2		1	1					1
Leguminosæ	19	29		11	5		8	4		
Liliaceæ	4	5		3	2					1
Lobeliaceæ	6	35	5	35	1	*			1	10
Loganiaceæ	1	5	1	5		*				3
Loranthaceæ	1	1								
Lythraceæ	2	2						1		
Malvaceæ	6	16		10				3		1
Menispermaceæ	2	3		1						
Myoporineæ	1	1	1	1		*				
Myrsinaceæ	1	3		3	1	*				
Myrtaceæ	3	6		2			1	1		
Naidaceæ	3	5								
Nyctaginaceæ	2	3								
Oleaceæ	1	1		1	1	*				
Onagraceæ	1	1					1			
Orchidaceæ	2	3	1	3	1					1
Palmeæ	2	4	1	3	1					1
Pandanaceæ	2	2		1	1					
Papayaceæ	1	1					1			
Phytolaccaceæ	1	1								
Piperaceæ	2	13		8			1			1
Pittosporaceæ	1	6		6	1	*				3
Plantaginaceæ	1	3		2				1		
Plumbaginaceæ	1	1								

	Genera.	Species.	Endemic. Genera.	Endemic. Species.	Genera of endemic species only.	Families of endemic species only.	Introduced species. Aborig-inal?	Introduced species. Recent.	New genera.	New species.
Polygonaceæ	2	3		1				1		
Portulaccaceæ	2	3		2	1					
Primulaceæ	1	2		1						
Ranunculaceæ	1	2		2	1	*				
Rhamnaceæ	3	7		5	1					
Rosaceæ	4	5	1	4	3					
Rubiaceæ	13	33	3	28	5		1	1		5
Rutaceæ	4	17	2	17	2	*			1	7
Santalaceæ	2	3		3	2					
Sapindaceæ	2	3					1			
Sapotaceæ	1	1		1	1	*				
Saxifragaceæ	1	1		1	1	*				
Scrophulariaceæ	2	2						1		
Smilacinæ	1	3		3						1
Solanaceæ	4	12	1	9	1		1	1		1
Sterculiaceæ	2	3		1			1	1		
Taccaceæ	1	1								
Ternstrœmiaceæ	1	1		1	1	*				
Thymeleaceæ	1	6		5						
Tiliaceæ	1	1		1	1	*				
Umbelliferæ	3	3		1	1			1		
Urticaceæ	11	14	2	8	4		2			
Verbenaceæ	4	4						3		
Violaceæ	2	6	1	6	1	*				1
Zinziberaceæ	2	2						1		
Zygophyllaceæ	1	1		1						
	253	554	39	376	76	26	27	42	5	67

Taking all the plants both native and introduced, we have as the proportion of species to each genus,	2.58
The endemic genera alone,	3.94
The genera represented only by endemic species,	1.28
Introduced genera,	1.07
Endemic genera of only one species,	16.
Genera of a single endemic species,	49.
Introduced genera of one species,	43.
Other genera of one species,	45.
Percentage of all the endemic species,	68.05
" species of endemic genera,	28.
" introduced species,	12.46
" species discovered by Mann and Brigham,	12.11
" species found elsewhere,	19.49

The new genera of flowering plants described or enumerated by Mr. Mann, are *Alsinidendron* H. Mann; *Platydesma* H. Mann; *Dipanax* B. Seemann; *Hesperomannia* A. Gray; *Brighamia* A. Gray. Of the whole collection made by us, some twelve sets have been distributed, numbering from three hundred and fifty to five hundred phænogamous plants, and many partial sets have also been published.

The Nominating Committee presented the names of candidates for the vacant Curatorships.

An election was then held, and Mr. J. A. Allen was chosen Curator of Reptiles, and Mr. C. F. Folsom Curator of Mammals and Comparative Anatomy.

The President announced that the next course of Lectures would be delivered by Mr. W. H. Niles, upon the Geological History of North America; they would be given on successive Wednesdays, commencing December 2d.

Section of Entomology. November 25, 1868.

Mr. P. S. Sprague in the chair. Fourteen members present.

On behalf of the author, Mr. F. G. Sanborn presented the following paper: —

Description of a New Species of Thecla. By Charles P. Whitney of Milford, N. H.

Thecla Souhegan. ♂ and ♀. Upper side brown, tinted with bluish-gray. Secondaries with two tails, between which is a small fulvous spot. Internal tail fringed on the inner side and tipped with white; external tail very short, black. External margin of wings black with white fringe. Basal half of costal edge of primaries fulvous before. Male with glossy oblong spot at extremity of disk.

Under side of the pearly gray of *Lycæna comyntas.* Primaries with a terminal row of seven black dashes, bordered on the outside with orange, and a curved sub-terminal row of seven black spots edged with white, the inner ones elongated, and a black transverse streak on discoidal nervure. Secondaries with a trigonate spot of orange resting on a black spot at anal angle, and partly surrounding a large blue spot, followed by a row of six orange crescents edged with black. Inside a sinuous line of eight black spots. A black dash in centre of wing. Body bluish-black, abdomen white, antennæ black, annulated with white, club tipped with fulvous.

Male expands $1\frac{1}{4}$ inch. Female expands $1\frac{3}{8}$ inch.

Taken in Milford, N. H., July 20th. Supposing it to be a species hitherto undescribed, I have given it the name of a river in the immediate vicinity of which I captured it.

Mr. B. P. Mann offered the following remarks on the preservation of larvæ in carbolic acid, specimens of which were exhibited: —

The numbered bottles, excepting No. 26, contain specimens collected on the 18th and 19th of June. These were placed in a mixture of one part of carbolic acid to one hundred and fifty parts of water, to which I think some alcohol and glycerine were added. The colors, with the exception of the green, have been perfectly preserved in all the specimens, and the green has been preserved in some of the specimens. I believe that green is the most difficult color to preserve in alcohol; one green specimen of mine has changed to a bright yellow in one day, being placed in a half-and-half mixture of alcohol and carbolic acid water containing $\frac{1}{150}$ carbolic acid. Alcohol also is apt to shrink specimens, but none of these have shrunk, although now kept five months. In bottle 15, collected June 18, 1868, are two specimens originally green, one of which has retained its color perfectly, but has been disintegrated beneath the skin so that bubbles of air are seen to move around in it. This has not seemed to become worse for three months, but led me to strengthen my solution. For all specimens collected since June, I have used a solution of $\frac{1}{57}$ carbolic acid and $\frac{56}{57}$ water. I added the carbolic acid in drops to cold water and shook it till it was all dissolved, then strained it through a cloth and used it. I subsequently followed directions which were given me, and used boiling water instead of cold water, which I think must improve the mixture, although I have made no experiments to show it. I consider bottle 26, collected in the last week of last August, as the most perfect success, the delicate shades of green and pink having been preserved unchanged. This, and the three unnumbered bottles, are preserved in the stronger $\frac{1}{57}$ solution of carbolic acid.

Dr. H. Hagen exhibited a remarkable specimen of *Morpho Ilioneus*, which he had found among the Brazilian insects belonging to the Museum of Comparative Zoölogy. In place of the ordinary head of the imago, it bore the head of the caterpillar. Three other instances of a similar nature were cited by Dr. Hagen; one by Müller, in *Dicranula vinula* of Europe; another by Wesmael, in *Nymphalis populi* of Europe; the third by Frederic Smith, in *Cybister limbatus* from Hong Kong; in all of these instances the insects were taken alive; the specimen exhibited by Dr. Hagen was quite fresh and unbroken.

Dr. E. P. Colby exhibited a specimen of *Bryaxis luniger* Lec. He had repeatedly taken this insect under stones on the seashore, which were covered by water to the depth of several feet at every high tide; they must have undergone repeated immersions from two to three hours in length.

December 2, 1868.

The President in the chair. Forty-six members present.

Mr. William T. Brigham presented a paper entitled:— Notes on Alsinidendron, Platydesma and Brighamia, new genera of Hawaiian Plants, by Horace Mann.

The first of these new genera belongs to the family of Caryophyllaceæ, and is a small shrub found on the Kaàla Mountains on the Island of Oáhu, at an elevation of about two thousand feet. Platydesma belongs to the Rutaceæ, and is a small tree, the leaves of which often attain the length of fifteen inches, found on the Konahuanùi Ridge of the same island. The third is a curious genus of Lobeliaceæ, discovered by Mr. Brigham on the island of Molokaì, and described by Dr. Asa Gray.

This paper will be published in full in the Memoirs of the Society (Vol. I, Pt. iv), and will be illustrated by three plates.

The following papers were read: —

Descriptions of North American Bees.—No. 1. By E. T. Cresson.

Family ANDRENIDÆ.

Genus Colletes Latr.

§. *Species from the United States and Canada.*

1. C. valida, n. sp. ♀. Black; head and thorax deeply and rather closely punctured; clypeus long, subconvex, with a broad shallow channel on its apical half, the space between their base and the eyes unusually long; labrum polished, with a more or less deep lateral impression; mandibles long, narrow, rufo-piceous at tip; head, thorax and legs clothed with long ochraceous pubescence, that on vertex and thorax above (which is tinged with fulvous) mixed with black, that on cheeks, pleura and metathorax pale; metathorax rugulose, the enclosed space at base shining, coarsely reticulated; wings hyaline, nervures black; abdomen shining, closely and finely punctured; basal segment clothed with a long, thin, pale ochraceous pubescence; apical margin of all the segments above, except the last, with a dense, even fascia of pale ochraceous pubescence; apical segment rugose, clothed with black pubescence; apical margin of ventral segments with a thin fringe of pale pubescence. Length six lines.

The ♂ differs by having the pubescence much more dense. Length five lines.

Hab. Massachusetts. Mr. Frank Stratton. (Coll. Am. Ent. Soc.)

This species is readily distinguished by the unusually long face, the space between the eyes and base of mandibles being twice the usual length.

2. C. propinqua, n. sp. ♀. Very similar to *C. valida*, but the pubescence is paler and rather shorter; the clypeus is much shorter, flat and coarsely sculptured; the labrum has two slight, central depressions; mandibles entirely black; the enclosed space at base of metathorax is less coarsely reticulated; the pubescence on the legs is paler and somewhat silvery; wing nervures brown; otherwise like *C. valida*. Length five and one-half lines.

The ♂ has the pubescence almost white, except on vertex and disk of thorax, where it is slightly dusky; tips of tarsi and wing nervures pale fulvous. Length five lines.

Hab. Mass., Pa., Va., Ill. (Coll. Am. Ent. Soc.)

This and *C. valida* are our largest and most robust species, and are easily separated by the form of the clypeus, which in this is short and depressed, and the space between the eyes and base of mandibles short.

3. **C. compacta,** n. sp. ♀. Closely resembles *C. propinqua*, but is smaller, and the pubescence shorter; the clypeus with a central longitudinal depression; the labrum with a central rounded elevation; the metathorax rugose, the basal space reticulated; the thorax above has the pubescence more blackish; abdomen less hairy, the fasciæ even and cinereous, that on apex of first segment broadly interrupted centrally, but becomes confluent with a band at base of second segment; the apical margin of the segments are depressed; the lateral margin of the last ventral segment is much elevated. Length four and three-fourths lines.

The ♂ is more slender, with the pubescence of head and thorax longer and more dense; antennæ longer; apical fascia of first segment entire; venter banded with cinereous, the last segment with lateral margin not elevated. Length four and one-half lines.

Hab. Connecticut, Illinois. (Coll. Am. Ent. Soc.)

4. **C. inæqualis** Say, Bost. Journ. Nat. Hist., I, p. 391. This is a robust species, with head and thorax coarsely sculptured, and with short cinereous pubescence, that on vertex and thorax above much mixed with black, that on metathorax and base of legs long and whitish; the prothorax has a prominent, acute, lateral spine; the abdomen is large, convex and shining, being delicately punctured, with the fasciæ even and white; the second segment has a fascia at base as well as at tip, and is confluent with a short band at apical sides of first segment; lateral apical margin of segments much depressed; venter obsoletely banded. Length four and three-fourths to five lines.

Hab. N. Y., N. J., Pa., Ill., Colorado. Eight ♀ specimens.

Resembles *C. compacta* in having a fascia of pubescence at base of second abdominal segment, and is readily distinguished by the prominent lateral prothoracic spine, which character (if this is really the true *C. inæqualis*) is not mentioned by Say.

5. **C. canadensis,** n. sp. ♂. Blackish, shining; head and thorax deeply and closely punctured, thickly covered by a rather long pale ochraceous pubescence, most dense on the face, cheeks and under surface of thorax, that on the mesothorax and scutellum slightly mixed with blackish; clypeus short, truncate in front; antennæ en-

tirely bl:ck; metathorax densely sculptured, the basal margin crenulated, or with a transverse row of short longitudinal striæ; tegulæ black, shining; wings hyaline, nervures piceous; legs black, thickly clothed with a pale ochraceous pubescence, longest and thickest on femora, apex of tarsi rufo-testaceous; abdomen elongate, subdepressed, closely and finely punctured, densely pubescent at base; apical margin of the segments, except the last, with a fascia of thin fusco-ochraceous pubescence, paler in certain lights; venter banded with dense pubescence of same color. Length six and one-half lines.

Hab. Canada West. Mr. Wm. Saunders. (Coll. Am. Ent. Soc.)

By the elongate, subdepressed form, this species has much the general appearance of an *Andrena*.

6. **C. distincta,** n. sp. ♂. Black, shining, head finely and closely punctured, clothed with pale ochraceous pubescence, very dense on face and cheeks, mixed with black on vertex, thorax with sparse, deep punctures, clothed with dense ochraceous pubescence, that on mesothorax pale yellowish-brown; postscutellum densely punctured; metathorax rugose, the basal space with a transverse row of short, distant, well-defined, longitudinal carinæ, the pubescence long; wings hyaline, apical half dusky, nervures black; legs slender, clothed with long ochraceous pubescence, tarsi fulvous; abdomen short, convex, shining, with fine, tolerably close punctures; basal segment thinly clothed with ochraceous pubescence, the apical margin of the segments above and beneath with a narrow fascia of pale ochraceous or cinereous pubescence. Length four lines.

Hab. Georgia. Mr. James Ridings. (Coll. Am. Ent. Soc.)

A very distinct species.

7. **C. americana,** n. sp. ♀. Small, robust, black, shining; head and thorax with distinct, rather close punctures, and clothed with short, dense lemon-yellow, sometimes ochraceous, pubescence, palest on metathorax; clypeus short, broad, depressed, rugosely punctured, apex truncate; tips of mandibles rufo-piceous; antennæ short, black; the pubescence on the under surface of thorax sometimes nearly white; pleura very densely and deeply punctured; postscutellum rugulose; basal margin of metathorax with a transverse row of short, distant, longitudinal carinæ; tegulæ dull testaceous; wings short, hyaline, nervures rufo-piceous; legs short, robust, black or piceous, clothed with pale ochraceous pubescence, very dense and long on outside of posterior femora; tibial spurs pale honey-yellow, tips of tarsi rufo-testaceous; abdomen ovate; convex, shining, finely and densely punctured, with a very short, fine, pale pubescence; first

segment smooth and polished, sometimes with a faint opaline iridescence, and with long lemon-yellow pubescence at base; apical margin of all the segments with a broad fascia of very dense, short, pale ochraceous or whitish pubescence. Length four lines.

The ♂ is narrower, with the pubescence longer and more dense, and white on cheeks, thorax beneath and legs; antennæ longer; the abdomen has the opaline iridescence at base more obvious; the venter is sometimes dull testaceous. Length four lines.

Hab. Mass., Del., Va., Ill. (Coll. Am. Ent. Soc.)

Readily distinguished by the short, robust form, short wings, lemon-yellow pubescence of head and thorax, and by the broad abdominal fasciæ. The space between the eyes and base of mandibles is unusually short.

8. **C. simulans,** n. sp. ♂. Black, shining; head densely and finely, thorax deeply, punctured, both clothed with long, dense, fulvo-ochraceous pubescence, palest on face, cheeks, thorax beneath and metathorax; clypeus rugose, metathorax sculptured as in *C. americana*; wings hyaline, faintly dusky at apex, nervures black; legs black, with ochraceous or whitish pubescence; abdomen closely and uniformly punctured; basal segment with long, pale ochraceous pubescence, the apical margin of the segments with a broad, even fascia of short, dense, whitish pubescence, those on venter narrower. Length four and one-half lines.

Hab. Colorado. Mr. Jas. Ridings. (Coll. Am. Ent. Soc.)

Closely allied to *C. americana* ♂, but is larger, with longer wings, the abdomen more densely punctured, and the fasciæ broader and more dense.

9. **C. consors,** n sp. ♂. Differs from *C. simulans* by the more finely punctured thorax, narrower second submarginal cell, more robust legs, shorter and stouter hind tibiæ, and more delicately punctured abdomen; this is more hairy, having long, thin, ochraceous pubescence, more obvious on the two basal segments, and becoming shorter and more or less mixed with black toward apex; the pubescence of the fasciæ is less dense, not so appressed, and pale ochraceous. Length four and one-half lines.

Hab. Colorado. Mr. Ridings. (Coll. Am. Ent. Soc.)

10. **C. albescens,** n. sp. ♀. Short, robust, black; head and thorax closely punctured, and with base of abdomen clothed with rather short, dense, hoary pubescence; base of metathorax coarsely reticulated; tegulæ piceous; wings short, hyaline, nervures rufo-testaceous; legs black, with hoary pubescence; abdomen very closely and

minutely punctured, with very short hoary pile; first segment polished; apical margin of all the segments with a broad, even fascia of very short dense white pubescence. Length four lines.

Hab. Illinois. Dr. Samuel Lewis. (Coll. Am. Ent. Soc.)

Readily distinguished by the small size and short, dense, hoary pubescence.

§ §. *Species from Mexico and Cuba.*

11. C. azteca, n. sp. ♀. Black; head densely clothed with pale ochraceous pubescence, that on vertex orange-yellow; clypeus coarsely punctured; flagellum dull testaceous beneath; mesothorax and scutellum clothed with a short, dense, fulvo-ferruginous pubescence, that on the thorax beneath and on metathorax thin and pale ochraceous; tegulæ testaceous, wings hyaline, nervures brown; legs slender, black, with long, pale ochraceous pubescence; abdomen short, ovate, convex, shining, with close, fine, distinct punctures; base of first segment with a thin, pale ochraceous pubescence, and apical margin of the segments, except the last, with a broad, entire fascia of dense whitish pubescence. Length four lines.

Hab. Orizaba, Mexico. Prof. F. Sumichrast. (Coll. Am. Ent. Soc.)

This is easily recognized by the color of the pubescence of the upper surface of the thorax, which is of a rich fulvo-ferruginous.

12. C. æthiops, n. sp. ♀. Robust, deep black, shining; head and thorax closely and deeply punctured, clothed with short, dense, black pubescence, slightly mixed with pale on face and cheeks; clypeus with large, deep punctures, apex subemarginate; metathorax rugulose, more coarsely so at base; wings hyaline, faintly dusky, especially at apex, nervures black; legs robust, with black, tarsi with pale, pubescence; abdomen broad at base, rapidly narrowed to apex, convex, delicately punctured, almost polished and nearly nude, having a thin, palish pubescence on apical margin of the segments, especially obvious on the sides. Length five lines.

Hab. Orizaba, Mexico. Prof. F. Sumichrast. (Coll Am. Ent. Soc.)

13. C. punctipennis, n. sp. ♀. Robust, black; head closely punctured, clothed with dense whitish pubescence, longest on cheeks, and mixed with black on vertex; clypeus nude, depressed, coarsely and confluently punctured; labrum polished, bifoveolate at base, fringed beneath with golden pubescence; mandibles piceous; thorax densely punctured, clothed with short, dense, white or hoary pubescence, that on mesothorax shortest and mixed with sparse black hairs, giving the surface a maculate appearance; scutellum with short black pubescence, margined entirely with whitish; metathorax and pleura with mixed black and hoary pubescence, long on the former; base of metathorax coarsely reticulated or crenulated; tegulæ black, polished; wings hyaline, nervures black, a small blackish spot beneath stigma, and a larger one at tip of marginal cell, the nervures at apex of both wings margined with fuliginous; legs robust, black, with short, dense, hoary and black sericeous pubescence; abdomen short, broad, robust, convex, shining, closely punctured, with short black pubescence, longer and more obvious on apical segments; base of first segment with rather long, thin, hoary pubescence; apical margin of all the segments, except last, with a narrow fascia of white pubescence, sometimes more or less interrupted above; apical ventral segment sometimes fulvous. Length five lines.

Hab. Orizaba, Mexico. Prof. F. Sumichrast. (Coll. Am. Ent. Soc.)

Readily distinguished by the maculate wings.

14. C. submarginata Cresson, Proc. Ent. Soc., IV, p. 167, ♀. This is short, robust, black; head clothed with whitish pubescence, long on the cheeks, and mixed with black on vertex; flagellum dull testaceous beneath; thorax rather densely clothed with short hoary pubescence, that on upper surface much intermixed with black, that on scutellum mostly black, that on sides of metathorax long, and on pleura rather sparse and short; tegulæ pale piceous; wings hyaline, faintly dusky at apex; legs piceous black, the four anterior femora clothed with long whitish pubescence, that on tarsi and posterior legs short and brownish; posterior femora and tibiæ unusually robust; tarsal tips rufo-testaceous; abdomen ovate, convex, polished, black, with a slight opaline iridescence, delicately punctured, base of first segment with a thin hoary pubescence; apical margin of the segments narrowly fringed with white pubescence, widely interrupted centrally on three basal segments. Length five and one-half lines.

♂ more slender than ♀, the pubescence longer, antennæ longer and entirely black, thorax less densely punctured, legs slender, the pubescence long and whitish, and the abdominal fasciæ very slightly interrupted. Length five lines.

Hab. Cuba. Prof. Poey ♀; Dr. Gundlach ♂. (Coll. Am. Ent. Soc.)

15. C. mexicana, n. sp. ♀. Very closely resembles *C. submarginata* in shape and color, and may be at once distinguished by the patch of long, dense, ochraceous pubescence on the breast, between the four anterior legs; the posterior femora have a fringe of long pale pubescence beneath, and their tibiæ have a short, dense, black pubescence; the abdomen is more highly polished, and the fasciæ are entire. Length four and three-fourths lines.

The ♂ is smaller and narrower than ♀, and with the pubescence longer and more dense than in *C. submarginata* ♂; the thorax is deeply punctured, and the abdominal fasciæ are broader, especially on apical segments. Length four lines.

Hab. Orizaba, Mexico. Prof. F. Sumichrast. (Coll. Am. Ent. Soc.)

§ § § *Species not recognized.*

C. mandibularis Smith, Brit. Mus. Cat. Hym., I, p. 5. Georgia.
C. thoracica Smith, Brit. Mus. Cat. Hym., I, p. 5. Florida.

Catalogue of the Reptiles and Batrachians found in the Vicinity of Springfield, Mass., with Notices of all the other species known to inhabit the State. By J. A. Allen.

The present catalogue probably gives a very nearly complete enumeration of the Reptiles and Batrachians existing at Springfield, Massachusetts, which, with few exceptions, embraces all hitherto discovered in the State. The others are also noticed, for the purpose of presenting a complete catalogue for the whole State, which seemed in this connection quite desirable; they are not, however, counted in the enumeration of those of Springfield. Since it is the especial design of the paper to present in a convenient form additional information on the distribution of these animals, notes have been added respecting their relative abundance, and occasionally such facts concerning their habits, and other points in their history, as seemed not generally known.

The Springfield list is based almost solely on observations made by the writer, mainly within five or six miles of the city, and continued during a considerable period. The very complete local collection of these animals in the Museum of the Springfield City Library Association, has, however, been freely consulted, and with much profit. I am also indebted to Mr. C. W. Bennett of Holyoke, for valuable notes on several species occurring in the vicinity of Mount Tom, a few miles north of Springfield, as also to Mr. S. Stebbins and Mr. C. A. Emery, through whose efforts the collections in this department in the Springfield Museum have been mainly accumulated. In the following pages due credit is given for these contributions. In the preparation of the notices of the extra-limital species, I have made free use of all I could find published on the subject, and have also received valuable aid from Mr. F. W. Putnam of Salem, all of which will be found duly accredited.

In Massachusetts, as perhaps generally elsewhere in our country, all the species of these classes, but especially of the Reptiles proper, appear to be gradually, but very perceptibly, decreasing in numbers, as they doubtless have been ever since the country began to be settled by Europeans. This seems to result principally from two causes. First, in respect to the snakes, the almost universal antipathy to these animals, which leads most people to destroy every one that comes within their reach; though, with two exceptions, and those species of very restricted distribution, all our Massachusetts species are among the most harmless of animals; second, the changes effected in their habitats through the necessary operations resulting from agricultural and sanitary improvements, as the draining of marshes and the burning over of newly cleared lands, and the destruction of the forests. The draining of ponds and marshes is the principal cause operating to reduce the numbers of the Batrachians generally, but more especially of the frogs and salamanders, and also the aquatic turtles; the removal of the forests also effects the diminution of the salamanders, while the burning every year of considerable tracts of newly cleared land destroys a great number of snakes and land turtles. The general instinctive dislike to snakes is tending rapidly to their extinction; species that were comparatively common at Springfield ten to fifteen years since, are now quite scarce, and must soon become great rarities, if not indeed quite extinct. The effect of fires in reducing the number of the terrestrial reptiles, as the annual burning over of the prairies at the West, continued for so many centuries, seems generally under-estimated, though it seems to be a sufficiently adequate explanation of the scarcity of snakes and land turtles in these districts.

The first attempt at an enumeration of the reptiles of Massachusetts seems to have been the Catalogue of Dr. D. S. C. H. Smith of Sutton, contained in Dr. Hitchcock's Geological Report of 1835, which, as Dr. Storer has justly remarked, was evidently drawn up with care, and embraced most of the species found in the State, and also a few names of nominal and extra-limital species. Dr. D. H. Storer soon followed with his, in many respects, admirable Report to the legislature on these animals, which was published in 1839, since which time no special treatise respecting them has been published. In the meantime, however, laborers in this field have extended our information, till now probably few, if any species, yet remain to be discovered, and our knowledge of their habits has been much increased; though as yet we know but poorly the history of the most common species, and of some scarcely anything. In these respects there still remains an ample and inviting field for investigation. Dr. Storer's Report, as he states, was prepared under many difficulties, the Report on the Fishes, in preparation at the same time, receiving the greater part of his leisure, as "being the more extended and far more important branch." He states, referring to Dr. Smith's list, that having erased the several species he had previously specified, "and introduced three Tortoises, two Colubers, one Heterodon, one Rana, one Hylodes, four Salamanders and one Scincus, which were not noticed in the catalogue above referred to, the Herpetology of our State, as far as I have been able to learn, is composed of fourteen genera and thirty-nine species;" and adds that "more extended investigation will undoubtedly ascertain the existence here of new species, as well as of many already described by naturalists." When we consider the large number of nominal species usually embraced, or described as new, in the writings of even our (reputedly) highest authorities, it seems a sufficient encomium upon Dr. Storer's work to state that all the species described by him in this report are valid. One only, and that really undescribed, was given by him as new.

A comparison of the present list with Dr. Storer's (see the "Tabular List" and "Summary" at the end of this paper) shows that in the thirty intervening years the number of species of Reptiles and Batrachians known to inhabit the State, has been increased from thirty-nine to forty-five, an addition of six species only, four of which were undescribed at the time of the report. Others known then as inhabitants of our State from but one or two specimens, have since been ascertained to be more or less common, while one (*Hylodes Pickeringii*) has proved to be one of the most abundant. It is probable that two or three of the species given here may yet prove to be merely nominal, as one or two of the salamanders, and possibly the *Bufo Fowleri*; one other of the added species (*Scotophis vulpinus*) seems likely to be of only casual occurrence, judging from its present known distribution, its existence here resting, as far as I can learn, on the single instance of its capture at Wenham by Mr. James Bartlett. The specimen was identified by Mr. F. W. Putnam, and by him communicated to the Museum of Comparative Zoölogy. The chief additions, then, to the species given in Dr. Storer's Report, are the *Scotophis alleghaniensis*, *Ancistrodon contortrix* and *Scaphiopus Holbrookii*. The only other species likely to exist is the Terrapin (*Malacoclemmys palustris*), which from its occurrence in Connecticut and Rhode Island we expect will ultimately be found in Massachusetts.

In reference to the geographical distribution of the Reptiles and Batrachians of Massachusetts, the data are as yet too few to determine positively whether two faunæ can be clearly distinguished,—the Canadian in the western, embracing the mountainous districts, and the Alleghanian in the eastern, embracing the lowlands,—as in the case of the mammals and birds; though from what is known of the general distribution of these animals this seems probable, and that the line of separation between the districts nearly coincides with that for the mammals and birds. Considered in connection with those inhabitating the adjoining regions, it is evident that in the case of some of the aquatic species, other physical conditions than temperature exert a powerful influence in determining the limits of their distribution. Thus in the State of New York there seem to be three faunæ as distinctly as there are two in Massachusetts—the Canadian at the north and in the mountains, the Alleghanian in the lowlands, and, in addition, for these classes at least, what may be termed a Huronian, lying west of the great Appalachian watershed, and characterized by the occurrence of several species of Chelonians and Urodela not found to the eastward; corresponding also to the "Great Lake Fauna" for fishes, and to which Lake Champlain probably belongs, as Mr. Putnam has noticed.[1]

Massachusetts is quite too far north to furnish many species of Saurians, the existence here of the single one thus far discovered resting, so far as I can learn, on the capture of the solitary example recorded by Dr. Storer. It is a species, however, whose habitat nearly reaches to Massachusetts, since it occurs not unfrequently, as well as another species, in the southern counties of New York, and in the extreme southern parts of Connecticut. Massachusetts is also near the northern limit of distribution of the Testudinata, some species apparently not reaching the highlands of the State, while a few only pass northward of the lowlands of southern Maine, or into the Canadian Fauna. None occur to the northward that do not also occur here, while the

[1] Proc. Bost. Soc. Nat. Hist., Vol. IX, pp. 178 and 233.

distribution of the greater part extends far to the southward and westward, where also the number of species gradually increases, and beyond which they do not appear to exist. One only is marine, and that is but an accidental visitor from the South. In respect to the Ophidians, nearly the same remarks apply as to the Testudinata, the lowlands of Massachusetts and southern Maine forming the northern limit of distribution of several (*Carphophiops amœnus*, *Heterodon platyrhinus*, *Scotophis alleghaniensis*, *? Bascanion constrictor* and perhaps of some others), while none seem to reach beyond the next fauna north.

Of the Batrachians, both the toads and frogs extend far to the northward, the common toad having been observed at Labrador, whence also one or more species of frogs and salamanders have been reported.[1] As yet we are not certain that Massachusetts or any part of southern New England (or of the Alleghanian Fauna), limits the northward distribution of any species of this group, nor that any species exist north of this region that do not occur here. They are generally species of wide distribution, several apparently extending throughout the temperate regions of Eastern North America. In respect to the Salamanders, however, it seems still uncertain what are to be regarded as true species, on account of the very great amount of variation presented by individuals of undoubtedly the same species at the same localities, and by certain slight variations characteristic of different regions of country,—variations which, from the gradual transition between different forms through individuals inhabiting the intervening districts, can hardly be admitted as specific. It is very evident, however, that the number of those currently adopted is quite too large. In treating of those of Massachusetts, not having at present the material nor the time for a proper examination of the subject, we have followed the leading authorities.

REPTILIA.

TESTUDINATA.

1. Glyptemys insculpta Ag. (*Emys insculpta* LeConte, Storer's Report, p. 209.) Sculptured Turtle. Common. In summer is generally found in dry fields remote from streams or ponds. To these it repairs towards autumn, as early sometimes as the last week in August, and passes the winter buried in the mud. Its food seems to be, to some extent, vegetable, Prof. Verrill having "found it feeding

[1] See notes on the Vertebrates of Labrador, by Dr. A. S. Packard, Jr., Proc. Bost. Soc. Nat. Hist., Vol. X, p. 279.

on the leaves and scapes of dandelion *(Taraxacum dens-leonis)*,"[1] while I have seen it eating the fruit of the common low field blackberry *(Rubus canadensis* L.).

2. **Cistudo virginea** Ag. *(C. carolina* Edwards, Storer's Rep., p. 214.) Box Turtle. Common. About as numerous as *Glyptemys insculpta*, and, like it, is found in summer more in dry places than near water.

Mr. W. H. Niles communicates to me the interesting fact that this species is the only turtle he has ever known to occur at Worthington, and that this, even, is extremely rare. The elevation of Worthington is about one thousand eight hundred feet above the sea, and nearly as much above the Connecticut at Springfield.

That turtles live to a great age is a well-known fact, but opportunities of determining their age even approximately are very rare. Occasionally persons engrave their initials and the year of marking upon the sternum of a specimen, and these being found after the lapse of a long interval, give us a few reliable data. A specimen of this species was found near Springfield some years since that had been inscribed in this way sixty years before. It was found within one fourth of a mile of the place where it was marked, and by the son of the gentleman who made the inscription. The writer has known of several cases of specimens being found that had been marked ten years; and in each instance in or near the field where they were left when marked. Hence it seems fair to infer that they do not commonly roam to very great distances.

3. **Nanemys guttata** Ag. (*Emys guttata* Schneider, Storer's Rep., p. 207.) Spotted Turtle. "Mud Turtle." Abundant. Found in and near ponds, muddy ditches and sluggish streams. Fully as numerous as the next *(Chrysemys picta)*, but the two are rarely found together; each species appropriating, apparently, certain districts to itself to the exclusion of the other. It is seldom seen away from water except when about to lay its eggs, which I have observed it doing during the second and third weeks of June.

4. **Chrysemys picta** Gray. (*Emys picta* Schneider, Storer's Rep., p. 208.) Painted Turtle. "Mud Turtle." Abundant. Found in the same situations as the last. The shrill piping note of this species is frequently heard in May and June, especially during intervals between showers in hot, sultry days.

5. **Ozotheca odorata** Ag. (*Sternothœrus odoratus* Storer's Rep.,

[1] Proc. Bost. Soc. Nat. Hist., Vol. IX, May, 1863, p. 196.

p. 210.) Mud Turtle. "Stink-pot." Found at certain localities (Ashley's pond, Holyoke—C. W. Bennett), but does not seem to be so generally distributed as the others.

6. Chelydra serpentina Schw. (*Emysaurus serpentina* Linn., Storer's Rep., p. 212.) Snapping Turtle. Common; living in ponds and muddy streams.

Two species besides those above enumerated have been known to occur in other parts of the State. One is the *Emys meleagris* Ag. (*Cistudo Blandingii* Holbrook, Storer's Rep., p. 215); and the other is the great Marine Leather Tortoise (*Sphargis coriacea* Merrem). Respecting the latter, Dr. Storer states (Rep., p. 217) that the only specimen of it he had heard of as having been seen on the coast of the United States, "was taken asleep on the surface of the water in Massachusetts Bay, in the year 1824, and was purchased by Mr. Greenwood of the New England Museum, of the captors, for two hundred dollars, and placed in this Institution, where it still remains." This specimen is described by Dr. Storer in his Report on the Reptiles of the State. Prof. Agassiz, in his "Contributions to the Natural History of the United States," (Vol. I, p. 273), describes another caught near Cape Cod in 1848, and now in the Museum of Comparative Zoölogy; thus far these are the only ones known to have been captured on our coast.

Though a tropical species, breeding on the Tortugas and Bahama Islands and Keys, it is nevertheless a wide wanderer. Dr. De Kay says it was first noticed on the coast of the United States in 1811, when a specimen then captured was described and figured by Dr. Mitchell.[1] Another specimen was taken off Sandy Hook in 1816, and preserved in the American Museum of New York. The third was the specimen captured in Massachusetts Bay. A fourth was taken, according to De Kay, in Long Island Sound, Sept. 7, 1826; and another in 1840, in Chesapeake Bay. Still another, already mentioned, was caught near Cape Cod in 1848; and according to Dr. F. H. Brown,[2] one was taken off Saco, Maine, in September, 1862.

Respecting *Emys meleagris*, Dr. Storer (under *Cistudo Blandingii*) states he had received a fine living specimen from Haverhill, through the kindness of Mr. Edward Appleton. Prof. Agassiz mentions having received it from Lancaster, from Dr. W. I. Burnett and Prof. S.

[1] Med. Repos., New Ser., 1812, p. 191, and 1813, figures.

[2] See Proc. Bost. Soc. Nat. Hist., Vol. IX, p. 236.

Tenny, and from Concord, from Mr. H. D. Thoreau. In the Proceedings of the Essex Institute (Vol. III, pp. 89 and 204) two specimens are mentioned as having been presented to the Museum from North Reading, one by Mr. Addison Flint, and the other by Mr. George F. Flint. It is extremely rare in New England, and though first made known from the prairies of Illinois and Wisconsin, seems not to be very common anywhere.

Another species, *Malacoclemmys palustris* Ag. (*Emys terrapin* Holbrook), though southern in its distribution, is well known as an inhabitant of Long Island and the shores of Rhode Island,[1] and it is quite probable that it will yet be found on the southeastern shore of Massachusetts and the neighboring islands.

Another species, the *Chelonia midas*, seems not very unlikely to occur on the southern coast as an accidental visitor from the south, since there are on record a number of instances of its capture off Sandy Hook, N. Y., and Mr. Linsley, in his "Catalogue of the Reptiles of Connecticut," (Am. Journ. of Sc. and Arts, Vol. XLVI, 1844, p. 38), mentions its capture at Stratford, Stonington, and New London.

The names *Testudo scabra* and *T. pennsylvanica*, occurring in Dr. Smith's list, in Dr. Hitchcock's Geological Report for 1835, undoubtedly refer, as Dr. Storer has observed, respectively to *Glyptemys insculpta* and *Ozotheca odorata.*

SAURIA.

A specimen of the blue-tailed lizard, *Pleistodon laticeps* Dum. and Bibr., (*Scincus fasciatus* Linn., Storer's Rep., p. 219) is stated by Dr. Storer to have been sent him from Barre, and to have been found "in a mud hole" in that place by Dr. Joseph N. Bates. Mr. Linsley, (l. c., p. 41) gives it as occurring occasionally near New Haven. Dr. De Kay says it is not uncommon in the southern counties of the State of New York; but Massachusetts is quite beyond its usual northward range, and it can be expected to occur here but rarely.

The Brown Swift or Pine Lizard (*Tropidolepis undulatus* Holbrook), a southern and western species, is given by Linsley from Connecticut, and Dr. De Kay notes its occurrence in Duchess and Putnam counties in New York. Though possibly occurring in this State, we can find no recorded instance of its capture here.

[1] Holbrook, N. Am. Herp., I, 89; De Kay, Nat. Hist. N. Y., p. 11.

OPHIDIA.

7. **Crotalus Durissus** Linn. (Storer's Rep., p. 233.) Banded Rattlesnake. Not unfrequent on Mount Tom, and occasionally killed on rocky hills in several of the towns near or adjoining Springfield. It also occurs at a few similar localities in the eastern part of the State.

8. **Ancistrodon contortrix** Baird and Girard. (*Trigonocephalus contortrix* Holbr.) "Copperhead." "Viper." "Deaf Adder." There is a well-known den of this species on Mount Tom, near which a considerable number of specimens are annually killed by different individuals. I have not heard of it elsewhere in the State, though Linsley has reported it from Connecticut. From Mr. C. W. Bennett, than whom no one is more familiar with Mount Tom and the contiguous country, or the peculiarities of its natural history, I learn the following interesting facts respecting it. Of five specimens killed July 4th (several years since), all were females, but no embryos were observed in them. They were all found in a heap. At another time, later in July, seven were killed, which, like the others, were all found lying within the space of a square yard and were all females. Five of them were examined by Mr. Bennett, and found to contain slightly developed embryos. August 23d, Mr. Bennett secured two females, which I saw at his house. One of them was badly crushed in killing; this, on being dissected, was found to contain five young, about six inches in length, but still quite immature; the other was sent in alcohol to Prof. Agassiz. In September, probably early in the month (the exact date was not noted), six specimens, all females, and all found in a heap, were killed, each of which had either seven or nine young (he has forgotten which number), about six inches in length, in the ovary. From the above facts it appears that the species is viviparous; that the young are few in number, and are brought forth late in the season; and that the pregnant females collect together. The number of embryos found by Mr. Bennett varied from five to seven, though he is not sure but the greatest number may have been nine.

Though not given in Dr. Smith's Catalogue, nor in Dr. Storer's valuable Report, Dr. Holbrook (North Am. Herp., III, p. 40) mentions having received it from Western New England, while Dr. De Kay, writing a little later, more expressly states: "Dr. Holbrook, however, has seen it in the neighborhood of Northampton, Massachusetts, and has received specimens from Vermont." The Northampton locality referred to is undoubtedly the present one on Mount Tom.

9. **Tropidonotus Sirtalis** Holbrook. (*Coluber Sirtalis* Linn., Storer's Rep., p. 221; *Eutænia Sirtalis* Bd. and Gir.) Striped Snake. Very common; our most abundant snake.

10. **Tropidonotus Saurita** Putnam. (*Coluber Saurita* Linn., Storer's Rep., p. 229; *Eutænia Saurita* Bd. and Gir.) Ribbon Snake. "Striped Snake." Nearly as common as the last, but more confined to damp or wet localities.

11. **Nerodia Sipedon** Baird and Girard. (*Coluber Sipedon* Linn., Storer's Rep., p. 228; *Tropidonotus niger* Holbrook.) Water Snake. "Water Adder." Rather common near ponds, occasionally occurring in great abundance. Seldom seen away from the borders of ponds or streams, and only in wet places.

This species seems to combine with its carnivorous appetite a considerable degree of rapidity of motion when in the water. At Fresh Pond, in Cambridge, I once saw one hauled from the edge of the water and killed, that had a live pickerel in its mouth a foot in length. The New England representatives of this species being generally darker than those of the Middle States, Dr. Holbrook considered them as belonging to a distinct species, which he called *Tropidonotus niger*.

12. **Lampropeltis triangula** Cope. (*Coluber eximius* De Kay, Storer's Rep., p. 227; *Ophibolus eximius* Bd. and Gir.) Milk Snake. "Chequered Adder." Not uncommon, but much less numerous than formerly.

13. **Bascanion constrictor** Bd. and Gir. (*Coluber constrictor* Linn., Storer's Rep., p. 225.) Black Snake. Not now generally common; formerly abundant. Like the field mice, it seems much more numerous some years than others; possibly the result of the same cause in both instances,—the relative degree to which the ground is protected by snow in winter. This species appears to be eminently gregarious, especially early in spring, when several (formerly scores) are often seen together sunning themselves. They probably collect in autumn, many hibernating together, sometimes alone, but not unfrequently associated with other species. A farmer in this vicinity turned up with his plough, quite early in May, 1868, a ball of them numbering between seventy and eighty, and averaging between four and five feet in length. Another farmer, not long since, ploughed up at the same season a bunch of snakes, chiefly of the common striped

species (*Tropidonotus Sirtalis*), but including some black snakes, numbering between forty and fifty. January 29th, 1864, after two weeks of very unseasonably warm weather, a living specimen of this species was found on the surface of the ground, which was then bare, and brought to me the same day alive. It was of course sluggish, and had evidently been thus prematurely enticed abroad by the excessive warmth of the weather.

I learn from Mr. W. H. Niles, that this species is apparently increasing in numbers at Worthington, it being now not at all uncommon, though formerly regarded as a rarity.

14. **Elaphis alleghaniensis** Holbr. (*Scotophis alleghaniensis* Bd. and Gir; *Coluber alleghaniensis* Holbr.) Pilot Black Snake. This southern species is apparently not rare along the Connecticut in this State, from Longmeadow to Mount Tom. Mr. C. W. Bennett, who first seems to have detected a black snake here with carinated scales (the common species having smooth, glossy scales), gives it as about one-half as numerous as the common black snake (*Buscanion constrictor*) at Mount Tom, where he and others within a few years have killed a considerable number. Mr. C. A. Emery has also found it in the vicinity of Springfield. Several specimens collected by the above-named gentlemen are in the Springfield Museum of Natural History. Mr. Bennett remembers to have seen it here as long ago as some twelve years since. He thinks it chiefly affects damp places in the summer, but crawls up on the hills in autumn. The specimens thus far captured have all been of very large size, ranging in length from about seven feet to seven feet and nine inches. Respecting its geographical distribution, Dr. Holbrook states that he had received it from the Highlands of the Hudson, from the summit of the Blue Ridge in Virginia, and many specimens from the mountains of the Carolinas, and Baird and Girard mention a single specimen from Carlisle, Pa. We believe this is the first time the species has been chronicled from New England.

We have learned from Prof. A. E. Verrill that it is also of more or less frequent occurrence at New Haven, Ct. Mr. Linsley (l. c., p. 42) has also reported it from the same vicinity.

A specimen of "*Scotophis vulpinus*" has been entered on the Catalogue of the Museum of Comparative Zoölogy (No. 796), as having been received from "Wenham, Mass," from Mr. James Bartlett, in 1861. If it is this species, it is its first, and so far as I can learn, only occurrence in New England. Mr. F. W. Putnam informs me that he remembers the specimen well, and that it was carefully identified; on his authority I give it as a Massachusetts animal.

15. Heterodon platyrhinos Latreille. (Storer's Rep., p. 231.) Hog-nosed Snake. "Blowing Adder." "Flat-head." Common. Especially numerous on our dry sandy plains, where it is the most abundant species.

Dr. Storer states in his Report that he had never seen a specimen of this animal, but says he is assured by Dr. Holbrook that he (the latter) possessed a specimen captured at Medfield. It also occurs quite plentifully, as I have recently learned, in the sandy regions of Barnstable County.[1] I was surprised to find, a few years since, that its existence in Massachusetts was generally doubted by the naturalists in the eastern part of the State.

16. Liopeltis vernalis Cope. (*Chlorosoma vernalis* Bd. and Gir.; *Coluber vernalis* De Kay, Storer's Rep., p. 224.) Green Snake. "Grass Snake." Not very uncommon, though much less numerous than formerly.

17. Storeria occipito-maculata Bd. and Gir. (*Coluber occipito-maculatus* Storer's Rep., p. 230.) Spotted-necked Snake. Not uncommon. First described by Dr. Storer in his Report on the Reptiles of Massachusetts.

18. Storeria DeKayi Bd. and Gir. (*Coluber DeKayi* Holbr.; *C. ordinatus* Linn., Storer's Rep., p. 223.) De Kay's Snake. Like the last, not uncommon. The first specimens of this species seen by Dr. Holbrook, its first describer, were furnished him from this State by Dr. Pickering. It was not made known to science as a distinct species till after the publication of Dr. Storer's Report, Dr. Storer and other earlier writers confounding it with a strictly southern species, the *C. ordinatus* of Linnæus.

19. Diadophis punctatus Bd. and Gir. (*Coluber punctatus* Linn., Storer's Rep., p. 225.) Ring-necked Snake. Not very uncommon; about as numerous, apparently, as the two preceding species.

20. Carphophiops amœnus Cope. (*Coluber amœnus* Say, Storer's Rep., p. 226.) Worm Snake. "Little Red Snake." "Ground Snake." Rather rare; apparently much less numerous than ten years

[1] In the list of donations to the Museum of the Boston Society of Natural History, mentioned as received Oct. 17, 1866 (see Proc., Vol. XI, p. 240), is a "Hog-nosed Snake" from Cape Cod, presented by Mr. F. G. Sanborn, which, excepting the case cited by Dr. Storer, is the only record I have seen of its occurrence in Eastern Massachusetts.

since. Decidedly subterrestrial in its habits, and apparently nocturnal. More frequently turned up by the plough or hoe, than seen crawling on the surface. It seeks to escape by trying to bury itself in the earth, and not by flight, as do the other species. Dr. Storer states he had but a single poorly preserved specimen, received from Professor Adams, who found it at Amherst. I have generally considered it far from rare, however, at Springfield, having captured several in a season. Of late it seems less common, as I have found but two or three specimens in several years. It seems to be even much rarer in the eastern part of the State, where, by the naturalists of this section, its existence in Massachusetts was not long since seriously questioned. Prof. A. E, Verrill, in his list of the Reptiles and Batrachians of Oxford County, Maine (Proc. Bost. Soc. Nat. Hist., Vol. IX, p. 196), states that he had found that the *Storeria occipito-maculata* had been mistaken for this species in Maine, and adds that it seemed to him "quite probable that the single imperfect specimen mentioned in Dr. Storer's Report on the Reptiles of Massachusetts, was also a *Storeria*, since," he says, "no other specimens have been found in this State, to my knowledge." In a small collection of Reptiles made by the writer at Springfield, in 1864, and sent to the Essex Institute, was one of this species, which is thus referred to in the minutes of the meeting of the Institute, held December 12, 1864. "Mr. Putnam mentioned that in a collection of reptiles received from J. A. Allen, Springfield, during the past season, there was a specimen of the *Celuta amœna* Bd. and Gir. (Worm Snake). Mr. Allen had for several years past been confident that he had seen this species near Springfield, but had never been able [by some mistake thus erroneously stated] to secure a specimen before. The only notice of this snake having been found in New England, is by Dr. Storer. . . . . 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." (Proc. Ess. Inst, Vol. IV, p. LXXXIII.) Since the publication of Prof. Verrill's list, in assorting a collection of birds and reptiles received at the Museum of Comparative Zoölogy from Waterville, Maine, collected by Prof. C. E. Hamlin, I found a specimen of *Carphophiops amœnus*, so that now the species is also to be added to the fauna of Maine. In 1842, Dr. Holbrook gave its range (N. Am. Herp., III, p. 115), as extending from New Hampshire to Florida. Dr. De Kay gives it as ranging from New Hampshire to Pennsylvania, but adds that he had not himself met with it.

In addition to the Ophidians above enumerated as inhabitants of this State, Dr. Smith's list in Dr. Hitchcock's Geological Report for 1835 contains a certain "*Coluber striatulus.*" While it is somewhat uncertain to what this name was intended to refer, the true *C. striatulus* Linn., (*Haldea striatula* Bd. and Gir.), is a strictly southern species, never likely to occur in Massachusetts. It seems not improbable that Dr. Smith may have applied this name to the young of *Tropidonotus sirtalis.* Another name that has been added to the list of our Ophidians, is that of that famous myth, the *Scoliophis atlanticus* or "Sea Serpent." The animal that formed the basis of this supposed species was captured, it appears, in September, 1817, near Gloucester, Cape Ann, and examined, both externally and anatomically, by a committee of the Linnæan Society of New England, especially appointed for this purpose. Their conclusions were that it was not only a valid and undescribed species, but that it formed a new genus; their lengthy report was accompanied by two plates, one representing its external appearance, and the other its internal anatomy. From their description and figures it certainly bore a strong resemblance to the common black snake, or *Coluber constrictor* of Linnæus, though unique in possessing "a row of protuberances along the back, apparently formed by undulations of the spine." Competent authorities have since decided it to be but a deformed specimen of this species, though Dr. Storer gives the report entire in a supplement to his Herpetological Report, having, he says, long sought for the paper in vain, for insertion in its proper connection in the Report, and adds: "That this is a new and very curious animal, is acknowledged by distinguished foreign naturalists." The original animal examined and reported upon by the committee of the Linnæan Society of New England has since been rediscovered, and proved, according to Prof. Wyman, "to be a black snake (*Coluber constrictor*) with a diseased spine."[1] Probably the same specimen is referred to by Dr. De Kay (Nat. Hist. N. York, Vol. III, p. 36), when he observes: "Many years since I examined, in the collection of Dr. Mitchell, a large snake which had been sent from Massachusetts, and had been described, I know not upon what authority, as the young of the Sea Serpent. Its vertebræ were diseased nearly throughout the whole extent of the column; but as it clearly belonged to this species (*Coluber constrictor*), the name of *Scoliophis atlanticus* must be expunged from the systems."

[1] See Proc. Bost. Soc. N. H., Vol. IX, p. 245.

An explanation has been recently given by Dr. Pickering[1], as communicated to him by an old whaler, that accounts very satisfactorily for the origin of the various stories of the Sea Serpent that have arisen; namely, that "it was a humpbacked whale scooping fish, the upper jaw being elevated, forming the supposed erected head and neck, and the hump representing the imagined curvature of the serpentine body."

BATRACHIA.

ANURA.

1. Bufo americanus LeConte. (Storer's Rep., p. 244.) Common Toad. Common. Much less abundant, however, than in some sections of the eastern part of the State, as at Cambridge and vicinity, where the species is extremely abundant, much more so than I have ever observed it elsewhere. Does it prefer the vicinity of the sea? I also found it very numerous the past summer (1868) on the little barren, uninhabited, sandy island of Muskeget, between Nantucket and Martha's Vineyard. In Cambridge the species appears very early in the season, where, quite early in April, I have often observed them in great numbers stiffened with cold on frosty mornings; while I have rarely noticed them at Springfield till after quite warm weather. Besides being less abundant at Springfield, the average size of the specimens commonly seen is certainly much less than at Cambridge. They commonly deposit their eggs during the first half of May. During the last part of August they often begin to disappear, some burying themselves in the dry, sandy fields, where I have found them a foot below the surface as early as the first week of September; others no doubt repair to ponds and, like the frogs, hibernate in the mud. In February I once found great numbers of both toads and frogs, the latter of several species, under loose stones in an unfrozen spring.

An interesting fact in reference to the torpidity of the toad came under my observation July 25th, 1864. Some workmen in clearing a well in which mud and miscellaneous material had been accumulating for upwards of twenty years, drew up, in emptying it of water, several living and dead toads. Afterwards as many as twenty were found in the mud in a torpid condition, their position varying in depth from a few inches to two or three feet below the surface. When first

[1] Proc. Bost. Soc. Nat. Hist., Vol. IX, p. 245.

drawn up they were quite motionless, and apparently almost lifeless; after a few seconds, however, their toes and legs began to twitch, and their eyes slowly to open and close; in three or four minutes they had become sufficiently animated to hop when disturbed, and in five or six minutes would quicken their pace considerably when a stick was pushed after them, even in the case of individuals brought up from a depth of two feet below the surface of the mud. If undisturbed they were not disposed to move for a considerable time. In all probability those found deepest in the mud had been there at least from ten to fifteen years, and probably much longer. The well usually becomes very low in summer, and in very dry seasons dries up, and remains so for several weeks. From the low temperature of the bottom of the well, which varies from 45° to 48° F., toads falling in at this time would naturally feel an inclination to hibernate, and would accordingly bury themselves in the mud. The water subsequently filling the well would not affect them materially, the conditions being similar to those natural to them when they repair to ponds to hibernate; and the temperature being constantly below that at which the toad is voluntarily active, there seems to be no reason why this torpid condition, or involuntary hibernation, might not be thus indefinitely protracted.

2. **Scaphiopus Holbrookii** Baird. (*S. solitarius Holbr.*) Spade-footed Toad. Apparently common, but, as at other localities, irregularly observed.

On hearing the very peculiar notes of this species six years since, at the well-known locality near the Botanic Garden in Cambridge, I recognized it at once as being something I had heard occasionally at Springfield. It was not, however, till May 27th, 1866, that I happened to be fortunate enough to obtain specimens; I found two in a path, after heavy rain, several hundred yards from any permanent pool; and, during the day, several pairs spawning in different small transient pools, though at this time they appeared sparingly. I also heard them in Chickopee the following day, five or six miles distant from the first locality.

In 1863, after unusually heavy rains towards the close of June, they came out in immense numbers, the transient pools formed by the heavy fall of rain seeming to be full of them; but they were heard only from 1 P. M. till about 3 A. M., of the following night; and being confined to the house by illness I failed at this time to obtain specimens. Not having been in Springfield at the proper time since, these are the only instances of their occurrence known to me. Specimens collected here in 1866 were deposited by the writer in the Springfield Natural History Museum, and in the Museum of the Essex Institute.[1]

The character of the season seems greatly to determine the time of the appearance of these animals, for they rarely, if ever, appear except after long-continued rains, during which the fall of water has been sufficient to saturate the ground thoroughly, and to form pools in situations ordinarily dry. If the spring opens with heavy rains, it is not uncommon for them to appear during the last of March, or early in April, often before the snow is gone; if dry they are not seen till later, and if no heavy rains occur during the spring or summer months, as sometimes happens, they are not seen at all that year. If sufficiently heavy rains occur in May, or even in June, or in July, and not previously, as happened one year at Springfield, they may be expected even then. The present year, remarkable for its wetness, seems fully to demonstrate this, no less than four sets of the *Scaphiopus* having been observed at Cambridge. The first, few in numbers, appeared during the few warm days that occurred about April 1st; the second, much more numerous, April 15th; the third May 14th, and the fourth May 22d; each during, or immediately following, very heavy falls of rain. They were observed not only at the old locality near the Botanic Garden, but in several others, including the pond west of the Museum of Comparative Zoölogy, and another east of it, formed by the temporary inundation of the marsh in Mr. Norton's woods. It takes but a few weeks for the young tadpoles to mature, the eggs generally hatching in from five to seven days, and the young being ready to leave the water in about three weeks; yet the pools selected by the Spadefoot for the home of their offspring often become dry before the tadpoles are fully grown, and they consequently perish,—so that ordinarily but a small part mature. The wetness of the present year was not only favorable for their spawning, but also for the development of the young, so that the increase of the Spadefoots must have been unusually large.

This species was first discovered by Dr. Holbrook in South Carolina, and first described by him in his North American Herpetology

[1] For the first announcement of the discovery of this animal at Springfield, see Proc. Ess. Inst., Vol. V, Records, p. 42.

(first edition, Vol. I, p. 85, pl. 12), as *Scaphiopus solitarius*;[1] subsequently it was found in Rockland County, New York, by Mr. J. P. Hill,[2] at Salem, Massachusetts, by Dr. Andrew Nichols,[3] and a little later at Cambridge, by Prof. Agassiz. As it is still known only from these and a few other widely separated localities, it is often cited as an example of a species locally distributed.[4] It appears to me, however, that the facts do not warrant this supposition; the species, from its peculiarly recluse or subterranean habits, is one of the hardest to observe, and only likely to attract attention at spawning time, when it is abroad at most but a day or two, and often but once in several

[1] Dr. Harlan redescribed it the following year as *Rana Holbrookii*, Medical and Physical Researches, 1835, p. 105. The citation of Dr. Holbrook's first edition, in this and other cases, is made from the references of DeKay and other writers, as I have been unable to find a copy of this edition in any of the public libraries in this vicinity (Boston), the author having, as I have found in several instances, taken up the first edition and replaced it with the second. Dr. DeKay gives the dates of the first edition as "1834 *et seq*," while Prof. Baird and others cite Volume I as published in 1836, and Volume II in 1838. The date of the second edition is 1842. The name *Holbrookii* used for this species by Dr. Harlan in 1835, has priority by about one year, if the correct date of Vol. I of Holbrook's first edition is 1836. Dr. Harlan, however, states expressly, that it had already been described and figured by Dr. Holbrook in his great work on North American Reptilia, to which he refers the reader; but as he does not cite the volume and page, it is probable the work had not at that time been duly published.

[2] DeKay, Nat. Hist. N. York, III, p. 66.

[3] Since writing the above I have had an opportunity of referring to Dr. Nichols' very interesting paper on the "Occurrence of *Scaphiopus solitarius*, in Essex County," read before the Essex County Natural History Society, June 17, 1843, and published in the third and last number of that Society's Journal (pp. 113–17, March, 1852). He states that they were first noticed in a pond in Danvers, "subsequent to a great rain in summer," "about the year 1810, 1811, or 1812," by Mr. John Swinerton. Their notes were heard at a distance of half a mile, and were mistaken for those of young crows. Between this time and 1843 Dr. Nichols states they had been observed but three times, namely, "August 12th, 1834; again in the summer of a year whose date is forgotten; and on June 16th, 1842." Dr. Nichols raised the toads from the spawn, and gives very interesting facts respecting their development. He states that those in confinement lived longer and grew larger in the tadpole state than those left in their native pools. Also that those kept in water with no opportunity of getting upon any support above it, such as a floating chip or dry land, were also slower in their development; from which he concludes that their transformation from the larval to the adult state conforms to circumstances. "So long," he says, "as water is wholly their residence, their caudal appendage is necessary and accordingly used, retaining its proportionate size and strength," but that if the "water be gradually withdrawn, and mud, moist earth, and then dry, be gradually substituted, they will much sooner undergo the change from the embryotic to the infantile condition of existence."

[4] See Proc. Bost. Soc. Nat. Hist., Vol. XI, p. 233.

years. We should take into account, also, the little attention this class of animals ordinarily receives, observers likely to detect it being almost as few and as scattered as the localities at which the species is thus far known to exist. Hence I see no reason for supposing it may not occur with nearly the same generality as other species, its habits only preventing it from being as commonly observed.

3. **Hyla versicolor** LeConte. (Storer's Rep., p. 241.) Tree Frog. "Tree Toad." Very common. For several days past (Sept. 18th), I have heard four or five individuals piping within hearing of where I am writing. Their notes are commonly first heard in spring, about May 1st. During the second and third weeks of May, I have frequently heard them at evening from trees in the vicinity of ponds, but have never been able to find them in the water, to which they must repair to spawn. They seem very sedentary in their habits, one having lived several months the past summer in an apple-tree near my window. From the same tree I have heard one in former years, from early in May till late in September, though it stands at quite a distance from water. Whether it is the same individual that I have heard so long, and where its place of hibernation is, I have as yet been unable to ascertain.

4. **Hyla squirella** Bosc. (Storer's Rep., p. 242. *Hyla Richardii* Baird.) Green Tree Frog. Apparently not rare in the proper localities. Its small size and green color, combined with its habits, render it difficult to discover. I found my first specimen on a fence rail, the last week in August, 1862. Up to the present year I had found but one other, also on a fence. I have now before me eight fine specimens, five or six of which were taken in a single afternoon from grass. There are also several specimens in the Springfield Museum, collected by Mr. C. W. Bennett at Holyoke. They are undoubtedly the *Hyla squirella* of Holbrook, the northern limit of distribution of which he thought was the thirty-fourth parallel, and the species exclusively southern. Dr. Storer, having but a single dried specimen from Roxbury, copied Holbrook's excellent description in full. Dr. DeKay found specimens near New York, which Dr. LeConte pronounced identical with the *H. squirella* of the south. Respecting its habits Dr. Holbrook observes: "This animal is found on trees, often seeking shelter under the bark of such as are decaying; it frequently chooses old logs for its place of hibernation. In fine weather, and after showers, it climbs even the highest trees in search of insects." I have observed it on low bushes, coarse plants and grass, and on fence rails,

but have never been able to recognize its note, though I have often heard one from trees in the woods which I attributed to it.

Respecting its colors, Dr. Holbrook remarked that they were even more changeable than in any species with which he was acquainted. "I have seen it," he says, "pass in a few moments from a light green, unspotted and as intense as that of *Hyla lateralis*, to ash color, and to a dull brown with darker spots; the spots also at times taking on different tints from the general surface. The markings, too," he observes, "vary exceedingly in different individuals."[1] The specimens I took from grass were quite uniform in general color, and quite green.[2]

5. Hyla Pickeringii LeConte. (*Hylodes Pickeringii* Holbrook. Storer's Rep., p. 240.) Piping Tree Frog. Extremely abundant. In early spring the marshes and pond margins everywhere ring with their shrill piping notes. They are not unfrequently heard in spring the last week in March, and are sometimes heard abroad at intervals during the later autumn months. In December (1st to 3d) 1866, during excessively warm weather, when the temperature reached 70° Fahr., and the strong south wind dissolved a light snow that had fallen, and nearly thawed out the frozen marshes, I heard numbers of this species, and at the same time saw *Rana fontinalis* and *R. palustris* perched on the banks of ditches and brooks, while *Emys insculpta* and *Nanemys guttata* had crawled out to enjoy the warmth. In a previous "cold snap" the temperature had fallen as low as 12°, snow had fallen, the marshes were frozen for a week, and the ponds were for a few hours covered with ice. The awakening at this time from their winter's slumbers, in consequence of an unusual change in the weather, shows how sensitive these creatures are, even in their winter retreats, to atmospheric changes.

While the majority of the representatives of this species undoubtedly repair to the water or to marshes to hibernate, it seems equally clear that all do not; on March 20th of the present year I heard several individuals in the woods, remote from water or marshes, during a very warm foggy afternoon, while half the ground was covered with snow, and the ponds and marshes were still thoroughly frozen. I have also heard them under similar circumstances late in November,

[1] North Am. Herp., Vol. iv, p. 124.

[2] We do not perceive that the species described as *Hyla Richardii* by Prof. Baird (Proc. Phil. Acad., Vol. vii, 1854, p. 60), based on a a specimen from Cambridge, Mass., differs in any particular from the present, of which we regard it a synonym. His description is, "Above uniform grass green; smooth; beneath white. Tibia considerably less than half the length of body. Hind foot less than the arm from the elbow. Less than one inch in length. *Hab.* Cambridge, Mass."

after severe frosts, and when a subsequent sudden change in the weather must have prevented their reaching the marshes that season.

The present year (1868), I first heard them (at Cambridge) April 1st, and in great numbers, the day being excessively warm. The ground was still frozen in the Museum marsh, while here and there were small banks of snow. At 5 P. M., I found the temperature of the running water in the Museum ditch, 48°, and of still water in pools containing very active individuals of this species and of *Rana sylvatica*, 58°. I give an abstract of some observations which were continued for about two weeks, with a view of determining the lowest temperature at which this and other species of our frogs are active, and begin to spawn. The weather, very warm and very cold days alternating, proved extremely favorable to my purpose.

"April 2d. Last night was very warm, as is to-day, the maximum temperature of 76° being reached at 3½ P. M. *Hyla Pickeringii* and *R. sylvatica* out in great numbers. *Chrysemys picta* and *Nanemys guttata* sunning themselves on the banks of the ditches. The marshes not yet fully thawed.

"April 3d. A smart frost in the morning, and a thin sheet of ice over very exposed water. At 6½ A. M. the temperature of running water in the Museum ditch was 34°; exposed pools of still water 34°–36°; sheltered still water, 40°–41°. No frogs heard or seen. In about two hours *H. Pickeringii* began to pipe, and half an hour later *R. sylvatica* was heard, the warmest water having increased in temperature to above 50°.

"April 4th. Hard frost in the morning, the ground considerably frozen, and thin ice on very much exposed pools. At 7 A. M. temperature of the water beneath the ice, 34°; of running water, 38°; of unfrozen (sheltered) pools, 38° at the surface, and 40° ten inches below the surface. No frogs seen or heard. At 9½ A. M. running water 48°; still water 46°–48°; no frogs. At 11¼ A. M. running water 50°; still water 52° (48°–54°; where shaded 48°; where it received reflected heat 54°). *H. Pickeringii* and *R. sylvatica* out sparingly; more numerous later in the day. Day rather cloudy, and somewhat raw. Thousands of *H. Pickeringii* piping during the evening, the temperature of the water being between 50° and 60°.

"Saw eggs of *R. sylvatica* laid yesterday; a large oblong mass, eight inches long and four or five wide, attached to the stem of a reclining weed.

"April 5th. An inch of snow fell just before daylight. Squally at

9 A. M.; day so cold that it thawed but little; began to freeze before sunset. No frogs.

"April 12th. Three storms since last date, three to six inches of snow falling in each. Heavy frosts nearly every night. *Hyla Pickeringii* has been heard a few times only, in the early part of evening; *Rana sylvatica* once or twice in the middle of the day. Last night a few *H. Pickeringii* piped nearly all night, although the ground was everywhere snow-covered, and melting snow was running into the marshes. Temperature of the air at sunset but a few degrees above the freezing point, but the weather moderating during the night, it is somewhat warmer this morning. Temperature of the water at 8 A. M. 39°–42°. *Hyla* silent. Day warmer than usual, and a few of the *Hyla* and *R. sylvatica* heard, the former till dusk. At 7 P. M., temperature of the air 31°, mud already stiffening with frost and ice forming on the pools of water. The warmest water observed had a temperature of 42°, varying to 38°. Wind brisk from the north. A few brave *H. Pickeringii* — very few and widely scattered — piping faintly in the marshes, their heads exposed to a stiff northerly breeze at a temperature of 31°!

"April 13th, 1 P. M. Air 34°; running water 45°; still water 42°–62°; average of still water fairly exposed to the sun, 52°–57°. Ice still on the water in shaded places, a few inches beneath which the water was 42°. Shallow water (two to four inches deep) in very sunny places 62°, while two yards distant and six inches deep, it was 57°. Wind a stiff northwest breeze; freezing in the shade. The morning being very cold, the first frogs were heard at 11½ A. M.; they continued active only till 4 P. M.

"April 14th. In the morning a heavy frost and some ice. *H. Pickeringii* and *R. sylvatica* out in great numbers by 10 A. M., and were clamorous throughout the day; the weather being warm and fine. *R. fontinalis* and *R. palustris* observed for the first time.

"April 15th. The marshes resounded all night with the notes of both *H. Pickeringii* and *R. sylvatica*. Day very warm, the temperature of the air reaching 70°. At 7 P. M. it was 62°, and that of the running water 52°, and of still water 58°; the warmest since April 1st. To-day *Hyla Pickeringii* commenced spawning. *R. halecina* first taken; *R. palustris* out in numbers. *R. sylvatica* again commenced spawning, the first eggs being observed April 4th, while since then the weather has been excessively cold. To-day also *Bufo amer-*

icanus appeared, and a very few pairs of *Scaphiopus Holbrookii* were observed spawning.

"April 16th. At 8 A. M. air 60°; running water 50°; still water 56°. At 7 P. M. air 60°; running water 52°; still water 58°–62°. Day fine and warm. This evening *Bufo americanus* spawning in great numbers, in water varying in temperature from 56°–62°."

At this date I was called away for a few days, and my record ceases. I had intended to note the length of time occupied in hatching the eggs of the different species, with at least three daily observations on the temperature of the water surrounding them; the rapidity of development, as I found, and as would be expected, varies with the temperature of the water.[1] Imperfect as these memoranda are, they show that *Hyla Pickeringii*, usually the first frog we hear in spring, is the species that continues active at the lowest temperature; and that *Rana sylvatica* will bear almost as great a degree of cold. According to observations made last spring, and partially recorded above, I found *H. Pickeringii* sometimes piping till the temperature of the water had fallen to 38°, and once when that of the air was 31°; but they were never observed in numbers when the water was colder than from 45° to 42°. I never saw or heard *R. sylvatica* when the water was colder than about 50°, or the air in the shade below 34°. With a rise of a few degrees only above these points in the temperature of the water, particularly at midday, both their numbers and activity would be considerably increased. Ordinarily I found a difference of about 10° in the temperature at which these species retire from the surface,—*R. sylvatica* disappearing at 54° to 48°, and *Hyla Pickeringii* at 44° to 38°.

There were several excessively warm days at the time of the first appearance of these species (April 1st–5th), when the water suddenly reached a maximum temperature of above 60°, and during this time *R. sylvatica* commenced spawning. Seven or eight days of freezing weather immediately succeeding intercepted their operations till the 15th, when the temperature of the water again reached 60° to 65°. At this time *H. Pickeringii* again commenced spawning; *R. sylvatica* was again seen pairing, and most of the other *Ranæ* were observed, as well as *Bufo* and *Scaphiopus*. The embryos in the ova of *R. sylvatica*, laid April 3d, were not much advanced two weeks

[1] Since the above was written I have met with an account of Hogg's experiments on the influence of light and heat on the rapidity of the hatching and metamorphosis of the larvæ of frogs, from which it appears that the former, as well as the latter, may have considerable influence.

later, in consequence of the constant low temperature of the water, though ordinarily hatching in six or eight days.[1]

In respect to the appearance of the other *Ranæ*, our observations agree very well with those of Mr. Putnam, except in reference to *R. halecina*, which he notes as appearing four days in advance of *R. sylvatica*, and as the first species of *Rana* seen that season. It is evident that the observations of a single season, or those made at one locality, cannot be satisfactory on such points, as the results must vary with the peculiarities of each, as well as with the carefulness of the observer. In noting the temperature of the water at this season, the varying temperature obtained within the distance of a few yards at the same time of observation, as given in the above records, shows the insufficiency of single or careless observations; the shelter afforded by even leafless trees materially diminishes radiation, as it also retards during the day the passage of solar heat.

The present year *Hyla Pickeringii* was as abundant in the marshes, May 14th, as at any time earlier. Before the first of June, however, they generally begin to disperse, and occur during the summer almost everywhere on the growing herbage, though rather more numerously in damp localities. I have found them on bushes, and they probably also ascend trees, though I have found them by far the most abundant in rank grass. Later in the season, and especially during the month of September, their peculiar notes may be occasionally noticed, though they are not uttered very frequently, nor with any regularity; and are, moreover, widely different from their well-known, reiterated *peep* heard from the marshes in the pairing season. They seem to delight in the cool, damp weather produced by the early fall rains, their notes being heard not unfrequently when the temperature of the air is below 50°, and as early as 9 A. M., after quite hard frosts, and in localities far from brooks or marshes. At this season, by a little careful searching, I have frequently gathered a number of specimens in a short time, notwithstanding that their diminutive size renders them such inconspicuous objects.

It seems very remarkable that a species so abundant as this should have so long remained unknown to naturalists. It was first described, as a distinct species, by Dr. Holbrook, in his North American Her-

[1] For almost the first published data on the time of appearance and spawning, and the length of time required for the hatching of the eggs of our different species of toads and frogs, see some valuable notes on the Toads and Frogs found about Cambridge, Mass., by Mr. F. W. Putnam, in these Proceedings, Vol. IX, p. 229.

petology (first edition, Vol. III), in 1838, under the name of *Hylodes Pickeringii*, from specimens collected in the vicinity of Salem, Massachusetts, and furnished him by his friend Dr. Pickering, whose name it bears, and who had pointed it out to him some years before as an undescribed species; Dr. Storer states in his Report that at that time (1839), he had seen but a single specimen, which was shown him by the Rev. John L. Russell of Salem, and collected by Dr. Nichols in Danvers. In the same year, however (June, 1839), Dr. Nichols called attention to this animal as a common species in Essex County, and gave a good description of it, with some interesting remarks on its habits (Journ. Essex Co. Nat. Hist. Soc., No. ii, p. 93), but wrongly identified it with the *Hyla femoralis* of the Southern States. Subsequently Dr. DeKay mentioned it as common near New York, and stated that it was found from Massachusetts to Pennsylvania, Dr. Holbrook having seen specimens from Philadelphia. It seems now to be a well-known species throughout New England and the Middle States.

6. **Rana Catesbiana** Shaw. (*R. pipiens* Linn., Storer's Rep., p. 235; *R. pipiens* Latr. of most authors.) Bull Frog. Abundant. Found chiefly in ponds, and never far from water except in wet weather or at night. Exceedingly voracious and carnivorous. I have taken from its stomach young specimens of *Chrysemys picta* an inch and a half in length. And woe be to the hapless young frog that hops into a pool where sits one of these greedy monsters! When collecting birds I have on several occasions had specimens, which fell into the edge of ponds when shot, stolen by them. In one instance a medium sized bull-frog seized and attempted to swallow a cedar bird (*Ampelis cedrorum*) that had fallen near him; he succeeded to his apparent satisfaction, although the tips of the wings and tail of the specimen projected from his mouth, while he sat composedly waiting for the other end to digest. On another occasion a more active fellow gobbled up a rare Warbler that chanced to drop near the water, and, to my great disgust, swam off with it beyond reach. Many farmers have learned by sad experience of their ability to swallow small ducklings.

7. **Rana clamitans** Daud. (*R. fontinalis* LeConte, Storer's Rep., p. 236.) Green Frog. Abundant. The most numerous species of *Rana*. Found along brooks and about the margins of ponds, sitting much of the time on the banks watching for their insect prey, and plunging into the water at the approach of danger. In wet weather,

especially at night, they are frequently seen on their passage from one pond or brook to another, or on short foraging excursions.

8. **Rana palustris** LeConte. (Storer's Rep., p. 238.) Marsh Frog. Pickerel Frog. Abundant. Generally associated with the preceding, which it closely resembles in habits.

9. **Rana halecina** Kalm. (Storer's Rep., p. 237.) Leopard Frog. Common. Much less abundant than either of the preceding *Ranæ*. In summer it is very generally found in fields, often remote from water; its favorite haunts are the moist, thick grass of meadows.

10. **Rana sylvatica** LeConte. (Storer's Rep., p. 239.) Wood Frog. Common. At Springfield it is about as numerous as the last, but in the vicinity of Cambridge one of the most abundant *Ranæ*, especially at spawning time. It is seldom seen about the water after the breeding season; often met with in summer in much the same situations as *R. halecina*, but more commonly in the woods, where I have seen it in November, as well as in March. I feel quite confident that this species, as well as the toads (*Bufo* and *Scaphiopus*), *Hyla Pickeringii* and the other *Hylæ*, do not always resort to ponds or marshes to hibernate, though such may be the general habit of most of them. I have seen individuals of this species in the woods on their way to ponds before the snow-banks were entirely melted, having hibernated, I have no doubt, beneath the leaves.

On their first appearance in spring their color is generally much darker than later in the season, individuals being sometimes seen that are nearly black, or of an intensely dark brown, on the dorsal surface. Exposed to the light, however, they soon become paler, sometimes changing greatly in a few hours. This dark color is common to both sexes, and is not peculiar to the males, as some have supposed. At any season different individuals are found to vary greatly in color; and from observing specimens in captivity, I have found that the same individual differs very considerably in depth of color in the course of a few days, or even hours. The same variation occurs, perhaps even more markedly, in *Hyla Pickeringii* and *Hyla versicolor*. In the latter species the variation seems fully under the will of the animal, the change from light to dark being sometimes made so suddenly as to be distinctly visible. From experiments made on this animal, I have found that the change is not at all dependent upon its surroundings, all the variations in color, which consist merely in its intensity, ranging from dark to light (light bluish-gray to quite dusky), being presented while these remain the same; though this power is doubtless often made use of by the animal to better effect its concealment. The pattern of the markings, as previous writers have observed, and also the depth of color, is very inconstant in the toads and frogs, and in no species does it appear to be more so than in this and *Hyla Pickeringii.* I cannot perceive that the *Rana cantabrigensis* Baird,[1] described from specimens sent him from Cambridge, Mass., by Prof. Agassiz, differs from frequent specimens of our own *R. sylvatica.*

In respect to the time and manner of breeding of our frogs, I regret to find that my notes are so incomplete. From observations made at Springfield, I had put down *R. sylvatica*, *R. clamitans* and *R. palustris* as breeding earliest of the *Ranæ*, and at nearly the same time; much earlier than *R. halecina.* In 1864 I found eggs in this last species as late as April 23d—after the eggs of some of the others had hatched—and doubted whether this species had then begun to spawn.

As is well known, our frogs and toads pair and deposit their eggs almost immediately on awakening from hibernation; generally, if the weather be favorable, in one or two days, and sometimes, as in the case of our *Scaphiopus*, in a few hours. Animation being partially suspended during the winter, it does not seem so probable that the eggs in the ovary should increase much in size during this period, as that they would be found almost mature late in the fall. By actual examination I have found the latter to be the case; yet this interesting fact, though probably not new to herpetologists, does not appear to be generally known, as I have been unable to find any record of it. The same thing, however, has been noted in a few instances in respect to certain fishes that spawn early in the spring. The present year I found females of *H. Pickeringii* in which, at the middle of September, the ova were distinctly visible through the thin semi-transparent walls of the abdomen. In several of the *Ranæ* I have found in October the ova of very nearly mature size.

[1] Proc. Phil. Acad. Nat. Sci., Vol. VII (Apr., 1854), p. 62. Prof. Baird's description is as follows:—

"*Rana cantabrigensis* Baird. Above yellowish-brown. A dark vitta through the eye, margined below by whitish. Lateral fold of skin light-colored, as is also a median dorsal line extending from the snout to the anus. A narrow light line along the posterior face of the thigh and leg. Tibia half the length of body. General appearance and size of *R. sylvatica.*

"*Hab.* Cambridge, Mass., (Collection of Prof. Agassiz)."

The above list embraces all the *Anura*, or toads and frogs, thus far detected in the State, but one, the Danvers toad (*Bufo Fowleri* Putnam),—if this really be a species distinct from the common *Bufo americanus*, as Mr. F. W. Putnam, than whom we have perhaps no higher herpetological authority, fully believes. Mr. Putnam states that it differs most markedly in its notes and habits from the common species, and also appreciably in the shape of the front part of the head. Prof. E. D. Cope, however, deems it only a variety of the common species, with which he also unites the *B. lentiginosus* of the Southern States. Mr. Putnam believes that no one who observes this animal in life can doubt its distinctness from the common toad; hence we give it provisionally a place in our list. If a distinct species, it has, so far as known, a remarkably restricted range, not having been found thus far outside of the single town of Danvers, and scarcely, it is said, outside of a single garden.

URODELA.

11. Plethodon erythronotus Baird. (*Salamandra erythronota* Green, Storer's Rep., p. 245.) Red-backed Salamander. Common. Quite numerous in damp, rocky woods, running over the leaves in damp weather, or concealed beneath stones or fallen wood. Probably the most abundant species here of the whole order. They vary greatly in color, representing the so-called *Plethodon cinereus* Tschudi (*Salamandra cinerea* of Green and some subsequent authors), with every intermediate condition between this and what are considered to represent typically the *erythronotus*. Much more abundant in the mountainous portions of the State than in the immediate vicinity of Springfield. We once observed them in great numbers under rotten wood, in a muddy spring hole, near the foot of Mount Tom, about the last of April.

12. Plethodon glutinosus Baird. (*Salamandra glutinosa* Green, Storer's Rep., p. 252.) Blue-spotted Salamander. Not very common, but apparently much less so than some of the others. Dr. Holbrook considered this "the most common of the North American Salamanders, and most widely diffused, abounding from latitude 43° to the Gulf of Mexico." He says it "lives most of its time concealed under rocks, or under the bark of fallen and decaying trees, and is frequently so numerous that many are found under the same tree." Dr. Storer states in his Report that he had received but one; I have found it much less common than either *Plethodon* *erythronotus* or *Diemictylus miniatus*; while it is not mentioned in Prof. Verrill's list of the Batrachians of Norway, Maine.

13. **Diemictylus miniatus** Raf. (*Salamandra symmetrica* Harlan, Storer's Rep., p. 246.) Symmetrical Salamander. Comparatively common. Nearly as abundant as the preceding, and generally found in similar situations.

This, as well as the preceding, I found exceedingly abundant in the damp forests of Wayne County, New York, where, in some localities, especially during damp weather, several could be seen at once within an area of a few yards, crawling slowly over the leaves. Usually scores of either species might be collected in a few minutes. In *D. miniatus* the color is quite variable, both as to the general tint and the markings; the former varying from bright reddish-brown to pale orange-yellow above, and from golden to pale sulphur-yellow below; while the black dots vary in number, being much more numerous in some specimens than in others; the number and position of the ocellated spots also differed not only in different specimens, but often on the two sides of the same specimen. Twenty-five or thirty specimens of this species now before me, belonging to the Natural History Museum of the Springfield City Library Association, vary in the number of ocellated spots on the sides from one to seven, one specimen having but one on one side and two on the other. Dr. DeKay's *Salamandra coccinea*[1] seems to have been based on individuals of this species, in which there were few ocellated spots and unusually bright colors.

14. **Diemictylus viridescens** Raf. (*Salamandra dorsalis* Harlan, Storer's Rep., p. 249.)[2] Many-spotted Salamander. Common. Generally seen early in spring in considerable numbers, in muddy streams and ponds.

15. **Amblystoma punctatum** Baird. (*Salamandra venenosa* Barton, Storer's Rep., p. 247.) Violet-colored Salamander. Not very common. But six or eight specimens have been collected by the writer in as many years. Found under rotten wood in damp forests.

[1] N. Y. Fauna, Vol. III, p. 81.

[2] Dr. Storer states in his Report (p. 250), that not meeting with any description which agreed with this species, " two years since I read an account of it before the Boston Society of Natural History, under the name of *S. millepunctata*." I have, however, been unable to find this name, or any reference by Dr. Storer to this species in any of the publications of the Society, and hence presume the name was never published.

16. Amblystoma opacum Baird. (*Salamandra fasciata* Green, Storer's Rep., p. 247.) Banded Salamander. Apparently not common. Have taken but three or four specimens. Dr. Storer speaks of having received it from Monson. He considered it rare in this State.

17. Pseudotriton salmoneus Baird. (*Salamandra salmonea* Storer's Rep., p. 248.) Salmon-colored Salamander. Apparently not common. Two specimens of this species in the Springfield Museum, collected in this vicinity by Mr. S. Stebbins, are the only known instances of its occurrence here.

This species was originally described by Dr. Storer, in Holbrook's Herpetology (Vol. III, first edition, p. 101, pl. 22; Vol. V, second edition, p. 33, pl. 8), from a specimen discovered by Dr. Binney in Vermont. Dr. Storer states in his Report, on the authority of Dr. Holbrook, that it had been found in the neighborhood of Danvers in this State. Dr. DeKay, in his Report on the Reptiles and Batrachians of New York, mentions a single specimen collected by Dr. Emmons in Essex County of that State; and Prof. Verrill includes it in his Norway (Maine) list, a single specimen having been found there by Mr. S. I. Smith. It does not seem to be anywhere a very abundant species.

18. Spelerpes bilineata Baird. (*Salamandra bilineata* Green, Holbrook's Herpet., Vol. V, p. 55, pl. 16.) Striped-backed Salamander. Not common. There is a single specimen, collected in this vicinity by Dr. G. A. Otis, Jr., in the Springfield Museum. According to Dr. Holbrook, it has been observed by Dr. Pickering at Salem. Prof. Verrill cites a single instance of its capture in Maine (Paris Hill, by Mr. S. R. Carter), and Dr. DeKay says several specimens had been obtained from the "Dripping Well" near Albany by Dr. Eights. Though considered a common species by both Green and Harlan, it is of unquestionably rare occurrence in this State.

The eight preceding species of Urodela, or tailed-batrachians, are all thus far detected in the vicinity of Springfield, though most of the following are likely to occur, as they have been found in other parts of the State. The immediate vicinity of Springfield, particularly to the eastward, is, from the dry and sandy character of the country, a rather unfavorable region for these animals, those already observed here occurring more abundantly in the immediately adjoining districts. Dr. Storer gives two additional species in his Report, and several others have been detected in the adjoining States which in all probability occur in this.

The Painted Salamander (*Desmognathus fuscus* Baird; *Salamandra picta* Harlan, Storer's Rep., p. 251) seems equally rare in this State with the preceding. Dr. Storer includes it in his Report on the authority of Dr. Pickering, who, he says, informed him that a specimen had been taken at Ipswich. It is mentioned by Dr. Holbrook as *Triton nigra*, who in saying that "Dr. Pickering found it near Salem," doubtless alludes to the same specimen. DeKay gives it a place in the New York Fauna, on the ground of its having been seen "both in Massachusetts and Pennsylvania." Prof. Verrill gives it from Maine.

The Brown-spotted or Red Salamander (*Pseudotriton ruber* Tschudi; *Salamandra maculata* Green, Storer's Rep., p. 252) was given by Dr. Storer as an animal of Massachusetts from a single young specimen having been found "in a pond in Groton" by Dr. J. W. Randall. Prof. Verrill gives it as "frequent" in Maine, where he has found it in "cold rocky brooks"; Dr. DeKay says it is one of the commonest species in the State of New York. Hence it is probably not rare in Massachusetts, though we have not met with it.

Dr. Holbrook assigns to Massachusetts the Long-tailed Salamander (*Spelerpes longicauda* Baird; *Salamandra longicauda* of Dr. Smith's List, in Hitchcock's Geological Report of 1835), and also the Tiger Triton (*Amblystoma tigrinum* Baird; *Triton tigrinum* Holbr., Herp., V, 79, pl. 26; *S. tigrina* of Dr. Smith's List), on the authority of Dr. Smith. Dr. Storer appears to have thought that both might be found here, but Dr. Emmons, on whose authority they are given by Dr. Smith, informed him, he says, that he thought he had seen a specimen of each; but added, "I will not take the responsibility of giving these two species as inhabitants of the Bay State;" hence Dr. Storer thought best not to include them in his Report. The former, having been observed at Albany, New York, by Dr. Green, and occurring also, according to DeKay, near New York City, may possibly be found in this State, but I have not learned of an instance of its capture here. The Violet-colored Salamander (*Amblystoma punctatum* Baird) may have been mistaken for the Tiger Triton (*Amblystoma tigrinum* Baird), the two species very strongly resembling each other in color and general character. I can find no positive record of its capture east of Central New York, though Holbrook gives its habitat as "New Jersey to Massachusetts."

Dr. DeKay mentions three other Salamanders as found in the State of New York, viz.;' *Salamandra coccinea* DeKay, *S. granulata* DeKay, and *Triton porphyriticus* DeKay; the latter he says he referred "originally to *glutinosa* Green," but afterwards placed it provisionally under *porphyritica* Green; the first two were described as new. The *S. coccinea*, as we have already observed, seems clearly to be referable to the brightly colored specimens of *Diemictylus miniatus*, having a minimum number of ocellated spots; the second, *S. granulata*, is referred by Prof. Cope[1] to the *Amblystoma Jeffersonianum* Baird. As this species has been chronicled by Prof. Cope from Lake Superior, New York and Burlington, Vt. (l. c., p. 197), and by Prof. Verrill[2] from Norway, Me., it seems fair to expect its occurrence in this State. The latter, *Triton porphyriticus* DeKay, probably refers to some variety of *Plethodon glutinosus*. Dr. DeKay also mentions two other species of Urodela (the Banded Proteus, *Menobranchus lateralis* Harlan and the Alleghany Hellbender, *Menopoma alleghaniensis* Harlan), as common inhabitants of Western New York, but neither of them are likely to occur in Massachusetts.

Hence the *Spelerpes longicauda* Baird and *Amblystoma Jeffersonianum* Baird (*A. porphyriticum* Verrill), from their occurrence in adjoining States, may be inferred to exist in this, though not, to the writer's knowledge, yet detected.

Tabular List of the Reptiles and Batrachians of Massachusetts.

The subjoined list enumerates all the species of Reptiles and Batrachians thus far known to occur in Massachusetts. For convenience of comparison, a list of the species known to inhabit the State at the time of Dr. Storer's Report, is given in the second column. Those described since the publication of the Report are indicated by an asterisk (*); those not yet detected at Springfield are printed in Italics. The numbers refer to the same species in each list.

REPTILES.

TESTUDINATA.

1. Glyptemys insculpta Ag.	1. Emys insculpta LeConte.
2. Cistudo Virginea Ag.	2. Cistudo carolina Edwards.

[1] *A Review of the species of the Amblystomidæ.* Proc. Phil. Acad. Nat. Sc., Dec., 1867, p. 195.

[2] Prof. Verrill, however, calls it *A. porphyriticum*, to which he thinks *A. Jeffersonianum* should perhaps be referred, (l. c., p. 199).

3. Nanemys guttata Ag.	3. Emys guttata Schw.
4. Chrysemys picta Gray.	4. " picta Schw.
5. *Emys meleagris* Ag.	5. Cistudo Blandingii Holbr
6. Ozotheca odorata Ag.	6. Sternothærus odoratus Stor.
7. Chelydra serpentina Schw.	7. Emysaurus serpentina Stor.
8. *Sphargis coriacea* Merr.	8. Sphargis coriacea Merr.

SAURIA.

9. *Plestiodon fasciatus* Dum. and Bibr.[1]	9. Scincus fasciatus Linn.

OPHIDIA.

10. Crotalus durissus Linn.	10. Crotalus durissus Linn.
11. Ancistrodon contortrix B & G.	11. ——— ———
12. Tropidonotus sirtalis Holbr.	12. Coluber sirtalis Linn.
13. " saurita Putnam.	13. " saurita Linn.
14. Nerodia sipedon B. & G.	14. " sipedon Linn.
15. Lampropeltis triangula Cope.	15. " eximius DeKay.
16. Bascanion constrictor B. & G.	16. " constrictor Linn.
17. Elaphis alleghaniensis Holbr.	17. ——— ———
18. * *Scotophis vulpinus* B. & G.	18. ——— ———
19. Liopeltis vernalis Cope.	19. Coluber vernalis DeKay.
20. Storeria occipito-maculata B. & G.	20. " occipito - maculatus Storer.
21. Storeria DeKayi B. & G.	21. " ordinatus Linn.
22. Diadophis punctatus B. & G.	22. " punctatus Linn
23. Carphophiops amœnus Cope.	23. " amœnus Say.
24. Heterodon platyrhinos Latr.	24. Heterodon platyrhinos Latr.

BATRACHIA.

ANURA.

1. Bufo americanus LeConte.	1. Bufo americanus.
2. * " *Fowleri* Putnam.	2. ——— ———
3. Scaphiopus Holbrookii Bd.	3. ——— ———
4. Hyla versicolor LeConte.	4. Hyla versicolor LeConte.
5. " squirella Bosc.	5. " squirella Bosc.
6. " Pickeringii LeConte.	6. Hylodes Pickeringii Holbr.

[1] *Plestiodon laticeps* Dum. & Bibr. in the list. Having found the name *laticeps* of Schneider of uncertain application, we adopt *fasciatus* as that next in priority.

7. Rana Catesbiana Shaw.	7. Rana pipiens Linn.
8. " clamitans Daud.	8. " fontinalis LeConte.
9. " palustris LeConte.	9. " palustris LeConte.
10. " halecina Kalm.	10. " halecina Kalm.
11. " sylvatica LeConte.	11. " sylvatica LeConte.

URODELA.

12. Plethodon erythronotus Bd.	12. Salamandra erythronota Gm.
13. " glutinosus Baird.	13. " symmetrica Harl.
14. Diemictylus miniatus Raf.	14. " dorsalis Harlan.
15. " viridescens Raf.	15. " venenosa Barton.
16. Amblystoma punctatum Baird.	16. " fasciata Green.
17. " opacum Baird.	17. " glutinosa Green.
18. Pseudotriton salmoneus Bd.	18. " salmonea Storer.
19. " *ruber* Tsch.	19. " maculata Green.
20. Spelerpes bilineata Baird.	20. " bilineata Green.
21. *Desmognathus fuscus* Bd.	21. " picta Harlan.

SUMMARY.

REPTILES.

Number of species of Reptiles found in the State	24
" " " given in Storer's Report . . .	21
" " " added to the Fauna of the State since Storer's Report	3
" " " observed in the vicinity of Springfield	21

BATRACHIANS.

Number of species of Batrachians found in the State	21
" " " given in Storer's Report . .	19
" " " added to the fauna of the State since Storer's Report . . .	2
" " " observed in the vicinity of Springfield	19
Whole number of species of both Reptiles and Batrachians in the State	45
Number of other species likely to occur	4

Some Observations on the Fauna of Madeira.
By Francis H. Brown, M.D.

We have in the Library of the Natural History Society but few references to the Fauna of Madeira and the islands lying in its neighborhood; and until the present year, we have had no specimens from the island in our cabinets. I therefore propose to give some of the results of investigation by naturalists who have resided in, or have visited the islands, as well as those lists which are at my command, of the animals in the various departments of Zoölogy.

Perhaps no region distant from the usual route of tourists has been so thoroughly worked up as Madeira, for it has been for many years the resort of invalids, especially from England, and many of these being scientific men, have passed a part of the hours of their compulsory tarry on the island in studying nature; and though our own library is destitute of works on the subject, very many have been written on it, and can be found in the libraries of the Old World.

The situation of the Island of Madeira renders the nature of its fauna, as well as of its flora, somewhat an equivocal one. Being in lat. 32° north of the Equator, it lies between the temperate and tropical regions, and its animals are typical of both; those, in fact, of the countries bordering on the Mediterranean basin, both of Europe and Africa, and of the Canary Islands. Situated, moreover, at a distance of nearly four hundred miles from the African coast, it possesses but few species which are peculiar to the island itself.

Of the *Mammalia* the number of species is very small; with the exception of some bats, none are indigenous. The wild goats and swine mentioned by early voyagers were undoubtedly introduced by vessels; and the same may be said of the rabbit, black and brown rat and mouse, which are now abundant. Seals formerly abounded on the island of Madeira, but are now rarely met with. They are occasionally seen on the neighboring islands. Dr. J. E. Gray, considering the species the type of a new genus, has given it the name *Heliophaca atlantica*. The British Museum contains specimens of the animal.

Of the birds, but one, a wren (*Regulus maderensis* Harcourt), is peculiar to the island, and this may be found among the laurels and arborescent heaths in the least frequented parts of the island. According to the list of Mr. Harcourt, which is copied below from the Annals and Magazine of Natural History for June, 1855, about thirty birds are given as breeding in Madeira, and sixty-eight are considered simply as stragglers from the African coast. African and South American birds are frequently brought to the island by ships touching there, and many undoubtedly have escaped and been introduced in this manner.

BIRDS BREEDING IN MADEIRA.

Falco tinnunculus Linn. Kestrel.
Falco buteo Linn. Buzzard.
Strix flammea Linn. Barn Owl.
Turdus merula Linn. Blackbird.
Sylvia rubecula Lath. Redbreast.
Sylvia atricapilla Lath. Blackcap.
Curruca Heinekein Jard. Variety of Blackcap.
Curruca conspicillata Gould. Spectacle Warbler.
Regulus maderensis Harcourt. Wren.
Motacilla boarula Linn. Gray Wagtail.
Anthus pratensis Bechst. Meadow Pipit.
Fringilla butyracea Linn. Green Canary.
Fringilla carduelis Linn. Goldfinch.
Fringilla petronia Linn. Ring Sparrow.
Fringilla tintillon Webb and Berth. Buff-breasted Chaffinch.
Fringilla cannabina Linn. Greater Redpoll or Linnet.
Cypselus unicolor Jard. Lesser Swift.
Cypselus murarius Temm. Common Swift.
Columba trocaz Hein. Long-toed Wood Pigeon.
Columba palumbus Linn. Ringdove.
Columba livia Briss. Rock pigeon.
Perdix rubra Briss. Red-legged Partridge.
Perdix coturnix Lath. Quail.
Scolopax rusticola Linn. Woodcock.
Sterna hirundo Linn. Tern.
Larus argentatus Brunn. Herring Gull.
Puffinus major Temm. Cinereous Shearwater.
Puffinus anglorum Temm. Manks Shearwater.
Puffinus obscurus Temm. Dusky Petrel.
Thalassidroma Leachii Temm. Leach's Petrel.
Thalassidroma Bulwerii Jard. Bulwer's Petrel.

STRAGGLERS.

Cathartes percnopterus Temm. Egyptian Vulture.
Falco nisus Linn. Sparrow Hawk.
Falco subbuteo Linn. Hobby Falcon.
Corvus corax Linn. Raven.
Corvus corone Linn. Carrion Crow.
Oriolus galbula Linn. Golden Oriole.
Sturnus vulgaris Linn. Common Starling.
Turdus iliacus Linn. Redwing.
Turdus musicus Linn. Common Thrush.
Sylvia hortensis Lath. Greater Pettychaps.
Troglodytes europæus Selb. Common Wren.
Motacilla alba Linn. Pied Wagtail.
Alauda arvensis Linn. Skylark.
Fringilla chloris Linn. Greenfinch or Grosbeak.
Fringilla domestica Linn. Common Sparrow.
Cuculus canorus Linn. Cuckow.
Musaphaga africana Temm. African plantain-eater.
Upupa epops Linn. Hoopoe.
Merops apiaster Linn. Bee-eater.
Alcedo ispida Linn. Kingfisher.
Hirundo urbica Linn. House Martin.
Hirundo rustica Linn. Chimney Swallow.
Hirundo riparia Linn. Bank Martin.
Caprimulgus europæus Linn. European Goatsucker.
Columba œnas Linn. Stockdove.
Columba turtur Linn. Turtle dove.
Œdicnemus crepitans Temm. Thick knee.
Calidris arenaria Ill. Sanderling.
Vanellus cristatus Meyer. Crested Lapwing.
Charadrius hiaticula Linn. Ringed Plover.
Charadrius pluvialis Linn. Golden Plover.
Strepsilus interpres Leach. Turnstone.
Ciconia nigra Temm. Black Stork.
Ardea cinerea Lath. Common Heron.
Ardea ralloides Scop. Squacco Heron.
Ardea russata Wagler. Buff-backed Heron.
Ardea purpurea Linn. Purple Heron.
Ardea minuta Linn. Little Heron or Bittern.
Ardea stellaris Linn. Common Heron.

Ardea nycticorax Linn. Night Heron.
Platalea leucorodia Linn. White Spoonbill.
Limosa melanura Leisler. Blacktailed Godwit.
Numenius arquata Lath. Common Curlew.
Numenius phæopus Temm. Whimbrel.
Tringa pugnax Linn. Ruff.
Tringa subarquata Temm. Pigmy Curlew.
Tringa variabilis Meyer. Dunlin.
Tringa cinerea Temm. Knot.
Totanus hypoleucos Temm. Sandpiper.
Totanus glottis Bechst. Greenshank.
Scolopax gallinago Linn. Common snipe.
Scolopax major Temm. Great or Solitary Piper.
Crex Baillonii Temm. Baillon's Crake.
Crex pratensis Selb. Land-rail or Corncrake.
Porphyrio Alleni Gray. Allen's Porphyrio.
Gallinula chloropus Lath. Gallinule or Waterhen.
Fulica atra Linn. Coot.
Anser segetum Steph. Bean Goose.
Mareca Penelope Selb. Widgeon.
Anas crecca Linn. Teal.
Sterna nigra Linn. Black Tern.
Sterna Dougallii Mont. Roseate Tern.
Larus tridactylus Lath. Kittiwake.
Lestris cataractes Temm. Skua.
Colymbus glacialis Linn. Northern Diver.
Sula alba Temm. Gannet or Solan Goose.
Procellaria mollis Gould. White Petrel.
Procellaria pacifica Aud. Pacific Petrel.
Thalassidroma pelagica Temm. Stormy Petrel.
Prion brevirostris Gould. Shortbeaked Petrel.

The *reptiles* of Madeira are very few in number. The gardens and vineyards are overrun by two or three species of small lizards, two of which I noticed to be *Ameiva sexlineata* and *Lacerta Dugesii* M. Edw. At the time of the vintage these little animals do a great amount of injury in the vineyards, of which, assisted by the rats, they are said to destroy nearly one-fifth of the produce, following the ripening fruit up the hills, and making sad havoc among the maturing crops. Several species of turtle are caught in the waters adjoining the island, not unlike those frequently seen by voyagers in this latitude.

The only indigenous fresh water *fish* of Madeira is an eel, of which several species or varieties are found in the streams, up to five hundred feet above the level of the sea. Mr. Lowe, who has given much attention to the ichthyology of Madeira, has enumerated about one hundred and eighty-six species of the marine fishes. He thus speaks of them in one of his papers: —

"The European visitor, on entering the markets, or examining the boats, is struck at once with the almost total absence of the flat fishes, *Salmonidæ* and cod fish tribe, which more especially characterize our stalls in England, and with the unwonted forms of the *Sargus*, *Pagrus*, *Pagellus*, *Box*, *Oblada*, *Smaris*, *Thynnus*, *Prometheus*, *Lichia*, etc.; or with the brilliant hues of the *Serranus*, *Beryx*, *Scarus*, etc.; or the grotesque, deformed *Scorpæna* and *Sebastes*. The impression will be somewhat different at different seasons. The spring is characterized by the commoner appearance of the splendid colored *Beryx* in the streets, attracting notice no less by its form and hues of silver, scarlet, rose and purple, than by the extraordinary size and opaline, or rather brassy lustre of its enormous eyes. With this, or even earlier, appears abundantly the common herring of Madeira (*Clupea maderensis*); and, as the season advances, the mackerel (*Scomber scombeus* L.); the scarlet Peixecaõ, or dog fish of Madeira, (*Crenilabrus caninus*); carneiro or mutton fish (*Scorpæna scrofa* L.) and Requieme (*Sebastes Kuhlii*); the pike-like Bicuda or Spet of the Mediterranean (*Sphyræna vulgaris*); the Sargo (*Sargus Rondeletii* Cuv. and Val.) with teeth resembling the human; and the plain colored Dobrada (*Oblada melanura* Cuv.). The herring and the Alfonsin (*Beryx splendens*) attain the climax of their season about March or April; the mackerel in May and June; but the whole, except the herring, continue throughout most part of the summer and autumn. In May the magnificent *Lampris lauta*, the beauty of which in the water excites the admiration even of the fisherman, begins to make its occasional appearance in the market; and, what is of far more importance in an economical point of view, the tunny fishery begins. This last is at its greatest height in June or July; and to it succeeds the capture of the Gaiado (*Thynnus Pelamys* L.), which is pursued with such success that I have sometimes watched a single boat, furnished with scarce half a dozen rods, pulling them at the rate of four or five a minute. With the Gaiado appears, in almost equal plenty, the Cœlho or rabbit-fish (*Prometheus atlanticus*); and these continue till the close of summer by the equinoctial rains of October. The winter months of January and February are chiefly characterized by the presence, close along the shores, of the little Guelro (*Atherina presbyter* Cuv.), or sand smelt of Madeira, of the common Madeiran herring (*Clupea maderensis*) and Sardinha (*Clupea sardina* Cuv.); the last two being captured principally after violent gales and storms, when the swollen rivers or torrents carry down much mud into the sea."

"The following species occur in great profusion, more or less, throughout the year, but still most plentifully in spring and summer, viz.; Garoupa (*Serranus cabrilla* Cuv.); Cherne (*Polyprion cernium* Cuv. and Val.); Goraz (*Pagellus centrodontus* Cuv.); Bezugo (*Pagellus acarue* Cuv.); Pargo (*Pargus vulgaris* Cuv.); Boga (*Box vulgaris* Cuv.); Bocairaõ (*Smaris Royeri* Bowd.); Ranhosaor Tronbeta (*Lichia glaycos* Cuv.); Chicharro or Madeiran horse mackerel (*Caranx Cuvieri*); Bodiaõ (*Scarus mutabilis*); and Abrodea (*Phycis mediterraneus* Lar.). The well known John Dory or Peixe Gallo (*Zeus faber* L.), and delicate Red Mullet or Salmoneta (*Mullus surumletus* L.), are also taken at all seasons, but more sparingly. The gray mullet or Tainha is captured very plentifully throughout the year, but most abundantly perhaps in June."

Of the *insects*, eleven hundred and eighty-six species are found in Madeira. A synopsis of the different genera, as given by Mr. T. Vernon Wollaston in his notes, and copied by Mr. White in his handbook, is inserted below. Only the Coleoptera, however, have been thoroughly investigated. In the elaborate work of Mr. Wollaston, entitled "Insecta Maderensia," he describes four hundred and eighty-three species of beetles; since the publication of his work, seventy-two new species have been added, raising the entire number discovered to five hundred and fifty-five species. Under twelve primary sections into which he divides the beetles, are found the following number of species: — Rhyncophora, 111; Brachelytra, 95; Necrophaga, 94; Geodephaga, 66; Heteromera, 46; Priocerata, 40; Cordylocerata, 45; Phytophaga, 23; Pseudotrimera, 22; Philhydrida, 16; Eucerata, 9; Hydradephaga, 8.

Other interesting data regarding the Coleoptera are thus given by Mr. White: "The type of this section of the Madeiran fauna is in the main Mediterranean; and it is thought to have a greater affinity to the fauna of Sicily than that of any other country which has been hitherto investigated. A slight connection with the beetles of Ireland can be traced. One of the striking features of the Coleopterous fauna of Madeira is the absence of numerous genera, and even of whole families, which are looked upon as almost universally distributed. Other remarkable features are that the wood and water beetles are few, and that the flower infesting tribes are very scarce. As a rule, the beetles of Madeira are obscurely colored, gay tints being rarely seen. Of the more conspicuous ones the following species are abundant beneath stones in Madeira:—*Scarites abbreviatus*, *Calosoma maderæ*, *Calathus complanatus*, *Harpalus vividus*, *Loparoceus morio* and *Hadrus cinerascens*. In Porto Santo and Deserta Grande, the large *Eurygnathus Latreillei* is found under similar circumstances. *Colymbetes lanio* is common in the streams of intermediate and lofty elevations. In certain districts a bright green Dasytes *(Dasytes illustris)*, the beautiful *Stenaxis Lowei* and the *Zonitis quadripunctata* are abundant on flowers. The laurels on the mountains are infested by *Atlantis lamellipes*, *Atlantis noctivagans*, *Blabinotus spinicollis* and *Trichoferus senex*. Cavernous hollows in the basalt and tufa of the lower regions are inhabited by *Blaps gages*, *Blaps fatadica*, *Hegeter elongatus*, and several species of *Helops*; whilst the great *Stromatium unicolor* is too well known in the houses of Funchal from the destruction its larva causes to the furniture, on which it chiefly subsists." Mr. Wollaston has presented a fine series of type specimens of the Madeira insects to the British Museum, where they may be seen.

The remaining orders of Madeiran insects have been less fully, and none of them exhaustively studied. A very troublesome little ant abounds in the houses of Madeira, and is supposed to be peculiar to the island. It has received the name *Œcophthora pusilla* from Prof. Heer, who has written an account of this little animal, a translation of which can be found in the Annals and Magazine of Natural History for March and April, 1856. "This ant swarms on the south side of the island up to the height of one thousand feet, living in societies composed of four classes, namely, laborers, soldiers, males and females. The soldiers have remarkably large heads, and the females are winged. The societies live in the ground, under stones, under the bark of trees, and within houses, always preferring a dry, warm locality. In Funchal there is hardly a house which does not harbor millions of these creatures, which climb to the highest story, issue in troops out of the smallest crack of the floor, and march in orderly columns to any point which attracts them. They are most abundant in the dry summer months; after continued wet weather their numbers are perceptibly less. Among the *Arachnida*, or spiders, there are many beautiful varieties. One, the *Lycosa* (*Tarantuloides*) *maderiana* Walckn., is reputed to be poisonous. The miting spider is quite common among the gardens of Funchal. Two or three species of *Myriapoda* are very common, even infesting the houses.

The freshwater and marine *shells* have been pretty thoroughly studied, especially by Mr. Lowe, Mr. Watson, the resident clergyman of the Scotch Church in Funchal, and by the Barone de Paiva, who has recently published a comprehensive treatise on the Mollusca of the Islands of the Madeiran Group. Of the land and fresh water shells Mr. Lowe enumerates one hundred and fifty-five species; Mr. Wollaston reduces the number of true species to one hundred and thirty-two, of which one hundred and eleven are peculiar to the Madeiras; five are common to the Canaries; four to the Azores; one to the Guinea Coast; and eleven to the south of Europe. Of the whole number, seventy-six species belong to the genus Helix, and twenty-three to the genus Pupa.[1]

The marine shells have been less carefully studied. Mr. McAndrews gives a list of one hundred and fifty-six species of marine testaceous mollusca which he obtained whilst dredging for a few days off the coast of Madeira. The genera most largely represented are *Tellina*, *Cardium*, *Lucina*, *Pecten*, *Hyalæa*, *Patella*, *Trochus*, *Rissoa*, *Murex*, *Mangelia* and *Mitra*. The boldness of the shore and the nature of the bottom render dredging somewhat difficult; there are, however, situations where it can be successfully performed, and it is from these few points only that the specimens have been obtained.

Appended to this article is given a

LIST OF BOOKS AND ARTICLES ON THE FAUNA, FLORA AND GEOLOGY OF MADEIRA AND THE ADJACENT ISLANDS.

BOWDICH (T. E.). Excursions in Madeira and Porto Santo. 4to. London, 1825.

DANA (J. D.). United States Exploring Expedition. Vol. X. 4to. Philadelphia, 1829.

DARWIN (C.). In his Monograph on the Cirripedia. 8vo. London, 1851.

GOURLAY (W.). Natural History of Madeira. 8vo. London, 1811.

HARCOURT (E. V.). Notice of the Birds of Madeira. Proceedings

[1] Of the Madeiran land shells now in the cabinet of the Society, a large number were given to the writer by Mrs. Scott of New York, for some months a resident of the island. Mr. Watson possesses a beautiful and choice collection of the land and fresh water shells; and so does also Sr. J. M. Moniz, a Portuguese gentleman in the employ of the Government. Mr. Moniz often has collections of the shells, as well as the ferns and other objects of natural history of the island, for sale.

of the Zoölogical Society of London for 1851. Annals and Magazine of Natural History for July, 1853.

HARCOURT (E. V.). List of the Birds of Madeira. Annals and Magazine of Natural History, June, 1855.

——— Sketch of Madeira. 8vo. London, 1851.

——— Piscium Maderensium species quædam novæ, etc. Transactions of the Cambridge Philosophical Society for 1836.

LOWE (R. T.). Primitiæ et Novitiæ Faunæ et Floræ Madeiræ et Portus Sancti. 4to. Cantabrigiæ, 1851.

——— Synopsis of the Fishes of Madeira. Trans. Zoöl. Soc. of London, II, 173, for 1841.

——— Supplements to same. Ibid., III, 1, 1849. Proceedings of the Zoölogical Society of London, Vols. VII, VIII, XI and XIV.

——— Notices of Fishes newly observed or discovered in Madeira during 1840, '41 and '42. Annals and Magazine of Natural History, 1st Ser., XIII, 390, 1844.

——— An account of Fishes discovered or observed in Madeira since 1842. Ibid., 2d Ser., X, 49, 1852.

——— Catalogus Molluscorum Pneumatorum Insularum Maderensium. Proceedings of Zoölogical Society of London for 1854.

——— Various smaller papers in the Zoölogical Journal, Annals of Natural History and Proceedings of the Zoölogical Society of London.

LYELL (SIR C.). On the Geology of some parts of Madeira. Quarterly Journal Geol. Soc. Lond., August, 1854.

——— A Manual of Elementary Geology. Ch. XXIX.

MASON (J. A.). A Treatise on the Climate and Meteorology of Madeira, etc. 8vo. London, 1850.

MCANDREW (R.). On the Geographical Distribution of Testaceous Mollusca in the North Atlantic and Neighboring Seas. 1854.

BARONE DE PAIVA. Monographia Molluscorum Terrestrium, Fluvialum, Lacustrium Insularum Maderensium. 4to. Lisbon.

SMITH (J.). On the Geology of Madeira. Proceedings Geol. Soc. Lond., III, 351, 1840–41.

WHITE (R.). Madeira, its Climate and Scenery. 2d Ed. 8vo. Edinburgh, 1857.

WOLLASTON (S. V.). Insecta Maderensia, being an account of the insects of the islands of the Madeiran Group. 4to. London, 1854.

Wollaston (S. V.). Notes on the Entomology of Madeira, in the Annals and Magazine of Natural History for 1858, 1859 and 1860.
——— On the Variation of Species. pp. 127–132. 8vo. London, 1856.
——— Catalogue of the Coleopterous insects of Madeira in the collection of the British Museum. 8vo. London, 1857.
Woodward (S. P.). Manual of the Mollusca. pp. 386–7. 12mo. London, 1854.

The Rev. J. B. Perry read the following sketch of the life of the late Dr. Ebenezer Emmons.

The subject of the following brief notice, formerly a corresponding member of this Society, deserves, it is thought, from some one of its members, a more elaborate commemoration than he has yet received. This is his just due, as in the advancement of American Geology he has occupied, and in its history is no doubt destined to hold, a more than ordinarily prominent position. Without attempting to do justice to the memory of one to whose long-continued labors and conscientious devotion to favorite studies, natural science in this country is greatly indebted, I propose, in the few sentences that follow, simply to call attention to a few of the more prominent points in his life, and to some of the most important of his publications.

Ebenezer Emmons, who was born in Middlefield, Mass., May 16th, 1799, was graduated at Williams College in 1818. During his collegiate course he listened to a series of lectures by Professor Eaton, and thus had his mind first called to the study of Geology.

Not far from the time of his graduation, he was united in marriage to Miss Maria Cone of Williamstown, who still survives him, making her home in Albany, New York.

Soon after leaving college, he entered upon the study of medicine, attending courses of lectures at Castleton, Vt., and in Pittsfield, Mass., receiving the degree of M. D. from the Berkshire Medical School in the latter place. He commenced the practice of medicine in Chester, Mass.; thence he went to South Williamstown, where he continued to be engaged for some years as a practising physician.

In connection with the duties of his profession, his mind, as is evident, was constantly occupied with collateral studies. His attention, as we have seen, had been early drawn, and it continued to be directed, to the Natural Sciences, and the fruits of these studies soon began to appear. In 1826 he published a "Manual of Mineralogy and Geology." From 1828 to '34, he lectured on Chemistry before the successive classes of his Alma Mater. He was elected Professor of Natural History in Williams College in 1833, and held the position until 1858, when he was transferred to the Department of Mineralogy and Geology. The latter position he continued to retain, at least nominally, until his death.

During the progress of the Geological Survey of his native State, he prepared a "Report on the Quadrupeds of Massachusetts," which was printed in 1840. On the organization of the Geological Survey of New York in 1836, he was appointed one of the Geologists-in-chief. In addition to his several annual reports, he made a "Final Report on the Geology of the Second District," which was published in 1842, and contains some account of his Taconic System. He was at the same time intrusted with the Agricultural Department of the Survey for the whole State. His observations and investigations in this direction were embodied in an extended Report, which occupies five quarto volumes, and was published in 1844. There appeared in the first volume of this Report—it was also issued in a separate form—an exposition of the Taconic System, much more matured and complete than the one contained in the Report on the Geology of the Second District. In January, 1845, he became, and for some time continued to be, Editor of the American Journal of Agriculture and Science, which was issued quarterly at Albany. In this enterprise he had as associates, first and from the start, Dr. A. J. Prime, afterward A. Osborne. At about the same time, or not very long after, he accepted a professorship, and for a while performed the duties appertaining to it, in the Albany Medical College.

In 1851 he was appointed State-Geologist of North Carolina, and entered upon the duties of his new position in January, 1852. During the latter year he published a short account of the Geology of that State. His first regular report appeared in 1856; his next, an octavo volume of three hundred and fourteen pages in 1857; and his third in 1858. During all this time, with the exception of the last year or two, as I am informed, he was in the habit of giving an annual course of lectures at Williams College; also of performing not a little additional labor connected with his favorite pursuits. As an evidence of this, the first volume of his American Geology, comprising two parts, appeared in 1855. He likewise found time to prepare a Manual of Geology, which was published in 1859, and passed to a second edition in 1860.

On the breaking out of the "great conflict," he was still busily engaged in the prosecution of the survey of North Carolina. It has been conjectured that he was detained in the South on account of his extensive and intimate acquaintance with the country, fears being entertained, should he be allowed to return to the North, that his knowledge would be turned to account by the Federal Government. He died at Brunswick, North Carolina, October 1st, 1863.

The following tribute, which appeared November 6th of the same year, is from the "Albany Evening Journal":—"Dr. Emmons exhibited a life-long devotion to science. Patient, persevering, cautious in his facts, rigid in his deductions, he has always carried into all the departments of science which he has investigated, a strong common sense, which has essentially influenced his conclusions. Among the scientific men of this country he held a high rank. Although disagreeing with many of them on some important points in Geology, especially the Taconic System, of which he was the originator and supporter, yet more recent investigations have tended to show his sagacity and correctness. His name will long live in the scientific annals of this country."

Thus has passed away another devotee of science, a *Savant* remarkable for his lively sympathy with nature, and for his clear appreciation of the orderly course of her working; remarkable alike for his keen insight and for his untiring industry; and, as I am informed, equally remarkable as well for his native gentleness and rare amiability of character, as for his Christian forbearance and unfailing courtesy, under all the varying relations he was called to sustain in life.

Mr. S. H. Scudder followed with a few remarks upon the forced seclusion of Dr. Emmons during the closing years of his life; shut out by the exigencies of the war from communication with his friends, he heard but the first intimation of a favorable change in the reception of the theories he had long and persistently maintained in the face of the strongest opposition.

Prof. A. S. Bickmore exhibited to the Society fifteen shells of the *Nautilus pompilius*, of various sizes, from one which measured five sixths of an inch by one inch and one sixth in its two diameters, to one measuring two and five sixths inches by three and three fourths inches in its two diameters.

All the smaller ones up to one, the diameters of which were one and seven eighths and two and seven eighths inches, are so loosely coiled that it is possible to look between the coils. These young specimens therefore represent the loosely-coiled Nautiloids of former geological ages; and the *Nautilus pompilius* at the different stages of its growth is an epitome of the whole group.

The shells exhibited were all collected on Amboina and the islands near it.

Referring to the young Nautili exhibited, Mr. A. Hyatt remarked that the young of all the coiled Cephalopods start with a straight or bent cone, and begin their coil abruptly, always leaving an opening in the umbilicus through the centre of the first whorl.

The development of the Nautiloids, in time, is also marked by a gradual involution from the perfectly straight *Orthoceras* to the *Nautilus pompilius*, where the expansion of the last whorl conceals the umbilicus. The progress of the Ammonoids, on the other hand, is marked by the gradual uncoiling of the shell, ending with the straight *Baculites* of the cretaceous; this feature is, therefore, of great importance in a natural classification of these groups.

Prof. Bickmore exhibited a number of skulls of the *Babirussa alfurus* Less., from the island of Buru, and one from the northern end of Celebes; together with a skull of the common wild hog from the latter locality.

The figures usually given of the babirussa represent its legs too long, and its muzzle too short. The male, female and young are correctly figured by Quoy and Gaimard in the voyage of the Astrolabe, pl. 22 and pl. 23.

The upper teeth do not come out beneath the edge of the upper lip, but rise directly through it. Those of the female are always short, rising but an inch or two above the flesh. Buru appears to be the eastern limit of the distribution of this animal. Ceram, which is a large island, and almost connected with Buru by a range of high islands, probably does not contain it, as several places on that island were visited, and no trace of it seen. Its western limit is Celebes.

It will be interesting to ascertain whether it is found on the Sula Islands, which are situated almost between Celebes and Buru.

Prof. Bickmore also exhibited seven pairs of antlers of the Amboina stag, *Cervus moluccensis* of Quoy and Gaimard (Voyage of the Astrolabe, pl. 24 and 25), and three pairs of the skulls and horns of the antelope from Celebes, *Anoa depressicornis* H. Smith. The only species allied to it occurs in Africa, which continent is the home of the antelopes.

Celebes is the western border of the old Australian Continent, the fauna of Borneo being Asiatic. The anoa, babirussa and wild hog, are the largest mammals of Celebes and the islands east of it; and as already noticed, even the babirussa is not known to occur east of Buru, while in Borneo the elephant, the rhinoceros, and other great animals are common.

Mr. F. W. Putnam exhibited a stone "bread pan" and "crusher," obtained in Nicaragua, by Mr. McNeil. Judging from their place of discovery, they were evidently relics of an ancient race, and yet the same sort of utensils are still used by the natives in the interior of the country. The crusher was similar to some forms of the so-called pestles of the aborigines of New England, and probably served the same purpose.

Dr. Samuel A. Green exhibited a hard, polished stone, with numerous parallel groovings, artificially worn on either side of one of the edges. Dr. J. Wyman stated that he had met with similar stones from Europe, but this was the first specimen he had seen from this country.

In a desultory conversation which followed upon these and similar topics, Dr. Wyman said it was a noticeable fact that the large stone implements of this country were fashioned by means of some picking instrument, and that even holes were bored through some of them in the same way. The inscriptions on the Dighton rock are of a similar character, and it is difficult to decide what material in the possession of the aborigines could have made so effectual a tool. Any angular stone implement would have been quickly shattered or dulled when brought into contact with so hard a rock as granite.

The Rev. J. B. Perry called attention to some interesting Indian relics, which he had seen in Swanton, Vt.

In the vicinity of Swanton Falls, in Franklin County, Vt., many Indian relics have been found from time to time. These have either come to light accidentally, or they have been discovered amidst the ruins of old wigwams, and in places of burial. They consist of implements of which the Red Man made use in hunting and fishing, in agriculture, perhaps also in a rude kind of weaving or netting; also of weapons of war, and of religious emblems. They are of special interest as indicating the degree of advancement to which the Aborigines had attained.

In the neighborhood referred to, there are remains of two Indian burial-places. These are of very different ages. The first claiming our notice is situated about two miles below the Falls, on a sandy terrace of considerable thickness, which rests on underlying clay. It is near the Missisquoi River, and undoubtedly belonged to the St. Francis tribe, a branch of the great Algonquin race, inhabiting that portion of Northwestern Vermont when it was first settled by whites. This burial-place was apparently connected with an old Indian village in the neighborhood, which consisted at an early day of about fifty huts, and was called Missisquoi, after the estuary or stream, on the banks of which it stood. It was unquestionably used as a place for the interment of the dead at a comparatively recent date; still some circumstances have led me to suspect that a portion of it served the same purpose at a much more ancient period, and long before it was thus employed by the St. Francis tribe. Its main features, however, clearly refer it to the last named Indians. On this ground have been discovered in abundance implements made of stone, both hatchets and axes, spear- and arrow-heads, gouges and chisels; also rude specimens of earthern ware of several descriptions, with various trinkets, as beads and other articles of adornment. In times of high water, when the river is swollen, human bones have been often washed out of the bank on which this old burying-ground is situated. Among these it is said that bones, in a few instances, have been met with, of such size as to indicate that the individuals to whom they belonged must have been of extraordinary stature. Though it be by no means certain, still it is possible that these were the remains of a more ancient people that inhabited the country at a far earlier day.

This conjecture leads me to notice the other burial-place already referred to. It is situated on what is called in the neighborhood the "old hemp yard." This is about two miles north of Swanton Falls, and is not very far from the line which separates the township of Swanton from that of Highgate. The above-cited name was given to this locality, not, as is often affirmed, because hemp was formerly raised on the ground, but because when the first settlements were effected it was densely covered with thrifty Norway pines, which, as the tradition has it, grew as thick and straight as hemp.

This latter place of sepulture is of great antiquity. It belonged to a race long since extinct, a race which inhabited the country before either the Iroquois or the Algonquins—the two great contemporaneous nations of Red Men in the region—came upon the stage of action. Of the origin of this burial-ground, and of the people whose remains were here entombed, the St. Francis Indians, as I am credibly informed, knew nothing. Respecting them, they even had no tradition, as I was once told by one of the few surviving members of the tribe. Upon the graves the largest trees were in full vigor, or already waning—and we are ignorant how many had previously matured, and gone to decay—when the region was first settled by whites. Indian relics are now often found directly beneath huge stumps, which still remain as a witness of the trees which must have taken root, flourished for centuries, and grown old on the resting-place, and since the disappearance of this more ancient people.

From these graves I have collected pieces of earthern ware, adorned with curious hieroglyphics of undoubted antiquity, and which to my mind give almost unmistakable evidence, if not of Asiatic origin, at least of a people closely allied in their sentiments and habits to the nations of the East. Reference is now more particularly made to earthen tubes, somewhat in the shape of a flute or pipe, from an inch to an inch and a half in diameter, and from about fifteen inches to two feet in length, ornamented with hieroglyphics of a moral or religious character. These symbols, so far as I can make them out, are closely akin to those employed as well in the Eleusinian rites, as in the old Cyribaic mysteries of Samothrace. Amongst these remains there are also specimens which might seem at once to hint at the Noachian deluge, and to symbolize the deliverance from it. A canoe, with what appears to be a bird, perhaps a dove, wrought in stone, is one of the emblems referred to. This, when compared with some of the Mexican antiquities interpreted as having such a signification, seems certainly with as much clearness as they, to point to the flood associated with the name of Noah. Some of the arrow-heads found in this burial-place, were made of a stone different from any, so far as I am aware, occurring in the region. It is of a fine grain, and very compact, and might be wrought by the lapidary. A few ornamental pieces, also discovered in the same place, were made from a limestone closely resembling the Rutland marble. The human bones exhumed from these old graves are, in most cases, more decayed than those which are with considerable certainty regarded as the remains of the St. Francis tribe. Paints are frequently discovered in connection with the other relics, and what appear to be pieces of antique cloth are occasionally met with. Shell-beads and short tubes of copper, which were probably once strung together, and formed either wampum, a species of necklace, or some other such ornament, are of very ordinary occurrence, while no beads like those used by the St. Francis tribe, at a much later day, are ever met with in this more ancient repository of the dead. It is accordingly my impression—I may say, indeed, that an examination of many of these relics has awakened in me the conviction — that this ancient people, though more aboriginal, were in many respects, especially in cultivation and refinement, much further advanced than the later inhabitants of the forest. The utensils found in their graves are usually of a finer finish, evincing far greater skill in the execution, and a much higher degree of artistic taste, than have usually appeared among the more recent Indians.

But at various other points in the immediate vicinity, in many localities besides the two places of interment just noticed, Indian relics have been found. Hatchets, arrow-heads, chisels and divers other implements have been picked up on the surface of the soil, and often brought to light by the plough. Chips of chert, or flint, as I well remember, occur in one locality in considerable abundance, although the only rock of a like kind in its natural position, known to occur in the whole region, is several miles away. These fragments I have been inclined to consider as the refuse material left by the Indians in making their spear- and arrow-heads. In several places, also, urns or vases of different kinds have been discovered. So vessels made of steatite or soapstone, and suited to be used over a fire, as a pot or kettle, are occasionally met with. These I have been disposed to regard, on account of their superior finish, as the workmanship of the more ancient inhabitants of the country. An old citizen informed me that about forty years ago, while he and two of his neighbors were at work constructing or repairing a road near what is called the Rolling Bank in Swanton, they found a human skeleton of gigantic size. It was uncovered by the scraper with which they were removing the soil. The skull was of such dimensions that one of the men, although himself of large proportions, readily placed his head within its cavity. The bones, or a portion of them, were examined by a physician, and, according to his estimate, were such as to indicate that the individual to whom they belonged must have been from seven and a half to eight feet in height. These, perhaps, were likewise the remains of one of those more ancient people, who once inhabited the region, and of whom it may be fitly said, "there were giants in the earth in those days."

Such are a few points which I trust will interest others as much as they have me, respecting this old home of portions of at least two of the aboriginal races of the Continent. Time fails me to give additional details for the present.

December 16, 1868.

The President in the chair. Forty-two members present.

Dr. T. M. Brewer presented a paper on the geographical distribution of the native birds of the Department of Vera Cruz, communicated to the Smithsonian Institution by Prof. F. Sumichrast, and with the consent of that Institution translated for the Memoirs of the Society.

He regarded it as a paper of great importance, presenting with remarkable precision the interesting features of that portion of Mexico, showing that with the altitude of the country the species of its birds vary in a remarkable manner. On the seashore, in the low, hot lands, below the height of about two thousand feet, occurs a belt or zone which the writer characterizes as the Hot Region. Within this are found exclusively tropical birds. West of this is another belt of territory rising from two thousand to five thousand feet, which he designates as the Temperate Region. Though not quite so distinct as the preceding, it is still well marked by a few positive, and by many negative characteristics. The third zone, which rises west of the last, to the height, in some parts, of eleven thousand six hundred feet, he calls the Alpine Region. The birds resident within this Alpine belt correspond in their genera, and even in many of their species, with the birds of northern North America. Some of our own birds which rarely visit Massachusetts except in winter, such as the Crossbill and the Pine Finch, are found there throughout the year, and our common Robin, *Turdus migratorius*, breeds abundantly in the Alpine regions of the department.

Of the one hundred and seventy species enumerated in the list of birds native to, and resident in, the State of Vera Cruz, no less than forty-six are actually or nominally birds of northern North America. They are distributed by Mr. Sumichrast, nine to the Hot, seventeen to the Temperate, and twenty to the Alpine Regions. Some, however, are common to two, and a few to the three regions. The following lists are appended by Mr. Sumichrast to his notes of the birds resident within the three several zones or regions.

BIRDS OF THE HOT REGION.

Granatellus Sallæi.
Pitylus poliogaster.
Saltator magnoides.
Lanio aurantius.
Phœnicothraupis rubica.
" rubicoides.
Ramphocelus sanguinolentus.
Tanagra diaconus.
Chlorophonia occipitalis.
Euphonia affinis.
" hirundinacea.
" Gouldii.
Guiraca concreta.
Cyanospiza parellina.
Icterus Wagleri.
" pustulatus.
" cucullatus.
" mesomelas.
Ostinops montezumæ.
Ocyalus wagleri.
Glyphorhynchus major.
Sittasomus sylvioïdes.
Xenops mexicanus.
Synallaxis erythrothorax.
Anabates rubiginosus.
Anabazenops variegaticeps.
Automolus cervinigularis.
Sclerurus mexicanus.
Grallaria guatemalensis.
Formicarius moniliger.
Thamnophilus melanocrissus.
Attila citreopygius.
Mionectes assimilis.
Milvulus tyrannus.
Tyrannus intrepidus.
Myiarchus mexicanus.
Myiobius sulphureipygius.
Oncostoma cinereigulare.

Platyrhynchus cancroma.
Erator albitorques.
Lipaugus unirufus.
Manacus candei.
Pipra mentalis.

The following species, not mentioned in Prof. Sumichrast's notes, are also referred by him to the Hot Region.

Ceryle superciliosa.
Momotus Lessoni.
Hylomanes momotula.
Trogon puella.
" caligatus.
" melanocephalus.
" massena.
Dryocopus guatemalensis.
Celeus castaneus.
Rhamphastos carinatus.
Pteroglossus torquatus.
Conurus aztec.
" holochlorus.
Chrysotis autumnalis.
" ochroptera.
Herpethorus cachinnans.
Spizætus ornatus.
" tyrannus.
Buteo Ghiesbreghtii.
Asturina nitida.
Rosthramus sociabilis.
Falco femoralis.
Peristera cinerea.
Geotrygon montana.
Lepidænas speciosa.
Crax globicera.
Penelope purpurascens.
Ortalida vetula.
Ortyx pectoralis.
Odontophorus guttatus.
Tinamus robustus.

BIRDS OF THE TEMPERATE REGION.

Catharus mexicanus.
Harporhynchus longirostris.
Melanotis cærulescens.
Sialia azurea.
Campylorhynchus zonatus.
Basileuterus culicivorus.
" rufifrons.
" bellii.
Euthlypis lacrymosa.
Neochloe brevipennis.
Cyclorhis flaviventris.
Vireolanius melitophrys.
Myiadestes unicolor.
Buarremon albinuchus.
Pyranga bidentata.
" erythromelæna.
Chrysomitris mexicana.
" notata.
Aimophila rufescens.
Icterus Audubonii.
" melanocephalus.
Quiscalus Sumichrastii.
Cyanocitta ornata.
Tyrannus vociferans.
Mitrephorus phœocercus.
Pionus senilis.
Aulacoramphus prasinus.

BIRDS OF THE ALPINE REGION.

Catharus occidentalis.
Hylocichla Audubonii.
Planesticus migratorius.
Turdus pinicola.
Cinclus mexicanus.
Sialia mexicana.
Lophophanes Wollweberi.
Parus meridionalis.
Psaltriparus melanotis.
Sitta carolinensis.
" pygmæa.
Certhia mexicana.
Campylorhynchus pallescens.
Troglodytes brunneicollis.
Parula superciliosa.
Dendrœca olivacea.
Geothlypis speciosa.
Setophaga picta.
Cardellina rubra.
Progne subis.
Vireo Huttonii.
Ptilogonys cinereus.
Myiadestes obscurus.
Diglossa baritula.
Hesperiphona vespertina.
Chrysomitris pinus.
Curvirostra americana.
Junco cinereus.
Atlapetes pileatus.
Guiraca melanocephala.
Chamæospiza torquata.
Pipilo maculatus.
Cyanura coronata.
Cyanocitta nana.
" californica?
" ultramarina?
" sordida.
Xiphocolaptes emigrans.
Grallaria ——— ?
Contopus mesoleucus.
" sordidulus.
" pertinax.
" virens.
Platypsaris ——— ?
Bathmidurus major?
Trogon mexicanus.
" ambiguus.
Picus Harrisii.
Colaptes mexicanus.
Rhynchopsitta pachyrhyncha.
Chlorœnas fasciata.
Dendrortyx barbatus.

The Secretary read by title a paper by Mr. William T. Brigham, on the Eruption of the Hawaiian Volcanoes in 1868. This will be published in full in the Memoirs.

Dr. B. Joy Jeffries made some remarks on the vision of Fishes and Amphibians.

He said that some two years ago M. Felix Plateau published his researches in the thirty-second volume of the Memoirs of the Royal Academy of Belgium. A typical fish's eye has a thin cornea, small anterior chamber, large and spherical crystalline lens occupying a considerable portion of the globe. Under water the cornea loses its refractive power, as it is bathed on either side by fluids of the same density, water and the aqueous humor. The lens alone being denser, produces the necessary refraction, hence its very spherical shape to refract parallel or diverging rays to a focus on the retina. Out of the water this eye would converge parallel or diverging rays to a focus before they reached the retina, so that the latter would only receive a circle of dispersion, instead of a perfect picture, were it not that, as M. Plateau has shown, the cornea is flattened at its centre over the small pupil of these animals. A large number of fishes were examined, and this was found to be invariably the case. His method of ascertaining this was first to observe a reflected image from the cornea, and more positively by removing the globe, carefully dissecting the muscles, fat, etc., and placing the eye so as to bring the plane of the iris vertical, pour round it thin plaster of Paris a little more than half the depth of the globe, thus obtaining a cast of the meridian curve of the cornea and sclerotic. He obtained such results as are shown by these diagrams, the cornea being always flattened in its central portion. An eye thus constructed would see nearly at the same distance out of, as in the water. A very few of the fishes, however, leave the water, either in search of food, or in migration. But there are a large number of amphibians who have a double existence, and seek their food in the water. When in this element, all refractive power of the cornea, as in man, is eliminated; do they then possess any power of accommodation by which they can render their crystalline lens spherical? None such has apparently yet been shown. If, however, their eyes are like those of fishes, then they will see equally well under as out of the water. The comparative anatomists who have examined the eyes of these animals, all report a large and spherical crystalline lens, the purpose of which was well understood, but apparently simply from lack of attention being called to it, the exact shape of the cornea was undetermined, it being assumed to be convex because the outer portion of it evidently was. It must of course be admitted that there are no true amphibians except a few batrachians. Yet amongst nearly all classes of the animal kingdom there are found species with respiratory apparatus adapted to life in air, which by slight modification of this and of the circulation, are enabled to live a considerable time under the water, and in the majority of cases seek their prey there. Now the presence of the ciliary muscle, the principal seat of the power of accommodation, has been determined in these animals, showing their power of vision in the air at varying distances. Plateau quotes authority to show the resemblance to the typical fish's eye amongst mammals in the seal, whale, *Delphinus Eschrichtii*, *Monodon monoceros*, the otters, the beaver and the water rat. A more or less flattened cornea and spherical lens have been found in these animals. With reference to the birds De Blainville says, "all who dive not only to seize their food by the beak as the ducks, but those which pursue their prey under water, as the divers and similar genera, have eyes exactly like fishes, the crystalline becoming more and more spherical, according to their habits, as shown by successive comparison of the cormorants, ducks, divers and loons." Now if the lens is spherical the cornea must be flattened, as it has been found and described by Siebold and Stannius, and more perfectly by M. Plateau. Among aquatic reptiles we have the crocodile and alligator with eyes like fish. Among the ophidians many are aquatic, as *Tropidonotus natrix* and *Eunectes murinus* of Brazil; of the serpents and of the vipers several species in the genera *Hydrophis*, *Platurus*, *Apysura*, *Disteira*, *Pelamis*, *Acalypta*, etc.

The researches of Schlegel, Jules Cloquet and Soemmering have shown the eyes of these animals to resemble those of the fishes. So also the special studies of Bojanus, Albus and Duméril and Bibron. Of the batrachians, those who seek food under water also have a spherical crystalline lens and flattened cornea more marked, according as their habits are more aquatic, as M. Plateau shows by a comparative examination of *Bufo vulgaris*, *Salamandra maculosa*, *Rana temporaria*, *Triton alpestris*, *Rana esculenta* and *Triton punctatus*. The comparison with the eyes of fishes holds good also among the articulates, those which are aquatic having more flattened corneæ and more spherical lenses.

Dr. Jeffries described M. Plateau's method of determining the distance of distinct vision in the eyes of fishes and batrachians in air and water. His examination of some fourteen species showed but a slight difference in reference to the two media. He also exhibited enlarged diagrams of M. Plateau's plates, giving sections of the eyes of the pike, loach, eel, frog and gull. He remarked that this point was new, and he had noticed it in his own dissections, but had not felt sure it was not a post mortem change. He was, however, sure that too little attention had been paid by comparative anatomists in giving correctly the outline of the section of the eyes of many of the animals. He had, for instance, seen in the living animal that the cornea was almost perfectly flat, yet the sections in the books are found giving a considerable convexity to it.

Dr. J. Wyman stated, as the result of a partial examination of the alcoholic specimen of *Nautilus pompilius*, brought home by Mr. Bickmore, that the chambers contained air.

Section of Entomology. December 23, 1868.

Mr. E. Burgess in the chair. Twelve members present.

Mr. S. H. Scudder made the following remarks upon the arrangement of the families of Orthoptera.

About a year ago I attempted to show by the aid of Graber's researches, that the saltatorial Orthoptera rank higher than the non-saltatorial, because in the latter the primitive position of the wings is retained through life, while, in the former, both pairs of wings essentially change their position during the different stages of growth. I now propose, by a closer examination of the relative ranks of these families and of their mutual affinities, to determine the serial order in which they should be treated.

Let us first observe the views which various authors have held.

Linné, in the tenth edition of his Systema Naturæ, published in 1760, placed the Orthoptera and beetles in the same division (Coleoptera), dividing the former into three genera, Forficula, Blatta and Gryllus; the latter genus he subdivided into the following sections: Mantis, Acrida (Truxalidæ), Bulla (Tetricides), Acheta (Gryllides), Tettigonia (Locustariæ) and Locusta (Acrydii).

In 1764, in his Museum Ulricæ Reginæ, he retained Forficula under Coleoptera, and removed the two other genera to Hemiptera, dividing them as before.

Two years later, in the twelfth edition of his Systema Naturæ, he retained nearly the same arrangement, but elevated the section Mantis to the rank of a genus, placing it between Blatta and Gryllus, and omitted Acrida altogether, merging the species formerly referred to that group in the section Locusta.

Geoffroy, in his Histoire abrégée des Insectes, published in 1764, divided the Coleoptera into three " Articles," in the second of which he placed Forficula, in company with Staphylinus, etc., and in the third the other orthopteran families, together with Thrips. He divided the third into five " orders," viz.: Blatta, Thrips, Gryllus (Gryllides), Acrydium (Acrydii), Locusta (Locustariæ) and Mantis.

In all the works of Fabricius, published between 1775 and 1793, he included these insects in his class Ulonata, dividing them artificially —by the structure of the antennæ—as follows:

I.	Acrydium (Tetricides).
	Gryllus (Acrydii).
II.	Truxalis.
III.	Forficula.
	Blatta.
	Mantis.
	Acheta (Gryllides).
	Locusta (Locustariæ.)

But in the body of his works he always followed a different succession of genera, viz.: Forficula, Blatta, Mantis, Acrydium, Truxalis, Acheta, Locusta, Gryllus.

DeGeer, in the third volume of his Histoire des Insectes, published in 1773, applies the name of Dermaptera to this group, and divided it into the genera Mantis, Locusta (Locustariæ), Acrydium (Acrydii), Gryllus (Gryllidæ), Blatta and Forficula.

Latreille, in his Précis des caractères génériques, published in 1796, divided the Orthoptera into three groups, as follows:

I.		Forficula.
II.		Blatta.
III.	Fam. 1.	Gryllus (Gryllides).
		Locusta (Locustariæ).
		Mantis.
	Fam. 2.	Truxalis.
		Acrydium (Acrydii).
		Acheta (Tetricides).

In his subsequent works, he has uniformly maintained one succession of genera, but has greatly varied his larger divisions at different times. In 1801 and 1807 he arranged the Orthoptera under three unnamed sections, as follows:

Sect. I.		Forficula.	
" II.		Blatta.	
" III.	Fam. 1.	Mantides	Spectra (Phasmida).
			Raptatoriæ (Mantides).
	" 2.	Gryllie.	
	" 3.	Locustariæ.	
	" 4.	Acrydiana.	

In 1810 he divided them into two sections, the first containing Forficulariæ, Blattariæ and Mantides, and the second Gryllides, Locustariæ and Acrydii. In 1817 he gave the name of Cursoria to the first division, and that of Saltatoria to the second. In 1825 he divided them again into three sections, differing materially from the three into which he first separated them, viz.:

Sect.	I.	Forficulariæ.
		Blattariæ.
		Mantides.
		Spectra.
"	II.	Gryllides.
		Locustariæ.
"	III.	Acrydites.

In 1829 he returned to his arrangement of 1810, only dividing the Mantides into two families, as in the last scheme. This method of division was also pursued by Serville, in his Revue des Orthoptères, in 1831, and in his general work on the Orthoptera, published in 1839. Lastly, in 1831, Latreille separated the Forficulariæ from the other Orthoptera, under the name of Dermaptera.

Marcel de Serres, in 1809, divided them into five families: Labidoures (Forficulariæ), Blattes, Anomides (Mantides, including also Mantispa), Nemides (Phasmida) and Grylloides. The latter were again separated into five divisions: Taupegrillons (Gryllotalpa), Grillons (Gryllus, etc.), Dactylions (Xya), Locustaires (Locustariæ) and Acrydiens (Acrydii).

In 1811, Olivier, in the Encyclopédie méthodique, first gave the name of Orthoptera to the group, from which, however, he excluded Forficula, as a coleopteron. He presented no special classification of his own.

Lamarck, both in 1816 and subsequently, divided the Orthoptera into four families,—Locustaires (including Locustariæ and Acridii), Mantides (including Mantides and Phasmida), Gryllonides and Coureurs (including Blattariæ and Forficulariæ).

MacLeay, in 1821, with his peculiar views of classification, allowed five families, arranged in a circle; beginning, for instance, with the Phasmida, the Blattaria were reached either directly, or through the medium of the Acrydina, Locustina and Gryllina, while the Dermaptera were conveniently termed an "osculant" group.

Duméril, in his Considérations générales sur la classe des Insectes, published in 1823, divided the Orthoptera into four families: Forficules ou Labidoures, Blattes ou Omalopodes, Difformes ou Anomides (Mantides and Phasmida), and Grylliformes ou Grylloides (Locustariæ, Acrydii and Gryllides).

In 1830, Leach published his elaborate scheme in the ninth volume of Brewster's Encyclopædia, in which the families under discussion were arranged in three orders,—Dermaptera (Forficulariæ), Orthoptera and Dictuoptera (Blattariæ); his Orthoptera were divided as follows:

Tribe I. Mantides.
  Fam. I. Phasmida.
  " II. Mantida.
Tribe II. Achetides (Gryllides).
  Fam. I. Gryllotalpida.
  " II. Achetida.
Tribe III. Locustides (Locustariæ).
" IV. Gryllides (Acrydii)
  Fam. I. Gryllida.
  " II. Acrydida (Tetricides).

Newman, in the second volume of the Entomological Magazine, published in 1834, considered the Orthoptera as a class, and divided them as follows:

Strips Forficulina,
  Order Forficulites.
Strips Achetina (Gryllides),
  Order Achetites.
Strips Gryllina (Locustariæ),
  Order Gryllites.
Strips Locustina (Acrydii),
  Order Locustites.
Strips Spectrina (Phasmidæ),
  Order Spectrites.
Strips Mantina,
  Order Mantites.
Strips Blattina,
  Order Blattites.

Burmeister, in 1838, in his Handbuch der Entomologie, separated the Dermatoptera (Forficulariæ) from the other Orthoptera, and divided the latter into Latreille's two sections of Cursoria,—families Blattina, Mantodea and Phasmodea, and Saltatoria,—families Acridiodea, Locustina and Gryllodea. The same arrangement was followed by DeHaan in 1842.

Westwood, in his Introduction to the modern classification of Insects, published in 1839–40, separated the Forficulariæ from the other Orthoptera under the name of Euplexoptera; and divided the Orthoptera into Cursoria,— family Blattidæ, Raptatoria, — family Mantidæ, Ambulatoria,—family Phasmidæ and Saltatoria,—families Achetidæ (Gryllides), Gryllidæ (Locustariæ) and Locustidæ (Acrydii).

Blanchard, in the third volume of his Histoire naturelle des animaux articulés, published in 1840, arranges them simply in seven families, as follows: Forficuliens, Blattiens, Mantiens, Phasmiens, Locustiens, Grylliens and Acridiens.

Fischer de Waldheim, in his Orthoptères de la Russie, published in 1846, separated the Forficulines from the other Orthoptera, and divided the latter (omitting the Phasmida, which did not occur in Russia, to his knowledge) into Cursoria,—including Blattina and Mantodea and Saltatoria, — including Gryllodea, Locustina and Acridiodea.

In 1850, Fieber divided the Orthoptera as follows:

Sect. I.	Fam. 1, Blattoideæ.
Sect. II.	
Subsect. I.	
A	
a	Fam. 2, Mantoideæ.
b	" 3, Phasmoideæ.
B	
a	
α	Fam. 4, Acridioideæ.
β	
*	Fam. 5, Locustoideæ.
**	" 6, Grylloideæ.
b	
*	Fam. 7, Scariphasteæ (Gryllotalpidæ).
**	" 8, Xyarideæ (Xya, etc.).
Subsect. II.	" 9, Forficuleæ.

In 1854 he proposed a similar scheme, which I have not seen, but which Gerstæcker in his Bericht reports substantially as follows: the

Orthoptera are first divided into two tribes, Orthoptera genuina and Harmoptera (Forficulariæ). The Orthoptera proper are again divided into two sections, Sternopoda (Blattariæ) and Pleuropoda. The latter are subdivided into Gressoria,—families Mantodea and Phasmodea, Saltatoria,—families Acridiodea, Locustina and Gryllodea, and Fossoria,—families Gryllotalpina and Xyodea.

H. Fischer of Freiberg, in his Orthoptera Europæa, published in 1853, has exactly reversed Westwood's divisions,[1] and united the Mantides and Phasmodea under Fieber's name of Gressoria.

Lastly, Gerstæcker, in the second volume of Carus' Handbuch der Zoologie, published in 1863, divides the Orthoptera genuina, from which he excludes the Dermatoptera (Forficulariæ), into three primary divisions, Cursoria,—including the family Blattina, Gressoria,—including the families Mantodea and Phasmodea, and Saltatoria,—including the families Gryllodea, Locustina and Acridiodea. The Dermatoptera he places below them.

Without attempting to discuss whether the Pseudo-Neuroptera should be admitted into the ranks of the Orthoptera, or to prove that the Forficulariæ should not be considered a separate group equal in value to the other Orthoptera as a whole, I will simply point out the way in which these families seem to me to arrange themselves. Having placed the saltatorial group above the non-saltatorial, a much more difficult question arises in determining the order of the three saltatorial families; I am, however, strongly inclined to place the Gryllides and Locustariæ above the Acrydii, on account of the specialization of the organs for ovipositing in the females, and the more perfected structure and higher character of the organs of stridulation in the males. The intimate relation of these two families to each other, both in the features alluded to, and in the close resemblance of such allied forms as *Phalangopsis* and *Rhaphidophora*, shows that the Acrydii cannot be placed between them, and the only remaining question is the relative position of the Gryllides and Locustariæ. Dufour has shown how similar the internal anatomy of *Xya* is to that of many Acrydii, but this is an exceptional case among Gryllides, and should not be allowed too great weight; on the other hand, the great variety of form of almost any given organ among the crickets, compared with its relative uniformity of structure among Locustariæ, seems to indicate the higher character of the former. And I do not

[1] In my remarks in the previous volume of these Proceedings, p. 390, I had overlooked Fischer's statement, that the table given by him was to be considered a *dispositio ascendens*.

think it is without meaning that the crickets often live in company,[1] that they sing both in concert and during day and night, and are the closer attendants upon man; their stridulating organ, too, seems much more complicated and more extensive, and the pitch of their song is higher; that of the Acrydii again is lowest of all.

The eggs of Gryllides are laid either singly in the ground, in irregular clusters in subterranean passages, or uniformly, in a single row, in the pith of twigs; those of Locustariæ are never laid singly, but either in the pith of plants, in regular clusters in the ground, or in regular rows on stems of plants; those of Acrydii are always laid in clusters, rudely regular, in the ground.

Lastly, the close resemblance between the hind legs of Locustariæ and Acrydii shows that these families cannot be widely separated.

The non-saltatorial families present fewer difficulties. The wide and acknowledged separation of the Forficulariæ from all other Orthoptera, proves that it cannot intervene between any of the families, aud must go to the bottom of the scale.

The Blattariæ are the nearest allies of the Forficulariæ, on account of their flattened shape, the form of the prothorax, etc. From the similarity also of their upper and under wings, their habits of concealment and nocturnal disposition, and their early appearance upon the earth in geological time, they must undoubtedly be ranked next above the Forficulariæ.

The specialization of their anterior legs marks the higher structure of the Mantides, but they show their affinity to the Blattariæ, and their inferiority to the Phasmida, in their flattened abdomen, the tendency of the prothorax to become broad and flat, the structure of the external genital organs, the position of the head and the exclusion of the eggs in a single cluster, enclosed in an ootheca.

The relationship of the Phasmida to the saltatorial Orthoptera is also shown in the cylindrical body, and, to some degree, in the structure of the external genital organs.

[1] It will naturally be objected to this that the Gryllides keep company beneath, or upon the *ground*, and are not given to flight; and that many Acrydii migrate high in the air, in immense swarms. As a whole, however, the swift and controlled flight of crickets is of a superior nature to that of Acrydii, which only use their wings as a parachute, to give greater effect to their leaps, or, at best, beat the air until they raise themselves sufficiently to be borne along by aërial currents; and the company they keep is only the result of their immense numbers and the instinct which leads each one to seek elsewhere the food which its own devastations have made so scarce. Furthermore, there are some Tittigideans which, at least to a certain extent, inhabit the water.

The Orthopteran families may then be placed in the following descending order: Gryllides, Locustariæ, Acrydii, Phasmida, Mantides, Blattariæ, Forficulariæ.

This order, if we omit the Forficulariæ and assume that Burmeister proceeded from the lower to the higher groups in his treatment of insects, is exactly the position assigned to them by that distinguished German entomologist.

January 6, 1869.

The President in the chair. Thirty-four members present.

Professor Carl Wedl of Vienna, Mr. John Cassin of Philadelphia, Hon. Lewis H. Morgan of Rochester, N. Y., and Dr. Burt G. Wilder of Ithaca, N. Y., were elected Corresponding Members.

The following gentlemen were elected Resident Members: Mr. Frederic Amory of Brookline, Mr. James W. Lovering of Cambridge, Mr. Charles F. Gerry of Hyde Park, Drs. Gustavus Hay, William W. Howard, Arthur H. Nichols, George L. Underwood and George F. Waters, and Messrs. H. J. Burton, Jr., James Chadwick, Benjamin F. Dwight, Augustus Hemmenway, George B. Knapp, Stephen C. Martin, Ernest Papendick, Frank H. Thomas and Solon Thornton of Boston.

The following paper was read:—

On the Land-slides in the Vicinity of Portland, Maine. By Edward S. Morse.

The occurrence of another land-slide in the vicinity of Portland, renders this area of considerable interest to the geologist, since this is the third slide that has happened in this region within the space of thirty-seven years. While studying the nature and causes of the recent slide, I became interested in the evidences of prehistoric land-slides, which have modified considerably the surface features of that district.

The first land-slide of which we have any account, occurred on the north bank of the Presumpscot River, above Pride's Bridge, on the night of the fifth of May, 1831.

There are two descriptions of this slide, one of which is contained in a paper entitled "Geology of Portland and Vicinity," by Prof. Edward Hitchcock, and published in the first volume of the Society's Journal. The other account is contained in Dr. Charles T. Jackson's Report on the Geology of Maine. We extract the following from Dr. Jackson's Report. "The season is said to have been uncommonly wet, and the clay, probably loosened by the frosts of winter, was rendered slippery, so that when its hold was broken it glided forward into the river. The waters of this stream were stopped in their course, and so dammed up as to overflow their banks and alter the channel to the southeastward. On examination we find no less than twelve winrows, or long masses of clay which have been precipitated forward, and the stumps of trees remaining all point toward the river.

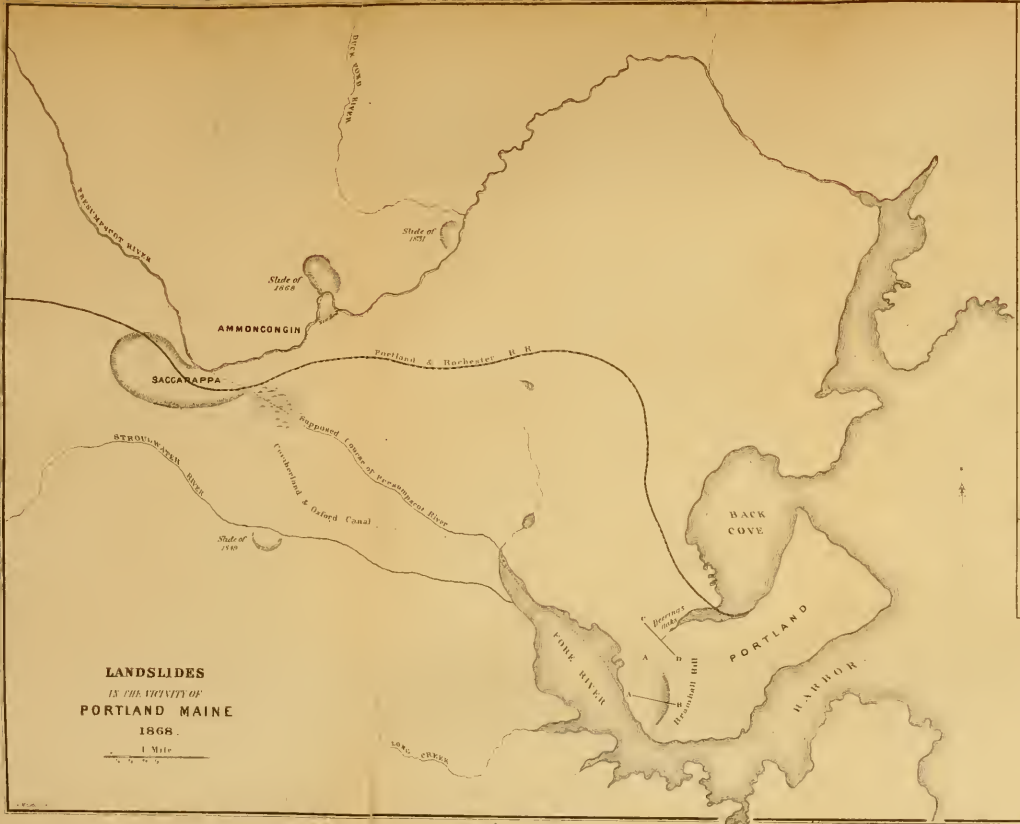
"One of the trees on the border of the stream stands inclined at an angle of 40° from the perpendicular, and toward the stream. The space left by this slide is one hundred and twenty yards in diameter, and the clay banks exposed are elevated thirty feet above the river.

"The lower bed of clay was of a dark blue, and very tenacious and plastic, while the upper beds are more sandy, and of a light gray color." Prof. Hitchcock's account of this slide differs only in two important particulars: that the trees on the ridges all inclined toward the bank, and from the river, and that he was informed that the slide occurred in time of drought.

Prof. Hitchcock is unquestionably right regarding the direction of the trees, and judging from circumstances connected with the more recent slides, Dr. Jackson had the best information regarding the character of the season. This slide is designated on the map accompanying this paper as the "Slide of 1831."

On Tuesday, the fifth day of June, 1849, a land-slide occurred on the southern bank of the Stroudwater River, a mile west of the village of S., and about five miles from Portland. We extract the following account of its appearance from the "Portland Transcript" of that time, a paper that has always contained thoroughly reliable data of events of this nature.

"The first view presented by this slide is a perpendicular descent of over twenty feet, while immediately beneath, and in front, and stretching along what was formerly the declivity of the ridge, is a chaotic mass of blue clay, intermixed with some water and a little



To illustrate Edward S. Morse's paper on the
LANDSLIDES IN THE VICINITY OF PORTLAND, MAINE,
in the Proceedings of the Boston Society of Natural History
Vol. XII Jan. 6, 1869.

sand. The impression it gives the beholder is, that as the land began to sink, the upper portion rushed swiftly down towards the little brook which ran at the foot of the ridge, and in its progress was entirely turned under, while the clay at the bottom came upon top. Scarcely a vestige of the sod is to be seen. In the rapid descent, large trees were carried down, overturned, and in some cases buried in the clay. In one instance a large pine was carried with great force between two trees but two or three feet apart, stripping off the branches upon either side, and burying the top some five or six feet in the earth beyond. The appearance of the upturned earth is billowy, and it is evident that the different strata of soil have been pretty thoroughly mixed up. The brook, now forced from its bed, creeps along the edge of the ruins, while immediately on the opposite bank arises a somewhat abrupt ridge covered with a thick growth of pines." Another report says that the phenomenon was preceded by several loud reports followed by heavy rumbling sounds, resembling thunder. This slide is designated upon the map as the " Slide of 1849." Its area was estimated at seven acres.

On the 22d day of November, 1868, another land-slide occurred on the north bank of the Presumpscot River, above the slide of 1831, and about a third of a mile below the village of Congin, or more properly Ammoncongin. This slide was much greater in extent than those already spoken of. The bed of the river, some two hundred feet in width, was filled for nearly half a mile with the débris. The contour of the sunken area is quite different from the other slides, as will be seen by referring to the map. As one looks into this chasm from the banks above, the appearance is startling. On a large portion of the sunken area, the trees stand nearly vertical, but here and there occur long ridges of soil bearing upon them the trees, inclining at various angles, many of the trees prostrate, and the intervals between the ridges filled with the light, upturned, plastic clay, or huge, square blocks of the unaltered clay. In one place may be seen a portion of an old wood road, with a large pile of cut wood, but little disturbed. Looking toward the river from the sunken area, the sight is singularly wild, for here the masses of earth have been forced out, the ridges of earth crowding upon each other, and trees and shrubs are broken, bent and turned in every direction. A few stately elms on the intervale beyond, show marks of the soft clay four feet above the present level of the surrounding clay, as if this mass surged out in billows, or else a considerable subsidence of the débris had taken place since its movement. These trees have entwined about them smaller trees that were caught by the elms as the torrent of clay swept by. This slide proved very destructive to property, damaging valuable intervale land by its overflow upon it, and by the complete obliteration of the river bed, forming a dam which caused the river to rise some fifteen or seventeen feet, thereby flooding the lower floors of the Cumberland paper-mill, and for a time completely checking its operations. The sunken area measures about eight hundred and forty thousand square feet, and extends back from the river a third of a mile. As in the slides of 1831 and 1849, the substratum consisted of blue clay, above which was a stratum of sandy loam. We have given these general descriptions of the three slides so that one may be better prepared to understand the causes which led to them. Let us now examine a few of the prominent features presented by these disturbances.

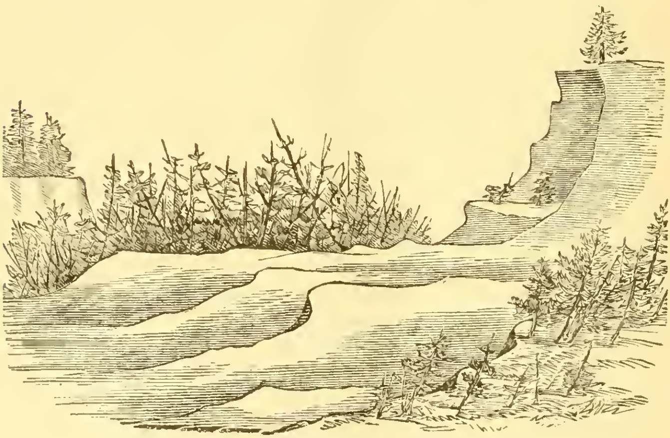


Fig. 1. Sketch of the Ammoncongin Land-slide.[1]

The sunken portion is broken up by ridges running parallel to the exposed banks of the slide, except where the mass is forced into the the river, and there these ridges are overturned, and oftentimes buried. These ridges consist of the surface soil unaltered, bearing upon them the trees, or whatever they originally supported. The

[1] Fig. 1 is reduced from a sketch by my brother, taken from within the sunken area, looking towards the river. It shows very clearly the character of these ridges.

space between these ridges is filled with semi-fluid clay, quite different in condition from the same beds exposed in the banks. These ridges indicate that the slide was not simultaneous, but in detached portions.

A portion of the bank nearest the river first falls, the harder clay above, with the sand and compacted soil, holding together. It slides on an incline, the lower portion being crowded into the river bed; this turns the original ground surface of the mass from the river, and toward the embankment. Another portion falls, forcing up the semi-fluid clay beneath, and perhaps partially burying the first fall, and thus section after section of the land falls until the accumulated débris checks all further progress. As these separate masses fall they force into the river those portions which first fell. In the Ammoncongin slide, the clay and soil were urged down the river quite two thousand feet, and up the river nearly sixteen hundred feet. The embankments of this slide at its outlet are nearly perpendicular, and over thirty feet in height. At its upper end the embankment is twenty-five feet in height, and rises one foot in five from the surface of the sunken area to the upper surface of the clay strata; here the embankment becomes nearly vertical, the vertical portion being confined to the overlying sand, which is about ten feet thick, and this latter feature obtains around the entire embankment. I am indebted to Mr. Hiram F. Mills, Hydraulic Engineer, for these figures, and for the privilege of reducing the plan of the Ammoncongin slide from his surveys. I have roughly estimated the superficial area of the ejected clay at fifteen hundred thousand square feet. Immediately at the mouth of the slide, and in the centre of the old river bed, the clay stands twenty-five feet above the water level, besides covering a large extent of intervale to a considerable depth.

Thus while the phenomena have the appearances of a slide, the evidences are that it is only a "slump" or fall, caused by the softer clay beneath yielding to the pressure above, and being forced out by the weight of the superincumbent mass.

Prof. Dana, in his Manual of Geology, states precisely the character of these movements in the following words: "A clayey layer, overlaid by other horizontal strata, sometimes becomes so softened by water from springs or rains, that the superincumbent mass by its weight alone presses it out laterally, provided its escape is possible, and sinking down, takes its place." p. 649. And he cites a subsidence of this kind that occurred near Tivoli on the Hudson River in 1862.

In a discussion before this Society, participated in by Mr. T. T. Bouvé and Dr. Chas. T. Jackson, the opinion was advanced that these slides might be partially due to the washing away of the substratum. If this were so, we must suppose a chasm to be worn out, and such conditions would be followed up by successive and repeated cavings in of the embankments, and we should expect to see the widest area of the slide bordering the river, while in this last event the area widens as it recedes from the river, and the occurrence evidently occupied but a short time. The softening of the substratum may be partially due to the proximity of the river, but the almost impervious nature of the clay tends to the accumulation of water, and boggy ground above; in the cases above cited, the surface was wet and boggy, and the drainage from these areas passed under the sand, and over the clay.[1] As above remarked, the character of the substratum obstructs free drainage. Thus on the occurrence of long continued rains (a circumstance noticed in two of the above mentioned slides), the clay is reduced to a semi-fluid mass, and the slide occurs as a natural sequence.

If the causes of these slides be rightly interpreted, it follows that where a clay bank of sufficient height borders a river, a slide may be anticipated; for the presence of a clay bank tends to the accumulation of water upon its surface, and the river has cut, or is cutting away the natural prop that would otherwise hold it in place. These slides would have been disastrous to life had they occurred in inhabited regions. In the case of the Ammoncongin land-slide, the damage was estimated at over one hundred thousand dollars, and the checking of the Cumberland paper mills, by which three hundred operatives were thrown out of employment, and losses estimated at one thousand dollars per day incurred. A gang of one hundred and fifty men were required to aid in the opening of a new channel on the intervale, and this has been accomplished.

Since three of these slides had occurred within the space of thirty-seven years, there was every reason to believe that traces of other slides might be detected, and we now proceed to their examination.

Mr. C. B. Fuller called my attention to a gorge below the one of 1868, which was evidently an old slide. Mr. George W. Hammond, the agent of the mills, has called my attention to one revealed by the

[1] In conversation with Mr. Mills, he expressed his opinion that the clay beneath these slides was always in this semi-fluid condition, and that the river in its action tapped these regions, as it were, allowing it to escape.

cutting of a new channel across the intervale opposite the Ammon-congin slide. At a depth of six or seven feet, the workmen came upon sticks and logs, turf and other material, indicating their burial by a slide, the chasm of which, he thinks, was evident in a gully that ran back from the intervale at that place. Several other gullies of like character have been noticed on the river by my brother, Mr. G. F. Morse.

There are traces, however, of two slides of great magnitude, one of which has quite changed the former course of Presumpscot River, as we shall presently see. One of these slides occurred within the city limits of Portland, and has formed the abrupt embankment of Bramhall's Hill. Mr. C. B. Fuller and others have oftentimes remarked the evidences of a slide at this place.

A few weeks since I made a special examination of this spot, and Fig. 2 gives a sectional view of it through the line A—B on the map. *a* represents the embankment over one hundred feet in height, *b* the lateral ridges so characteristic of these slides, and *c* the level mass of clay forced out by the action.

In this view, all the characteristics of a land-slide are as plainly seen as if the slide occurred but yesterday. On looking down from the embankment, the lateral ridges are seen to front the embankment only. While examining this slide from the point marked A on the map, my attention was attracted to the evidences of a river once running through Deering's Oaks, and into Back Cove. In Fig. 3 I have represented a sectional view through the line C—D, on the map. This shows clearly a broad river bed. As one passes over the Portland and Rochester Railroad bridge, and examines the estuary across which the bridge is built, he cannot help remarking the evidences of the former presence of a river at that place, pouring into Back Cove. The traces of a terrace still plainly exist. To the west of this region are scattered brick-yards, and the whole surface is low and clayey, the surface sand being quite removed, and, as I believe, by a series of land-slides. All these evidences prove that at one time a large body of water poured through this region, cutting out the long estuary called the Fore River, producing the Bramhall slide, and, at one time, on being turned aside through Deering's Oaks, assisting, at least, in wearing out the estuary called Back Cove. Certainly the Stroudwater River is too small a stream to have produced these results, since it has no natural reservoir, and drains but a small portion of country.

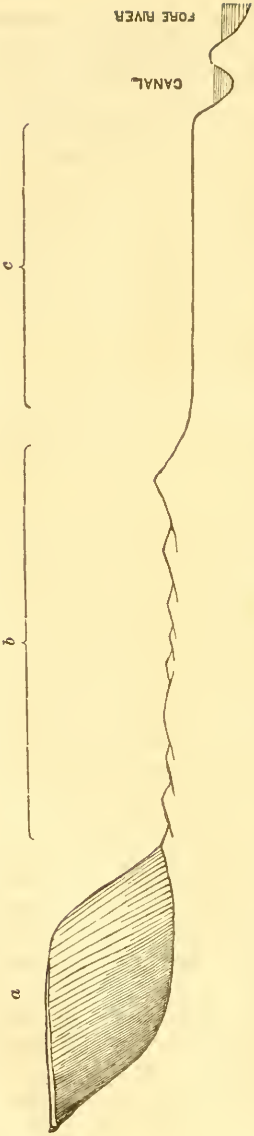


Fig. 2. Section through A—B. (See map.)

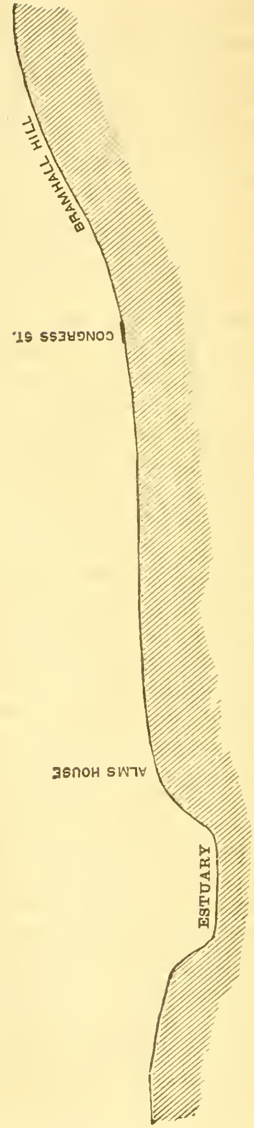


Fig. 3. Section through C—D. (See map.)

My brother, who is quite thoroughly versed in the surface features of this region, concurs with me in the opinion that at one time the Presumpscot river flowed through these estuaries, and originally formed the Fore River estuary.

An additional proof of this is seen in the traces of another slide of great magnitude, which we believe first turned the Presumpscot River into its present course. (The embankments of this slide on the map surround the name Saccarappa.) The outlet of this slide is occupied by the village of Saccarappa. It will be noticed that this slide occurred on the south side of the river, at the precise angle, and is of sufficient magnitude, to have produced these results. And furthermore, my brother has partially traced the old bed of the river commencing south of Saccarappa, and running through the marshy land whose waters empty into Fore River. The supposed old channel is dotted on the map.

As to the evidences of the Saccarappa slide, they are of the most positive character. In the first place, the village rests on a level plain of clay, and bordering this on all sides is an embankment from ten to twenty feet in height. The upper portion of this depression has always been called by the inhabitants Warren's Cellar, and indeed many have regarded this area as sunken land. In digging wells and sewers, trunks and branches of trees are met with at a depth of thirty feet from the surface. My brother sends me a birch stick, and says: "It was dug out at a depth of twelve feet from the surface, and about one eighth of a mile from the present bed of the river. A great many pieces of wood have been found in digging for a sewer. Some loam has been found, but not much. I saw one leaf that was dug out; it was quite fresh. . . . I think there are evidences of another slide running to the south of the Saccarappa slide, and if this is the case, it would lend additional proof to the hypothesis that the river formerly had a southerly course." Another gentleman informs me that he saw a number of leaves of the *Gaultheria procumbens*, which were still green, taken at a depth of thirty feet. Some bones, presumed to be those of a bear, were also found. I have rudely estimated the superficial area of the slide at one hundred and eighty-three acres.

The whole region presents a vast amount of material for study, and we trust that accurate surveys may be made, tracing out these older slides. Additional data may be expected in the course of another year, as my brother will, if leisure allows, follow up to a definite conclusion the speculations already advanced regarding the ancient course of the Presumpscot River.

[NOTE.—From certain points to which my attention was called by Mr. Mills, I am led to believe with him, that in the case of the Ammoncongin slide the movement was quite simultaneous; that the weight of the superincumbent strata of clay and sand pressed out the semi-fluid mass laterally, the sunken area settling with slight lateral motion excepting near the mouth, leaving the sides nearly vertical; and that the ridges at present bordering the bottom of the sunken space are the result of subsequent action.]

Mr. W. H. Niles stated that some workmen recently engaged in boring a well at Fort Warren, had discovered some well preserved shells of *Natica heros*, *Venus mercenaria* and *Cardita borealis*, one hundred feet below the surface of the earth, and just above the slate rock common in the vicinity. He believed this to be the greatest depth from which such remains had been drawn.

January 20, 1869.

Vice President Mr. T. T. Bouvé in the chair. Forty-five members present.

The Vice President announced the death of Mr. John Cassin, recently chosen a Corresponding Member.

Dr. T. M. Brewer addressed the Society as follows: —

MR. PRESIDENT: —

With the deepest appreciation of the irreparable loss which American Science has sustained, even more than with an overwhelming sense of personal bereavement and grief, I appear before you to-night to announce the death of one who, by common consent, has been acknowledged to be the first in rank among American ornithologists. John Cassin of Philadelphia, died in that city, Sunday, January 10th, in the fifty-seventh year of his age.

I would that it were within the compass of my poor words to express to you in language that could do full justice to this occasion, and present, in adequate terms of eulogium, the great and extraordinary attainments of the bright luminary in the science of ornithology which has just gone out in our midst, leaving us without any equal in his department of that science. In sadness which no words can describe — with feelings of utter loneliness and privation, we mourn the departure from our world of science of one who leaves none upon whom his mantle can fall. We can only bow in humble submission to the inscrutable will of our Heavenly Father who has been pleased thus to take from us our brother in the very prime of his mature manhood.

John Cassin was born of Quaker parentage, in Chester, Pa., Sept. 6th, 1813. In 1834, at the age of twenty-one, he took up his abode in Philadelphia, where he has ever since resided. In his earlier life he engaged in mercantile pursuits, and afterwards, for several years, held important positions under the national government. At the death of Mr. Bowen, the principal engraver of Philadelphia, Mr. Cassin assumed the management of the establishment, which he continued until his death. All the reports of explorations and surveys issued by our government have been largely indebted to him for the excellence of their illustrations.

For more than thirty years Mr. Cassin has devoted all the leisure hours he could take from the requirements of his business to the study of ornithology. Privileged to reside in Philadelphia among the kindred spirits that compose its Academy, yet more privileged in having access to its wealth of ornithological specimens, — probably the greatest in the world, — and to its even greater wealth in scientific works, where is to be found, procured by the munificence of his friend, the late Dr. Wilson, every known publication of any value on the subject of ornithology — with all these privileges no one could well have enjoyed greater advantages for pursuing his favorite study, and certainly no one could have better improved such rare opportunities.

With a full appreciation of all that I aver, I claim for my lamented friend, that as a general ornithologist, especially in regard to his knowledge of the forms of the Old World, Mr. Cassin had no superior either in this country or elsewhere—it may even be doubted if he had an equal. By long and diligent study, by the most thorough investigations, and by the most careful researches into the authorities, with a patient perseverance that nothing could discourage, he rendered himself a complete master of the science. So perfectly familiar was he with the forms of the Old World, that he investigated their classification, established new genera and described new species as readily in Africa as in America, and the savans of Europe have accepted with deference his decisions.

Mr. Cassin has been for many years an active member of the Philadelphia Academy of Natural Sciences. His valuable contributions have enriched the pages of its Journal, and added a world-wide reputation to its Proceedings. His activity and zeal in the cause of science have aided to draw around that institution munificent patrons, as well as distinguished colaborers, under whose influence, and by whose means, the Academy has risen to the highest rank as a well endowed and honorable school of the natural sciences. Time would hardly serve me to read even the titles of the fifty-six separate and distinct papers, descriptive, analytic and synoptical, given in the Catalogue of the Royal Society of London, as contributed from time to time by Mr. Cassin to the Proceedings of the Academy, and which constitute only a portion of his valuable contributions to ornithological science. His more elaborate publications have been his Birds of California and Texas, an octavo volume, giving descriptions and colored engravings of fifty species of birds not enumerated by Audubon; the Ornithology of the United

States Exploring Expedition under Lieut. Wilkes; the Ornithology of the Japan Expedition; the Ornithology of Gilliss's Astronomical Expedition to Chili; and the portions of the Ornithology of the Pacific Railroad Explorations and Surveys relating to the Rapacious and the Wading Birds.

His communications and all his contributions to science are distinguished by their careful research, their thoroughness, and their unfailing accuracy—an accuracy that was ever above reproach, and as it seems even beyond criticism.

Nor was it alone as a closet naturalist that Mr. Cassin was distinguished. He was also an ardent lover of nature, and a close observer of living birds, both in their wild wood haunts, and under the open sky. I am indebted to him for much valuable information, derived from his observations upon the habits of various birds; and it was to aid from his unequalled knowledge that we have looked forward for the correct classification of the collection of our Society. But alas, that once ever open volume, so abounding in its wealth of knowledge, is now forever closed to us on earth, and with his fleeting spirit has passed from us that seemingly exhaustless treasury of science to which we never appealed in vain.

As a man, our departed friend was of unswerving uprightness, warm-hearted, cordial and sincere, firm and abiding in his friendship, and only a foe to whatever was wrong, ungenerous or illiberal—possessed of strong, fervent and generous impulses, and frank and outspoken in the expression of his opinions. Decided in his own views, he was still ever tolerant and liberal towards those who differed from him.

In a word, whether we regard Mr. Cassin as the naturalist, whose scientific achievements had placed him in the front ranks of the votaries of science; as the man of business, and the honored head of a house which was devoting all its energies and the highest artistic skill to the illustration of science; or as the ever sympathizing and congenial friend,—his death in the full prime and vigor of life, and in the very midst of his transcendent usefulness, can only be received as one of those inscrutable deprivations which, while we must accept them in humble faith, we cannot but deplore.

While we mourn the loss sustained alike by science and by friendship in his early death, let us who are still among the living not lose sight of the great lessons taught by his valuable life. We can now see what may be accomplished by one man of true science in a brief lifetime. That noble collection in Philadelphia derives its unapproached value from its perfect arrangement and classification, the results of his unwearied diligence and unequalled knowledge. Let us receive with grateful memories the example taught us in his private life, and ever cherish the virtues of kindness, friendship and justice, that so adorned his character. It should ever be the especial aim of all who study the works of nature not to forget to emulate also these attributes of their divine Author.

"Naturalists of all climes should work out their mission in harmony and fellowship. It is often not so,—would that all like Hartlaub cultivated and understood, as well as science, kindness, friendship, justice." May these noble sentiments, the closing words of Mr. Cassin's greatest work, and which so well set forth the moral standard of his own life, become the motto of every true lover of nature, and student of science!

On behalf of the author, the Secretary read the following additional notes as an appendix to Mr. J. A. Allen's paper on the Reptiles and Batrachians of Massachusetts, presented at the meeting of December 2, 1868.

Sphargis coriacea Merr. Mr. E. S. Morse of the Peabody Academy of Science, informs me that a specimen of this species was captured near Portland, Me., in 1866. The specimen, which was of very large size, was examined and carefully drawn by Mr. Morse.

Ancistrodon contortrix Baird and Girard. Prof. A. E. Verrill writes me: "There is, or *was* a specimen of *Ancistrodon contortrix* in the Museum of Comparative Zoölogy, collected at the Blue Hills, Milton, Mass., where it is said they are not uncommon. That is probably its most eastern locality known. It is not rare here." [New Haven, Ct.].

Scaphiopus Holbrookii Baird. Respecting this species, Prof. Verrill writes me: "I notice that you mention the occurrence of *Scaphiopus* last season not only in the 'old locality,' but in the pools and ditches about the Museum! This is quite interesting to me, inasmuch as I took the trouble in the spring of 1860, or 1861, to introduce from the 'old locality' a large number of the eggs, and a few old ones of both sexes, at several points in those very same pools and ditches. But as I had heard nothing of them since, I supposed that the experiment was a failure. But it seems now that it was probably a success! My object was mainly to provide against the probable destruction of the species about Cambridge, by the progress of improvements, and the filling up or draining of the 'old locality.' "

Hemidactilium scutatum Tsch. Prof. A. E. Verrill, among other notes kindly communicated respecting the reptiles occurring about New Haven, observes: "Among our Batrachians I find nothing of special interest except *Hemidactilium scutatum* Tsch., which appears to be not uncommon here.

Amblystoma opacum. Prof. Verrill, writing from N. Haven, says that it "is not rare. The other salamanders and frogs, so far as observed, are those commonly seen about Cambridge."

Diemyctylus miniatus and **D. viridescens.** Prof. Verrill also adds that he "found *D. miniatus* among the mountains of Essex Co., N. Y., quite common (more so, in fact, than I have ever seen it elsewhere). Therefore," he observes, "it is decidedly a member of the Canadian Fauna. I cannot agree with Prof. Cope in regarding this as a form of *D. viridescens*. I have had a pair of the latter in confinement this fall, taken after the frosts set in." Respecting this pair he gives the following interesting observations: "Soon after I got them, the male commenced to embrace the female persistently, clasping her, as usual in this species, with his hind legs back of her fore legs. His hind legs soon became much larger and stouter, and the inside became black and callous, and his color became darker generally, while the blood vessels of the female became turgid with blood, especially about the abdomen, and the anal region of both became enlarged. What would have been the result of all this I do not know, for the female was accidentally killed several weeks ago, and the male has lost all the characters acquired under sexual excitement. This species lays its eggs, in Maine, attached to weeds and grass in shallow water, in oval masses two inches or more in diameter, looking much like frog's eggs." Prof. Verrill further states that Mr. S. I. Smith and himself have both observed them, and that Mr. Smith has reared the young from them. Of these he has saved a complete series for the collection at Yale College, and also sent some to the Museum of Comparative Zoölogy, to which Institution Prof. Verrill has also contributed bunches of the eggs. The breeding habits and the eggs of this species he believes have not been described. It loses its external gills, he states, only quite late in its development, but earlier than *Desmognathus* and *Amblystoma*.

The following paper was read by the Secretary: —

On the Reptilian Orders, Pythonomorpha and Streptosauria. By Edward D. Cope, A. M., Corresponding Secretary of the Academy of Natural Sciences of Philadelphia.

In the course of investigations prosecuted during the past six years, with reference to the structure and relations of the extinct Reptilia, the following general conclusions have been attained, besides many of lesser significance.

1. That the Dinosauria present a graduated series of approximations to the birds, and possess several peculiarities in common with that class, standing between it and the Crocodilia.

2. That serpents exist in the Eocene formations of this country.

3. That the Chelydra type was greatly developed during the American Cretaceous, and that all the supposed marine turtles described from it are really of the first named group.

4. That the Reptilia of the American Triassic are of the Belodon type.

5. The discovery of the characters of the order Pythonomorpha.

6. The discovery of the characters of the order Streptosauria.

7. The discovery of the characters of numerous members of the Batrachian suborder Microsauria in the United States.

PYTHONOMORPHA.

At present I propose to notice the fifth and sixth results of these investigations.

The genus Mosasaurus, since the discovery of the large specimen in the St. Peter's Mount at Maestricht, has been a subject of discussion by many palæontologists, and always to the writer, with unsatisfactory results. While Faujas held it to be a crocodile, Camper and Cuvier regarded it as a lacertilian, and placed it near the Monitors. In the latter relation it has been allowed to remain by Goldfuss and Owen, who have since written upon it, and so it continues to be regarded by all palæontologists of the present day, who have expressed an opinion on the subject.

I hope, however, to be able to demonstrate, by the light of new material recently discovered, that the Mosasauridæ and Clidastidæ constitute a peculiar order of reptiles, which possess many of the characters of serpents, with some of Lacertilia, and others of the Sauropterygia. The reason why, as I conceive, this genus and its allies have been so little understood, has been a lack of analysis of the structure of portions of the cranium little known, as well as of portions better known; and the lack of certainty as to the structure of the limbs.

With reference to the latter, Cuvier says that very few bones of the extremities of Mosasaurus have been found, and their rarity was such that, for a moment, he was led to doubt whether the animal possessed limbs. He states that he was soon undeceived by recognizing a bone of the pelvis which certainly belonged to Mosasaurus. The bone considered to be a pubis, resembling that of the Monitor, is figured in the Ossemens Fossiles. Cuvier further says, that among some fossils from Seichem, he detected a scapula resembling that of the Monitor, and subsequently received drawings from Maestricht of a clavicle resembling that of a common lizard, and also a coracoid bone. From the specimens and figures, Cuvier supposes the shoulder of the Mosasaurus to have exhibited a close resemblance to that of the lizards. After remarking that he had been unable to procure any long bones of the limbs of Mosasaurus, he expresses his views in regard to certain figures of bones, represented by Faujas-Saint-Fond and Camper, reproduced in the Ossemens Fossiles. In regard to the figure of a portion of an ulna, Cuvier says that if the bone belonged to Mosasaurus, it would indicate the extremities to have been moderately elevated. But, he continues, the bones of the feet, so far as they are known, appear on the contrary, to have belonged to a sort of contracted fin, as in the Dolphins or Plesiosaurians. Of the different bones of the feet, figured in the Ossemens Fossiles, after Camper, Cuvier likens some of them to the principal carpal bones of the crocodile; another appeared to belong to some huge saurian, some are phalanges, and two are attributed by him to turtles, whose remains are not less common in the deposits containing those of the Mosasaurus. In conclusion, Cuvier adds that "it was not without hesitation that he expressed the conjectures from mere figures, when the immediate comparison of the bones themselves would scarcely suffice, so great is their diversity, and so small the precision of their forms in reptiles."

Goldfuss describes and figures several bone fragments from the deposits of the cretaceous period of the Upper Missouri, which he views as the portion of a scapula, a coracoid bone, and an olecranon process of the Mosasaurus. In relation to the habits of the animal, he says, that as it lived in the ocean the toes no doubt were webbed, but the remains which have been discovered, on the contrary, do not lead to the supposition that it possessed fins, like the Icthyosauria. Prof. Owen, after remarking that no part of the organization of Mosasaurus is so little known as that of the locomotive extremities, and substantially quoting the views of Cuvier expressed above, enters into the description of some long bones of the extremities, "showing the lacertilian type of structure," which were obtained in the Green-sand formation of New Jersey. Prof. Owen says, "on the highly probable supposition that these bones belong to Mosasaurus, they indicate the extremities of that gigantic lizard to have been organized according to the type of the existing Lacertilia, and not of the Enaliosauria or Cetacea." Pictet says the humerus of Mosasaurus is thick and short, like that of Icthyosaurus, but gives no evidence for this assertion. He adds, we may conjecture, from the flattening of the bones of the members, that the feet were probably converted into fins like those of the Enaliosaurians.[1] Finally Leidy (Cretaceous Reptiles, 42) states that "remains, apparently of Mosasaurus, which I have had the opportunity of examining, indicate the limbs to have been fins, partaking in their structure of the characters of those of the marine turtle and the Plesiosaurus."

An anonymous writer in the Geological Magazine for 1868, commenting on this view, remarks that "admitting the lacertilian affin-

[1] Leidy, Cretaceous Reptiles, 41.

ities of Mosasaurus," this combination, is "incongruous," and assigns the bones mentioned by Leidy, to the turtles and Plesiosauria respectively.

I, however, believe that Leidy has correctly assigned such limbs to the two species that came under his observation; and I add the evidence derived from another species of Mosasaurus, and from one of Clidastes, as entirely confirmatory of it. On the other hand I am unable to assign hind limbs to any of the species of the order.

The characters of the order are as follows:—

1. The teeth have no fangs.

2. There is merely a squamosal suture between the maxillary and premaxillary.

3. The opisthotic bone projects free from the cranium, and is the suspensorium of the os quadratum.

4. There is no columella.

5. There is no symphysis mandibuli.

6. The parietal is decurved posteriorly and unites with the sphenoid, forming the cranial wall in front of the proötic.

7. The subarticular and sphenial elements of the mandible are connected by articular faces.

8. The vertebræ are very numerous, much exceeding one hundred, and frequently present the zygosphen articulation.

9. The abdominal cavity is long, and is surrounded by many short, curved ribs, which have a free antero-posterior movement on vertical, articulating surfaces, and which commence immediately behind the head.

10. The pterygoids are elongate and bear numerous teeth, and in one type are free, except at the extremities.

11. The brain case is not fully ossified anteriorly.

12. Scapular and coracoid elements are present.

13. The caudal vertebræ are furnished with chevron bones.

14. The squamosal bone is present.

15. The angular bone is distinct.

16. The os quadratum is movably articulated to the opisthotic.

17. The os quadratum embraces and encloses the meatus auditorius externus.

18. The opisthotic is supported by a pedestal projecting from the cranial walls, composed of the prolonged proötic in front, and the exoccipital behind, which embraces the suspensorium for much of its length.

19. The anterior limbs are fins, with all the elements in a single plane, the radius incapable of rotation. The humerus broad and flat.

20. There are probably no hind limbs.

Of the above characters the first ten are those of serpents; the five characters following are lacertilian, while the seventeenth and eighteenth are peculiar, and not found in any existing order of reptiles. The eighteenth is characteristic of the Sauropterygia.

The characters of the teeth are much like those of serpents, and resemble much less those of any saurians, since they are without true dentinal fangs; for the ossification of the pulp, which produces a fang-like support to the crown, is only a subordinate character, like that of ossification or non-ossification of cartilages within many existing families. The pterygoids which are in contact immediately in Mosasaurus, are largely free in Clidastes, where they bear teeth as abundantly as do any serpents. Among the Lacertilia the dentition is either truly rhizodont (the Acrodonta) or pleurodont. The teeth of the Varanidæ are especially different from those of the present order, and, present only a modification of the pleurodont character. The outer parapet of the jaw is low, and the shanks proportionately short; they are, in addition, more expanded than in most other pleurodont families.

The characters presented by the temporal region are highly peculiar, and important in determining the affinities of the group. The discovery of its structure furnishes the desired explanation for sundry enigmatical bones which occur not unfrequently in our cretaceous formations. In the following diagnoses the present is compared with the three orders, to which it makes nearest approach.

Testudinata. Opisthotic distinct, closely united to exoccipital, squamosal and proötic, and supporting squamosal and quadratum.

Lacertilia. Opisthotic distinct, closely attached to parietal arc, and at extremity to exoccipital and proötic; supporting squamosal and quadratum.

Pythonomorpha. Opisthotic distinct, not, or scarcely in contact with parietal arc, embraced at one end by proötic and exoccipital, and supporting squamosal and quadratum.

Ophidia. Opisthotic distinct, attached only to proötic, and supporting only quadratum.

There can be no doubt that the suspensorium of Mosasaurus is homologous with the element in the tortoises called by Huxley opisthotic. It appears also to be homologous to, and analogous with, the suspensorium of the Ophidia; hence I conclude that the latter bone is the opisthotic and not the squamosal, as given by Huxley (Elements Compar. Anatomy); and the more, as it coexists with a true squamosal in these extinct reptiles. Internally it forms a very small, or no part of the walls of the cranium; but it is a solid plug between the embracing laminæ of the proötic and exoccipital. The two latter bones are therefore unusually and peculiarly prolonged outwards, and unite by their edges on both the upper and inferior faces of the suspensorium. The fenestra ovalis is at the base of the infero-posterior face of the latter, and enters an exceedingly small vestibule. The fenestra rotunda is immediately below it, and is funnel-shaped, with a small orifice. In the small development of the auditory apparatus, it is again like the serpents.

The mandibular arch is very much like that of serpents. The lack of symphysis gave each ramus the independent motion which they possess in the Ophidia. The articulation of the splenial is a character not seen in any lacertilian, but is highly characteristic of the boæform serpents of the genera Loxocemus and Eryx, though it does not occur in Boa proper, nor in many other serpents. This has allowed of considerable motion, as the bones of the ramus above it are scarcely united by a squamosal suture, and the dentary terminates abruptly in a furcation of the coronoid, etc. This termination, with the articular faces of the inferior elements, is characteristic of fragments not uncommon in the cretaceous beds, and which have never in this country been referred to their place. The coronoid bone also is developed only as in the few serpents that possess it,—as Eryx, Xenopeltis and Boa; Goldfuss notices its great anterior prolongation and curvature, and overlapping of the extremity of the dentary. Finally the obtuseness and abbreviation of the angle of the jaw is ophidian, rarely lacertilian. The distinctness of the angular bone is, on the other hand, a lacertilian feature.

In the genus Clidastes, the pterygoid bones are distinct, except at their anterior extremity, as in serpents, and bear a long series (17 e. g.) of teeth, resembling thus the serpents.

The vertebral column closely resembles in many features that of the serpents. It is longer, and contains more numerous vertebræ than any lacertilian or saurian type, and has, therefore, a much more slender form than they. The ribs are cylindric, as in serpents, and are present throughout the cervical, long dorsal and lumbar series of vertebræ, forming a much longer series, and embracing a more ophidian visceral cavity, than is seen in the other reptilian types. An important section of the order possesses the zygosphen articulation and vertebræ closely resembling those of the serpents. The diapophyses present the vertical costal articular face of the Boas. The immensely long tail, used as a powerful swimming organ, is flattened as in the sea snakes, while its chevron bones are a lacertilian rather than ophidian character.

The proötic extends from the basioccipital to the parietal, and overlaps the latter by its superior anterior margin; this does not occur among Lacertilia, except in aberrant forms, but is common to all serpents. There is a strong superior and anterior ala on the sphenoid, which articulates with an alisphenoid.

The ribs are cylindrical throughout much of their length, and resemble those of serpents and lizards in their articulation, by a compressed vertical head, to a vertically compressed diapophysis.

With respect to the characters in which this order is identical with the Lacertilia, the following observations may be made.

The brain case appears to be unossified anteriorly, as in tortoises, crocodiles and lacertilians, and the parietal both descends, as in Testudinata, and the alispenoid ascends, as in Crocodilia.

The scapulæ and coracoids are not very different from those of lacertilians, and are not coalescent. The scapula appears to have had an angle or process similar to the procoracoid, while the coracoid is entirely without the emarginations common to Lacertilia. No trace of claviculus, mesosternum or xiphisternum has been found. On the whole, the scapular arch is quite as likely to be similar to that of the Sauropterygia, at that of the Lacertilia.

The attachment of the palatines to the maxillaries is a lacertilian feature.

The os quadratum is like that of the Lacertilia in its form and its support by two suspensoria. It is as mobile as in the serpents, and differs from that of both these orders in enclosing the meatus auditorius behind by a large decurved process. In this these animals resemble the Testudinata, but in this only, for it is not attached to the proötic in front as in them.

In both families of the order there is a zygomatic or squamosal arch, but it is very doubtful whether any malar arch exists. There is no connection by malar or quadrato-jugal posteriorly.

The chevron bones of the caudals, as is well known, are highly developed; they resemble those of some saurians. These elements do not exist in the Ophidia, where hypapophyses take their place. A structure somewhat resembling the latter seems to exist in Elasmosaurus.

The parietal fontanelle is similar to that seen in Lacertilia and Sauropterygia.

Thus seven characters in which it resembles the Lacertilia are shared by at least one other order of reptiles. In its lacertilian characters it approaches nearest the Varanidæ, which themselves, offer some approximations to the Ophidia. The elongation of the proötic anterior to the internal ear is a character of all the slender-tongued lizards, and the long superior nostrils and lack of malar arch belong only to the Varani.

The singular manner in which the opisthotic is supported is only paralleled, so far as I am aware, by the ophidian family of the Tortricidæ, where it is similarly projected from the grasp of the proötic and exoccipital, as suspensor of the quadratum. In Cylindrophis the parietal and part of the supraoccipital enter the connection also.

The anterior limbs, as has been observed, combine the characters of Testudinata and Sauropterygia. The ulna and radius, and all more distal portions of the limbs, are those of the latter order. The large, ovoid, flat carpals, and flat, medially contracted digits, with fixed articulations, are of that type.

From the preceding evidence, we may now look upon the mosasauroids and their allies as a race of gigantic, marine, serpent-like reptiles, with powers of swimming and running, like the modern Ophidia. Adding a pair of short anterior paddles, they are not badly represented by old Pontoppidan's figure of the sea serpent.

That terrestrial representatives now unknown to us, inhabited the forests and swamps of the Mesozoic continents, and strove for mastery with the huge dinosaurs, that also sought their shades, is probable. That their habit was to devour whole is evident, and though the articulation of the lower jaw will not admit of as much extension as that of the Ophidia, it exceeds other reptiles in this capacity in consequence of the lateral motion of the splenial articulation. The carnivorous dinosaur, on the other hand, tore his prey to pieces, as do mammals of the present day.

Thus in the mosasauroids, we almost realize the fictions of snake-like dragons and sea serpents, in which men have been ever prone to indulge. On account of the ophidian part of their affinities, I have called this order the Pythonomorpha.

In time they immediately preceded the Eocene Palæophides, and probably will find in them structural allies.

The families embraced are two, the Mosasauridæ and Clidastidæ, which differ as follows: —

The vertebræ with the zygosphen articulation; the pterygoids free on the internal and external margins; no (?) postparietal arch . . . CLIDASTIDÆ.

The vertebræ without the zygosphen articulation; the pterygoids in contact on the median line; (?) a postparietal arch . . . . MOSASAURIDÆ.

I think it highly probable that the genus Saurospondylus of Seeley, from the lower chalk of England, belongs to this order. If so, it is the type of a peculiar family to be known by the absence of neural spine and low position of the zygapophyses, which have horizontal articular faces. The *S. dissimilis* Seeley, is a much smaller animal than any here enumerated, and is known by a single vertebra.[1]

Goldfuss states that Mosasaurus possesses a malar arch. This is absent in Clidastes, and I am inclined to doubt whether Goldfuss has demonstrated his point; if present, he states that it is very slender.

CLIDASTIDÆ.

CLIDASTES Cope, Proc. Acad. Nat. Sci. Philad., 1868, p. 233.

In this genus there has been no trace of hind limbs found.

Clidastes iguanavus Cope, Proceedings Acad. Nat. Sci, Philad., 1868, 181. Ibid. 1869.

Cretaceous Green-sand of New Jersey.

Clidastes propython Cope.

This species is known from an almost complete skeleton found by Dr. Edw. R. Showalter in the Rotten Limestone, near Uniontown in Alabama.

Its general proportions may be estimated as follows: As a considerable number of vertebræ have been lost, it will be necessary to illustrate in some points from Cuvier's estimate of the length of Mosasaurus Camperi.

[1] See Ann. and Mag. Nat. Hist., Sept., 1855.

M. CAMPERI.			C. PROPYTHON.
	2	Atlas and Axis	2
	11	Cervicals with hypapophysis	6
	5	Dorsals with zygapophyses and ribs	15
	—	At least to be added to this series	10
18	1	Total	33
64	2	Between the last and those bearing chevron bones (estimated for C. propython).	96
51	3	Caudals with chevron bones.	60
133		Total	189

Where the dorsal series of the *Cl. propython* is interrupted, the vertebræ have increased in the strength of their processes rather than diminished, and I consider an addition of ten to be below rather than above the mark. Of the caudals there are preserved forty-four, all with chevron bones, and none with diapophyses. I have added nine for those without chevron bones, while the interruptions in the series readily justify the addition of seven more. The last series is estimated from that of the *M. Camperi*, adding relatively to the increase observed in the series preserved. The length may be estimated as follows:

	Inches.
Of the cervicals and dorsals (average)	$37\frac{1}{8}$
Remaining vertebræ with diapophyses	90
" " without "	30
The cranium	$14\frac{1}{2}$
Total; 14 feet, $3\frac{5}{8}$ inches	$171\frac{5}{8}$

The very ophidian character of the vertebræ, however, leads me to suspect that the length will be hereafter found to be considerably greater. The relative length of the cranium above given, is not greater than in the Iguana, while its dimensions, as compared with the cervical vertebræ, are not relatively greater than in the existing serpents. If the ophidian characters, therefore, were as strongly exhibited in the vertebral series as I suppose, the length would be eighteen feet at the least.

The discoveries with reference to the vertebral column of the *M. missuriensis* prove Cuvier's estimate to have been much too low; while Goldfuss' estimate for the former is probably as much behind nature as Cuvier's is behind *it.*

MOSASAURIDÆ.

There are probably three generic forms known in this group. We know them to differ so far, only in their vertebræ and mode of implantation of teeth, though no doubt others exist. As to distinguishing them by the crowns of their teeth, I doubt the possibility of this, not only in this family, but even in any of the order, so far as known. They are, in this respect, like the serpents, whose genera cannot be distinguished in peculiarities of the solid teeth only:

The dorsal vertebræ compressed, the body elongate . . . . MACROSAURUS.

The dorsal vertebræ more or less depressed; the articular faces transversely ovate; pterygoid teeth in alveoli . . . . . MOSASAURUS.

Vertebræ as the last; the pterygoid teeth pleurodont . . . . PLATECARPUS.

The species which have been described appear to be referable to the above genera, as follows:

MACROSAURUS Owen.

This genus has undoubted relationships to Clidastes; I have observed in a few of its vertebræ traces of a notch which, in the latter, separates the zygosphen from the zygapophysis. Unfortunately other portions of the genus are unknown.

Macrosaurus validus Cope. sp. nov. *Nectoportheus validus* Cope, Proc. Acad. Nat. Sci. Philad., 1868, 181.

Cretaceous Green-sand of New Jersey.

Macrosaurus lævis Owen, Quart. Journ. Geol. Society, London, 1849, v, 380.

Cretaceous Green-sand of New Jersey and ? North Carolina.

MOSASAURUS Conybeare.

There are numerous species of this genus which appear to belong to two groups, the one characterized by the rounded, and the other by the depressed form of the lumbar vertebræ. A species of the latter type has been referred to the genus Amphorosteus by Gibbes. They, however, seem to graduate into each other in such a way as to preclude generic distinction on that ground.

The giants of the order belong here, for the *M. missuriensis*, *M.*

Mitchillii and *M. Camperi*, are among the most elongate of animals. They are only exceeded by some of the whales of the present day. Add to this their slender proportions, with no doubt, powers of swimming in the ocean, running, springing and climbing on land, and we have a combination of characters more formidable than those of the cimoliasaurs, elasmosaurs and crocodiles of that age of great reptiles.

Leidy observes that the varieties of form in the teeth indicate unusual variation for a single species, or else a larger number of species than has been hitherto supposed. I adopt the latter view after a comparison of extended material, as I find the most marked peculiarities in the quadrate bones and vertebræ, in addition to those of the teeth.

I. The posterior dorsals elevated, and with subpentagonal section.

Mandibular teeth fourteen on each ramus; premaxillaries six; pterygoids eight, of moderate size . . . . *M. giganteus.*

Mandibular teeth twelve, spaced. Size smaller . . *M. gracilis.*

Mandibular teeth ? ; premaxillaries four, pterygoids eight, subequal ; the shaft of the humerus slender sub-cylindric; squamosal bone without horizontal expansion on the opisthotic; quadrate bone longer than broad, its proximal extremity an open sigmoid with a very small continuation on the edge of the ala; teeth more or less facetted. . . . . *M. Mitchillii.*

Quadrate bone above a closer sigmoid, with a long, wide continuation on the edge of the ala ; knob inside the meatus very small. . . . . *M. maximus.*

Teeth compressed, without facets, the pterygoid unequal, the median very large; together eight. . . . . *M. impar.*

II. The posterior lumbars with depressed centra, and ovate extremities.

α. Large species.

β. Anterior lumbars little depressed.

Mandibular teeth fourteen; pterygoids ten; squamosal with broad, triangular expansion above opisthotic. Quadrate bone longer than broad. Dorsals transversely ovate, sides rounded . *M. missuriensis.*

β β. Anterior lumbars flattened like the posterior.

Dorsals flattened, with lateral keel on side; caudals vertical and ovate. . . . . *M. Brumbyi.*

α α. Small species.

Centra transversely ovate; caudals vertical ovate . . *M. minor.*

Mosasaurus giganteus Soemmering. *Lacerta gigantea* Soemmering. *Mosasaurus Hofmannii* Mantell. *M. Camperi* Meyer. *M. belgicus* Hall.

Upper cretaceous; Belgium, Rhine-Prussia and England.

Mosasaurus gracilis Owen, British Fossil Reptiles. Upper cretaceous, England.

Mosasaurus Mitchillii DeKay. *Geosaurus Mitchillii* DeKay. *Atlantochelys Mortoni* Agassiz. *Mosasaurus Cowperi* and *M. carolinensis* Gibbes.

The upper cretaceous of the Eastern United States.

In addition to the characters already pointed out, this species differs from the *M. missuriensis*, as follows, judging from the figures and descriptions of Goldfuss.

In *M. Mitchillii* the proötic wraps over the opisthotic to its superior face; in *M. missuriensis* the exoccipital wraps over to the superior face of the same bone.

In *missuriensis* the squamosal forms a horizontal three-cornered expansion, and only touches the opisthotic behind.

In *Mitchillii* the squamosal is largely inferior, and has no superior expansion.

In *Mitchillii* the under face of the suspensorium is underwrapped by the proötic, in *missuriensis* by the exoccipital. Glenoid cavity two thirds on squamosal in *M. Mitchillii*; not at all on squamosal in *M. missuriensis*.

Mosasaurus maximus Cope. sp. nov.

This new species is indicated by a nearly perfect os quadratum, several dorsal and cervical vertebræ, including axis and atlas, a portion of the mandible with probably numerous teeth. The latter have not yet come into my hands. The remains indicate an animal of the largest size, perhaps seventy-five feet in length.

The quadrate bone, compared with those of two other species from the New Jersey Green-sand, presents marked characters. Six quadrate bones of the *M. Mitchillii* exhibit such constancy in the form as was to have been anticipated, while one of the third species,—perhaps the *M. depressus* Cope, is quite different from both. Its proximal extremity is sub-tripodal, the external angle being much longer than that over the great ala, being in fact a process. In the *M. maximus* and *M. Mitchillii*, it is an obtuse angle, and that over the ala a process, which is very large in the former, and small in the latter. The knob just within the meatus of the ear is very prominent in the *M. depres-*

sus and *M. Mitchillii*, while it is rudimental in *M. maximus*; in the latter the outer ridge bounding the meatus is prolonged into a process below, which is merely rudimentary in the two species named. The centra of the dorsal vertebræ are very cylindric, and shortened antero-posteriorly.

The full description of this species is reserved for the monograph now in publication. The remains preserved are larger in their proportions than those of the Mæstricht animal. A portion of an individual from the lower Green-sand bed of Monmouth Co., N. J., has been submitted to me by the director of the geological survey of the State, Prof. Geo. H. Cook. Portions of an individual of similar proportions, which were found in Gloucester Co., are preserved in the Cabinet of the Burlington Co. Lyceum. Vertebræ quite similar have been brought by Dr. F. V. Hayden from Nebraska.

The *M. Mitchillii* may attain the dimensions of this species, though none such have come under my observation. The names which may be applied to this animal are few. The *Atlantochelys Mortoni* Agass., may refer to any large species of the genus, so far as our knowledge goes; it has, however, never been described, and cannot therefore retain this name. The *Mosasaurus DeKayi* Brown, is founded on a tooth like that of *M. Mitchillii*, and cannot be distinguished on such basis alone. The *M. impar* is only known from jaws and teeth, and hence is the only species the name of which is liable to have been duplicated here. It may belong to any of the American species here enumerated, except *M. Mitchillii* and *M. missuriensis*, whose teeth are well known. As it is earlier named than, and may be the same as *M. depressus* Cope, I do not describe the remains of the latter here.

The *Elliptonodon compressus* Emmons, I do not consider to be a Mosasauroid. The *Baseodon reversus* Leidy, is founded on pterygoid teeth of some species. They resemble those of *M. Mitchillii.*

Mosasaurus missuriensis Harlan. *Ichthyosaurus* do. Harlan, Trans. Amer. Philos. Soc., IV, 405, Tab. xx, 1834. *Batrachiosaurus* Harlan. *Batrachiotherium* Harlan. *Mosasaurus neovidii* Meyer. *M. Maximiliani* Goldfuss. *M. missuriensis* Leidy.

An unusually perfect specimen of this species was recently exhumed by W. E. Webb, near the town of Topeka in Kansas. My friend, Prof. J. Parker of Lincoln College of that place, informs me that it is seventy-five feet in length, and the gentleman who discovered it, that it measures eighty feet. Its mandibular rami are stated by the latter to measure five feet. Measurements of the vertebræ indicate them to be of a size quite similar to those of large individuals which have been discovered in the Green-sand of New Jersey. They measure as follows, as stated on photographs by my friend, W. E. Webb.

	Diameter.
Cervicals, centra only	2.5 inches.
Dorsals, with diapophyses	7 "
Lumbars	2 "

These proportions illustrate again the ophidian form of this genus, and the relatively large size of the head.

The teeth resemble in size those of large specimens of *M. Mitchillii.* A cranium of this species has been figured by Goldfuss of Bonn.

The following corrections should be made in the nomenclature adopted by him in the explanations of his plate, Nova Acta Nat. Cur., 1845, tab. VI to IX.

TAB. VI.

T. is squamosal, called *temporal.*

T. m. is opisthotic called *temporo-mastoid.*

T. p. is proötic and epiotic.

P. is a thin lamina of parietal, prolonged backwards over supraoccipital.

TAB. IX.

2 ? ? said to be pubis.

3 is quadratum, said to be olecranon.

From the upper cretaceous of Middle North America.

Mosasaurus Brumbyi Gibbes. *Amphorosteus Brumbyi* Gibbes. Smithsonian Contrib. to Knowledge, II, 9, Tab. III, 10–16.

This species appears to be common in the rotten limestone of Georgia and Alabama. Further description in MS. will be published hereafter.

Mosasaurus minor Gibbes. Loc. cit. 7 Tab. I, 3–5.

This small species appears not to have been so large as the *Clidastes iguanavus* Cope.

The cretaceous of Alabama.

PLATECARPUS Cope. (From πλάτη, an oar.)

This genus is especially characterized by the peculiar insertion of the pterygoid teeth. Its humerus also is more chelonian than that of Mosasaurus, while the os quadratum presents marked differences.

These peculiarities have been pointed out by Leidy, who refers the species to the genus Holcodus of Gibbes. Now this genus Leidy shows was made to include also teeth of Hyposaurus, and it may be that the name should be restricted to that genus, as its meaning is "grooved tooth," a term not applicable to a Mosasauroid. But as it has been accepted for the Mosasauroid included by Gibbes, by the next writer, Leidy, it must be retained for it, according to the just rule usually followed. There is, however, for us no evidence that the present genus possessed such a tooth; and as the teeth of all the genera bear such a close mutual resemblance, I think it must be left for future discovery to determine the application of the genus Holcodus.

Dorsals transversely ovate, rounded; quadrate bone broad as long, meatus larger. Humerus little contracted medially, with flat shaft; pterygoid teeth eight . . . . *P. tympaniticus.*

Platecarpus tympaniticus Cope. *Holcodus acutidens* Leidy, Cretaceous Reptiles N. Am., p. 118, Tab. VII, 4–7; VIII, 1–2–7; XI, 14; vix Gibbes Smithson. Contrib., 1851, II, 7, Tab. I, 3–5 vel Leidy, loc. cit., Tab. X—17.

The individual of this Mosasauroid, from which it is known, was of medium size; it was found in the upper cretaceous of Mississippi, near Columbus, by Dr. William Spillman.

STREPTOSAURIA.

Under this name I have characterized a group of high rank among the Reptiles, which is allied to the Sauropterygia. The diagnosis will be as follows.

The articular processes of the vertebræ, reversed in their directions; viz., the anterior looking downwards, the posterior upwards; the procoracoids distinct from the scapulæ, but confluent with each other and the mesosternum into a simple breast plate. Mandible with symphysis. Pelvic arch present; limbs present. Neural arches of vertebræ coössified with centra.

The characters of this order are altogether peculiar. They are largely derived from an almost complete specimen of *Elasmosaurus platyurus* Cope in the Museum of the Academy of Natural Sciences of Philadelphia. The vertebral character may be explained on the supposition that the zygosphen and zygantral articulation is present, and the zygapophysial wanting, or that the obliquity of the faces of contact of the zygapophyses is reversed. The genera known are three,

I. The vertebræ plane, moderately elongate.

Tail very long, compressed; fore limb small; no diapophyses on lumbar region . . . . ELASMOSAURUS.

Tail short, depressed; forelimb strong; diapophyses on lumbar vertebræ . . . . CIMOLIASAURUS.

II. The vertebræ with very short antero-posterior diameter, slightly biconcave . . . . CRYMOCETUS.

The species indicated are seven, as follows:

ELASMOSAURUS Cope.

Elasmosaurus platyurus Cope. Proc. Acad. Nat. Sci., Phil., 1868, 92.

Length about forty-five feet; bulk of body near that of an elephant. The upper cretaceous of Kansas.

Elasmosaurus orientalis Cope, MS.

Dimensions similar to those of the preceding. The Cretaceous Green-sand of New Jersey.

Elasmosaurus constrictus. *Plesiosaurus constrictus* Owen, British Reptiles.

Known only from a caudal vertebra from the British Chalk.

CIMOLIASAURUS Leidy.

Cimoliasaurus, *Discosaurus* and *Brimosaurus* Leidy.

Cimoliasaurus magnus Leidy, Cretaceous Reptiles N. Am. *Discosaurus vetustus* Leidy l. c.

Cretaceous Green-sand of the Eastern United States.

Cimoliasaurus grandis Leidy. *Brimosaurus grandis* Leidy. Proc. Acad. Nat. Sci., Philad., 1854, 72.

Upper cretaceous of Arkansas.

Cimoliasaurus latispinus. *Plesiosaurus latispinus* Owen, British Reptiles.

From the Green-sand of England. Perhaps it is an Elasmosaurus.

CRYMOCETUS Cope.

Crymocetus Barnardi. *Plesiosaurus Barnardi* Owen, British Reptiles. Palæontographical Soc., Cretac. Rept., Tab. XVIII.

From the chalk of England. This species is founded by Owen on supposed cervical vertebræ. They appear to me to be rather lumbars, and to indicate an ally of the preceding genera.

Dr. C. T. Jackson announced the discovery of a new locality for tin ore in Winslow, Maine.

Mr. Daniel Moore of Waterville, Maine, has recently sent me some samples of tin ore, discovered on the farm of Benjamin Furbur, one and a half miles below Winslow bridge on the road to Augusta.

The rock in which the veins exist is a compact mica slate or gneiss, and the vein stone consists of fluor spar (of a purple color), silvery radiated mica in hexagonal prisms and quartz. A little granular arsenical iron or mispickel, is found in the quartz, and some patches of yellow copper pyrites.

The tin ore is the brown tin stone or cassiterite (oxide of tin colored with oxide of iron), and the ore is crystallized in modified quadrangular prisms, which are pretty well terminated, and in hemitrope crystals or macles of larger size than usual.

The bed rock is reported by Mr. Moore to be eight feet in width, and as having a course of northeast and southwest. The fluor spar veins are represented to be from one half inch to one foot wide, and they carry the tin ore. The number of these veins is stated to be from twelve to fourteen, and most of them contain tin ore in scattered crystals.

I have made the following assay of the tin ore. After reserving the samples, which I now exhibit to the Society, I took the rest of the ore (which, after being pulverized, weighed three hundred and thirty-three grains), and washed it down to one hundred and seventy-five grains of concentrated ore. This, digested with a mixture of nitric and chlorhydric acid, until all matters soluble in acids were removed, and the tin ore which remained undissolved, was collected on a filter, washed, dried, and weighed one hundred and sixty-three grains.

This reduced in a crucible lined with lampblack, and the tin purified by melting it with borax, gave seventy-five and one-half grains of pure metallic tin, or 46.32 per cent., on the concentrated ore.

It is a satisfaction to be able to announce the discovery of a real tin mine, after having seen so many pretended discoveries of this ore published, which had no mineral foundation. It is to be hoped and expected that when people learn to recognize tin ores, that more localities of them will be discovered, especially in the New England States where there are obvious geological indications of their existence.

Capt. N. E. Atwood presented the following description of a shark, *Carcharias tigris* Atwood.

The whole upper portion of the back dark blue; this color extends eight inches down the sides of the body from the anterior portion of the first dorsal; below this there is a band, eight inches broad at this point, of a light leaden color, running the entire length of the body, but becoming narrower as it extends forwards and backwards, in proportion as the circumference of the fish diminishes; the edge of this coloring is very uneven. Gape of the mouth large; both jaws armed with four prominent rows of visible teeth; other rows, lying behind, are flat and covered by the membrane; the largest teeth are near the tip of the lower jaw and measure $1\frac{1}{4}$ inches in length, and $\frac{1}{4}$ of an inch in breadth, at the base; they are smooth and curve inwards.

Length 8 feet 10 inches. Breadth at the origin of the first dorsal 22 inches; at the extremities of the ventrals 10 inches; distance from the tip of the pointed snout to the first branchial orifice 2 feet; from the first to the fifth, and last branchial orifice 5 inches; branchial apertures about 9 inches in length, nearly equal; from the tip of the snout to the eye 8 inches; the nearly circular eye $1\frac{1}{2}$ inches in diameter; distance between the eyes $7\frac{1}{4}$ inches; the nostrils are placed $2\frac{3}{4}$ inches in front of the eyes.

The anterior portion of the first dorsal is placed 3 inches behind the pectorals; it is 13 inches high and 12 inches long at the base, $2\frac{3}{4}$ inches of the posterior extremity remaining unattached. The second dorsal is placed 25 inches behind the posterior edge of the first dorsal; it is $2\frac{1}{4}$ inches high and 4 inches long at the base, 3 inches of its posterior extremity remaining free; distance from the posterior extremity of this fin to the base of the caudal 7 inches. Pectorals 23 inches high and $11\frac{1}{2}$ inches long at the base, 4 inches remaining unattached. The anterior portion of the ventrals arises on a line opposite the middle of the space between the two dorsals; they are four inches high and eight inches long at the base, three inches of the posterior extremity remaining free. The anal fin arises one inch behind a point opposite the front of the second dorsal, with which it corresponds in form and size. The upper lobe of the caudal, measuring from the anterior edge of the base is 23 inches in length, the lower lobe 18 inches; the tips of its lobes are 31 inches apart; the centre of this fin measures 9 inches in breadth.

The first specimen of this very rare shark was brought from the

Gulf of Mexico, and presented to the State Cabinet; the second was taken at Truro and presented to the Museum of Comparative Zoölogy; the third, which had bitten off and swallowed large portions of a sword-fish, was captured in 1864, at Provincetown, and given to the Society. A fourth specimen, a female, and the one described above, was taken at Provincetown, in August last.

In external form it resembles *C. Atwoodii* more than any other species; but differs from that in the form of the mouth, in the shape and armature of the teeth, and in the direction and comparative length of the branchial orifices.

The specimen seemed to be a young one, as no *Remoræ* were found attached to its head, as was the case in the specimen formerly presented to the Society; upwards of twenty parasites of one species were taken from the outer surface of the body, and three of another kind from its mouth; in its stomach and intestines several tape-worms of various lengths were found; in the stomach were remains of several Dog fish in a state of decomposition; the liver was large, and yielded about five gallons of oil.

Section of Entomology. January 27, 1869.

Mr. C. S. Minot in the chair. Thirteen members present.

The following paper was read:—

Description of North American Bees. No. 2. By E. T. Cresson.

Family ANDRENIDÆ.

Genus Prosopis Fabr.

§. *Species from the United States.*

1. **P. basalis** Smith, Brit. Mus. Cat. Hym., i, p. 23. ♀. Entirely deep black; head and thorax opaque, finely punctured, more closely so on the face; mesothorax with a central impressed line, and a short one on each side over the tegulæ; enclosed space at base of metathorax rugose, the latter pubescent; wings hyaline, the apical half faintly

tinged with dusky; nervures black, recurrent nervures generally confluent with those of submarginal cells, but sometimes the second is received by the second submarginal cell near its tip; legs clothed with thin, hoary pubescence; abdomen smooth and polished at base, indistinctly punctured at tip; a slight apical fringe of hoary pubescence on each side of basal segment. Length three and one half to four lines.

The ♂ is longer and narrower, clothed with whitish pubescence, the abdomen subopaque, the face below antennæ, spot at base of four posterior tibiæ, the anterior femora and tibiæ before, and basal joint of all the tarsi, white; scape of antennæ broadly dilated, heart-shaped and concave beneath, the frontal half orange-yellow; wings hyaline, dusky at apex, the second submarginal cell, in the single specimen before me, receives both recurrent nervures. Length three and one half lines.

Hab. Colorado Territory. Mr. James Ridings (Coll. Am. Ent. Soc.). "Hudson's Bay." Smith.

2. P. varifrons, n. sp. ♀. Deep black; head and thorax opaque, finely and closely punctured; a cuneiform mark on each side of face, sometimes a transverse mark on apex of clypeus, spot on tegulæ, another on tubercles, spot at base of all the tibiæ, broad on posterior pair, yellowish-white; mesothorax with faintly impressed lines; metathorax subrugose, the enclosed basal space reticulated; wings hyaline, faintly dusky towards apex, nervures black, neuration as in ♀ *basalis*, with same variation; legs with thin silvery pubescence, especially on tibiæ and tarsi, tibial spurs whitish; abdomen smooth, shining, the basal segment highly polished, with a slight fringe of hoary pubescence on each side at tip, apical segments subpubescent. Length two and one half to three lines.

Hab. Colorado Territory. Mr. Jas. Ridings. (Coll. Am. Ent. Soc.) This may be identical with *elliptica* Kirby, which I fail to recognize.

3. P. affinis Smith, Brit. Mus. Cat. Hym., i, p. 24. ♀. Black, opaque, head and thorax very closely punctured, abdomen smooth and shining, metathorax rugulose, coarsely so at base; a cuneiform or triangular mark on each side of face, line or two spots on collar, spot on tubercles, and base of all the tibiæ, much broader on posterior pair, lemon-yellow; tegulæ piceous; wings hyaline, dusky at apex; lateral apical margin of first abdominal segment with a more or less distinct patch of whitish pubescence. Length two to three and a half lines.

The ♂ is rather more slender than the ♀; sides of the face, extending a short distance above insertion of antennæ, clypeus, a triangular space above, labrum, a spot on mandibles, most of anterior tibiæ, and all the tarsi except tips, lemon-yellow; otherwise marked like the ♀; flagellum of antennæ more or less testaceous beneath; abdomen more pubescent at apex. Length two to three lines.

Hab. Ct., N. Y., Pa., Va., Ill., Col. Ter. (Coll. Am. Ent. Soc.) A very common species. Varies much in size. Sometimes the collar is immaculate. In the ♂ the yellow line on each side of the face varies in length, but never curves inwardly above insertion of antennæ.

4. P. sparsa, n. sp. ♀. Differs from *affinis* by the punctures of head and thorax being much more sparse, and by the subquadrate head; the base of metathorax is only slightly rugose, the apical half of the enclosed space being smooth and shining; a subtriangular spot on each side of the face, tubercles, a narrow, interrupted band on collar and base of posterior tibiæ pale yellow; wings dusky-hyaline, iridescent; labrum strongly produced. Length three lines.

Hab. Pennsylvania. (Coll. Am. Ent. Soc.)

5. P. verticalis, n. sp. ♂. Black; head and thorax densely punctured, clothed with a short, thin, pale pubescence; sides of face, clypeus, an elongate triangular piece above, spot on base of mandibles, tubercles, anterior tibiæ, spot at base of four posterior tibiæ, and all the tarsi, except tips, lemon-yellow; the stripe on each side of the face curves inwardly just above the insertion of antennæ, and ends in a smooth, polished, rounded space—not seen in any of the other species; antennæ nearly as long as head and thorax, the scape larger than usual, dilated; metathorax coarsely rugose at base; wings hyaline, iridescent, dusky at apex, neither of the recurrent nervures enter the second submarginal cell; abdomen shining, first segment polished, the remainder feebly punctured, and clothed with a short pubescence, which becomes more dense on apical segments. Length two and one half to three lines.

Hab. Mass., Penn., Coll. Ter. (Coll. Am. Ent. Soc.)

6. P. antennata, n. sp. ♂. Differs from *verticalis* by the pale markings being white; the anterior orbits curve inward more suddenly at insertion of antennæ, above which there is no polished space; the scape is more dilated, being triangular in shape, and has a white spot in front; the anterior tibiæ have a white stripe in front, the middle pair a spot at base, and the posterior pair a broad annulus at base;

only the basal joint of the tarsi is white; wings uniformly pale dusky, and the metathorax is less coarsely rugose at base. Length two and one half lines.

Hab. New Jersey. (Coll. Am. Ent. Soc.)

7. **P. pygmæa,** n. sp. ♂. Much like *verticalis*, but is smaller; the anterior orbital line curves inwardly just above insertion of antennæ, and widens slightly at tip; the scape is not unusually dilated, and has a yellow line or spot in front; the flagellum is testaceous beneath. Length one and one half to two lines.

Hab. Illinois. (Coll. Am. Ent. Soc.).

§§. *Species from Mexico and Cuba.*

8 **P. azteca,** n. sp. ♀. Black, clothed with a short, pale pubescence; head closely punctured, thorax deeply and coarsely punctured, abdomen smooth and shining; line on anterior orbits dilated beneath antennæ; conical mark on clypeus, line on collar, tubercles, one or two dots on tegulæ, and spot on base of tibiæ, lemon-yellow; front prominent between antennæ; scape slender; scutellum sparsely punctured; base of metathorax rugose; wings hyaline, iridescent; abdomen ovate, lateral apical margin of segments with a white fringe. Length three lines.

Hab. Orizaba, Mexico. Prof. F. Sumichrast. (Coll. Am. Ent. Soc.)

9. **P. dubiosa,** n. sp. ♂. Slender; head densely and finely punctured; anterior orbits notched at insertion of antennæ, clypeus, line on mandibles, scape in front, collar, one or two dots on tegulæ, tubercles, scutellum, tips of anterior femora, their tibiæ and tarsi, and annulus at base of four posterior tibiæ, lemon-yellow; antennæ long, flagellum pale fulvous, dusky above; thorax deeply and coarsely punctured; metathorax truncate and somewhat concave behind, the base above with a transverse series of longitudinal carinæ; abdomen elongate, narrow, subopaque, the surface very minutely sculptured, lateral apical margin of the segments with a white fringe. Length two and one half lines.

Hab. Orizaba, Mexico. Prof. F. Sumichrast. (Coll. Am. Ent. Soc.) May possibly be the ♂ of *azteca*.

10. **P. mexicana,** n. sp. ♀. Robust, black, head very closely and minutely punctured; anterior orbits slightly notched at insertion of antennæ, broad stripe down middle of clypeus, spot above, collar, spot on tegulæ, tubercles, scutellum, anterior tibiæ in front, and

annulus at base of four posterior tibiæ, lemon-yellow; antennæ short, ferruginous, brownish above; thorax robust, deeply and coarsely punctured; scutellum shining and sparsely punctured; metathorax clothed with short, hoary pile, truncate and subexcavate behind, the base longitudinally striated; wings hyaline, iridescent; abdomen ovate, convex, polished, the first segment with a few large scattered punctures, the two basal segments with a short, lateral, apical fascia of white pubescence. Length three lines.

♂ more slender; the face beneath antennæ, labrum, mandibles, and scape in front, yellow; antennæ long, fulvous beneath; tarsi more or less yellowish; first segment of abdomen with large, deep pits, the second with numerous smaller punctures; apex of second and the remaining segments entirely smooth. Length two and one half lines.

Hab. Orizaba, Mexico. Prof. F. Sumichrast. (Coll. Am. Ent. Soc.)

11. P. grossa, n. sp. ♂. Deep black; head closely and finely punctured; anterior orbits, pointed above and dilated beneath antennæ, clypeus, spot above, dot on tegulæ, spot on tubercles, interrupted band on scutellum, anterior tibiæ in front, and posterior pair at base, white; antennæ moderately long, brownish-testaceous beneath; thorax and two basal segments of abdomen deeply and grossly punctured, confluently so on abdomen; metathorax truncate behind, the base above with a few well-defined, longitudinal carinæ; wings hyaline, iridescent, a fuliginous costal streak extending from stigma to apex of wing; first and second segments of abdomen with a narrow, entire apical fascia of white pubescence. Length three lines.

Hab. Orizaba, Mexico. Prof. F. Sumichrast. (Coll. Am. Ent. Soc.)

12. P. limbifrons, n. sp. ♀. Black, opaque, abdomen smooth and shining; lateral margin of face, an interrupted line on prothorax, tubercles, dot on tegulæ and base of tibiæ more or less cream-color; head and thorax densely and finely punctured; metathorax rugose at base, abruptly truncate behind; wings fusco-hyaline, subiridescent, both recurrent nervures unite with those of the second submarginal cell; on each side of first segment of abdomen a short apical line of silvery-white pubescence. Length three and one fourth lines.

Hab. Cuba. (Coll. Dr. J. Gundlach, No. 223.)

§§§. *Species not recognized.*

P. elliptica Kirby, Faun. Bor. Am., iv, p. 266. Hudson's Bay.

P. confluens Smith, Brit. Mus. Cat. Hym., i, p. 24. East Florida.

Mr. F. G. Sanborn exhibited a branch of white oak, *Q. alba* Linn., from which the extremity had been severed by the larva of *Elaphidion villosum* Fabr., and which had been also perforated by the larva of *Leptostylus macula* Say.

The specimen illustrated in a striking manner a degree of intelligence displayed by the first mentioned species, which after completing its central burrow, and nearly severing the twig, as usual, between its winter quarters and the body of the tree, found its operations intruded upon by the larva of *Leptostylus*, which was engaged in penetrating the twig in the same direction, but nearer the bark than the burrow of *Elaphidion.* He maintained that the specimen showed incontestably that on making this discovery, the larva of *Elaphidion* had retired in its burrow about one half inch from this point, and successfully undertaken the by no means inconsiderable labor of severing the twig a second time in a locality sufficiently removed from the encroachments of *Leptostylus* to satisfy its somewhat misentomical feelings.

February 3, 1869.

Dr. Charles Pickering in the chair. Sixteen members present.

The following papers were read:—

Notes on New or little known Species of American Cancroid Crustacea. By Sidney I. Smith.

The following notes were begun as part of a more extended article on the higher crustacea of the western coast of tropical America, but the delay in bringing together the requisite material and the discovery of undescribed forms from the eastern coast, have induced me to publish in this preliminary manner the more interesting of the new or little known species of both coasts. The materials upon which the descriptions are based, unless otherwise indicated, are in the collections of the Museum of Yale College.

Xantho denticulata White, List of Crust. in British Mus., p. 17 (no description), 1847.

Xantho denticulatus White,[1] Annals and Mag. Nat. Hist., 2d series, Vol. II, p. 285, 1848.

Carapax naked, anteriorly deflexed and deeply areolated; gastric region elevated and surrounded laterally and posteriorly by a deep groove, the anterior lobes prominent, the antero-lateral slightly divided anteriorly and separated by a well marked groove from the median, which extends forward in a slender point to the anterior lobes; hepatic region projecting into several obtusely conical tubercles, and separated from the branchial region by a deep furrow; antero-lateral lobe of the branchial region prominently projecting; postero-lateral slope and margin crossed obliquely by a slight furrow. Front projecting, slightly deflexed, and with a slight groove along the anterior edge, which is nearly straight as seen from above, but sinuous in its margin as seen from before. Antero-lateral margin armed with about nine spiniform teeth, the anterior one being small, and situated below the level of the others. Inner sub-orbital tooth prominent. Latero-inferior regions slightly granulous. Basal segment of the external antennæ joining a slight process from the front.

Chelipeds with the carpus and hand rugose above; the hand smooth below and on the inside, the fingers black and slightly and obtusely toothed within, ambulatory feet nearly smooth, the dactyli slender, compressed, and slightly hairy along the edges.

Length of carapax in a female from the Abrolhos Reefs, 16.6 millim.; breadth, including teeth, 26.5 millim.; ratio of length to breadth, 1: 1.66.

Abrolhos Reefs, Brazil; C. F. Hartt. Aspinwall; F. H. Bradley. Bermuda; J. M. Jones.

Xantho Stimpsonii differs from this species in having the front quadrilobate and the carpi and hands of the chelipeds tuberculated above, in the areolation of the carapax, etc.

Panopeus Edw.

The species of this genus, which, as far as known, is peculiar to America, are becoming quite numerous, although but a single one was known to Milne Edwards at the time of the publication of his *Histoire naturelle des Crustacés*. There have already been described twelve species: — *P. Herbstii* Edw., *P. Harrisii* Stimp., *P. Wurdemannii* Gibbes, *P. occidentalis* Sauss., *P. serratus* Sauss., *P. america-*

[1] Stimpson, being apparently unaware of White's species, has described (Annals Lyc. Nat. Hist., N. Y., Vol. VII, p. 207, 1860) an allied species from Cape St. Lucas, as *Xantho denticulata*, which I will here designate as *Xantho Stimpsonii*.

nus Sauss., *P. texanus* Stimp., *P. transversus* Stimp., and *P. abbreviatus* Stimp., from the eastern coasts of North America and the West Indies; *P. chilensis* Edw. et Lucas, *P. crenatus* Edw. et Lucas, and *P. transversus* Stimp., from the western coasts of Central and South America; and *P. lævis* Dana, described as from an unknown locality, but referred to the west coast of South America by Stimpson (Annals Lyc. Nat. Hist., N. Y., Vol. VII, p. 54). In these notes seven additional species are described, four of them from the east and three from the west coast.

I add here a table to facilitate the determination of the species.

A. A tubercle on the sub-hepatic region just below the first lobe of the antero-lateral border of the carapax.

a. Antero-lateral margin of the carapax armed with projecting teeth, of which the three posterior ones on each side are prominent and sharply angular.

1. External hiatus of the orbit a broad and deep opening. Tubercle of the sub-hepatic region prominent.
P. Herbstii, *P. validus*.

2. External hiatus of the orbit a deep notch rather than an opening. A groove along the outer border of the carpus next the articulation with the hand.
P. occidentalis, *P. serratus*, *P. Harttii*, *P. Bradleyi*.

b. Antero-lateral margin divided by slight incisions into four lobes (the first being composed of the angle of the orbit coalesced with the second normal tooth), the first three truncate, the fourth forming the lateral angle of the carapax. Tubercle of the sub-hepatic region not prominent.
P. transversus, *P. politus*, *P. planus*.

B. No tubercle on the sub-hepatic region. External hiatus of the orbit small.
P. crenatas, *P. Harrisii*, *P. depressus*, *P. Sayi*.

Having had no opportunity to examine *P. americanus*, *P. texanus*, *P. abbreviatus*, *P. chilensis*, *P. Wurdemanni* and *P. lævis*, they are not included in the table.

Panopeus Herbstii Edw., Hist. nat. des Crust., tome i, p. 403, 1834 (non *Cancer Panope* Herbst).

Carapax moderately convex and crossed by a few very slight granulous rugæ, areolation distinctly marked, but the areolets not protuberant; front and antero-lateral border finely granulous and clothed with scattered, coarse pubescence. Front prominent and nearly horizontal, the edge thin, obscurely four-lobed as seen from above, median lobes much the largest, extending a little further forward than the lateral and separated on the upper edge by a short, deep groove. Superior margin of the orbit with two distinct fissures. Post-orbital tooth separated from the second tooth of the antero-lateral margin by a rounded sinus, and forming with it a prominent bidentate lobe, with the inner tooth obtusely triangular and extending forward to a line with the outer angle of the inferior margin of the orbit, the outer tooth rounded at the tip; remaining teeth of the antero-lateral margin large and prominent; third tooth with its anterior edge straight, and the outer, or posterior, edge arcuate; fourth acutely triangular, the anterior edge thickened and curved slightly forward; fifth, or posterior tooth slender and acute, the anterior edge much thickened and strongly curved forward. Inferior lateral regions granulous and pubescent. Inferior margin of the orbit divided by a deep fissure, the inner lobe projecting as a sharp tooth nearly to a line with the front, the outer lobe broad, with the edge thin and straight.

Chelipeds with the carpi and hands smooth or slightly rugose; hands unequal, stout, larger one (either the right or the left) with a tubercle on the outer side projecting forward from the edge between the bases of the fingers; dactylus with a strong basal tooth within; smaller hands with the fingers more slender and slightly deflexed, the dactylus wanting wholly the basal tooth; fingers of both hands with longitudinal impressed striæ. Ambulatory feet with the basal joints pubescent along the edges, the terminal joints wholly pubescent.

Color of alcoholic specimens dark olive above; the fingers black, lighter at the tips.

Several specimens give the following measurements:—

Locality.	Sex.	Length of carapax.	Breadth of carapax.	Ratio.
Florida ?	♂	17·9 mm.	24·0 mm.	1 : 1·34.
Egmont Key, Fla.,	"	21·5 "	30·0 "	1 : 1·39.
" " "	"	26·0 "	35·6 "	1 : 1·36.
Bahamas,	"	26·4 "	39·0 "	1 : 1·47.
Florida,	"	33·0 "	49·8 "	1 : 1·48.
Bahamas,	"	35·0 "	51·8 "	1 : 1·46.
Egmont Key, Fla ,	♀	13·4 "	17·8 "	1 : 1·33.
" " "	"	17·8 "	24·8 "	1 : 1·39.
Florida ?	"	25·8 "	37·6 "	1 : 1·42.
"	"	27·0 "	38·7 "	1 : 1·43.

South Carolina (Coll. Essex Institute). Bahamas; Dr. H. Bryant (Coll. Boston Soc. Nat. Hist.). St. Augustine, Fla.; Col. W. E. Foster. Egmont Key, west coast of Florida; Col. E. Jewett. Aspinwall; F. H. Bradley.

The *Cancer Panope* Herbst (Krabben und Krebse, Tab. 54, fig. 5, Vol. III, zweites Heft, p. 40, 1801), if we may trust the figure, is very different from this species, and cannot be referred to any described species of *Panopeus*; moreover, Herbst distinctly states that it is an East Indian species.

Variety **obesus.**

Carapax strongly convex. Front broad, deflexed, not prominent, the edge as seen from above nearly straight, and not at all four-lobed. Post-orbital tooth not prominent, slightly separated from the second normal tooth of the antero-lateral margin by a very shallow sinus; remaining teeth of the margin not very prominent; the third broad, and its outer edge truncate; fourth broad, the anterior edge very short, but slightly hooked forward at the apex, and the outer edge slightly arcuate; last tooth very short, but acute, and its apex slightly curved forward. Inferior regions, chelipeds, etc., very nearly as in *Herbstii.*

Color of alcoholic specimens, brownish olive, clouded and spotted with dull red on the anterior part of the carapax, and on the upper side of the chelipeds; fingers black or dark brown, lighter at the tips. In all the specimens the hands are spotted externally with red.

Length of carapax in a male, 23.6 millim.; breadth, 33.4 millim.; ratio, 1 : 1.41.

Egmont Key, Fla.; Col. E. Jewett. Aspinwall; F. H. Bradley.

Specimens from Egmont Key appear quite distinct from specimens of *Herbstii* from the same locality, having the carapax broader and much more convex, the teeth of the antero-lateral margin less prominent and somewhat different in form, and the coloration quite different; but specimens of *Herbstii*, in the Society's collection, from Bahama and Florida, approach quite closely to the variety, in the breadth and convexity of the carapax, the form of the teeth of the antero-lateral margin of the carapax, and even slightly in coloration.

Panopeus validus, sp. nov.

Carapax slightly convex, deeply areolated, and crossed anteriorly by a few coarsely granulous rugæ, lateral regions and the anterior part of the gastric region sparsely and coarsely granulous, and clothed with hairy pubescence. Front prominent and horizontal, the edge granulous and distinctly four-lobed as seen from above, the median lobes much the largest, extending farther forward than the lateral, and separated by a distinct fissure from which a deep median groove extends a short distance backward. Superior margin of the orbit divided by two deep fissures. Post-orbital tooth stout, separated from the second tooth of the antero-lateral border by a deep, rounded sinus, and forming with it a prominent bidentate lobe, the teeth being of nearly equal prominence; remaining teeth large and very prominent; third tooth with its apex strongly hooked forward, and its outer or posterior edge arcuate; fourth tooth very long, the apex rather slender and turned abruptly forward; fifth, or posterior tooth, narrow and vertically thickened, the apex slender and curved forward. Inferior lateral regions rather coarsely granulous and clothed with a hairy pubescence. Inferior margin of the orbit divided by a deep fissure into two lobes, the inner one projecting forward as a long, stout tooth, the outer one broad, with the outer angle of the anterior edge strongly projecting. Tubercle of the sub-hepatic region stout and spiniform.

Chelipeds with the carpi rugose externally, and with a shallow depression along the outer border next the articulation with the hand; hands a little unequal, stout, obtusely carinated on the upper edge, very slightly rugose above; dactyli with a rounded carina on the upper edge at the base; all the fingers irregularly toothed within, and marked with distinct longitudinal impressed striæ; in the larger hand, a stout tooth at the base of the dactylus, and a rudimentary tubercle on the outer anterior edge of the palm between the bases of the fingers. Ambulatory feet stout and very pubescent, especially on the terminal joints. Fingers dark brown, lighter at the tips.

Length of carapax in a male, 30.0 millim.; breadth, 43.2 millim.; ratio, 1: 1.44.

Panama and Acajutea; F. H. Bradley.

This species appears to be closely allied to *P. chilensis* Edw. et Lucas (Voy. dans l'Amér. Mérid. de D'Orbigny, Crust., p. 16, pl. VIII, fig. 2), but the fingers in that species are said to be "*non cannelés*," and the carapax seems to be much smoother than in the Panama species.

Panopeus occidentalis Saussure, Crust. nouv. de Mexique et des Antilles, p. 15, pl. I, fig. 6, 1858.

In the Society's collection there is a specimen of *Panopeus* collected at the Bahamas by Dr. Bryant, which evidently belongs to this species.

The general outline of the carapax is very similar to that of *P. Herbstii* of the same size, but the carapax is smoother, the areolets slightly swollen and more distinctly marked, the three posterior teeth of the antero-lateral margin are broad and stout, obtusely triangular, strongly upturned, and not at all hooked forward; the carpus is smooth and the groove on the outer anterior margin is rather broad and shallow; the hands are very much as in *Herbstii*, but smoother; the ambulatory feet are relatively longer and slenderer than in *Herbstii.*

Length of carapax in the single male specimen, 20.9 millim.; breadth, 29.2; ratio, 1:1.40.

Panopeus serratus Saussure, op. cit., p. 16, pl. I, fig. 7.

I refer to this species a single female specimen collected at St. Thomas by Prof. C. F. Hartt. It differs from the last species in the rougher carapax, the more slender and acute teeth of the antero-lateral margin, and markedly in the very rugose upper sides of the carpi and hands. From *P. Harttii* it differs in having the carapax much narrower in proportion, much more convex, the areolets not nearly so well marked nor so prominent, and the front only very obscurely four-lobed.

Length of carapax, 12.2 millim.; breadth, 16.2; ratio, 1 : 1.33.

Panopeus Harttii, sp. nov.

Carapax broadest at the penultimate teeth of the antero-lateral margin, convex anteriorly, slightly flattened behind; areolets well marked and somewhat protuberant anteriorly; coarsely granulous and slightly pubescent on the front and antero-lateral borders; hepatic regions prominent and bearing a transverse ridge; anterior lobes of the gastric region prominent; the anterior part of all the regions crossed transversely by slight granulous rugæ. Front very much deflexed, the anterior edge thin and four-lobed, the median lobes much the largest, evenly rounded, and a little more prominent than the lateral, which project as small obtusely triangular teeth. Post-orbital tooth short and slender, and separated from the second tooth of the antero-lateral margin by a broad sinus which breaks the margin completely; remaining teeth triangular in form, much thickened vertically, and separated by quite broad sinuses, the posterior two on each side very slender, and of nearly equal prominence. Inferior lateral regions coarsely granulous. Inferior margin of the orbit broken by a deep fissure, the inner lobe forming a stout tooth, the outer lobe broad, and the lateral angle projecting slightly in advance of the post-orbital tooth.

Chelipeds with the carpi externally granular-rugose, and with a deep groove along the outer margin next the articulation with the hand; hands a little unequal, slightly rugose above; fingers slender, deflexed, with slight impressed lines, and slightly and obtusely toothed within, the dactylus in the larger hand having usually a larger tooth at the base. Ambulatory feet slender and pubescent along the edges. Fingers black, lighter at the tips, the color not spreading upon the palm.

Length of carapax in a male, 15.0 millim.; breadth, 22.5 millim.; ratio, 1 : 1.50.

Abrolhos Reefs, Brazil; Prof. C. F. Hartt.

Panopeus Bradleyi, sp. nov.

Carapax slightly convex in an antero-posterior direction, but not at all transversely; antero-lateral border slightly upturned, so that the points of the teeth are nearly, or quite, on a level with the middle of the carapax; areolations well marked, and the regions somewhat protuberant; microscopically granulous on the margins, and with a few very slight transverse rugæ. Front slightly prominent, nearly horizontal, the edge thin, with a minute median incision, and the lateral angles projecting as narrow obtuse teeth. Incisions of the superior margin of the orbit well marked. Post-orbital tooth small, triangular, and separated from the second tooth of the antero-lateral margin by a rounded sinus; remaining teeth rather prominent, triangular, thickened along the anterior edge, and with sharp depressions running back upon the carapax between their bases. Postero-lateral border crossed by a slight depression. Inner angle of the inferior margin of the orbit projecting into a prominent sharp tooth, outside of which the edge of the orbit is thin, straight and not prominent. External hiatus of the orbit a deep, acutely triangular notch. Tubercle of the sub-hepatic region very small and close under the margin of the carapax.

Chelipeds with the carpi rugose externally, and with a deep and narrow groove along the anterior margin of the outer side; hands unequal, with a slight double carina along the upper edge; larger hand stout, fingers short, widely gaping, irregularly toothed within, and with a stout tooth at the base of each finger, the one on the dactylus shutting just within the other; smaller hand with the fingers slender, not gaping and wanting the basal teeth. Fingers brown, lighter at the tips, and the dactyli lighter than the other fingers.

Length of carapax in the male, 8.4 millim.; breadth, 11.5 millim.; ratio, 1 : 1.37.

Panama; F. H. Bradley.

Panopeus politus, sp. nov.

Carapax entirely naked above, broad, moderately convex in two directions, slightly granulous and uneven on the front and antero-lateral border, smooth on the median region and posteriorly; regions slightly, but distinctly marked. Front strongly deflexed, the edge somewhat beveled from above, four-lobed, the median lobes being very broad, prominent, and separated by a sharp notch, the lateral lobes projecting as small teeth. First lobe of the antero-lateral margin broad, and its edge slightly concave; remaining lobes truncate and separated by three slight notches, from which slight grooves extend back upon the carapax, that from the second notch being most distinct, and forming the posterior limit of the hepatic region. Inner angle of the inferior margin of the orbit forming a prominent tooth, the outer part of the margin projecting very little. All the sub-orbital and sub-hepatic regions distinctly granulous; the tubercle on the sub-hepatic region being much depressed, forming a slight granulous prominence.

Chelipeds with the carpi and hands smooth and evenly rounded above; hands a little unequal, fingers rather stout, irregularly toothed within, and with a prominent tooth at the base of the dactylus in the larger hand. Ambulatory feet nearly naked, except the dactyli, which are covered with a close pubescence.

Color of alcoholic specimen light brown above, tinged with bluish purple on the anterior part of the carapax and the upper side of the chelipeds; fingers black, lighter at the tips, the color not spreading upon the palm.

Length of carapax in a female, 13.8 millim.; breadth, 21.4 millim.; ratio, 1 : 1.55.

Abrolhos Reefs, Brazil; Prof. C. F. Hartt.

This species is allied to *P. transversus* Stimpson (Annals Lyc. Nat. Hist. N. Y., Vol. VII, p. 210, 1860), from the west coast of Central America, but is easily distinguished from it by the more deeply areolated and uneven carapax, the more produced front, the concave instead of convex post-orbital lobe, and by the more deeply notched and uneven antero-lateral margin. The color also is very different.

Panopeus planus, sp. nov.

Carapax naked, very broad, depressed and very flat above; front and sides crossed by numerous granulous rugæ; areolation very distinct, the gastric region surrounded laterally and posteriorly by a deep groove, a deep groove extending from the anterior extremity of the median gastric lobe to the middle of the front, and a similar groove separating the hepatic from the branchial region, and joining the middle incision of the antero-lateral margin. Front nearly horizontal, scarcely at all prominent, the edge slightly thickened and granulous, a very little arcuate in the middle, with a slight median incision, and the lateral angles projecting as small teeth, nearly or quite to a line with the middle. First lobe of the antero-lateral margin broad, not at all advanced, and its edge straight; remaining lobes not at all prominent and separated by very slight notches. Sub-orbital and sub-hepatic regions very much as in *P. politus*, but rather more strongly granulous and quite pubescent.

Chelipeds with the carpi and hands smooth and evenly rounded above, the fingers rather slender, slightly deflexed, and with very slight, longitudinal, impressed striæ. Ambulatory feet long and slender, pubescent along the edges and the dactyli wholly pubescent.

Length of carapax in a male, 16.5 millim.; breadth, 26.4 millim.; ratio, 1 : 1.60.

Panama; F. H. Bradley.

This species is at once distinguished from all others in the genus by its very flat carapax.

Panopeus depressus, sp. nov.

Carapax depressed, slightly convex, crossed by numerous transverse granulous rugæ, and granulous and slightly pubescent on the front and antero-lateral border; regions slightly marked and not protuberant, except the anterior part of the gastric which is somewhat swollen. Front broad, nearly horizontal, not at all prominent, and its edge thin, almost perfectly straight, and with a slight median notch in the larger specimens. First lobe of the antero-lateral margin broad, composed of the angle of the orbit coalesced with the second normal tooth, its edge thin, the inner angle slightly curved forward to form the angle of the orbit, the outer angle slightly rounded; remaining teeth of the antero-lateral margin separated by deep triangular notches; third normal tooth broad, truncate, its anterior angle sharp, posterior angle rounded; fourth tooth prominent, its anterior edge straight or slightly hooked forward at the apex, outer and posterior edge arcuate; last tooth narrow, its apex slender and hooked forward. Inferior lateral regions pubescent and thickly granulate. Inferior margin of the orbit thin, its edge as seen from below continuous but somewhat concave, and the inner angle projecting forward to a line with the inner angle of the superior margin.

Chelipeds unequal, carpi and hands slightly granulous above; larger hand stout, the dactylus curved strongly and without a strong basal tooth within; smaller hand with the fingers slender and somewhat spoon-shaped at the tips; all the fingers with slight longitudinal impressed striæ. Ambulatory feet pubescent along the edges, the dactyli in the posterior pair much shorter than the others. Terminal segment of the male abdomen narrower than the penult, about three-fourths as long as broad, the sides convex and the tip rather broadly rounded. Fingers black, lighter at the tips, the black spreading far upon the palm.

Length of the carapax in a male, 18.6 millim; breadth, 26.8; ratio, 1 : 1.44.

New Haven, Conn., common. Found in abundance at Egmont Key, Fla., by Col. E. Jewett. There are also specimens in the Society's collection.

This species, as well as the next, has very likely been confounded with the young of *P. Herbstii*, but it is very different, and is easily distinguished from it by the more depressed carapax, the very different teeth of the antero-lateral margin, and by the entire absence of the tooth at the base of the dactylus in the larger hand.

Panopeus Sayi, sp. nov.

Cancer Panope (pars) Say, Journal Acad. Nat. Sci. Philadelphia, Vol. I, p. 58, 1817 (non Herbst).

Carapax narrow, strongly convex, microscopically granulous and slightly pubescent; regions distinctly marked and protuberant. Front very prominent and slightly deflexed, the edge thin, strongly arcuate as seen from above, with a distinct median incision, the lateral angles rounded and not at all projecting. First lobe of the antero-lateral margin composed of the angle of the orbit coalesced with the second normal tooth, not at all prominent, slightly concave, the inner angle slightly projecting to form the angle of the orbit, outer angle short and rounded; third normal tooth projecting much more than the lobe in front of it, and truncate; fourth tooth prominent, somewhat triangular and separated from the third and fifth by rather deep triangular notches; fifth, or last, narrow, triangular, much thickened and with a ridge extending back upon the carapax. In some young specimens the tips of the teeth are slightly hooked forward. Inferior lateral regions finely granulate. Inferior margin of the orbit not broken by a notch, but the inner angle rather abruptly projecting as an obtusely triangular tooth. External hiatus of the orbit a small and very narrow incision.

Chelipeds unequal (either the right or left being the larger), carpi and hands smooth or slightly rugose above; larger hand very stout, the fingers short and thick, obtusely toothed within, and without a strong basal tooth on the dactylus. Ambulatory feet somewhat pubescent, all the dactyli long and slender. Terminal segment of the male abdomen broader than the penult, about two-thirds as long as broad, the side slightly concave and the tip abruptly triangular. Fingers black, the tips lighter and the black spreading broadly upon the palm.

Length of carapax in a male from New Haven, 18.8 millim.; breadth, 25.2 millim.; ratio, 1:1.34. Length of carapax in a male from Cape Cod, 19.2 millim.; breadth, 25.2 millim., ratio, 1:1.31.

New Haven, Conn., in the same localities with the last species and in about equal abundance. Eastham, Cape Cod; W. C. Fish (Collection of the Essex Institute).

This species is easily distinguished from *P. depressus* by its narrower and much more convex and swollen carapax, the projecting and arcuate front, the more abruptly projecting inner angle of the inferior margin of the orbit, and by the very different form of the terminal segment of the male abdomen. The teeth of the antero-lateral margin are also quite different. In some respects it agrees with Stimpson's description of *P. texanus* (Annals Lyc. Nat. Hist. N. Y., Vol. VII, p. 55, 1859) and it may possibly prove to be that species, but over one hundred specimens examined agree in having the fingers black, the left hand frequently the larger and the first second normal teeth of the antero-lateral border coalescing.

Pilumnus limosus, sp. nov.

Body and feet covered with a light brown, velvet-like pubescence composed of short clavate hairs, among which the tubercles and granules appear as little depressed pits in the general surface. Carapax strongly deflexed in front but much flattened posteriorly, distinctly areolated, and ornamented above with about forty, scattered, small tubercles or granules, of which fourteen of the larger ones are on the gastric region, two being on each of the anterior lobes, three on each of the antero-lateral, one on the extremity of the median, and three arranged in a triangle behind it; the remaining ones which are smaller, irregularly distributed over the branchial and posterior regions. Front very strongly deflexed and four-lobed, the median lobes much larger than the lateral, projecting almost perpendicularly downward, separated by a deep, acutely triangular sinus, and their outer and anterior edges slightly denticulate; the lateral lobes projecting as slender teeth. Superior margin of the orbit armed with three small tubercles, of which the outer one forms the external angle. Antero-lateral margin armed with three long, triangular teeth which are separated from the angle of the orbit by a broad shallow sinus, below which, on the inferior region, there is a slender tubercle. Inferior margin of the orbit broken by a deep sinus, the inner lobe prominent and usually somewhat bituberculate at the tip, the outer lobe armed along the margin with three or four small tubercles; external hiatus well marked. Inferior orbital region with a few scattered granules. An oblique line of eight or ten small tubercles on the sub-branchial region terminating just behind the posterior tooth of the antero-lateral margin.

Chelipeds slightly unequal, carpus armed with a strong spine on the inner edge and a few scattered tubercles on the upper surface, hand tuberculose above and externally, the palm with a naked and smooth space on the lower edge at the base of the finger, fingers smooth, striate and dark brown, the color not spreading upon the palm. Ambulatory feet slender and armed with a few scattered sharp granules on the upper side.

Length of the carapax in a male from Panama, 11.4 millim.; breadth, 15.0; ratio, 1 : 1.31. Length of carapax in a female from the same locality, 11.0 millim.; breadth, 14.5 millim.; ratio, 1:1.32.

Zorritos, Peru, and Panama; F. H. Bradley.

Trapezia formosa, sp. nov.

Carapax without lateral spines or teeth, very smooth and shining, convex in two directions, very broad in the middle but much contracted at the orbits; regions not at all defined; two puncta on the posterior part of the gastric region, a scattered group of several on each side in front of these and quite near the orbits, and an irregular sub-marginal line of small ones along the front. Front with a slight groove along the margin above, the edge thin, slightly crenulated, and somewhat six-lobed, the median lobes narrow but more prominent than the others; outer angle of the orbit not at all prominent; sides very convex, the edge obtusely rounded, and, in the younger specimens, a very slight rounded projection on the anterior margin of the branchial region, which is entirely wanting in the larger specimens.

Chelipeds slightly unequal, smooth and glabrous, with a very few scattered puncta on the upper side; meros rather short; the anterior edge armed with about six small teeth; carpus with a slight, obtuse and rounded projection on the inner margin; hand stout but not swollen, the fingers short, considerably incurved, with a few sharp teeth within, not gaping but the pointed tips somewhat hooked by one another. Ambulatory feet slender, and glabrous to the tarsi.

Color of alcoholic specimens uniform orange, a little darker above than below; the fingers brownish.

A number of specimens give the following measurements:—

Sex.	Length of carapax.	Breadth of carapax.	Ratio.	Breadth at outer angles of orbits.	Breadth of front between orbits.
♂	5·6 mm.	6·8 mm.	1:1·21	6·2 mm.	3·6 mm.
"	7·4 "	9·2 "	1:1·24	8·1 "	4·6 "
"	7·6 "	9·6 "	1:1·26	8·4 "	5·0 "
♀	6·9 "	8·4 "	1:1·22	7·4 "	4·0 "
"	8·9 "	11·8 "	1:1·31	9·5 "	5·6 "

Pearl Islands, Bay of Panama, among *Pocillipora capitata* Verrill; F. H. Bradley.

This species is easily distinguished from the next by the carapax being much broader in proportion, much narrowed in front, the outer angles of the orbits short and rounded, the sides arcuate and without a marginal tooth on the anterior lobe of the branchial region.

? **Trapezia cymodoce** Guérin, Dana, U. S. Expl. Expd., Crust., p. 257, pl. 15, fig. 5.

This species, or one so closely allied that the published descriptions and figures do not enable me to distinguish it, was collected by Mr. Bradley with the last species, and in much greater abundance.

Carapax smooth and glabrous, broad, slightly convex, and in younger specimens quite as broad at the outer angles of the orbits as between the lateral teeth, but in large specimens, and especially females, it is slightly contracted in front; the puncta arranged much as in the last species but less marked and regular on the front. Front distinctly six-lobed, without a groove along the upper margin, the edge thin, and in some specimens very slightly crenulate; external angle of the orbit rather prominent and in young specimens acute and somewhat spiniform; lateral edges thin, not at all rounded, and with a very distinct tooth on the anterior lobe of the branchial region, which, in young specimens, projects forward as a sharp spine.

Chelipeds much as in the last species, but the meros more strongly toothed. Ambulatory feet slightly hairy on the terminal segments.

Coloration very much as in *T. formosa* but the fingers a little darker.

Several specimens give the following measurements:—

Sex.	Length of carapax.	Breadth of carapax.	Ratio.	Breadth at outer angles of orbits.	Breadth of front between orbits.
♀	7·2 mm.	8·6 mm.	1:1·19	8·6 mm.	4·9 mm.
"	8·4 "	9·8 "	1:1·17	9·4 "	5·1 "
"	9·8 "	11·3 "	1:1·15	11·1 "	6·6 "
"	11·6 "	13·5 "	1:1·16	12·6 "	7·4 "
♂	6·8 "	8·0 "	1:1·18	7·9 "	4·8 "
"	11·6 "	13·8 "	1:1·19	13·1 "	7·6 "

It appears to be a much larger species than *T. formosa*.

Quadrella nitida, sp. nov.

Carapax smooth, convex in two directions, broadest in the middle; front armed with six spiniform teeth, the median ones larger, more prominent, and separated by a deeper sinus than the others; external angle of the orbit projecting as a sharp spine; sides convex, the edge obtuse and rounded, with a single slender spine, or in the larger specimens only a slight angular projection, at the anterior lobe of the branchial region. Inner angle of the sub-orbital margin armed with a slender spine which projects considerably beyond the spine of the front above it.

Chelipeds somewhat unequal, very large; meros long, its posterior edge rounded, the anterior edge armed with six to eight slender spines, usually eight in the larger and six in the smaller cheliped; carpus smooth, evenly rounded on the outer side and with a single short spine on the anterior part of the inner side; hands stout and considerably swollen, especially the larger one, smooth and unarmed, equaling or exceeding in length the breadth of the carapax, the fingers not gaping, those of the larger hand rather stout and strongly incurved, those of the smaller hand longer and more slender. Ambulatory feet slender and smooth except the dactyli which are slightly pubescent.

Color of alcoholic specimens light yellowish, the fingers tinged with orange and encircled with a median band of black.

Length of carapax in a male, excluding the teeth of the front, 9.3 millim.; breadth, 11.2 millim.; ratio of length to breadth, 1:1.20; length, including spines of the front, 10.0 millim. Another male gives, length of carapax, 7.3 millim; breadth, 8.5 millim.; ratio, 1:1.16; length including spines, 7.8; length of meros in larger cheliped, 6.4; length of hand, 10.4; breadth of hand, 4.3; length of meros in smaller cheliped, 5.8; length of hand, 9.4; breadth of hand, 3.3. Length of carapax in a female, 8.0 millim.; breadth, 9.6 millim.; ratio, 1:1.20; length including spines, 8.6 millim.

In young specimens the sides of the carapax are less convex than in adults.

Pacheca, one of the Pearl Islands, Bay of Panama, six to eight fathoms among pearl oysters; F. H. Bradley.

Q. coronata Dana, the only other described species of the genus, was from the Sooloo Sea, or Balabac Straits.

Notes on the Concentric Structure of Granitic Rocks. By N. S. Shaler.

Von Buch, in his paper on the concentric form of massive rocks, called attention to the peculiar onion-like lamellation visible upon the outside of almost all granite masses; he left, however, the question of the origin of this peculiar structure quite unexplained. It probably afforded him another proof of the theory of upheaval of volcanic and other dome-like elevations, an opinion which it oftentimes seems to support. So far as is known to the author, though several writers have referred to the existence of this peculiar feature in certain massive rocks, no effort has been made to trace the cause of its existence.

As affecting the disintegration of granitic and other massive rocks where it occurs, this feature in their structure has a very great importance. Being most marked in those regions where the ordinary joints and fissuring have had the least effect in preparing the way for detrital agents, it enables flowing water, frost and waves, to break open masses which, but for this element of weakness, would be very little affected by the agents of decay. The shore of New England and the more northern portions of the Continent of North America, abound with cliffs of the hummocky form so characteristic of granitic shores, which, on inspection, show how far this feature renders the pounding of the sea effective. Looking closely at the structure of any portion of such a shore line, we perceive that the waves, finding their way beneath the successive concentric layers of the rock, rend them in large masses from their places and grind them to pieces. The fragments are then either carried to deeper water, where they are protected from further effects of the waves, or impelled by the action of storms striking the shore obliquely, they are drawn to the nearest nook of the coast, where they are dragged to and fro among the rattling pebbles of a rolling beach until reduced to sand or mud, and borne away by tidal currents. Thus, owing to this structure, massive rocks are rapidly worn away which would otherwise present an almost unyielding front to the waves, and the deposit of sedimentary matter proceeds with rapidity over areas which would receive little such increment were it not for this element of weakness of the neighboring rock shores. It is unquestionable that the rapid silting up of the numerous inlets and bays which fret the shore of the northern and southern hemisphere within the so-called *fiord zone*, a phenomenon of political, as well as scientific importance, is due in a considerable degree to the rapid decay of the massive rocks, rendered possible by this feature in their structure.

Concentric lamellation differs widely from the common features of cleavage in rocks, inasmuch as however complicated and distorted the cleavage system may be, it is always reducible to sets of planes, crossing each other,—if there be more than one such system, but never producing systems of curves, which are the essential feature in the fractures we are describing. This much is readily seen upon the exterior of any mass characterized by this structure. Upon examining, where it has proved possible, the internal features, the interesting fact became evident that the concentric arrangment was confined to the external portions of the mass, never being discernible at a greater depth than four or five feet, rarely, indeed, below three feet from the surface. This determination has been made from the examination of a very few sections, which were fitted for the purpose, inasmuch as it is by no means easy to find quarries which give sufficiently extensive sections to admit of study of such features, which cannot be well examined in a small sectional area. Sometimes it happens that at greater depths than are above indicated, there occur fissures which at first sight seem to have the same general correspondence with the surface, as the concentric or onion fracture in question; but it has always happened that a careful examination has rendered it apparent that the correspondence was accidental, and the lines not of the concentric character at all. It may be possible in case small dome-like elevations exist in nature, to have phenomena comparable to this, where the concentric divisions being the original planes of stratification, have been thrown into a boss-like form by the action of elevatory forces. But however true it may be that nature forms on a large scale true and unbroken domes, a question which cannot be discussed here, there is probably no need of disproving the dome theory, as applied to the masses of from fifty to five hundred feet in diameter, where this concentric structure is most manifest.

That concentric structure is induced by the action of forces which operate on the external surface of the masses which exhibit indications of this feature, is sufficiently proven by the fact, that wherever a surface of rock, of the character which enables it to fracture in this way, has been laid bare by recent geological changes, concentric fractures, though previously wanting, soon become distinctly manifested.

The most unquestionable evidence of this fact is to be found whenever trap dykes have been excavated by the action of atmosphere or waves, thus exposing to external influences some portions of the massive rocks which had been previously sheltered from the air. It is often possible to trace the same dyke, from a point where it remains almost unworn, to where it has been eroded to the depth of many feet; and in such cases it may frequently be seen that the fissure formed in the massive rock exhibits on its sides distinct evidence of the concentric lamellation, which is most clearly shown where the walls have been the longest exposed to the weather, and becomes less and less plain as we approach the not yet eroded trap beneath which it evidently does not exist. When the side walls of the dyke have become worn down from the vertical position, so that they form shelving slopes of a low angle, the concentric structure is still clearly visible, and is often the means by which disintegrating agents find their way into the massive rock.

It is not very easy to see in what way external forces operating on a massive rock could fissure it in this concentric form; it may be the product of a number of forces acting together, but it is probable that the chief agent is to be found in the changes of temperature to which the surface has been exposed. A rock surface on our sea-shores and hill-tops is chilled in winter to thirty degrees below zero, and under the midsummer suns absorbs enough heat to raise the temperature often to one hundred and twenty and one hundred and twenty-five degrees, giving a variation of about one hundred and fifty degrees extending over the six months of the half year. In addition to this there is a considerable variation, amounting often to nearly half the annual change between the temperatures of day and night. This incessant change in the temperature of the outer portions of the mass must be accompanied by a considerable movement, or at least a tendency to move, of the portion affected by the changes of temperature. The change of temperature of 150 degrees Fahr. in a sheet of granite one hundred feet in diameter, would produce a lateral expansion of about one inch at the surface. The amount of the change in temperature would gradually diminish from the surface towards the interior. We are unfortunately without any accurate data which would enable us to determine the depth to which changes of temperature affect the heat of massive rocks. The data derived from observations which have been made on soils are so far complicated by the effect of percolating water as to be useless. It is, however, quite plain that at the depth of a very few feet we shall discover material which is essentially unaffected by any variations of temperature. It is also quite easily seen that this outer region of rock, which is in almost constant movement from the changes of temperature, must tend to detach itself from the immobile mass. If we consider the effect of heating the surface of a table of rock, it will become apparent that the part exposed to the sunshine tending to expand while the unheated portion remains unaffected, there will arise a movement which, unless overcome by the cohesion of the materials, will separate the outer portion of the rock from the interior mass. The tendency will be to form a shell upon the centre of the mass, elevated from it except upon the edges.

In many cases there would probably be two lines of separation formed, one at the limit of annual variation, and another at or near the point where the extreme daily variations cease to be felt.

It has frequently been noticed in regions where massive rocks abound, that certain points give forth a sonorous sound when struck by the foot,—a sound which suggests to the ear that there is a cavity beneath the surface at that point. A tolerably careful examination of one or two such points has satisfied me that the resonance is due to the fact that the heat of the sun has caused some of the larger sheets of the concentric layer to arch upwards so that it rests upon its edges, not being in contact with the subjacent mass in the centre, thus making a very shallow cavity, which, however, is large enough to give a resonance to the upper wall. This resonance seems to be greater after long continued hot weather, as would be expected if this hypothesis were true.

The extremity of the peninsula of Cape Ann, near Rockport, exhibits hundreds of acres of rock surface nearly destitute of vegetation, and completely covered with blocks of stone which have been separated from the mass beneath by the action of frost working in fractures of the concentric character above described. Should the glacial sheet ever return to this surface it would find an immense amount of material prepared for transportation.

It will naturally occur to the reader that possibly this concentric fracture may be due to the action of water bringing about the decay of the rock, and that these concentric sheets are only great exfoliations of disintegrated material. An examination however will convince the observer that these great sheets of rock which are separated by these fractures are not penetrated by decay; moreover the exfoliation caused by chemical change is generally observable on the same masses in the form of obscure scales, rarely producing sheets more than an inch or two in thickness, while the sheets of rock separated by the concentric fractures are from one to three feet in thickness. When the position of the rock exposed to weathering is such that neither waves nor frost can at once profit by the fracture and lift the separated rock from its bed, then the agents of decay enter into the fissure and proceed slowly to widen it upwards and downwards so that the disintegrating agents have thrice the surface to work upon that they would have if the decay were confined to the outer surface of the rock alone.

It is evident that this tendency to concentric fracture must tend to produce dome-like forms wherever masses of unstratified rock are exposed to weathering, and it is probable that we must attribute most of the rounded bosses of rock which cover New England and other regions where such domes abound, to the action of this agent. I am inclined to think that glacial action has in most cases done little more than round and smooth the domes previously formed by the operation of this mode of decay.

The Secretary read a paper by Col. Charles Whittlesey of Cleveland, Ohio, upon the Physical Geology of Eastern Ohio.

This paper embodied some of the results reached by a long series of observations upon the exact dip, thickness and mass of the carboniferous and devonian rocks of eastern Ohio. The work was commenced by Col. Whittlesey thirty years ago, while engaged, under the late Professor Mather, upon the State Geological Survey, and has been continued at intervals since that time. The paper, which will be printed in full in the Memoirs of the Society, was accompanied by a map and sections.

February 17, 1869.

Dr. T. M. Brewer in the chair. Thirty-eight members present.

The following papers were read: —

A Synopsis of the Birds hitherto described from the Hawaiian Islands. With Notes by Sanford B. Dole, Esq., of Honolulu, Corresponding Member.

In compiling the following list, all authorities on this subject have been consulted, and it is believed that it includes all species that have been described, and all that have been noticed by naturalists as belonging to the Hawaiian Islands. As by far the greater number of birds are found in the mountain regions of the interior, and thus have escaped the naturalists of various exploring expeditions, whose limited time has been spent near the shores, or on the lowland, the list shows a large preponderance of shore and water-birds, and probably comprises but little more than half the avi-fauna of the group. And yet our Museums, and those of Europe as well, have so few specimens, even of the species here enumerated as peculiar to the islands, that it seems well to print the brief characteristics given in the original descriptions, which it is hoped that a further study may supplement or correct. Of the endemic species little is known in regard to their habits or times of incubation, and few eggs are ever found, as their nests are mostly in the jungle, or on the mountain plateaux where no person resides, and where few go. In former times, when feathers were demanded as a tax by the king and chiefs, many natives made a practice of snaring birds, generally with bird-lime made from the juice of lobeliaceous or other plants; and so common was this occupation that peculiar trees were transplanted to new places in the forests, and well armed with the bird-lime, that the curiosity of the birds might cause the loss of their much prized feathers. Now few know the haunts of the birds, and the art has almost fallen into disuse. Messrs. Brigham and Mann, during their recent visit to the islands, found great difficulty in obtaining specimens of the mountain birds, of which they saw great numbers, and only procured some four or five species. The former found a bird on Molokai, which the natives said was a "malihini," or stranger, and portions were placed in the collection of the Society, but have not yet been identified.

The compiler has made a few additions to the birds already noticed. He would here acknowledge the material assistance in this work, rendered him by Wm. T. Brigham, Esq., of Boston, whose notes were placed at his disposal.

FALCONIDÆ.

1. **Pandion solitarius** Cassin, United States Expl. Exped., Mammalogy and Ornithology, p. 97. Atlas, pl. IV. Adult. (Polioaëtus)—*Buteo solitarius* Peale, Zoölogy U. S. Expl. Exped., Birds, p. 62, (Edit. 1848).

P. caput et corpus totum infra flavescenti-alba, dorsum, alæ caudaque umbrinæ. Hujus generis minimus. Long. 17 pollices. (Cassin.)

The bill is moderately long, conspicuously lobed, and attenuated at the end. Tail containing twelve feathers, is 7.5 in. long, silky white beneath, tinged with yellow.

Hab. Hawaii, Kealakeakua Bay (specimen in Mus. Philadelphia Acad. Nat. Sciences), Niihau and Molokai.

STRIGIDÆ.

2. **Strix delicatula** Gould, Proc. Zoöl. Soc. London, 1836, p. 140. Cassin, U. S. Expl. Exped., Mam. and Ornith., p. 105. *Strix lulu* Peale, Zoöl. U. S. Expl. Exped., Birds, p. 74 (Edit. 1848). *Kaio ?* of the natives.

S. Adultus ♂, supra in fundo grisescente tenuissime nigricante-vermiculata, maculis crebris albidis, nigro-circumdatis, in capite et collo minus conspicuis; disco faciali albido, margine et periopthalmiis brunneo-rufescentibus; pectore et epigastrio albis, maculis minutis, subtriquetris nigris; abdomine imo, cruribus et subcaudalibus immaculatis, albis; ala omnino magis rufescente, remigibus pallide rufescentibus, nigricante-vermiculatis, fasciis nonnullis irregularibus fuscis, pogonio interno albicantibus; cauda simili modo picta, fasciis 4–5 angustis fuscis; subalaribus albis, maculis minutis nigris; rostro pallide corneo; pedibus flavidis. Long. circa 14.5 in.; rostrum 9 lines, ala 10 in., caud. 4 in., tars. 2 in. 2 lines. (Finsch und Hartlaub, Ornithologie Central-Polynesiens, p. 11.)

This species was first referred to Niihau by Cook. It is probably the species common on Kauai, Oahu and Maui.

3. **Brachyotus gallapagoensis** Gould, Proc. Zoöl. Soc. London, 1837, p. 10. Cassin, U. S. Expl. Exped., Mam. and Ornith., p. 107. *Strix sandwicensis* Bloxham, Voyage of the Blonde, p. 250 (1826)? Gould, Voyage of the Beagle, III, p. 82 (1841). *Pueo* of the natives.

Fascia circa oculos fuliginosa; striga superciliari plumis nares tangentibus et circa angulum oris, gula et disci fasciatis margine albis; vertice corporeque supra intense stramineo fuscoque variegatis; primariis intense fuscis ad apicem, stramineo fasciatis ad basin; corpore subtus stramineo notis irregularibus fasciisque fuscis ornato; femoribus tarsisque plumosis rufescenti-stramineis; rostro et unguibus nigris. Longus totus 13.5 in.; rostri 1 in., alæ 11 in., caudæ 6 in., tarsi 2 in. (Gould.)

MELIPHAGIDÆ.

4. **Moho niger** Gmelin, Syst. Nat., I, p. 465 (*Merops*). *Mohoa nobilis* Merrem, Beyt. zur Besond. Gesch. Vögel, p. 8, pl. II. Cassin, Proceedings Phil. Acad. Nat. Sci., Vol. VII, p. 440.

Crisso flavo, cauda cuneiformi, rectricibus duabus extimis extus et apice albis. 14 poll. long.

Hab. Hawaii.

5. **Moho braccata** Cassin, Proc. Phil. Acad. Nat. Sci., Vol. VII, p. 440.

Smaller than the preceding, bill less curved, tail moderate, central feathers longest. Tibiæ yellow. Head above black; throat and breast with every feather having a terminal spot of ashy white; back, rump and under parts dark chocolate brown, with a few longitudinal lines of white on the back. Wings and tail brownish black, the former edged with white at the shoulder. Bill and feet dark. Total length 8.5 in.; wing 3.67 in; tail, 3.5 in. (Specimen in Mus. Acad. Philad., ♂.)

6. **Moho angustipluma** Peale, Zoöl. U. S. Expl. Exped., Birds, p. 147 (Edit. 1848). *Entomiza* Cassin, U. S. Expl. Exped., Mam. and Ornith., p. 168. Atlas, pl. XI, fig. 1. *Entomiza* Peale. *Oo* of the natives.

Supra fusca lineis longitudinalibus albis, gutture flavescenti-albo, pectore et abdomine albis, fusco lineatis, crissis rufis, alis et cauda fuscis, linea suboculari nigra. Long. tot. 13.5 pollices. (Cassin.)

Form rather slender; bill curved. Hab. Hawaii, wooded region.

Specimen in Smithsonian Institution.

7. **Moho apicalis** Gould, Proc. Zoöl. Soc. London, 1860, p. 381. Dixon's Voyage round the World, plate opposite p. 357.

General plumage sooty black; tail brown, all but the two middle feathers largely tipped with white; the two central feathers somewhat narrower than the others, and gradually diminishing in the apical third of their length into fine hair-like or filamentous upturned points; axillæ or under surface of the shoulder white; flanks and under tail-coverts bright yellow; bill and legs black. Total length 12 in.; bill 1.5 in.; wing. 4.75 in.; tail 6.75 in.; tarsi 1.5 in. Hab. Hawaii.

PROMEROPIDÆ.

8. **Drepanis coccinea** Merrem. *Mellisuga coccinea* Merrem, Beyt. Bes. Gesch. Vögel, p. 17, pl. IV. *Certhia coccinea* Gmelin, Syst. Nat., I, p. 470 (1788). *C. vestiaria* Latham, Ind. Ornith., I, p. 282 (1790). *D. coccinea* Cassin, U. S. Expl. Exped., Mam. and Ornith., p. 177. Shaw, Nat. Misc., III, pl. LXXV; Vieillot, Ois. dor., pl. LII, LIII.

D. coccinea, alis caudaque nigris (Forster); rostro capite longis, acinacis modo curvato, albido; pedibus cum unguibus longis albicantibus; rectricibus brevis, acuminatis; alarum margine et pennarum gularium radice alba, longitudine vix 6 pollices adæquans. (Gmelin.) Hab. Hawaii. Formerly much sought for its feathers.

9. **Drepanis pacifica** Gmelin, Syst. Nat., I, p. 470 (*Certhia pacifica*).

D. nigra, subtus obscura, humeris, dorso inferiore, uropygio crissoque flavis, tectricibus alarum inferioribus niveis, caudæ superioribus et nonnullis alarum interioribus flavis; rostro valde curvato fusco, basi pallidis; pedibus ex atro fuscis. Long. 8 pollices. Hab. Hawaii, Kauai.

10. **Drepanis sanguinea** Gmelin, Syst. Nat., I, p. 479. (*Certhia sanguinea.*)

D. sanguinea, remigibus caudaque nigris, abdomine obscuro, crisso albo; rostro obscuro, pedibus nigris; remigum secundarium margine badis, rectricibus acuminatis. Long. 5 pollices. (Gmelin.) *Apapane* of the natives. Hab. Hawaii, Kauai.

Gmelin gives *D. virens* as possibly the ♀ of this species; the edges of the secondaries are yellow, and the "pedes obscuri" otherwise as above.

11. **Drepanis flava** Bloxham, Voyage of the Blonde, p. 249. *Amakihi* of the natives.

Length 4.5 in; bill dark brown, slightly curved, sharp pointed, .5 in. long; upper mandible rather longer than the lower; nostril at the base covered with a hard membrane; tongue tubular, divided at the extremity into minute threads or filaments; neck, breast and belly, yellow; upper part a yellowish olive green; ♂ of a deeper color than ♀; legs brown; toes three forwards and one backwards, the middle connected with the outer one as far as the first joint. (Bloxham.)

12. **Hemignathus lucidus** Cassin, U. S. Expl. Exped., Mam. and Ornith., p. 180. *Nectarina lucida* Lichtenstein, Mém. Acad. Berlin, 1839, p. 451, pl. v, figs. 2, 3. Voyage Vénus, Oiseaux, pl. I. *Vestiaria heterorhynchus* Lesson, Rev. Zool., 1842, p. 209. *Drepanis lucida* G. R. Gray, Gen. of Birds, I, p. 96. Hab. Oahu.

13. **Hemignathus obscurus** Cassin, U. S. Expl. Exped., Mam. and Ornith., p. 178. *Certhia obscura* Gmelin, Syst. Nat., I, p. 470. Aud. et Vieill., Oiseaux dor., II, pl. LIII. Latham, Gen. Syn., I, pl. XXXIII, fig. 1. *Drepanis Ellisiana* Gray, Cat. Birds of Trop. Islands of the Pacific, 1857, p. 9. *Iwi* of natives.

Bill long, gradually curved, pointed; wing 3 in. long, third feather longest; tail 1.7 in. even. Front and line over the eyes, pale greenish yellow; spot in front of the eye black. Entire upper parts olive green tinged with yellow; under parts greenish yellow; lighter under throat and under tail coverts. Length of skin about 6 in. Hab. Hawaii, Maui, Oahu, Kauai.

14. **Hemignathus olivaceus** Cassin, U. S. Expl. Exped., Mam. and Ornith., p. 179. *Heterorhynchus olivaceus* Lafresnaye, Mag. de Zool., 1839, p. 17, pl. x. *Certhia olivacea* Gmelin, Syst. Nat., I, p. 473.

H. olivaceus, subtus fuscus, orbitis albicantibus; rostro nigro; rectricibus extimis apice albis, ceteris cum remigibus fuscis, tinctu olivaceo; pedibus pallide fuscis. (Gmelin.)

15. **Myzomela nigriventris** Peale, Zoöl. U. S. Expl. Exped., Birds, p. 150. Cassin, U. S. Expl. Exped., Mam. and Ornith., p. 175. Atlas, plate XII, fig. 1. Adult. Hartl., Weigm. Arch. f. Naturgeschichte, 1852, p. 109. *M. melanogastra* Bonaparte, Comptes Rendus, 1854, p. 263. Finsch und Hartlaub, Ornith. Central-Polynesiens, p. 56, plate VII, fig. 3, adult, fig. 4, young.

Corpore supra, capite et collo totis pectoreque fulgide coccineis;

macula parva anteoculari, alis, cauda et abdomine toto nigerrimis; subalaribus, et subcaudalibus, rostro ex pedibus nigris; iride brunnea. (Hartlaub). Long. 4.5 in.; rostrum, 7.5 lines. ♂. Sexes alike in plumage. Hab. Hawaii, dense forests. Specimen in Smithsonian Institution.

MUSCICAPIDÆ.

16. **Muscicapa maculata** Gmelin, Syst. Nat., I, p. 945.

M. ferruginea, subtus dilute spadicea, remigibus atris, tectricibus alarum macula prope apicem ex ferrugineo alba, rectricibus fuscis, extimis intus apice albis; rostro nigro. This is perhaps an uncertain species.

TURDIDÆ.

17. **Tatare otaitiensis** Lesson, Traité d'Ornithologie, I, p. 317 (1831). Cassin, U. S. Expl. Exped., Mam. and Ornith., p. 159. *Sitta otatare* Lesson, Voyage Coquille, Zoologie, I, p. 666, plate XXIII, fig. 2. *Tatare fuscus* A. Lesson, Rev. Zool., 1842, p. 210. Lafresnaye, ibid. 1845, p. 449. *Turdus longirostris?* Gmelin, Syst. Nat., I, p. 823. *Tatare longirostris* Pelzeln, Novara Exped., Vögel (1865), p. 60. Finsch und Hartlaub, Ornith. Central-Polynesiens, p. 66.

Ad. Supra obsolete olivaceo-brunnescens, tergo et uropygio magis olivascentibus; alarum tectricibus margine flavidis; subtus pallide flava; remigibus fuscis; pallidius limbatis; rectricibus intermediis fuscis, extremo apice flavo-pallentibus binis externis totis pallide flavis; sequentibus pro majore parte basali fuscis; subalaribus flavis; nota supraoculari flavida; rostro supra brunneo, mandibula pallida; pedibus pallide brunneis; iride avellanea. Long. 8 in., Jun. totus fuscus. This species varies much in color. Hab. Hawaii, Kauai, reedy marshes. Specimens in Smithsonian Inst. and Mus. Phil. Acad.

18. **Turdus sandvicensis** Gmelin, Syst. Nat., I, p. 813. Latham, Syn., II, I, p. 39. *Colluricincla? sandvicensis.* Gray, Cat. Birds of Trop. Islands of Pacific, p. 24. *Amaui* of the natives.

T. supra et abdomine fuscescens; subtus et fronte ex cinereo albus; rostro pedibusque atris; cauda æquale. Longus 5.5 pollices. (Gmelin.)

AMPELIDÆ.

19. Taenioptera obscura Cassin, U. S. Expl. Exped., Mam. and Ornith., p. 155. Atlas, plate IX, fig. 3. ♂ adult. *Muscicapa obscura.* Gmelin, Syst. Nat., I, p. 945 (1788). Latham, Ind. Ornith., II, p. 470. *Phæornis obscura*, Sclater, Ibis, 1859, p. 327. *Chasiempsis obscura*, Finsch und Hartlaub. Dusky Fly-catcher. *Eopsaltria obscura* Gray, Cat. Birds of Trop. Islands of Pacific, p. 22.

Adult ♂, all upper plumage light reddish brown, tinged with cinereous on forehead; under parts light ashy. Bill dark; tarsi lighter. ♀ bright fulvous band across folded wing; under parts nearly white. Length of skin about 7 in.; wing 4 in.; tail 3 in.; tarsus 1.5 in. Specimens in Smiths. Inst. and Philadel. Mus.

20. Eopsaltria sandvicensis Gmelin, Syst. Nat., I, 945 (*Muscicapa sandvicensis*). Latham, Gen. Syn., II, p. 344. Bloxham, Voyage of Blonde, p. 250. Cabanis. Ornith. Notiz., I, p. 208. *Chasiempsis sandvicensis* Finsch und Hartlaub. *Elepaio* of the natives.

E. fusca, subtus ochroleuca, fronte exfusco lutescente, superciliis albis, mento pallido striis atris picto, pectore et tectricum alarum margine ferrugineo, remigibus retricibusque fuscis, apice albis; rostro nigro basi flavicante; pedibus nigris. Long. 5.5 pollices.

CORVIDÆ.

21. Corvus hawaiiensis Peale, Zoöl. U. S. Expl. Exped., Birds, p. 106 (1st Ed., 1848). Cassin, U. S. Expl. Exped., Mam. and Ornith., p. 119, Atlas, pl. VI. *C. tropicus* Gmelin. *Alala* of the natives.

Totus fuliginosus cinereo tinctus, rostro et tarsis nigris. Lon. tot. poll. 18.8 in. ♂ alar. 12 in., caud. 8 in., rostr., 2.2 in., tarsus 2.5 in. (Cassin.)

Several of these birds were seen by Messrs. Brigham and Mann in the forests of Kona at an elevation of six thousand feet. All specimens have hitherto come from Kealakeakua in this district of Hawaii. The caw is not unlike that of the American species. Probably no other Corvus exists on the Hawaiian group, and this species is by no means abundant.

Corvus? tropicus Gmelin, Syst. Nat., I, p. 372.

FRINGILLIDÆ.

22. **Hypoloxias coccinea** Gmelin, Syst. Nat., I, p. 921 (*Fringilla coccinea*). *Scarlet Finch* Latham, Syn., II, I, p. 270. *Loxops coccinea* Gray, Cat. of Birds of Trop. Ids. of Pacific, p. 28. Cabanis, Ornith. Notiz., p. 330. *Akepa* of the natives.

H. ex coccineo aurantia, alis caudaque æquali atris, remigum margine exteriore aurantio primorumque apice nigro; rostro fuscescente; pedibus nigris. Longa 4.5 in.

23. **Psittirostra psittacea** Latham, Syn., II, I, p. 108. *Loxia psittacea* Gmelin, Syst. Nat., I, p. 844. *P. icterocephala* Gray, Cat. of Birds of Trop. Ids. of Pacific, 1859, p. 28. *Ou* of the natives?

P. olivacea, remigum rectricumque æqualium margine flavicante, mandibula inferiore multo breviore; rostro, pedibusque fuscescentibus; ♂ capite colloque flavo. Longa 7 pollices.

24. **Emberiza sandvicensis** Gmelin, Syst. Nat., I, p. 875. Latham, Syn., II, p. 363.

E. fusca, subtus exalbida fusco maculata, superciliis flavis temporibus atris; rostro pedibusque atris; linea subocularis obscura; abdominis medio exalbido non maculato. (Gmelin.)

25. **Emberiza atricapilla** Gmelin, Syst. Nat., I, p. 875. Latham, Syn., II, p. 202.

E. spadicea, pennarum singularum stria media fusca, subtus cinerea, vertice flavo, fronte et fascia oculari nigra, mento exalbido, occipite cinereo; rostro atro; uropygio pallide olivaceo; tectricibus alarum remigibusque margine pallidis; abdominis pennis medio pallidissime flavicantibus; cauda æquale, pedibus fuscis, unguibus atris. (Gmelin.)

PSITTACIDÆ.

Psittacus pyrrhopterus Latham, Ind. Orn. Suppl., p. xxxii. *Brotogeris pyrrhopterus* Vigors, Zoöl. Journ., II, p. 400, pl. IV, Suppl. *Conurus pyrrhopterus* G. R. Gray, List of Psitt. Brit. Museum, p. 46. Is mentioned by various authors as belonging to this group, but so far as I know, does not occur. It is a native of Guayaquil.

Ceriphilus Kuhlii Wagl., Monogr. Psitt., p. 566. Gray, Cat. of Birds of Trop. Ids. of Pacific, 1859, p. 32. *Psittacula Kuhlii* Vigors, Zoöl. Journ., I, p. 412, pl. XVI; Lears, Parr., pl. XXXVIII.

Ceriphilus fringillaceus Bonaparte, Rev. et Mag. de Zool., 1854, p. 157. Gray, Cat. of Birds of Trop. Ids. of Pacific, 1859, p. 33. *Psittacus australis* Gmelin, Syst. Nat., I, p. 329.

C. viridis, vertice cæruleo pennis elongatis cristato, gula et abdomine medio rubris, femoribus purpureis, fronte pallide viridi; rectricibus duobus intermediis viridibus, apice flavis, reliquiis flavicantibus, margine et apice viridibus, pedibus obscuris, unguibus nigris. (Gmelin.)

It is very doubtful whether any of the Psittacidæ occur. Mr. Brigham saw none in a very extensive journey over the Group.

RALLIDÆ.

26. **Ortygometra sandvicensis** Gmelin? *Rallus quadristrigatus* Horsfield, Trans. Linn. Soc., XIV, 1820, p. 196. *R. sandvicensis*, var. β., Gmelin, Syst. Nat., p. 717. *O. quadristrigata* Finsch und Hartlaub, Ornith. Central-Polynesiens, p. 164. *Porzana sandvicensis* Hartlaub, Weigm. Arch. für Naturg., 1852, p. 137.

Adul. Supra griseus; fronte cinereo-fuscescente; tergo et uropygio griseo-fuscis; linea a basi rostri ad supercilia ducta alba; gastræo cinereo-albicante; crisso pallide ochroleuco; alis fuscis, pennis pallide marginatis; pedibus viridi-olivaceis; rostro fusco-luteo; iride sanguinea. Long. 6.5 in., rostr. 9.12 in., alar. 3.5 in.

27. **Ortygometra obscura** Gmelin, Syst. Nat., II, p. 718 (*Rallus obscurus*). Latham, Syn., III, I, p. 237, n. 16. *Porcana obscura* Hartlaub, Weigm. Archiv für Naturg., 1852, p. 137.

Fuscus nigro-striatus, subtus ex ferrugineo fuscus, rostro nigro; pedibus spadiceis; mandibularum acies flavicans. Longus 6 pollices. (Gmelin.)

28. **Gallinula chloropus** L. *Rallus aquaticus* Gmelin, Syst. Nat., I, p. 712. *S. chloropus* Pelzeln, Novara Exped., Vögel, p. 135. *Alae* of the natives.

Iris cherry red; cere and bill scarlet red, the latter lemon yellow at the tip; feet yellowish green, the toes brownish above; claws light brown. (Pelzeln.)

29. **Fulica alae** Peale, Zool. U. S. Expl. Exped., Birds, p. 224. Cassin, U. S. Expl. Exped., Mam. and Ornith., p. 306. Atlas, pl. XXXVI. Adult. *Alae keokeo* of the natives.

F. americana minor, rostro gracilliore. Tota profunde cinerea, capite et collo prope nigris. Long. tot. 13 pollices. (Cassin.)

Common in *kalo* patches. Specimen in Mus. Bost. Nat. Hist. Soc.

ARDEIDÆ.

30. Ardea sacra Gmelin, Syst. Nat., I, p. 640. Finsch und Hartlaub, Ornith. Central-Polynesiens, p. 201. *A. vulgaris* Forster, Desc. An., p. 172 (1844). Cassin, U. S. Expl. Exped., Mam. and Ornith., p. 296. *Auku* of the natives.

A. saturate cinereo-cærulescens, abdomine subfuscente, linea a mento per mediam gulam decurvente lata nivea; cristæ, tergi et pectoris plumis elongatis, apice ligulatis; rostro supra fusco, infra et apice flavescente; pedibus flavidis; iride flava. Long. 24 pollices. (Finsch und Hartlaub.)

The young birds are wholly white, and the ♀ whiter than the ♂. Iris is yellow.

Common all over the group.

31. Ardea exilis Gmelin, Syst. Nat., I, p. 645. Latham, Syn., III, I, p. 66. Gray, Cat. of Birds of Trop. Ids. of Pacific, p. 49.

A. capite lævi et corpore supra ex rufo-badio, subtus albo, colli lateribus rufis, remigibus caudaque nigris; rostro virescente, iridibus stramineis; colli pennis lateralibus et inferioribus prælongis et laxis; pectore ex fuscescente nigro; tectricibus alarum mediis ferrugineis; remigibus nonnullis apice badiis; pedibus viridis. (Gmelin).

Hab. Oahu.

SCOLOPACIDÆ.

32. Numenius australis Gould, Proc. Zoöl. Soc. London, 1837, part. v, p. 155. *N. tahitiensis* Gray, Cat. of Birds of Trop. Ids. of Pacific, p. 49. *Scolopax tahitiensis* Gmelin, Syst. Nat., I, p. 656.

Summo capite nuchaque nigro-fuscis, singulis plumis cervino marginatis; dorso nigrescenti-fusco, singulis plumis rubescenti-cervino ad marginem irregulariter maculatis; tectricibus alæ nigro-fuscis, cinereo marginatis; tertiariis brunneis, marginibus pallidioribus irregulariter maculatis; uropygio tectricibusque superioribus caudæ nigro-fuscis, singulis plumis cinerescenti-cervino ad marginem fasciatis; tectricibus majoribus alarum, nigro-fuscis, ad apicem albis; 1, 2, 3, 4 et 5, primariis brunneis, stemmatibus albis, reliquis cum secondariis irregulariter albo fasciatis; lateribus faciei, gutture, corporeque, infra pallide seminis, singulis plumis, linea centrali nigrescenti-fusca; rostro ad basin flavescenti-brunneo, ad apicem nigrescenti-brunneo; pedibus olivaceis. Long. tot. unc. 20; rostri 5.7; alæ 11; caudæ 4.5; tarsi .4.

33. Actitis incanus Finsch und Hartlaub, Ornith. Central-

Polynesiens, p. 182. *Scolopax incanus* Gmelin, Syst. Nat., I, p. 658. *To'anus brevipes* Cassin, Proc. Acad. Nat. Sci. Phil., VIII, p. 40 (1856); ibid, 1862, p. 321. *Totanus oceanicus* et *brevipes* Cassin, U. S. Expl. Exped., Mam. and Ornith., pp. 318, 319. *T. polynesiæ* Peale, Zoöl. U. S. Expl. Exped., Birds, p. 237, pl. LXV. *T. brevipes* Pelzeln, Novara Exped., Vögel, p. 129.

Ad. Supra totus sordide cinereus, subunicolor; alarum tectricibus pallidius marginatis; superciliis albis; loris nigricantibus; remigibus majoribus nigricante-fuscis, gula alba; collo antico pectoreque cinerescentibus; abdomine, subalaribus et subcaudalibus albis; rostro obscuro, mandibulæ basi pallescente; pedibus virescentibus; iride fusca. (Winter.)

Collo laterali et antico, capitis lateribus, pectore, epigastrio, subcaudalibus et hypochondriis in fundo albo irregulariter obscure cinereo-fasciatis; abdomine medio pure albo. (Summer.) Long. 12 in. (Finsch und Hartlaub.)

CHARADRIADÆ.

34. **Charadrius fulvus** Gmelin, Syst. Nat., I, p. 687. Latham, Ind. Ornith., II, p. 747. *C. xanthocheilus* Wagler, Syst. Avium, 1827. Cassin, U. S. Expl. Exped., Mam. and Ornith., p. 325. *C. pluvialis* Pelzeln, Novara Exped., Vögel, p. 115. Gould, Birds of Australia, V, pl. XIII. *Kolea* of the natives.

Ad. Supra nigro, albido et flavescente maculatim varius; fronte et superciliis latis utrinque per colli latera juxta nigredinem colli antici decurrentibus pure albis; genis, regione parotica, colli lateribus, jugulo, pectore abdomineque mediis nigerrimis; hypochondriis albo, nigroque fasciatis; subcaudalibus mediis nigris; rostro nigro; pedibus fuscis; iride fusca; ♀ supra distinctius flavido nigroque maculata; jugulo, pectoreque flavido-griscescentibus, obscurius nubilatis; abdomine medio et subcaudalibus albis. Long. 8.5 in.

Hab., Oahu, Molokai.

35. **Charadrius hiaticula** Latham, Syn., III, I, p. 202. Gmelin, Syst. Nat., I, p. 683. *Ulili* of the natives.

C. pectore nigro, fronte nigricante fasciola alba; vertice fusco, pedibus luteis; rostro fulvo, versus apicem nigro; iride avellanea; mento, gula, pectore et abdomine albis. (Gmelin.)

Hab., Hawaii.

36. **Strepsilas interpres** Cassin, U. S. Expl. Exped., Mam. and Ornith., p. 322. Finsch und Hartlaub, Ornith., Central-Poly-

nesiens, p. 197. Baird, Birds of North America, p. 701. *Tringa oahuensis* Bloxham, Voyage Blonde, p. 251. Gould, Birds of Austr., VI, pl. XL. *Cinclus interpres* Gray, Cat. of Birds of Trop. Ids. of Pacific, p. 48.

Common on the shores.

ANATIDÆ.

37. Bernicla sandvicensis Vigors, Proc. Zoöl. Soc. London, 1834, p. 43. Cassin, U. S., Expl. Exped., Mam. and Ornith., p. 338, *Anser hawaiiensis* Eydoux et Souleyet, Voy. Bonite, Oiseaux, p. 104. Atlas, pl. X. Peale, Zoöl. U. S. Expl. Exped., Birds, p. 249. *Nene* of the natives.

Hab., Highlands of Hawaii and Maui. Common in flocks of 3–7.

This bird is seldom seen near water, living almost constantly on the high lava fields, at an elevation of five to seven thousand feet, where it finds abundant food in the ohelo (*Vaccinium penduliflora*), and a species of Sonchus (*S. asper*). It builds its nest in the grass, and lays two or three eggs, white, and about the size of those of the common goose.

38. Anas superciliosa Gmelin, Syst. Nat., I, p. 537. Latham, Ind. Orn., p. 852. Var. *sandvicensis* Bonaparte, Compt. Rend., 1856, p. 649. Var. *A. superciliosa* G. R. Gray, Cat. Birds Trop. Ids., 1859, p. 54. Finsch und Hartlaub, Ornith. Central-Polynesiens, p. 213. *Koloa* of the natives.

Ad. Fusca, notaei et grastraei plumis pallidius marginatis; pileo fusco-nigricante; collo pallidiore, ochroleuco, fusco striolato, postice longitudinaliter obscuro; superciliis, fascia lata infraoculari, gutture colloque antico unicoloribus, ochroleucis; fascia lata utrinque per oculum ducta alteroque stricta ad rostri basin orta fuscis; speculo alari pulchro viridi, late nigro-marginato; rostro nigro; pedibus brunneis; iride aureo-flava. Long. 23 in.

Anas boschas Cassin, U. S. Expl. Exped., Mam. and Ornith., p. 339. Hartlaub, Weigm. Arch. für Naturg., 1852, p. 122. Mallard. *Kaka* of the natives. Naturalized on all the islands of the group.

39. Anas clypeata Gmelin, Syst. Nat., I, p. 518. Audubon, Birds of America, VI, p. 293; *Spatula clypeata?* Gray, Cat. of Birds of Trop. Islands of Pacific, 1859, p. 55. Shoveller Duck. *Moha* of the natives.

A. rostro nigro, ungue incurvato; iride flava; capite, colloque viride-nitentia, in violaceum colorem vergentia; pectore alvo, lunatulo; dorso, remigibus caudaque cuneiformis fuscis; abdomine castaneo;

crisso nigro; tectricibus alarum primis secundisque pallide cæruleis, majoribus fuscis, apice albis; rectricibus extimis albis, reliquarum margo albus; pedibus fulvis. (Gmelin).

Hab., Oahu, Hawaii.

LARIDÆ.

40. Sterna Bergii Lichtenstein, Verz. Doubl. Berlin Mus. (1823), p. 80. Finsch und Hartlaub, Ornith. Central-Polynesiens, p. 216. *S. rectrirostris* Peale, Zoöl. U. S. Expl. Exped., Birds, p. 281, pl. LXXV, fig. 2. *S. poliocerca* Cassin, U. S. Expl. Exped., Mam. and Ornith., p. 384. *Thalasseus Bergii* Blas., Cal. y. f. Ornith. (1866), p. 81. *S.* (*Sylochelidon*) *poliocerca* Gray, Cat. Birds Trop. Ids. Pacific, 1859, p. 58.

Ad. Dorso, alis et cauda dilute cærulescente-canis; fronte, capitis lateribus, collo toto corporeque subtus pure albis; vertice et nucha subcristata nitide et circumscripte nigris; remigibus majoribus pogonio externo toto obscure cinereis, interno pro majore parte scapisque albis; sub alaribus albis; rostro flavissimo; pedibus nigris; iride nigra.

Jun. Supra sordide cinerea plus minus infuscata; pileo cinereo et nigricante vario; crista fusco-nigricante; colli lateribus in fundo albo cinereo-maculatis. Long. 23 in. (Finsch und Hartlaub.)

41. Sterna panaya Finsch und Hartlaub, Ornith. Central-Polynesiens, p. 228, pl. IV, figs. 1, 2, 3. Eggs. *S. panayensis* Gmelin, Syst. Nat., I, p. 607. Latham, Ind. Ornith., II, p. 808. *S. oahuensis* Bloxham, Voyage Blonde, p. 251. *Haliplana panayensis* Bonaparte, Compt. Rend., 1856, p. 772. *H. panaya* Coues, Isis, 1864, p. 391. *S. serrata* Gray, Cat. Birds Trop. Ids. Pacific, 1859, p. 59. Forster, Descript. etc., p. 276. *Kala* of the natives?

Ad. Supra fuliginosa; pileo nuchaque fusco-nigris; fronte, superciliis brevibus, margine alari et gastraeo toto pure albus; fascia per oculum ducta late nigro-fusca; remigibus majoribus nigris versus marginem internum albicantibus; cauda fuliginosa; rostro et pedibus nigris; iride fusca.

Jun. Notæi plumis margine pallide rufescentibus; pileo albo et nigricante longitudinaliter vario; gastraei albidine minus pura. Long. 13 pollices; caud. 5 pollices. (Finsch und Hartlaub).

42. Gygis alba Cassin, U. S. Expl. Exped., Mam. and Ornith., p. 389. Fig., Egg. Finsch und Hartlaub, Ornith. Central-Polynesiens. *Sterna alba* Sparrman, Mus. Carls, No. XI (1786). *S. candida*

Gmelin, Syst. Nat., I, p. 607 (descr. fals.). Latham, Ind. Ornith., p. 807. Gould, Birds of Austr., VII, pl. XXX.

Ad. Tota sericeo-alba, unicolor; rostro nigro, basi pulchre violascente-cæruleo; pedibus pallide cæruleis, membranis interdigitalibus flavis; iride fusco-nigra. Long. 10.5 pollices; caud. 3.5 pollices. (Finsch und Hartlaub.)

A single egg is laid on a bare branch of a tree, a knot or slight cavity being its only protection. It is 1.6 in. long and 1.2 in. in diameter, the ends nearly alike in form; color brownish white, sprinkled with thread-like spots and patches of burnt umber. (Peale.)

43. Anous stolidus Cassin, U. S. Expl. Exped., Mam. and Ornith., p. 391. Finsch und Hartlaub, Ornith. Central-Polynesiens, p. 234. *A. stolidus* et *frater* Coues, Proc. Acad. Nat. Sci. Philad., 1862, p. 558. Baird, Birds of North America, p. 865. Gould, Birds of Austr., pl. XXXIV. *A. pileatus* et *stolidus*, Pelzeln, Novara Exped., Vögel, p. 155. *A. niger* Stephens, Gen. Zoöl., XIII, p. 140 (1825). *Oio* of the natives? Sperm-whale bird.

Ad. Pulchre fuliginosus; remigibus majoribus et cauda fere nigris; pileo albicante-cano; loris nigricantibus; rostro et pedibus nigris; iride fusca. Long. 20 pollices. (Finsch und Hartlaub.)

The differences between the American and Pacific forms of this bird are thus tabulated by Dr. Coues, *loc. cit.*

AMERICAN.	PACIFIC.
Length of wing 10 to 10.5 in.	Length of wing 11 to 11.25 in.
Length of tail about 6 in.	Length of tail about .7 in.
Height of bill at base .38 in.	Height of bill at base .43 in.
Length of tarsus 1 in.	Length of tarsus 1 in. (same).
Length of middle toe and claw 1.45 in.	Length of middle toe and claw 1.60.
Middle toe and claw 1.45 length of tarsus.	Middle toe and claw 1.60 length of tarsus.
Central tail feathers but slightly shorter than the next.	Central tail feathers half an inch shorter than the next.
Occiput bluish plumbeous, becoming pure white on the front. Sides of head and neck all round with a decided wash of bluish plumbeous. Feet nearly black in dried specimen.	Occiput brownish ash, becoming ashy white (not pure) on the front. Sides of head and neck not notably different from general fuliginous. Feet reddish brown in dried skin.

The dimensions of a specimen I shot in lat. 20° 30′ N., long. 154° W., were as follows:—Total length 13 in., spread of wings 22.77 in., length of bill 2 in. Flight rapid and unsteady. Breeds on the sea cliffs on the Hawaiian Islands.

PELICANIDÆ.

44. Phaeton rubricauda Boddaert, Tabl. Pl. Enl., p. 57. Finsch und Hartlaub, Ornith. Central-Polynesiens, p. 248. Cassin, U. S. Expl. Exped., Mam. and Ornith., p. 395. *P. phœnicurus* Gmelin, Syst. Nat., I, p. 583. Gould, Birds of Austr., VII, pl. LXXIII.

Ad. Totus sericeo-albus, rosaceo, tinctus; remigibus concoloribus; rectricibus duabus intermediis longissimis, intense rubris, scapis nigris; rostro rubro; pedibus flavis, membranis nigris. Long. cor. 3 pollices.

Quite common throughout the group, especially on Niihau and Kauai. The natives climb the almost inaccessible cliffs to get the rose colored tail-feathers which they pull from the birds on their nests.

45. Phaeton æthereus Linnæus, Syst. Nat., p. 219 (1766). Cassin, U. S. Expl. Exped., Mam. and Ornith., p. 394. Finsch und Hartlaub, Ornith. Central-Polynesiens, p. 250.

P. albus, dorso nigro-fasciolate et undulate; rostro læte rubro; iride flava. (Finsch und Hartlaub.)

46. Tachypetes aquilus Vieill., Gal. des Oiseaux (1825), p. 274. Baird, Birds of North America, p. 873. Finsch und Hartlaub, Ornith. Central-Polynesiens, p. 265. Cassin, U. S. Expl. Exped., Mam. and Ornith., p. 358. *T. Palmerstoni*, Ibid., p. 359. Cassin, Proc. Acad. Nat. Sci. Philad., 1856. *Atagen aquilus* Gray, Cat. Birds Trop. Ids., 1859, p. 61.

Breeds on Nihoa. (Kittlitz.)

PROCELLARIDÆ.

47. Thalassidroma ——. An unnamed species from the Hawaiian Islands is in the Smithsonian collection.

48. Procellaria alba Gmelin, Syst. Nat., I, p. 565; *Æstrelata leucocephala?* Bonaparte, Consp. Avium, II, p. 189. *Uau* of the natives.

P. ex fusco nigra, gulæ area, pectore, abdomine et crisso albis; tectricibus caudæ inferioribus ex cinereo et albo mistis; rostro nigro; cauda rotundata, 16 pollices longa. (Gmelin.)

A LIST OF HAWAIIAN NAMES OF INDIGENOUS BIRDS.

A = Aaianuheakane, large sea bird.

Ao = kaao.

Aua = alala.

Auku, Ardea sacra.
Aukuu.
Akakane.
Akeake.
Akeke = akekeke = keke.
Akekee, small brown bird.
Akepa, Hypoloxias coccinea.
Akihialoa, small, yellow.
Akihipolena, small red bird.
Akohekohe, nesting on ground.
Alaalai.
Alae, Gallinula chloropus.
Alae keokeo, Fulica alae.
Alauwahio, small, yellow=Lauwi.
Alala, Corvus hawaiiensis.
Amaui, Turdus sandvicensis.
Amakihi, Drepanis flava.
Amakika.
Apane, small, red feathers = Ii.
Apapane, Drepanis coccinea.
Elepaio, Eopsaltria sandvicensis.
Iao, resembles the Moho.
Iawi, small, red = Iiwi.
Ii, bill hooked, feathers partly red = Apane.
Iiwipolena.
Io, Brachyotus gallipagoensis?
Iwa, largewith black feathers.
Iwi = Iawi, Hemignathus obscurus.
Oio, Anous stolidus?
Oo, small, brown, web-footed.
Ou = Moho.
Ou, Psittirostra psittacea?
Ouou, small.
Omao resembles the Ou.
Uau, a diver, Procellaria alba.
Uaukewai, as large as a turkey, back black, breast and wings white.
Ukaka, ♀ of Oo.
Ukeke, }
Ukekeke }
Ulili, Charadrius hiaticula.
Uwau, water-fowl.
Haakoae, white.
Kaio, Strix delicatula?
Kaunuanaau, large, Hawaii.
Kaupu, large, black. Nihoa and Kaula.
Kaka, Anas boschas.
Kakawahie.
Kala, Sterna panaya?
Kanono, a red fowl.
Keke = Akeke.
Ki, small.
Kioea, long legs. Molokai.
Kiki, usually caught in net.
Kiwaa, very large.
Koae, Phæton æthereus?
Kolea, Charadrius fulvus.
Koloa, Anas superciliosa.
Kukuluaeo, long-legs.
Lauwi = Alauwahio, small, yellow.
Laka.
Lale.
Leleu.
Lio.
Mamo, yellow feathers.
Manuioio, small bird.
Manuu.
Manuku, dove.
Moho, wingless bird.
Mali, large bird.
Mu, small, yellow feathers.
Nene, Bernicla sandvicensis.
Noio, small, black, lives on fish.
Pipi = ♀ Oo.
Piwai, a wild duck.
Polena = Oo, sp.

Descriptions of some Extinct Fishes previously unknown.
By E. D. Cope.

TELEOSTEI.

Histiophorus homalorhamphus Cope.[1]

Established on an osseous muzzle procured by Wm. S. Vaux, from the Eocene or Miocene Green-sand of the neighborhood of Squankum, New Jersey, with a portion of the muzzle of *Cœlorhynclus ornatus* Leidy. Form nearly cylindrical, with a slight depression; the transverse diameter (one inch) exceeding the vertical by less than one eighth of the former. Dentigerous inferior bands not separated by a groove, width of each two thirds the lesser diameter; each forms with the other a strong, but obtuse angle, and is basally flattened, then curved upwards at the external margin. Alveolæ numerous, small, five in the tenth of an inch. The base is broken, but the longer diameter is 4.66 of the length. Surface of the bone not dentigerous, with numerous anastomosing striæ. Total length 4.4 inches.

Four extinct species of this genus of sword fishes have been described; the *H. priscus* Agass., from the London clay, the beak of which is not known; *H. minor* Agass., which is deeply fluted, and *H. robustus* Leidy (Post-pliocene Foss. S. Car., 119, *Xiphias*), which is from the Post-pliocene of Ashley River, S. Carolina; it is much depressed, the dentigerous surface is a continuous plane, separated by a deep groove. The *H. antiquus* (*Xiphias* Leidy), from the New Jersey Eocene, is also a more depressed species, with the dentary surfaces on one plane.

Pogonias multidentatus Cope.

This species is indicated by a left superior pharyngeal bone, with the dental scars and several successional teeth in their respective alveolæ. The form of the bone is an elongate oval, the inner free margin many times heavier than the outer, and strongly bevelled. The inner edge is slightly broken away. The general form is that of the *Pogonias chromis*, now living on our coasts; the size is one third less, and the number of teeth in the same area, relatively, considerably greater. The inner series has consisted of seven teeth, of which the median three were larger; all but the terminals had parallelogrammic bases. Of the second row nearly seven enter an inch, and on the outer edge seven enter a half inch. The sizes graduate from the inner series, and if there have been any brush-like teeth, as in *P. chromis*, their bases have been broken away. On the middle of

[1] Proc. Acad. Nat. Sc. Philad., 1855, 414.

the bone there are four longitudinal rows of teeth, anteriorly five or six. A successional tooth extracted had a crown subtrigonal in outline, the surface projecting strongly. The successional teeth have evidently passed entirely through the bone from below, absorbing the ostein above them, and on reaching the surface have been strengthened by the ossification of the pulp below them, which has thus closed the opening already made.

	Inches.
Length of upper pharyngeal bone	1.87
Long. diameter of tooth, first row	.3
" " " second row	.18

Obtained by my friend, Oliver N. Bryan, from the Miocene cliffs of Nomini, Westmoreland Co., Virginia.

Phacodus irregularis Cope, gen. et. sp. nov.

Char. gen. Teeth fusiform, irregularly and closely crowded on the surface of an elongate semidiscoid bone of possibly the hyoid apparatus. Masticatory surface moderately convex; crown abruptly contracted below into a short root, which presents a very small orifice for the admission of the nutrient vessels, etc. The teeth have thus somewhat the shape of an onion inverted. The pulp cavity is large. The superficial layer of the crown is very thin; its structure has not been definitely ascertained, but its punctate appearance resembles that of a worn surface of vaso-dentine.

The successional teeth are very abundant, and closely placed; they appear to rise through the spongy tissue of the bone without reference to any definite line of succession or superposition. Those of the inferior series, visible on the under surface of the bone, have an average larger size than those of the upper surface which are in use.

This genus is allied to the *Pisodus* of Owen (Odontography, p. 138), and like it, is of uncertain affinities. I have regarded it as distinct from the latter, since Owen says, in it the crowns of the teeth "are extremely dense and hard." In *Phacodus* the masticatory layer is very thin and penetrated by minute orifices, and cannot have been subject to much attrition owing to its lack of hardness.

Char. specif. The teeth, though irregularly arranged, are for short distances in longitudinal lines. They are transversely ovate and closely packed, or with slight intervals. Those at the outer and inner margins of the bone are considerably smaller than the median, and more rounded. The crowns of the successional teeth are flattened, as well as those in use. The median teeth number five in a half inch; the lateral seven in the same length. The surface of the root is finely striate, the striæ coarser at the point of convergence at the orifice of the pulp cavity.

The crown in many of the teeth has been broken away, leaving the short conic pulp cavity and its thin walls exposed.

The bone itself is convex in transverse direction, descending more gradually on the convex margin.

	Lines.
Length of bone	19.5
Width "	10
Thickness of bone	3.2

This interesting species left its remains in the Miocene marl near Shiloh, Cumberland Co., N. J.

ELASMOBRANCHI.

Pristis amblodon Cope.

This name is proposed for a species whose remains occur in the Eocene Green-sand bed of New Jersey. It is characterized by the peculiarity that both its edges are similarly obtusely rounded, instead of the posterior being grooved, as usual in the genus. Associated with this arrangement both edges are curved to the tip, and not one only, as usually, though one curvature is greater than the other. The form of the teeth is neither slender nor stout, and they are not curved out of the horizontal plane. Surface smooth. Length sixteen lines; width at basis five lines.

Pristis brachyodon Cope.

Founded on some teeth from the Green-sand of Petersburg, Virginia. Width at base two and four fifths times its length; anterior edge heavily rounded, oblique, posterior straight, flat, with a shallow and narrow sulcus on the basal two fifths. For about the same extent on one side about ten longitudinal ridges at irregular distances. Without vertical curvature; tip not attenuated, general proportions heavy.

The teeth from different parts of the premaxillary weapon of the *Pristes* agree very closely in structure, and any of them indicate the species with equal accuracy. Of extinct *Pristes*, three are named and one described in the Poissons Fossiles of Agassiz, Galeotti has described *P. Lathami*, and Prof. Leidy has made known two from the United States, *P. ensidens* from the Pliocene of Ashley River, and the gigantic *P. curvidens* from the New Jersey Green-sand.

The teeth of the former are acute on both edges, and are broader than in any other species; those of the latter are much narrower and deeper than the *P. brachyodon*, and decurved.

Leptomylus densus Cope, genus et species novæ Chimeridarum.

This species appears to be intermediate between *Psaliodus* Egert., and the other genera of *Chimeridæ*. While that genus does not exhibit dentinal tubercles on the inferior maxillary bones, the present has but one, which is small and narrow, and near the inner margin of that bone. The other bones of the anterior cranial arches are not yet known. The structure of the bone is more dense than in the other forms known to me. The extremity of the element is broken, but the inner margin does not exhibit any symphyseal bevel, where it occurs in the species of *Ischyodon*. The median interior longitudinal ridge is obtuse and little marked, and coated with a dense glossy layer.

Char. specif. Anterior extremity prolonged, and slightly narrowed. The posterior face is plane, transversely concave longitudinally. When the external margin rises, the internal falls off, and the narrow area of dentine is directed obliquely upwards and inwards. The inner face, above an anterior thickened margin as deep as the prolonged beak, is concave, but is again convex near the superior margin. It is marked with coarse and obscure curved lines, which are parallel to the posterior outer margin. The inferior or anterior margin is a contracted ridge, its inner plane vertical, while the superior part of the inner face expands inwards. The dentinal column supporting the tubercle is as large as a goose quill. There are no other columns.

	Lines.
Depth one inch behind tubercle	50.25
Depth at middle of jaw	26.2
Length from first point	65
Added for lost apex	14
Length of tubercle	7.1

This species is the largest Chimæroid fish yet discovered in North America, and equals the large *Ischyodus Townsendii* of Egerton, from the Portland stone of Great Britain.

This species was procured by the writer from Judson Gaskill, one of the directors of the Birmingham Cretaceous marl pits, New Jersey, where the specimen was found.

During the same season, and at the same place, but some weeks anterior to that of the specimen just described, a superior maxillary was found, which may belong to the same species. It indicates also a genus distinct from any known. Its general features are those of the same element of *Edaphodus* and *Ischyodus*, but it differs in the presence of only two very narrow dentinal bands, which are opposite and parallel, one on the outer margin, and the other within the inner margin of the bone. The form is much depressed and spade-like, the superior face scarcely descending regularly to the edge. The outer margin expands an inch behind the extremity, and is bevelled off from the continued width of the upper face. The latter exhibits slight longitudinal striæ. It presents proximally the usual large groove.

	Lines.
Width at extremity	14
Depth on inner margin $3\frac{3}{4}$ in. from anterior extremity .	9
Length of inner dentinal patch	16
" outer " "	11

ISCHYODUS.

I. Inner posterior dentinal area divided into three parts.

Inner symphyseal surface barely reaching anterior dentinal area; posterior outer crest with small area. . . . . *I. mirificus.*

II. Inner posterior dentinal area undivided.

α. A posterior outer crest with large area.

Areas very large, marginal; body of maxilla contracted to a vertical edge behind; symphysis very short, straight. . . . *I. Smockii.*

α α. No posterior outer marginal crest.

Anterior outer area oval, not marginal, short; the inner wide, in two planes, the inner descending on the margin and reached by inner symphyseal face. . . . . *I. monolophus.*

α α α. Neither anterior nor posterior outer marginal crests distinct.

Anterior outer area very small, the posterior large; the interior very large and oblique transversely; beak twisted out of the planes of the body of the maxillary. . . . . *I. divaricatus.*

Ischyodus monolophus Cope.

This species is represented in my collection by two inferior maxillary pieces from opposite sides, which were found in the Green-sand near Barnesboro', Gloucester Co., N. J. They did not belong to the same individual, as one exceeds the other in its dimensions. Besides the characters pointed out above, it is to be added that a small dentinal column opens on the symphyseal face opposite the middle of the inner posterior area, perhaps a little larger than one in the same position in *I. mirificus* and *I. Smockii.* The terminal band-like area, or what is in the longitudinal section the superior arched plate, is well developed, and opens along the outer inferior corner of the beak for half its length. The beak itself is long and narrow, like that of *I. mirificus.* The inferior margin is well curved inwards. The outer side is concave above when in position, the masticatory face overhanging a very little. The outer margin rises very little behind the anterior dentinal area, and does not bear any dentinal area for the length of the former behind it, where both specimens are broken. The large inner area is very wide and oblique in transverse plane. There is a small area—the end of a cylindrical column, just below the inferior arched plate.

	Lines.
Length to anterior margin anterior area	22
Length of anterior area	8
Width of posterior inner area	10.6
Width of maxilla at middle above	14.8
Width of maxilla at middle of beak	6
Depth of maxilla at middle of beak	8.9
Depth of maxilla anterior outer crest	18.8

This species serves to connect the rather aberrant *I. mirificus* with more usual forms. The specimens are a little smaller than those of *I. divaricatus.*

Ischyodus divaricatus Cope.

This species is represented by an inferior maxillary bone of the right side in the Museum of the Academy, from the cretaceous marl of Burlington Co., N. J.

It indicates a species allied to the *Ischyodon mirificus* (*Edaphodon mirificus* Leidy, Proceed. Acad. Nat. Sci. Philadel., 1856, p 221) and of about the same size. The differences may thus be readily summed up. The bone is less prolonged and attenuated at the apex; the inner or symphyseal margin, instead of presenting equal or less elevation than the outer, has a greater elevation; and instead of being a nearly straight line presents a thin angular expansion; the outer margin has a corresponding concavity not seen in the known species. In the latter, there is at this point a prominence above which is situated the anterior of the external tubercles; this projection is followed by an open groove. Both the prominence and groove are wanting in *I. divaricatus.* Both the external tubercles are smaller than in *I. mirificus*, the anterior very much so, and with a round form. The internal is on the contrary very much larger, and anteriorly has an acuminate outline. The flat anterior, inferior dentinal column is present as in *I. mirificus*, but is much less oblique and more transverse than in the latter; the antero-inferior margin is thus broader.

	Lines.
Length from outer posterior tubercle	39
Depth at same point	25.5
Greatest width at same point	19
Length of outer anterior tubercle	4.7

Ischyodus Smockii Cope.

This species is intermediate between the two species of the genus already mentioned, and is about half the size of the smaller, *I. divaricatus*. Several specimens of mandibular rami from the Cretaceous Green-sand of New Jersey.

The general proportions are much less elongate than in the *I. mirificus*, but not so stout as in *I. divaricatus*. The tubercles are relatively much larger than in either, and all with planer surfaces than either; they are therefore elevated supero-anteriorly, and the plane of the posterior face descends abruptly from the supero-anterior margin of each. The outer margin has therefore an outline of two steps; the inner of one. The outer tubercles are narrowed in front; the inner is more obtuse and is large, being separated by a very narrow strip from the outer posterior. It is not divided into three as in *I. mirificus*; also the small inner terminal column of that species is wanting, as in *I. divaricatus*. It differs from the last named in its regular extremity, without elevated and expanded symphyseal margin. The outer face is uniformly concave transversely; the inner face has also a longitudinal concavity which is much stronger. The surface striæ are longitudinal; sometimes broken.

	Lines
Length from anterior extremity of posterior outer tubercle; (a little of apex restored.)	28
Depth from same point	20
Length of anterior outer tubercle	12
Width of interior tubercle	11

This species is dedicated to John C. Smock, assistant on the State Geological Survey of New Jersey under Prof. Cook, as a recognition of his labors, and material aid therein.

Plinthicus stenodon Cope gen. et spec. nov. Myliobatidarum.

Char. gen. Masticatory surface of the tooth in a transverse band, which does not stand above the laminated insertion into the cartilaginous table below, but is connected with that usual position by a broad obliquely horizontal bony lamina. This lamina is not continuous with the masticatory surface above, but is depressed beneath its plane so that the lamina and masticatory band of the tooth next posterior may rest upon it. The grinding plate is thus formed of a number of transverse bands as in Aëtobatis, which are supported on oblique plates, arranged tile or shingle-like, and whose origin is far posterior to their exposure. There appears to have been no supplementary series of teeth. This inferior and non-exposed portion of the laminiform tooth is longitudinally grooved, those of the inferior surface being adapted to those of the superior surface of the next preceding. The anterior margin of the masticatory band is also suture-like, for a similar reason.

This remarkable genus appears to be for the first time brought to the notice of naturalists. Its affinities are obviously to Aëtobatis.

Char. specif. I suppose the single tooth preserved, to belong to the palatal series; it is entirely transverse, and without alteration at the extremity except that it thins off. The masticatory surface is slightly convex, and little more than half as wide as the laminar plate which supports it. This plate rises from the horizontal at an angle of about 35°. The laminæ of insertion are ovate parallelogrammic, and attached by a narrower base; they are remarkably coarse, there being five included in a length of two lines. A projecting angle continues the upper surface of the superior plate above these laminæ while a groove on the inner junction of the two receives the same of the next tooth. Immediately above this a delicate ridge bounds it. The general surface is nearly plane.

As one extremity is broken off the proportions cannot be readily ascertained, but if they bear any relation to the coarseness of the inferior laminæ, the transverse extent of the plate has been considerable.

	Lines.
Length of plate	? 18
Width of plate	4
Width of masticatory face	1.8
Thickness of masticatory face	1
Thickness at basal laminæ	2

This ray was found by Reuben Davis, at his marl pit in the Miocene formation near Shiloh, Cumberland Co., New Jersey, name from πλίνθος, a tile or shingle.

Dr. B. Joy Jeffries stated that the experiments with after images reported by the President at a previous meeting, and a further continuation of them by himself subsequently, although original with both observers, were nevertheless covered by others published by Prof. Volkmann in 1863. By his very ingenious series of experimentations Volkmann had been able to deduce certain laws in reference to the projection of after images, which laws the experiments reported at this Society confirmed. Dr. Jeffries thought the result of his own experience carried the subject even a step further than Volkmann had done, giving as it did still greater part to the mind in governing the projection of after images. By means of models and diagrams Dr. Jeffries illustrated Volkmann's experiments and gave the results deduced from them which he showed were the same as those arrived at by the President's and his own experiments.

Mr. Edward S. Morse called attention to a recent statement in the Zoölogical Record concerning a series of articles by himself on the Land Snails of New England, in which the reviewer remarked that he had returned to the system of Lamarck and Pfeiffer in the classification of these animals.

The articles in question, being published in a popular magazine were necessarily rendered as simple as possible, and divested of all technical details, and on this account only the earlier nomenclature was used. Mr. Morse disclaimed the intention of abandoning the position he had previously[1] maintained, that these animals were divisible into natural groups by the structural peculiarities of the principal parts of the animal, such as the character of the lingual membrane, the form of the buccal plate, etc.

While in general he had followed Albers in these subdivisions, he felt that he could not have adopted all of his genera without open violation to the natural characters of the animal, and though strongly tempted to follow the example of other systematists and include extra limital species in the new genera proposed, had refrained from doing so since he had had no opportunity at that time of examining

[1] Observations on the Terrestrial Pulmonifera of Maine, etc., 1864.

other species than those collected in his immediate neighborhood. Had Albers, in his Heliceen, considered the structural characters of the animal, even the shell alone of some of the species he enumerates, he would not have been led into bringing together such dissimilar forms as *Strobila labyrinthica*, *Helicodiscus lineata*, and *Hyalina multidentata* under the subgenus Gastrodonta, with *Helix interna* as the type! or where under Patula he includes such widely diverging species as *Helix pygmæa*, *exigua* and *alternata*, with *H. rotundata* as the type. Or again, after mentioning the leading feature of the genus Vertigo, namely, in its being devoid of inferior tentacles, he deliberately leaves out the European species, *V. minutissima* and *edentula*, and the American species, *V. Hoppi* and *V. decora*, placing these species under the genus Pupilla, with *P. muscorum* as the type. Other examples might be multiplied where, by disregarding structural features, the most heterogeneous forms are brought together. At the same time Albers has recognized clearly the value of certain groups, as for example, Conulus, Macrocyclis, Vallonia and others, limiting them properly to the few species they naturally represent. He desired to be explicit, because had this not been corrected, it would appear that he had retracted his former views.

Mr. Morse then proceeded to point out some of the leading characters of our Helices, representing on the blackboard the various forms of the exserted animals, with their peculiar armature of lingual teeth and buccal plates.

Section of Entomology. February 24, 1869.

Mr. L. L. Thaxter in the chair. Fifteen members present.

Mr. C. S. Minot read the following description of the male of Hesperia Metea Scudd.:

Mr. Scudder, in his "List of the New England Butterflies," published in the Proceedings of the Essex Institute, Vol. III, p. 161, describes the female of *Hesperia Metea*. I have in my collection a male and female of this species, taken by myself in Dorchester, Mass., in the latter part of May. The female was captured hovering over blueberry blossoms, and it is upon this plant that the larvæ probably feed. The male, also, though captured on a different day, was taken in close proximity to these bushes. Mr. Walter Faxon has also a female, which he caught near Blue Hill, in the middle of May.

In the male, the black velvety dash on the primaries extends from the first divarication of the median to the outer termination of the cell. Over the basal half of the wing are sprinkled a number of bright chromaceous scales, most numerous near the costa. The basal half of the space included between the dash and the outer margin and the branches of the median, is suffused with chromaceous. Of the two spots at the termination of the discal cell, that nearest the costa is a little advanced and dirty white, as in the female, while the lower is of a bright chrome color. Otherwise the primaries above are the same as in the female. Secondaries as in the female, though the markings of the under side are more distinctly repeated.

Beneath the primaries and secondaries tinged with ochraceous. The markings the same as in the female, but more distinct. In both the males and females the nervures beneath are considerably lighter than the ground color.

Mr. Scudder, in the description of his specimen, states that the "secondaries are uniform in tint." This does not agree with either my female or Mr. Faxon's, for in them both the secondaries are considerably darker at the base than at the margin.

Mr. Minot also remarked that from an examination of about twenty specimens of *Hesperia Pocahontas* and *H. Quadaquina*, he was convinced that they belonged to the same species.

The Secretary stated that during the past year an expedition, composed mostly of students from Williams College, under the lead of Prof. James Orton of Rochester, N. Y., had returned from S. America, where they had been making collections in natural history. The field of the expedition lay between the Pacific shore and the headwaters of the Amazons, and the general route was from Guayaquil up the Rio Guayas, over the western Cordillera near Chimborazo into the valley of Quito; thence over the eastern Cordillera to the Rio Napo, and down that river to the Marañon. The insects had been placed in the hands of different persons for examination, and the following reports were now presented to the Section.

NOTICES OF THE HEMIPTERA OBTAINED BY THE EXPEDITION OF PROF. JAMES ORTON IN ECUADOR AND BRAZIL. BY P. R. UHLER.

The following list of species gives but a faint idea of the Hemipterous Fauna of the sections of country traversed by this expedition. No large collection of Hemiptera from those interesting regions exists in the United States. Accordingly one cannot fail to lament the absence of at least a moderate aggregation of the more common types there so abundant. The great basin of the Amazons, as well as the streams forming some of the sources of this river, along which the expedition proceeded, is represented in Europe by some thousands of species. In this collection, however, we have no forms from the extensive group of Scutelleroids, only three Pentatomoids, four Coreoids, one Lygaeoid, one Pyrrhocoroid, and a fragment of a Reduvioid. Those constitute the only representatives of the Heteroptera, while the common Fulgora, an imperfect Cicada and two Tettigonoids are the only Homoptera which were brought home by the expedition.

That a fine opportunity to supply some one of our collections with a considerable series of the most important and instructive forms of this highly interesting order of insects has been omitted, those will best appreciate who have attempted in the United States to make investigations in this field.

HETEROPTERA.

Fam. HALYDIDÆ.

Antiteuchus fraternus Uhler. Pale brownish-gray, above ivory-yellow, densely, confluently punctured with brown. Face flattened, the edge black, slightly elevated; tylus much shorter than the lateral lobes, which are rounded in front, the lateral margins abruptly sinuated before the eyes; surface rugulose, coarsely, deeply, rather remotely punctured with brown, with here and there elevated, sphacelated points, each side before the ocelli is an arcuated, impressed line; ocelli red; eyes brown, the orbits whitish-yellow; under side of head yellowish-white, remotely, in spots confluently punctured, the base impunctured; rostrum honey-yellow, reaching the middle of the third ventral segment, the labium and tip embrowned, basal joint a little longer than the head, second a little longer than the first, third and fourth together about equal to the second; antennæ black, hairy, piceous at base, the apical joint white except at base, the basal joint stoutest, extending a little beyond the apex of the head, the fourth and fifth joints fusiform, equal in length, third joint a little the longest. Pronotum ivory yellowish, coarsely, deeply punctured with fuscous, freckled with brown between the punctures, very moderately convex, almost flattened on the middle, callosities smooth, transverse, widely separated, very indistinctly elevated, before them is a broad, deep, transverse impression, and around them are several sphacelated whitish dots, arranged in transverse series, anterior margin excavated to receive the convex occiput, lateral margins oblique, slightly rounded, with a minute tubercle on the blunt anterior angles; humeral angles almost truncated, slightly convex, the humeri elevated; posterior margin faintly bisinuate. Pectus finely, closely punctured, medio- and post-pectus rugulose, dark piceous, with a few whitish sphacelated points; posterior margin of the post-pectus white with a hue of red exteriorly; legs pale testaceous, minutely punctured with brown, unguiculi black. Scutellum punctured like the pronotum, long, not suddenly sinuated on the sides, bluntly rounded at tip, on each basal angle is a large, yellow, round spot, encircled with brown. Hemelytra broadly rounded on the exterior margin, paler than the pronotum, rather uniformly punctured with fuscous, not mottled between the punctures, infuscated at base, the nerves much elevated, rib-like, whitish, as also the sutures and interstitial lines, on the disk is a rounded black spot; embolium coarsely punctured with fuscous; membrane pale brownish, deeply infuscated within at base, wings slightly brownish, the nervures and costal margin brown, as well as the surface adjoining them, nervures of the posterior edge darker brown. Tergum pale yellowish-piceous, except at tip, where it is deep piceous, connexivum yellow, confluently punctured with brown; venter embrowned at sides and behind, a broad, smooth, polished, piceous stripe, rounded at the tip, occupies the disk from near the base to the penultimate segment; punctures fine, deep, confluent, fuscous.

Length twelve millimetres. Breadth across thorax six millimetres.

Taken near the Napo River.

It seems to be related to *A. griseus* Dallas, but disagrees in many respects with his description.

Fam. Edessidæ.

Edessa cervus Dallas, Brit. Mus. Cat., p. 320, No. 2. *Cimex cervus* Fab., Ent. Syst., IV, 91, 49.

This species is common in Guiana, Brazil and Columbia. The specimen procured differs from the type in having the humeral projections shorter. It was taken between Napo and Marañon.

Aceratodes sp.? Taken between Quito and Napo. It appears to be new, but it is too much altered and mutilated to bear description.

Brachystethus geniculatus Fab. *Edessa geniculata* Fab., Syst. Rhyng., p. 153, 32.

This is a variety lacking the yellow margin of the thorax, and without the yellow feet and anus.

Collected at Guayaquil.

Fam. Mictidæ.

Pachylis laticornis H. Schf. Wanz. Ins., iii, p. 63, figs. 276, and 277. *Lygæus laticornis* Fab., Ent. Syst. Suppl., 538, 15.

Obtained between Napo and Marañon. It is very common in different parts of Brazil, and it has been met with in Guiana and Columbia.

Fam. Anisoscelidæ.

Diactor foliaceus Dallas, Brit. Mus. Cat., p. 451, 2. *Lygæus foliaceus* Fab., Syst. Rhyng., 210, 28. Stoll, Punaises, pl. 28, fig. 201.

Found between Napo and Marañon. It is one of the most beautiful of this group. Specimens have been collected at Para, along the Amazons, and as far west as Guayaquil. The geographical range of this species is thus seen to be remarkable.

Belonomus gen. nov.

Elongate-oval; head long, sub-cylindrico-triangular, blunt at tip; the tylus narrow, a little longer than the lateral lobes, the tip expanding in breadth below these lobes; the superior lobes wide, high, arched in front, linearly depressed on the lower margin; inferior lobes appressed, narrowing towards the tip, subtruncated; bucculæ thick, arched in front, narrowed behind, about one fifth as long as the basal joint of rostrum; rostrum slender, reaching the middle of the second ventral segment, the basal joint but little stouter than the second, of the same length as the head, second joint rather longer, the third about half as long as the second, fourth about equal in length to the first; antennæ as long as the abdomen, the basal joint curved, thicker than the others, subequal to the second in length, second and third straight, slender, cylindrical, the third about three fourths the length of the second, the fourth slightly thicker than the third, about one and a half times as long as the second, acute at tip, fusiform at base, a minute joint is inserted between the third and fourth; eyes round, prominent, situated a little nearer to the base of the head than to the origin of the antennæ; ocelli rather nearer to the eyes than to each other. Pronotum rugulose, suddenly declining in front, narrowed to the apex, where it is scarcely wider than the head, shoulders produced laterally into thin, subtriangularly-rounded, upcurved lobes, the tip of each with a long acuminate point, the margins before and behind the tip serrato-denticulate, the denticulations smaller and more blunt anteriorly; callosities feebly defined; the posterior margin produced in a transverse lap over the base of the scutellum. Costal margins of the hemelytra straight, parallel to each other, narrower than the lateral middle of the abdomen, corium protracted into a narrow margin along the outside of the membrane; nervures of the membrane straight, a few of them nearest the margin, and on the middle, forked at tip. Scutellum flat, elevated at base. Sternum broadly sulcate. Legs long, slender, gradually enlarging to the tip; a double row of teeth on the underside of femora near the tip, the one row gradually reduced in size, and continued to near the base; between the rows is a broad sulcus; tibiæ simple, slightly enlarged at tip. Stigmata of the venter situated near to the connexivum, a very little in advance of the middle of the segments, connexivum dilated and upcurved on the middle segments. Female, middle of the apical margin of the sixth segment split and emarginated, also transversely incised, the genital segment originating beneath this, broadly triangular, slightly rounded at tip, and emarginated, the lateral angles a little acuminate, the apical segment truncated.

B. annulaticornis Uhler. Tile red, beneath pale, dull cinnamon color; head polished, a little infuscated, and slightly seabrous above, under side smooth, whitish at base; orbits of the ocelli piceous;

antennæ, basal joint rufous, second black, annulated at base and on the middle with rufo-flavous, third black, rufo-flavous at base, fourth fuscous, rufo-flavous at base; rostrum flavo-rufous, infuscated on the labium and middle line, tip black. Pronotum opaque, tile red, transversely, confluently rugulose, with punctures between the ridges, sides deeply inuated, the lateral edge almost to tip of humeral angles black, and with black denticulations both before and behind the angles; pectus slightly rugulose, the anterior segment confluently, more finely punctured than above, the intermediate and posterior segments still more finely, remotely punctured, sternum smooth, polished, a black dot on the middle of the meso- and metapleura, and corresponding series of dots on the sides of the ventral segments; legs long, slender, the teeth of the tip largest, all the teeth more or less blackish, tibiæ closely armed with erect bristly hairs, the tip slightly infuscated, as also the tip of the tarsal joints. Scutellum raised at base, rugulose about the tip, remotely punctured. Hemelytra minutely pubescent, nervures of the corium much elevated, paler than the surface, punctures more remote and coarse at base, finer and closer on the disk and towards the tip; membrane brownish-hyaline; wings slightly tinged with brown, the nervures darker brown. Tergum cinnamon-reddish, the connexivum infuscated, its edge black, and with a pale spot at the basal corner of each segment, excepting the two last; venter smooth, polished.

Length twenty-five millimetres. Length of thorax in a straight line, six millimetres. Breadth between the tips of thoracic prolongations, ten millimetres.

Collected between Napo and Marañon.

Hypselonotus linea Dallas, Brit. Mus. Cat., p. 465; No. 4. *Lygæus linea* Fab., Syst. Rhyng., p. 220, 75. Stoll, Punaises, pl. 11, fig. 82.

Captured between Quito and Napo.

Fam. Lygæidæ.

Lygæus confraternus Uhler. Form of *L. Poeyi* Guerin. Dirty reddish-yellow. Tylus, antennæ, rostrum, eyes and tarsi piceous-black. Cranium convex, orange-yellow, slightly pubescent; the reddish ocelli placed upon black dots; rostrum reaching to the extremity of the posterior coxæ, under side of head whitish. Pronotum flattened on the disk, broader than long, the lateral margins thickened and elevated, of a dirty orange color, the disk and posterior middle pale yellow, with a dirty orange stripe along the middle; the anterior margin with a short, interrupted, black streak; on each side of middle behind the callosities a curved, impressed, transverse, black line, which gives off a short, oblique branch from the inner end, resembling a barb. Pectus dirty white, a small spot each side close to the head, and a transverse stripe near the posterior margin of antepectus dull black; meso- and metasternum dull black, and a black stripe, abbreviated, just above the middle coxæ. Legs clothed with yellowish grey pubescence, femora rufescent, infuscated above, tibiæ fuscescent, rufous at base above, tarsi densely yellowish pubescent beneath. Scutellum blackish fuscous, impressed each side, the middle line, and lateral margins interruptedly, dirty rufous. Hemelytra clothed with golden pubescence, the sutures slightly infuscated; membrane dirty ochreous, infuscated along the suture, the nervures red, the posterior ones infuscated; the intermediate one straight, and giving off a short, oblique branch. Venter dirty white, clothed with fine grayish pubescence, at base each side is a short black band, the posterior margin of the segments narrowly black.

Length eleven millimetres. Humeral breadth three and three fourths millimetres.

Taken between Napo and Marañon. It is allied to *L. modestus* Stål.

Fam. PYRRHOCORIDÆ.

Dysdercus ruficeps H. Schf. Wanz. Ins., III, p. 95, fig. 319. *Lygæus ruficeps* Perty, Delectus, p. 172, tab. 34, fig. 7.

Obtained near the Napo River. I have seen specimens from various parts of Brazil, from Panama and Guiana.

Fam. ZELIDÆ.

The body of a *Zelus?* is in the collection taken between Napo and Marañon, but as the characteristic parts are lost, it is impossible to recognise either the genus or species.

Fam. BELOSTOMIDÆ.

B. annulipes H. Schf. Wanz. Ins., IX, 28, figs. 803, 804. Found at Guayaquil.

HOMOPTERA.

Fam. FULGORINA.

Fulgora laternaria Amyot et Serv., p. 490, 1. Linné, Syst. Nat., II, 703, 1.

Taken between Napo and Marañon. I can discover no distinctive characters to separate this from the typical *F. laternaria* Autor, from Brazil. The specimens are not large, but they agree with small specimens in my collection, which were taken in Eastern Brazil.

Fam. CICADINA.

Zammara sp? Taken near Quito. A very beautiful insect, probably undescribed, but too much mutilated and distorted to bear characterization.

Cicada sp? Too much altered to be recognized. Found at Guayaquil.

Fam. TETTIGONIDÆ.

Tettigonia rugicollis Signoret, Ann. Soc. Ent. France, 3d series, III, p. 525, pl. 21, fig. 18. One specimen taken between Quito and Napo.

Fam. JASSIDÆ.

Gypona sp? Taken between Quito and Napo. A species allied to *G. columba* Fitch, but probably new. The specimen is too much altered to bear description.

The bean-shaped bodies coated with white, mealy and flocculent matter appear to be excrescences, caused by the punctures of *Coccina*, and apparently serving as nids for the reception and development of their eggs. I can find no account of similar objects in any of the books to which I have access.

LIST OF COLEOPTERA COLLECTED BY PROFESSOR JAMES ORTON IN ECUADOR AND BRAZIL. BY G. D. SMITH.

Pseudoxycheila bipustulata Dej. Between Quito and Napo.
Tetracha Klugii Moritz. Napo and Marañon.
Dyscolus chalybeus Dej. " " "
Gyretes bidens Oliv. " " "

Passalus transversus Schönh. Napo.
" furcilabris Perty. Napo and Marañon.
" difficilis Reiche. " " "
" interstitialis Esch. Napo.
Deltachilum sp. Napo and Marañon.
Phanæus sp. Quito.
Oxysternus conspicillatus Web. Napo and Marañon.
Onthophorita æruginosa Perty. " " "
Eurysternus marmoratus Schönh. " " "
Chœridium litigiosum Dej. " " "
Dermestes versicolor Casteln.
Pinotus octavius Dej. Napo and Marañon.
Faula immaculata Burm. Napo.
Lachnosterna sp. Napo and Marañon.
Anomala valida Burm. Guayaquil.
" marginicollis Deyr. Quito.
" two species undet. Between Quito and Napo.
Pelidnota glauca Fabr. Napo and Marañon.
" sp.
Thyridium cupriventre Blanch. Between Quito and Napo.
Stenocrates labrator Fabr. Napo and Marañon.
Chrysophora chrysochlora Latr. Napo.
Golofa sp. Quito.
Cyclocephala ustulata Burm. Guayaquil.
Enema sp.
Heterogomphus dilaticollis Burm. Napo and Marañon.
" thoas Burm.
" sp.
Megacerus chorinæus Fabr. Napo.
Podischnus agenor Burm. Napo.
Chalepus zoilus Burm. Quito.
" sp.
Ligyrus robustus Sallé. Napo and Marañon.
" fossator Burm. " " "
Megalosoma actæon Linné.
Phileurus didymus Burm.
Cotinis atrata Gory and Perch. Napo and Marañon.
" subviolacea Gory and Perch. Quito.
Chalcolepidius virens Pal. de Beauv. Napo.
" limbatus Esch. Quito.
Pyrophorus pellucens Esch. Napo and Marañon.

Pyrophorus tuberculatus Cand. Napo.
" clarus Germ. Between Quito and Napo.
Semiotus imperialis Cand. Nanegal.
Aspidosoma Fenouxii Perty. Napo and Marañon.
Photuris versicolor Fabr. Napo River.
" sp. " "
Chauliognathus Blanchardii Kirby. Between Quito and Napo.
Astylus lateralis Buq. Quito.
Zophobus morio Fabr. Napo River.
Nyctobates sp. Napo and Marañon.
Brentus bidentatus Fabr. Napo.
Cylindrocorynus dentipes Linn. Napo and Marañon.
Cratosomus sp.
Lixus sp.
Listroderes sp.
Sphenophorus hemipterus Linn. Napo and Marañon.
" borassi Fabr. " " "
Parandra punctata Chevr. Napo and Marañon.
Prionus sp.
Psalidognathus Friendii Reiche. Napo.
" modestus Friend. "
Callichroma velutina Fabr. Quito.
Chlorida festiva Fabr. Napo and Marañon.
Eburia sexmaculata Fabr. Napo and Marañon.
Sphærion terminatum Dej. Napo.
Steirastoma brevis Linn. Quito.
Acrocinus longimanus Linn. Napo.
Xestia confusa Linn.
Mastostethus balteatus Klug. Napo and Marañon.
Doryphora undata Deg. Napo.
" decemstellata Stål. Napo and Marañon.
" sp. Between Quito and Napo.
Polygramma undecemlineata Stål. Napo and Marañon.
Elytrosphæra fulminigera Deyr. Quito.
Diabrotica sp. Between Quito and Napo.
Graptodera plebeja Oliv. Between Quito and Napo.
Desmonota multicava Latr. Between Quito and Napo.
" sp. Napo and Marañon.
Epilachna cruciata Muls. Napo and Marañon.
" proteus Guer. " " "
Ægithus surinamensis Linn. Between Quito and Napo.

Omoiotelus crocicollis Lac. Napo River.
Erotylus Debauvei De May. Between Quito and Napo.
Corynomalus cinctus Fabr. Napo River.
And eighteen other undetermined species.

Notes on Orthoptera Collected by Professor James Orton on either side of the Andes of Equatorial South America. By Samuel H. Scudder.

Hitherto, we have known almost nothing of the Orthoptera of the region explored by the party under Professor Orton. Chili on the south and New Grenada on the north are well represented in European cabinets, but the region midway between them has been represented in orthopterological science by a few scattered descriptions, principally of Phasmida and Blattariæ. It is therefore greatly to be regretted that these explorers did not bring home something more than this mere handful of specimens, which have proved such a comparatively great addition to our knowledge of the Ecuadorian fauna. A single hour's well directed search would certainly have tripled the number of species. Still we may congratulate ourselves upon what we have obtained, since thirty of the forty species enumerated are new and require the establishment of five additional genera; of these species all of the Gryllides, Locustariæ, Mantidæ and Forficulariæ, and all but one of the Acrydii are new; while only one of the four Phasmida and three of the nine Blattariæ have not been described; two of the genera, Tropidacris and Lophacris have not been characterized here, because they form the subject of comparison with the other gigantic Acrydians, in the succeeding paper.

GRYLLIDES.

1. Nemobius Ortonii nov. sp.

Head luteous, varied above and on the vertex with dark fuscous and with two fuscous points on the front, at the base of the antennæ interiorly; mouth parts pallid; antennæ luteous, annulated distantly and minutely with fuscous. Pronotum luteous, with a slight median furrow; the anterior and posterior borders with a narrow, and the middle of the sides with a longitudinal, wavy, broader line of black; the upper surface variegated with black and furnished with short black hairs; on either side of the middle, but not reaching the furrow, and situated just in advance of the middle, a broad naked transverse stripe, reaching the lateral black band, twice as broad above as below. Tegmina pallid at the sides, above variegated with pallid and dark fuscous, the veins sometimes of one, sometimes of the other color; wings pellucid, the costal border and spaces exposed in folding, discolored. Legs pallid, blotched with dark fuscous; the hind femora very stout, the hind tibiæ abundantly armed with long spines. Anal cerci very long, stout at base, rapidly tapering, dusky, furnished with long hairs; ovipositor scarcely exserted. Length of body .44 in.; of antennæ 1.25 in.; of tegmina .34 in.; of wings .62 in.; of hind femora .28 in.; of anal cerci .22 in. One ♀. Napo or Marañon.

2. **Platydactylus fasciatus** nov. sp.

Pale testaceous, the prothorax darker; head with a dusky line bordering the antennæ and the eyes; first joint of antennæ testaceous, beyond black; eyes large, globose, pyriform. Tegmina longer than body, testaceous with fuscous veins, the inner half with seven or eight obscure, oblique, fuscous bands nearly as broad as the spaces between; wings longer than tegmina, pellucid or slightly clouded, the costal edge fuscous, an obscure clouded longitudinal space at the apex near the bottom of the median field. Abdomen blackish above; ovipositor reddish, black at tip and on the side along the median line; at base curved strongly upwards; beyond bowed slightly in a reverse direction; anal cerci stout, pale, hairy. Length of body .85 in.; of tegmina 1.05 in.; of wings 1.27 in.; of ovipositor .62 in. One ♀. From Napo or Marañon.

3. **Trigonidium gracile** nov. sp.

Vertex of head fusco-luteous, front blackish, mouth part pale; basal two joints of antennæ blackish, beyond pale. Pronotum fusco-luteous, marked with fuscous; abdomen blackish fuscous. Tegmina dark luteous, nearly as long as the abdomen, wings blackish, with luteous veins, reaching far beyond the tegmina. Legs very slender, pale, the hind tibiæ with very long and slender spines on the apical half. Ovipositor reddish brown, blackish along the middle, falciform, slightly swollen at the middle, the tip upturned rather sharply and terminating in a very fine point; anal cerci very long and slender, the basal third pale, beyond fuscous. Length of body .17 in.; of wings .26in.; of hind tibiæ .16 in.; of anal cerci .055 in.; of ovipositor .07 in. One ♀. Napo River.

LOCUSTARIÆ.

4. **Steirodon quadratum** nov. sp.

Head dark brown, sides of front paler; base of labrum black, lobe whitish; mandibles whitish; vertex dark brown, a band above the eyes very dull luteous; vertex docked squarely in front, the neck constricted; basal joint of antennæ blackish, the rest reddish-brown, their apices blackish. Pronotum dull brownish fulvous, the anterior margin slightly emarginate and yellowish, the hinder margin scarcely raised, broadly rounded and nearly straight, margined distinctly but narrowly with black, the color extending anteriorly along the lateral carinæ more than one-third the way to the anterior margin; lateral carinæ square, sharp posteriorly; pleura marginate, especially in front. Tegmina grass green, the stridulating vein luteous, the margin next the pronotum, when at rest, black. Legs brownish yellow, hind tibiæ greenish. Length of pronotum .31 in.; breadth of same anteriorly .17 in.; do. posteriorly .26 in.; length of tegmina 2.38 in.; breadth of same .71 in.; length of hind tibiæ 1.33 in. One ♂. Guayaquil.

5. Acanthodis ? antennatus nov. sp.

Head smooth, green; antennæ pale green, of great length. Pronotum dull green, scabrous with frequent tubercules; front border straight; hind border slightly produced, broadly rounded, nearly straight. Tegmina green, longer than the abdomen, shagreened with an anastomosis of irregular veins, the tip produced anteriorly to a rounded point; wings hyaline, as long as the tegmina. Legs rather stout; foramina of anterior tibiæ large, oblong, obovate, open; foot pads of the terminal tarsal joints largely developed. Ovipositor long, broad, testaceous, the upper edge perfectly straight, basal half of blade of uniform breadth, the tip minutely pointed; anal cerci rather short, conical, luteo-fuscous. Length of pronotum .28 in.; of tegmina 1.35 in.; breadth of same .34 in.; length of antennæ 5.8 in.; of hind tibiæ .9 in.; of ovipositor .7 in.; breadth of same .08 in.; length of anal cerci .1 in. One ♀. Napo River.

6. Meroncidium conspersum nov. sp.

Head smooth, testaceous; the summit, vertex, first two joints of antennæ, borders of the antennal sockets and the lateral carinæ of front black; rest of antennæ reddish brown; mouth parts testaceous. Prothorax black above, and along the anterior and posterior borders at the sides, the rest testaceous; black portions very roughly scabrous with rounded elevations; prosternum bimucronate. Tegmina dark testaceous, the inner border black and covered with transverse black bars and spots; hind wings fuscous. Hind femora broad, compressed, the apical half with five or six black spines; hind tibiæ armed with four rows of rather short black spines. Ovipositor broad, sharply pointed, the lower edge slightly rounded, the upper edge nearly straight, with a slight median elevation; basal half luteous, apical half and lower border black. Length of body 1.88 in.; of tegmina 2.1 in.; of hind tibiæ 1.26 in.; of ovipositor .87 in.; breadth of same .18 in. One ♀. Napo or Marañon.

7. Copiophora gracilis nov. sp.

Vertical spine squarish at base, the apical two thirds conical; basal half furnished superiorly with a double row of tubercules directed forwards; inferiorly with a single prominent tubercle; above, and a little in advance of this on each side, a single smaller tubercle; the apex sharply pointed and turned a very little downward; front of mandible and upper edge of clypeus black. Tegmina with a few black points along the middle. Hind femora armed along the whole inferior carina with a row of distant sharply pointed spines, curved a little outwards. Length of vertical spine .23 in.; of pronotum .33 in.; of tegmina 1.35 in.; of hind femora .65 in. One ♂. Napo or Marañon.

8. Conocephalus brevicauda nov. sp.

Stout; first four joints of antennæ, sockets of antennæ, front of mandibles and upper edge of clypeus black; antennæ luteo-fuscous, distantly and narrowly annulated with fuscous; tubercle of vertex very broad, short, the front slightly rounded, the neck a little constricted. Lateral carinæ of pronotum edged with blackish fuscous; pleura well rounded beneath. Tegmina rather broad, sprinkled with black dots. Legs short and rather stout; ovipositor very short, sharply pointed. Length of body 1.25 in.; of pronotum .35 in.; of tegmina 1.7 in.; of hind femora .84 in.; of ovipositor .5 in.; breadth of same .08 in.: distance from centre of eye to tip of vertex .13 in. One ♀. Napo River.

9. Conocephalus tenuicauda nov. sp.

Slender, uniformly green. Tubercle of vertex short, broad, the front scarcely rounded, produced beneath to a blunt, very short, conical tooth. Lower edge of pleura of pronotum docked angularly in front. Tegmina slender, immaculate. Ovipositor very slender, long, not very sharply pointed. Length of body 1.1 in.; of pronotum .29 in.; of tegmina 1.57 in.; of hind femora .9 in.; of ovipositor .77 in.; breadth of same .04 in.; distance from centre of eye to tip of vertex .07 in. One ♀. Napo or Marañon.

PANOPLOSCELIS nov. gen.

Allied to *Listroscelis*. Head large, globose, the front very broad but slightly convex, with rather prominent lateral angles, the vertex regularly and strongly convex, produced in front between the antennæ into a compressed lamina, bilaminate behind, cut transversely so as to be bidentate in front; sockets of the antennæ produced interiorly into a high rounded lamina; eyes globose, prominent; mandibles very large, hollowed exteriorly; maxillary palpi slender, last joint slightly swollen toward the apex and curved inwards, a little longer than the preceding three joints taken together; labial palpi stouter; first joint of antennæ large and stout, fully as long as the longitudinal diameter of the eye; second joint just half as thick, scarcely longer than broad; remaining joints simple and similar. Pronotum large, divided by two deep curved furrows into three sections; the anterior two as broad as the head; the posterior much broader and produced posteriorly into a high, rounded, nearly vertical lamina, protecting the organs of flight; prosternum bimucronate. Tegmina very short, coarse and stout, produced to a broad rounded point, the ♂ with greatly developed, laterally prominent, coarse and heavy stridulating organs; wings very short, nearly abortive; meso- and metasternum distantly bimucronate. Legs very long, very stout and very spiny; coxæ heavy, the angles produced to short spines, all the femora stout, the front with a double row of spines beneath, the inner the stouter, with three very large, stout and finely pointed ones on the inner surface near the apex; the middle with a double row beneath, the anterior the stouter; the posterior with a single row beneath externally, growing larger toward the tip; fore and hind tibiæ with four, and middle femora with three rows of stout spines; foramina of anterior tibiæ linear, very small; abdomen large, a little compressed.

10. P. armata nov. sp.

Head rugose, especially the front and sides, blackish brown; labrum and mandibles smooth; palpi and first joint of antennæ very dark mahogany brown; rest of antennæ black. Pronotum blackish brown, very rugose, the posterior edge slightly marginated. Tegmina dark brown, not nearly so long as the pronotum, rugulose; wings abortive, not half the length of the tegmina. Legs deep mahogany brown, the tarsi and all the knees darker; the bases of all the tibiæ externally warty, mahogany brown; spines tipped minutely with black. Abdomen obscure, dark mahogany brown, beneath darker, the stigmata yellowish, the appendages dull luteous. Length of basal joint of antennæ .14 in.; of apical joint of maxillary palpi .29 in.; distance from vertical spine to tip of labrum .7 in.; length of pronotum .7 in.; of tegmina .58 in.; breadth of tegmina, exclusive of tympanum .27

in.; breadth of tympanum .22 in.; length of wings .24 in.; of fore tibiæ 1.25 in.; of middle tibiæ 1.15 in.; of hind tibiæ 2.03 in. One ♂. Napo or Marañon.

DISCERATUS nov. gen.

Body curved slightly, a little compressed. Head bluntly rounded anteriorly, the front very declivent; sockets of the antennæ with an elevated rim, and between them the vertex produced into a low crater-like elevation with a slight ridge running from it in front; upper edge of clypeus bearing, on either side externally, a rather long, cylindrical projection, curved slightly downwards and rounded at the tip; eyes of medium size, prominent; palpi rather short and stout. Pronotum produced anteriorly, partially covering the head; posteriorly docked somewhat squarely, scarcely covering the mesonotum; the sides rather short, the lower edge a little rounded, higher behind than in front. Tegmina minute, wings wanting. Legs rather stout, the anterior pair long; the hind femora rather slender, not long; coxæ and sides of thoracic sterna produced into small blunt spines. Ovipositor very broad at base, curved pretty strongly, tapering rapidly, the tip pointed; anal cerci very short.

11. **D. nubiger** nov. sp.

Head smooth, front reddish, sides greenish yellow tinged with red; vertical projection and a median line posterior to it blackish; antennæ reddish, palpi pale. Pronotum reddish brown, edged with black anteriorly. Legs testaceous, the knees slightly dusky. Tegmina blackish, with luteous veins. Abdomen dark testaceous; ovipositor pale testaceous, bordered on the apical half and minutely dotted on the middle of the sides of the apical half with reddish; the apex sharply pointed; anal cerci pale, very short, blunt, conical. Length of body .95 in.; of pronotum .25 in.; of tegmina .12 in.; of fore femora .35 in.; of hind femora .52 in.; of ovipositor .42 in.; breadth of same at base .12 in.; length of anal cerci .06 in. One ♀. Salto, ten thousand feet above the sea, on the slope of the volcano of Antisana.

ACANTHACARA nov. gen.

Body curved, slightly compressed. Head produced; the vertex prolonged into a sharply pointed, long and curved thorn; front smooth, very declivent; first and second joints of antennæ large, remaining joints slender; eyes rather small, prominent, globose. Pronotum rather long, produced backward a little over the mesonotum, the sides short, rounded, with a broad and shallow lobe in the middle of the posterior half; meso- and metanotum resembling the abdominal segments, unprovided with wings; the thoracic sterna exteriorly, and the coxæ internally bearing small, short, blunt spines. Legs slender, the posterior femora rather short. Ovipositor broad at base, pointed at tip (?), curved pretty strongly; anal cerci very short, conical.

12. A. acuta nov. sp.

Whole upper surface, from the tip of the vertical spine to the ovipositor, testaceous, with a median, blackish, frequently obsolete line from the base of the vertical spine to the penultimate abdominal segment; the sides bordered above with a dark fuscous streak from the eyes to the tip of the abdomen; under surface of vertical spine, and the space between and around the antennæ blackish; first joint of antennæ obscurely fuscous, the remainder luteous, distantly and narrowly annulated with fuscous. Legs luteous, banded and blurred with blackish fuscous; femora armed externally and internally at the tip, with a sharply pointed spine. Ovipositor reddish; anal cerci pale, rapidly tapering, pointed, sparsely pilose. Length of body .62 in.; of pronotum .17 in.; of vertical spine .07 in.; of hind femora .38 in.; of anal cerci .04 in. One ♀. Between Quito and Napo.

ACRYDII.

13. Proscopia bulbosa nov. sp.

Of a nearly uniform griseous color. Head somewhat hour-glass shaped, above the jaws tapering, but a little swollen, to a constricted neck, above which and just below the eyes the head expands again; vertex short, as long as the width of the head below the eyes, tapering a little to a rounded apex; surface scabrous with distant elevated points, the back with a median furrow between the eyes and upwards to the tip of the vertex with a slight median carina; front, between the lower edges of the eyes, with a long, lozenge shaped hollowing, containing a median carina. Prothorax swollen next the head and like the mesothorax scabrous with large, irregular, distant, raised points. Legs very slender, the hind femora greatly swollen at the base, rough with longitudinal rows of greatly elevated points; hind tibiæ with very minute spines. Length of head, exclusive of the vertex .28 in.; of vertex .04 in.; of prothorax .42 in.; of hind tibiæ 1.06 in.; breadth of hind femora at base .09 in. One ♂. Napo or Marañon.

14. Proscopia sajax nov. sp.

Greenish brown, the legs paler, with dusky tips to the femora; the head with a small testaceous spot just above the base of the mandibles. Head rather smooth, long, uniformly tapering to the eyes, the vertex rather long, marginate, constricted slightly between the eyes; back of the head from between the eyes half way to the prothorax with an insignificant carina; front with a slight median ridge from eyes to labrum. Thorax scabrous with irregular, elevated, rough points, becoming very short, transverse ridges on the dorsum. Legs rather slender (the hind pair lost). Length of head, exclusive of vertex .37 in.; of vertex beyond eyes .08 in.; of antennæ .16 in.; of prothorax .42 in.; of fore tibiæ .52 in. One specimen, the abdomen of which is broken, from Napo or Marañon.

15. Cephalocæma acuminata nov. sp.

Body reddish brown. Head smooth, forming a greatly elongated cone, just below the middle of which the eyes are hardly prominent; above the eyes the tubercle becomes quadrate; below the eyes there is a rounded frontal carina. Prothorax slightly rugose with short, transverse, impressed lines and punctures; meso- and metathorax with slightly impressed curving lines and deeper punctures, which markings continue upon the basal segments of the abdomen, the lines becoming finer and more indistinct posteriorly. Legs slender. Length of body, exclusive of head 2.3 in.; whole length of head .8 in.; length of tubercle beyond the eyes .35 in.; of antennæ .16 in.; of prothorax .48 in.; of mesothorax .12 in.; of hind femora 1 in. One ♀. Between Quito and Napo.

16. Xiphicera octomaculata nov. sp.

Brownish; antennæ, excepting base, brownish fuscous; tubercle of vertex, viewed from above, twice as long as broad, the apex broadly rounded. Lateral carinæ of pronotum scabrous with frequent tubercules, anterior border with little raised points, posterior border less than a right angle. Tegmina, each with four long and slender, sometimes confluent, dull luteous spots, bordered heavily with black, and arranged along the costal border nearly to the tip; wings yellowish, with luteous veins and a black outer border, which is very broad at the apex and very narrow at the inner angle. Hind tibiæ having the inner row of spines greatly produced, in the plane of the movement of the leg, into long, nearly straight, black tipped spines, the upper ones very broad and flatly compressed at base. Length of body 1.6 in.; of tubercle of vertex .12 in.; of tegmina 1.52 in.; of hind femora 1 in.; of longest tibial spine .11 in. One ♂. Napo or Marañon.

17. Lophacris Humboldtii nov. gen. et sp.

Vertex, summit and upper portion of sides of head smooth; front and lower portions of sides scabrous with minute pittings. Prothorax uniformly rugose, the crest very high, greatly compressed, anteriorly with four lobes, which have rounded summits, and the first of which projects considerably over the head; the anterior portion separated from the posterior by a deep but very narrow transverse excision; posteriorly there is first a single lobe nearly as large as the anterior ones, and behind it much smaller, and generally rather sharply bimucronate elevations; posterior border of prothorax barely making a right angle; prosternal spine long, stout, straight, smooth, or slightly punctured, scarcely tapering, the tip bluntly rounded. Tegmina large and broad; wings large, evidently roseate in part, but as the insect has been immersed in alcohol, the colors have faded. Length of body 4 in.; greatest height of pronotal ridge above a line drawn from the top of the head to the hinder tip of the pronotum .4 in.; length of tegmina 3.6 in.; of hind tibiæ 1.66 in. One ♀ from Napo or Marañon. Another ♀ from Guayaquil, brought home in a dried state, but almost consumed by insects, seems to belong to this species. So far as can be determined, the wings are colored with a delicate shade of pea green, and the veins in the posterior half are roseate; the pronotal crest is hardly so high or so strongly compressed as in the other specimen. The head and ovipositor of still another female, apparently of this species, were brought from Napo or Marañon.

18. Tropidacris rex nov. gen. et sp.

Head smooth above, the vertex and a dull reddish band on either side extending to the back of the head from the upper edge of the eye, minutely punctured; clypeus and labrum dull olivaceous brown, punctured; front rugulose; lateral carinæ prominent, sides of head sparsely furnished with fine hairs. Pronotum luteo-fuscous, scabrous with elevated, rounded, whitish points and abbreviated lines; median carina and posterior border edged with black; first and second lobes nearly connate, elevated posteriorly more than anteriorly. Tegmina obscure brownish fuscous, marked with olivaceous on the basal half and with pale luteous apically, the principal veins castaneous, the secondary veins olivaceous and luteo-olivaceous; wings red, marked with a very broad, external, blackish band, and with rows of multitudinous black spots, avoiding the cross-veins, giving the whole wing a tessellated appearance. Hind femora marked within and without with whitish, and furnished with an arcuate band at the tip; spines of hind tibiæ black. Length of body 3.9 in.; of tegmina 4.34 in.; of hind femora 1.72 in.; band on the outer edge of the wings .36. broad. One ♀. Guayaquil.

19. Acridium occidentale nov. sp.

Dark brown; the head smooth, with very minute, distant punctulations; frontal and lateral carinæ very prominent; tip of labrum and edges of mandibles whitish. Prothorax profusely punctate, the median carina very slight; prosternal spine rather stout, long, scarcely tapering, excepting at tip, straight but inclining slightly backwards. Tegmina obscure brownish, outer half semiopaque with fuscous spots; wings hyaline. Hind femora externally flat and white, the carinæ distinct, the hind tibiæ with black tipped spines. Length of body 2 in.; of pronotum .39 in.; of antennæ .68 in.; of tegmina 1.23 in.; of hind tibiæ .96 in. Two ♀. Napo or Marañon.

20. Acridium labratum nov. sp.

Head, especially the frontal ridge, punctate, brownish, the edge of the labrum and terminal joints of the palpi pale; the carinæ prominent; antennæ pale fuscous, darker toward the tip; eyes large, oblong, prominent, separated above by a narrow space. Pronotum brownish, closely punctate, the median carina barely perceptible. Tegmina brownish, blotched indistinctly and abundantly with small fuscous spots; wings hyaline, with blackish veins, tinged with faint yellowish at the base, and blackish fuscous at the apical half of the costal margin. Legs brownish, tarsi edged with blackish; hind femora internally and externally flat and dark brownish fuscous, the external inferior carina yellowish; hind tibiæ armed with black tipped spines. Length of body 1.23 in.; of tegmina 1.17 in.; of hind femora .66 in. One ♀. Napo or Marañon.

21. Chrysochraon ? abbreviatum nov. sp.

Brownish yellow; head smooth; lateral carinæ of front distinct, prominent; median carina distinct, growing broader toward the clypeus. Pronotum docked squarely in front, broadly rounded behind, anteriorly smooth, posteriorly punctulate; median carina distinct, slight; lateral carinæ not prominent, marked by a black line, which extends forwards to the eye. Tegmina brownish, immaculate, longer than the abdomen; wings pellucid, faintly nebulose, especially, but still very slightly, at the tip; costal margin blackish; hind tibiæ obscure fuscous, with pale, black tipped spines; ovipositor reddish. Length of body .6 in.; of tegmina .5 in.; of hind femora .42. One ♀. Between Quito and Napo.

22. Œdipoda bivenosa nov. sp.

Head rather smooth, dull luteous, marked with black points and minute reddish brown blotches, arranged in irregular lines; antennæ reddish, growing fuscous toward the tip. Prothorax finely scabrous, less so on the anterior third; a distinct but not high median carina, and distinct, sharp, but not elevated lateral carinæ; posterior border forming a right angle, minutely bordered. Tegmina longer than the abdomen, brownish opaque, growing pellucid toward the tip, marked with blackish and blackish fuscous blotches, of which three are more prominent than the others, and are situated on the principal vein; the first and largest at one third the distance from the base to the apex; the second at one half that distance, and the third and smallest at two thirds that distance; the veins fuscous, excepting one prominent one in the middle of the wing, along the apical two thirds of the basal half, which is luteous; wings pellucid, the veins prominently fuscous, the base faintly washed with pale greenish yellow, the middle of the outer margin slightly nebulous, the basal half of costal margin a little fuscous. Legs brownish, marked with black points and furnished with black tipped spines; ovipositor pale luteous, edged and tipped with black. Length of body .83 in.; of tegmina .85 in.; of hind femora .46 in. One ♀. Ecuador.

23. Amorphopa caiman Sauss.

A single ♂, taken between Quito and Napo, is referred with some doubt to Saussure's species.

PHASMIDA.

24. Bacteria sp.

One specimen, labelled as coming from Napo or Marañon, the abdomen of which is entirely wanting, is referable to *B. molita* Westw., or *B. gracilis* Burm., but may not belong to either species. The middle pair of legs have both the femora and tibiæ very obscurely fasciated.

25. Acanthoderus immanis nov. sp.

Whole body rugose. Head with a median prominence, cleft in the middle nearly to the base, so as to form on either side a divergent, spinulose, compressed spur, three quarters of a line in length, and backed by a strong thorn. A pair of similar but erect thorns on the prothorax; four spines, the middle two of which are scarcely smaller, upon the anterior border of the mesothorax; from the outer edge of the middle of the mesonotum spring two strongly divergent, very stout, subconical prominences, armed at the tip with short but stout spines, and below the tip with elevated warts; these prominences are the largest on the body, and are fully one and one third lines in length, and nearly half a line broad at base; the anterior edge of the metathorax bears a median prominence similar to that on the head, but with the spurs scarcely so divergent, and bearing at the tip longer and less frequent spinules; posteriorly the lower edge of the pleura of the metathorax is dilated into a flat, depressed, triangular, spinuliferous lamina, protecting the posterior coxæ; it is about four fifths of a line in length. The middle of the anterior half of each of the first five abdominal segments supports a pair of divergent thorns, from each of which a slender spiculiferous lamina extends backwards, those of opposite sides meeting in the middle of the posterior border; the sixth abdominal segment bears a median, elevated, rugose lamina, bifurcate anteriorly, its ridge rounded and armed posteriorly with three equal, triangular, compressed teeth; behind this segment the median carina is elevated and rugose. The legs throughout, but especially the femora, are armed profusely with laminated spines; the hinder portions of the apices of the joints on the basal half of the antennæ swollen. Length of body 1.2 in.; of antennæ 1.05 in.; of hind femora .4 in. It is allied to *A. Tisiphone* Westw. One ♂ from Napo or Marañon.

26. Phasma putidum Bates.

One ♂, two ♀ and one pupa from Napo or Marañon. The wings of both of the ♀ measure 2.3 in. in length, or a little more than those of Bates's specimens.

27. P. Menius Westw.

One ♀ taken in Ecuador seems to be referable to Westwood's species. The alternate joints of the antennæ are not marked at the base with a broad whitish ring, excepting in a few instances near the tip, and where the pale color extends also over the apex of the preceding joint; the centre of the tegmina is elevated into a triangular perpendicular lamina, the apex of which is rounded. The wings measure slightly more than one and a half inches in length.

MANTIDES.

28. Stagmatoptera binotata nov. sp.

Prothorax trigonal, the lateral border with small, flattened, laterally projecting spines, those at the base of the legs smaller and more uniform than the others; the spines of the fore tibiæ and tarsi black, except externally; a median spot on the interior surface of the tibiæ, near the point of reception of the apical tarsal spine, black. Tegmina green, a large median spot ferruginous, the inner edge in the ♂ nearly hyaline; wings hyaline, sprinkled with numerous quadrate, yellowish spots (perhaps greenish in fresh specimens), seated upon the cross veinlets throughout nearly the whole wing; middle and hind tarsi blackish beneath. Length of prothorax ♂ 1.1 in., ♀ 1.46 in.; of tegmina ♂ 1.98 in., ♀ 1.85 in.; of fore tibiæ ♂ .62 in., ♀ .86 in. One ♂, one ♀. Napo or Marañon.

BLATTARIÆ.

29. Phyllodromia pallipes nov. sp.

Head piceous, labrum and clypeus luteous; basal three joints of maxillary palpi pale, apical two fuscous; antennæ black. Pronotum scarcely concealing the whole of the head, black, immaculate, minutely and rather sparsely punctulate; entire border minutely marginate. Tegmina dark castaneous, semidiaphanous toward the tip, costal edge yellowish; wings faintly fuliginous with dusky veins, costal edge, especially near tip, castaneous. Femora and tibiæ and most of the coxæ pale, the tibiæ suffused with yellowish brown, especially toward the apex; tarsi darker. Abdomen black; anal cerci nearly as long as the first hind tarsal joint, rather broad, pointed, black, the apex pale. Length of body, .58 in.; of body, including tegmina, .76 in. One ♂ from Napo or Marañon.

30. Ischnoptera melana Walk.?

My single specimen from Napo River does not wholly agree with Walker's description; it is not so dark, the tarsi are not tawny toward the tip, and the tegmina show no dusky markings near the apex.

31. Periplaneta americana (Linn.) Burm. One specimen from Napo or Marañon.

32. Periplaneta australasiæ (Fabr.) Burm. Two specimens from Napo or Marañon.

33. Panchlora exoleta Klug. One specimen from Napo or Marañon.

34. Zetobora rudis Walk. One specimen, unlabelled.

35. Blabera cubensis Sauss. Two specimens from Guayaquil.

36. " femorata nov. sp.

Head black, labrum and lower part of front luteous, the upper part of labrum with a transverse fuscous band; eyes separated from each other by a space greater than the length of the first antennal joint; palpi reddish brown; antennæ thick at base, tapering more rapidly than usual; first eleven joints piceous, shining, beyond dull blackish fuscous, apical third dull ferruginous, the apices of the joints tipped above with fuscous. Pronotal shield irregularly ovate, the lateral angles equally distant from the front and hind border, the whole border slightly marginate, but the hind border obscurely; the front border well rounded, projected forward so as just to conceal the head, the hinder half of the sides forming an obtuse rounded angle with the hind border; the hind border slightly curved; pronotum ferruginous, whole hind border and half way to the lateral angles broadly bordered with black; a very large and broad discal spot with ill defined borders, its front broadly and deeply concave, so as to make it widely and rather sharply bilobed, with large, quadrangular, lateral expansions, and a well rounded, convex hind border scarcely reaching the marginal band; this spot encloses dull, indistinct, ferruginous markings in the shape of a ⊥; the whole shield, and especially just in front of and behind the discal spot, minutely and transversely wrinkled. Tegmina fuliginous, paler toward the tip, with a dark fuscous, narrow, humeral stripe, becoming gradually fainter and scarcely extending over half of the tegmina; wings hyaline, costal border testaceous; legs very stout, fuscous above, fusco-luteous beneath; mesothorax and metathorax bordered above posteriorly with pale testaceous. Abdomen above uniformly dark castaneous brown, beneath ferruginous, the sides and terminal segment blackish fuscous; anal cerci short, stout, tapering, fuscous; terminal segment small, subquadrate, in my single specimen asymmetrical. Length of body 1.46 in.; of body including tegmina 1.94 in.; of antennæ 1.25 in.; of pronotal shield .46 in.; breadth of same .67 in. It is allied to *B. marmorata* Brunn. One ♂ from Napo or Marañon.

37. B. armigera nov. sp.

Head black, with two circular ferruginous spots just within the bases of the antennæ; eyes separated by a space scarcely so large as half the length of the first joint of the antennæ; antennæ slender, tapering; first fourteen joints piceous, shining; beyond dull fuscous, slightly washed with luteous toward tip. Pronotal shield broadly and irregularly ovate, the whole border slightly marginate, the hinder border obscurely so; the front border well rounded, the middle of the front scarcely produced and barely concealing the head, the lateral borders well rounded, the hind border very slightly produced and obtusely angulated; pronotum luteo-ferruginous, enclosing a large, shield shaped, piceous, immaculate spot, widely distant from the front and lateral borders, and separated from the hind border only by the very margin itself; its front border is subrect, very slightly and angularly excavated in the middle, the upper outer angles rounded, the spot narrowing posteriorly, its sides a little hollowed in the middle, and its hinder border well rounded. Tegmina testaceous, the costal edge ferruginous, a narrow, black, humeral stripe of equal width throughout, scarcely as long as the pronotum; apical half of the tegmina faintly tinged with fuliginous, commencing at the end of the anal field and widening posteriorly, but not including any of the costal field; wings hyaline; costal border testaceous. Legs black; meso- and metanotum luteous, spotted with blackish fuscous. Abdomen blackish fuscous above, the sides narrowly edged with testaceous; the supraänal plate testaceous, fuscous at base; abdomen below black, with some obscure dull luteous markings on the basal segments; terminal segment narrowly bordered posteriorly with ferruginous; anal cerci moderately long, tapering slightly, bluntly rounded at tip, blackish. Length of body 1.92 in.; of body including the tegmina 2.58 in.; of antennæ 1.3 in.; of pronotum .52 in.; breadth of same .75 in. It is nearly related to *B. gigantea.* One ♂. Napo or Marañon.

Other Blattariæ were obtained, but either young specimens, or too mutilated to bear description.

FORFICULARIÆ.

38. Chelidura robusta nov. sp.

Head piceous; labrum slightly reddish; mouth parts and first and part of second joints of antennæ reddish. Prothorax, tegmina, abdomen and forceps piceous; pronotum docked squarely in front, the lateral angles square, the hind border well rounded, convex, the lateral borders slightly marginate; a finely graven median line. Tegmina short, quadrate, smooth; upper surface and sides of abdominal segments minutely, the penultimate segment also profusely punctured. Legs brownish yellow. Forceps stout, trigonal, beneath flat, straight nearly to the tip, the lower surface for this same distance furnished interiorly with a minute blade; the tips are bent toward each other, but not strongly. Length of body including forceps, .9 in.; of forceps, .2 in.; of tegmina, .12 in.; width of pronotum, .12 in. Two ♂. Between Quito and Napo, and at Napo.

39. Psalidophora nigripennis nov. sp.

Piceous; pronotum and front of head, shining, the former bordered laterally with dull luteous. Head broader than the pronotum, smooth; the long, basal and minute, second joint of antennæ black; remaining joints, like the palpi, fusco-rufous. Pronotum quadrate, the posterior border broadly rounded; a very slight median carina. Tegmina and exposed parts of wings black, densely and most minutely punctured, and furnished with a very few fine, distant, long, erect hairs. Femora black, tibiæ and tarsi luteous. Abdomen blackish at the sides and along the posterior edges of the segments, and blackish fuscous in the middle. Length of pronotum, .05 in.; of tegmina, .11 in.; of hind femora, .12 in. One specimen (with forceps broken) was taken between Quito and Napo.

40. Labia bilineata nov. sp.

Piceous, with infrequent, short, decumbent, lustrous hairs; head minutely punctured; basal joints of antennæ luteous; palpi blackish fuscous. Pronotum quadrate with a slight median furrow, not attaining either margin; the sides faintly bordered with dull luteous. Tegmina smooth, with a broad, pale luteous, humeral stripe reaching neither the outer border nor the humerus nor apex; exposed portion of wings marked indistinctly with luteous on the inner edge at the tip and near the outer border. Basal half of femora black, outer half luteous; tibiæ brownish fuscous, the apex paler; tarsi dull fusco-luteous, the basal joints paler; abdomen blackish, densely punctured, the hinder edges above fusco-rufous. Forceps straight, parallel, incurved a little at the tip, under surface flat, the inner, inferior edge denticulate. Length of body including forceps, .34 in.; of tegmina, .05 in.; of forceps, .06 in. One ♀, the hind legs of which are lost and the antennæ broken, was taken between Quito and Napo.

The following paper was also presented:—

A Study of the Gigantic Lobe-crested Grasshoppers of South and Central America. By Samuel H. Scudder.

An examination of the gigantic crested grasshoppers, mentioned in the previous paper, has induced me to review the whole group. Some errors have been detected in the work of preceding authors, showing that they have given but comparatively slight attention to these insects or to their representation by earlier writers;[1] in consequence, the synonymy of several well known species, as will be seen beyond, has become greatly confused.[2]

[1] For instance, Serville and Burmeister, in quoting Drury's description and figure of *Gryllus dux*, copy the mistake which Fabricius makes and repeats in all his works, of referring to the first instead of the second volume of the Illustrations of Natural History.

[2] This seems the more remarkable, since an examination of many scores of specimens has shown that the variability of these huge Orthoptera is comparatively slight. I have compared over fifty specimens of a single species, *Tropidacris cristata*, occurring in many different localities from Surinam to Rio, and find the variation to be insignificant,—a fact which has given me greater confidence in the opinions I had formed concerning the different species.

This section of the old genus Acridium is divisible into three groups, represented respectively by the familiar species, *Acridium dux* (Drury), *A. carinatum* (Stoll'), and *A. Olfersii* Burm. *A. cristatum* (Linné) falls into the first group, although the almost total absence of a median crest on the posterior prolongation of the pronotum, as well as several minor characters, separate it from other members of the same division.

These three groups seem to be of generic value, and since *A. tartaricum* (Linn.) Oliv., ought to be taken as the type of the genus Acridium proper, they must all be separated from that genus and may be called respectively *Tropidacris*, *Titanacris* and *Lophacris.*

TROPIDACRIS (τροπὶς, ἀκρὶς).

Head large, compressed; space between eyes equal to the shorter diameter of the eye;[1] median frontal ridge broader than the length of the first joint of the antennæ; the breadth of the labrum is equal to the distance from the upper edge of clypeus to the upper limit of the median frontal ridge, or one and one half times the longer diameter of the eye (see previous note), or fully one and one half times broader than long; the lateral angles of the front are distinct divergent. Pronotum tapering moderately,—the breadth anteriorly being to that posteriorly as 1 : 1.2; the angle of the posterior border is a right angle or less; the median crest is much more prominent anteriorly than posteriorly, sometimes obsolete behind; the prosternal thorn rather slender, barely compressed laterally, inclined backward a little, the tip curved slightly backwards and pointed. Tegmina fully five and one half times longer than broad, the costal edge narrow; secondary veins very prominent; internomedian vein furcate; basal branch of the externomedian vein simple, but united by distinct cross veins to the internomedian vein. Wings long and broad, largely spotted with dusky colors; cross veining at tip scarcely more frequent than in other parts of the wing, and perfectly regular; the area between the first and second branches of the anal vein not noticeably broad, broken by cross veins into spaces not more than half as long again as broad (♀), or noticeably broader than the adjoining areas, broken by cross veins into spaces twice as long as broad (♂); second branch of anal vein regular, sending downward one primary

[1] The eyes in the male of *T. Fabricii* are very large, and hence the space between them is a little less than the shorter diameter of the eye; and the breadth of the labrum is equal to only one and one fourth times the longer diameter of the eye.

shoot and sometimes more than one secondary shoot, but usually only forking close to the tip (♀) or irregular, deflected from a regular course (♂); intercalary longitudinal veins of anal area extending fully half way toward the base of the wings. Abdomen comparatively slender; outer surface of hind femora flat or barely convex; terminal segment of the male nearly as narrow at base as at tip, greatly produced and tapering, compressed into a dull carina along the lower edge.

1. **T. dux** (Drury) Scudder.

Gryllus dux Drury, Illustr. Nat. Hist., II, pl. 40.
" " Fabr., Sp. Ins., I, 362 (in part?).
" " " Ent. Syst., II, 47 (in part?).
" " " Mant. Ins., 235 (in part?).
" " Gœtze, Ent. Beitr., II, 102.

Gryllus (*Locusta*) *dux* Stoll', Repr. des Spectres, etc., Saut. d. Pass., 6, 7, pl. 1[b], fig. 1.

Acridium dux Oliv., Encycl. Méth., VI, 215, pl. CXXVI, fig. 1.
" " Latr., Gen. Crust. et Ins., III, 105.
" " Flor, v. Sivers, Antill. xii.

Locusta dux Dunc., Introd. Entom., 257, pl. XV, fig. 2.
" (*Rutidoderes*) *dux* Westw., Drury, Exot. Ent., II, 92, pl. XLIV (in part).

Gryllus cristatus Thunb., Mém. Acad. St. Petersb., V, 224; IX, 402.

Acrydium Latreillei Fitch, Trans. N. Y. St. Agric. Soc., XVI, 507. Third Rep. Nox. Ins., 172, pls. III, IV.

Pronotal crest tipped with black (perhaps greenish black in life); first and second lobes as distinct as the others; on the posterior half of the pronotum the crest anteriorly is elevated considerably,—more than in the allied species. Tegmina greenish griseous, the veins luteous and luteo-fulvous, variegated with pale blotches, small and frequent on the basal half, confluent about the middle and apically, forming very irregular, rather broad and distant, zigzag bands parallel with the outer border. Wings brick red, rather broadly bordered with black at the hind margin, and furnished with multitudinous black spots over the whole wing; these spots are ordinarily quadrate, transverse, but near the middle of the outer border they become confluent, forming wavy bands along the longitudinal veins; and toward the inner border they form confluent or broken bands subparallel to the hinder border; these spots are less frequent, and often very indistinct in the ♂. Hind femora externally ornamented with a double row of roundish or oval spots, merging into one toward the apex; hind tibiæ furnished with greenish black spines; claws of tarsi tipped with black. Expanse of tegmina, ♀ 215–236 mm., average 227 mm. ♂ 130 mm.

Bay of Honduras (Drury), Surinam (Stoll'), Panama (Fitch).

Panama, Texas (Mus. Comp. Zoöl.), Aspinwall (Smith. Inst.), Nicaragua, Guatemala, Tehuantepec (my coll.).

It is evident that the ordinary application of Drury's name of *dux* to the Brazilian species which I have characterized under the name of *Fabricii* is incorrect. These pages prove that there are two distinct species in Brazil and on the Isthmus, and that Drury's figure and description of *Gryllus dux*, as well as the locality given by him, apply only to the species from the Isthmus.

Specimens from the Isthmus, which I consider to belong to the *A. Latreillei* of Fitch, differ from the description and figures of *A. Latreillei* by Perty, in the following particulars: the tegmina are brownish fuscous and not violaceous; the tarsi are obscure red and not blood-red; the crest resembles that of *T. Fabricii*, only it is more elevated, while in *T. Latreillei* the second and third lobes of the crest are elevated above the others, and the first is much more prominent anteriorly than behind; the spines of the hind tibiæ are black throughout, instead of being merely black tipped.

They differ also from Serville's description of *A. Latreillei* in having the spots in the vicinity of the anterior border quadrate and not rounded and punctiform.

Thunberg's descriptions apply best to this species; "postice vix rugosus, crista minori serrulata," or "posticus planus, carina minori, serrulata," spoken of the thorax, cannot apply to the true *cristatus*.

Stoll's figure seems to apply to this species rather than to *T. Latreillei*, the only other one to which it could refer.

2. **T. rex** Scudder.

First and second lobes of pronotum nearly connate, elevated posteriorly more than anteriorly; posteriorly with a mixture of dull and sharp serrulations. Tegmina brownish fuscous, obscure apically, tinged with olivaceous basally; on the basal half the secondary veins are bordered with pale greenish yellow, broadening into spots and irregular blotches in the middle field; on the apical half the spots are paler, more obscure, become dirty white at the apex, and show a tendency to group themselves into narrow distant bands, which (excepting at the extreme apex) cross the tegmina at right angles to the lower border, or even incline a little toward the base. Wings brick red, with a very broad black outer margin and rows of black spots over the whole wing, often confluent, and arranged much as in the next species. Hind femora externally with a row of quadrate bluish white spots, decreasing regularly in size toward the apex; spines of hind tibiæ black; claws of tarsi tipped with black.

Expanse of tegmina, ♀ 228 mm.

Ecuador. Prof. Orton.

3. T. Latreillei (Perty) Scudder.

Acridium Latreillei Perty, Delect. Anim. Artic., 123, pl. XXIV, fig. 4.

Acridium Latreillei Serv., Orthopt., 652.

" " De Haan, Verh. Nat. Gesch. Ned. Bezitt., Zool., 144, 151.

Not *A. Latreillei* Fitch.

Crest of pronotum considerably elevated, the anterior two lobes merged into one, which is elevated abruptly in front and slopes gradually away behind; the two succeeding higher, angular, parted and deeply cleft; the posterior portion of the crest at once depressed, of nearly uniform height, bluntly serrulate. Tegmina violaceous, varied with pale and yellow spots; wings brick red, with a broad black margin along the whole posterior border, and black quadrate and rounded spots interspersed over the whole wing, forming near the anal border narrow, wavy or irregular, transverse, parallel and approximate bands of black. Hind femora spotted externally with white. After Perty.

An alcoholic specimen (♀, no locality) in the Society's Museum has a pronotal crest, the anterior portion of which agrees altogether in form with that of *T. rex*, but posteriorly the serrulations are blunt; the posterior surface of the pronotum is furnished with irregular tubercles, which are independent, distant, rounded,—not confluent, approximate, linear, as in *T. rex*; the crest and posterior border of the pronotum are not edged with black as in the latter; and the spines of the hind tibiæ are only tipped with black, instead of being wholly black; the pale bands on the apical half of the tegmina of *T. Latreillei* are broad and diagonally disposed, not narrow and transverse, as in *T. rex*.

Expanse of tegmina, ♀ 212–222 mm.

Amazons (Perty, Serville); Rio, Para, Bahia (De Haan).

Brazil (Peab. Acad.)

4. T. Fabricii Scudder.

Gryllus dux Fabr., Ent. Syst., II, 47 (in part?).

" " " Spec. Ins., I, 362 (in part?).

" " " Mant. Ins., I, 235 (in part?).

Gryllus dux Thunb., Mem. Acad. St. Petersb., IV, 225; IX, 393, 402.

Acridium dux Oliv., Encyl. méth., VI, 215?

" " Serv., Ann. d. Sc. nat., XXII, 283.

" " " Orthopt., 653.

" " Burm., Handb. d. Ent., II, 628.

" " Brullé, Hist. nat. d. Ins., IX, 225, pl. XX.

" " De Haan, Verh. Nat. Gesch. Ned. Bezitt., Zool., 144, 151.

Locusta (*Rutidoderes*) *dux* Westw., Drury, Exot. Ent., II, 92, pl. XLIV (in part).

Gryllus (*Locusta*) *cristatus* (*var.* alæ in aliis antice rubræ) Linn. Mus. Lud. Ulr. Reg., 137, No. 28.

Not *A. dux* Drury.

The front lobe of crest shorter than the others; the three following equal, rounded, not greatly but regularly arched; posteriorly the crest diminishes rapidly, consisting, as it were, of a single posteriorly elongated lobe, elevated anteriorly and slightly tubercular on the ridge. Tegmina dark green with paler veins. Wings brick red, greenish at the apex in the ♀, with a narrow posterior margin of black and recurrent rows of quadrate and rounded spots following up the principal vein, and especially that along the upper edge of the anal area, growing smaller, and fading out before reaching the base; the spots are generally seated upon the principal veins, but are seldom cut by the cross veins; in the ♀ the black is absent from all but the anal area, excepting at the outer margin. Hind femora ornamented externally with a double row of quadrate whitish spots usually united into one at an angle; hind tibiæ pale greenish, the spines greenish with black tips.

The descriptions cited from Fabricius apply best to this species because he speaks of the tegmina and prothorax as greenish; in all other particulars, the description would answer equally well for this and for *T. dux*. It is also more likely that he saw specimens from Brazil, the home of *T. Fabricii*, than from Central America, the home of *T. dux*. He speaks of his specimen or specimens as coming from meridional America, and as seen in the Banksian Museum; may it not then have been Drury's original specimen? or were there other specimens of this species and of *T. dux*, or of this species only, and were the two confounded by Fabricius? Neither seems unlikely.

Expanse of tegmina, ♀ 182–187 mm. ♂ 130 mm.

Rio, Para, Bahia (De Haan); Brazil (Serville); S. America (Burmeister); Meridional America (Serville, Fabricius).

Rio (Mus. Comp. Zoöl., Peab. Acad., my coll.); Para (Peab. Acad.).

5. T. cristata (Linn.) Scudder.

Gryllus crista thoracis quadrifida Linn., Amœn. Acad., I, 513, No. 21, fig. 4.

Gryllus (Locusta) cristatus Linn., Mus. Lud. Ulr. Reg., 137, No. 28.

" " " Linn., Syst. Nat., 12th Ed., II, 699.

" *cristatus* Stoll', Repr. d. Spectr., etc., Saut. d. Pass., 21, 22, pl. x^b, figs. 30, 33.

Gryllus cristatus Fabr., Syst. Ent., 288; Ent. Syst., II, 46; Spec. Ins., I, 362; Mant. Ins., I, 235.

Gryllus cristatus Thunb., Mem. Acad. St. Petersb., V, 224, IX, 402.

Locusta cristata Dunc., Introd. Entom., 257, pl. XVI, fig. 1.

Acridium cristatum Oliv., Encycl. Méthod., VI, 215.

" " Latr., Gen. Crust. et Ins., III, 105.

" " Burm., Handb. d. Entom., II, 627.

" " Serv., Ann. d. Sc. Nat., XXII, 283.

" " " Orthopt., 650.

Acridium cristatum DeHaan, Verh. Nat. Gesch. Ned. Bezitt., Zool., 141, 151.

Acridium cristatum Lam., Hist. nat. Anim. sans Vert., IV, 241.

? Gryllus grandis Thunb., Mem. Acad. St. Petersb., IX, 403.

" *collaris* Stoll', loc. cit., 99, pl. XXI^b, fig. 80.

On either side of the pronotum the lobes of the pronotal crest are separated by much deeper constrictions than in any other species; posteriorly the prothorax is deeply and irregularly punctured with but a faint and equal indication of a median carina. Tegmina fuscous, blotched faintly with griseous. Wings pale greenish blue, very faint on the upper half of the wing, tessellated with blackish fuscous spots, and furnished with a broad blackish border, fuliginous toward the apex, the cross veins traversing which are frequently bordered narrowly with pale. Hind femora externally with a double row of distant rounded spots, merged into one toward the apex; spines of hind tibiæ yellowish, tipped with black.

Expanse of tegmina, ♂ 136–158 mm., average 149 mm.; ♀ 170–203 mm., average 184 mm.

Asia, Africa (Linné); Arabia (Fabricius, Stoll', Thunberg, Linné); America (Stoll', Serville, Linné); S. America (Burmeister); Meridional America, principally Cayenne (Serville); Rio, Para, Bahia (De Haan).

Para, Santarem, Rio, Tajapouru, Manaos, Pernambuco, Hyanuary, Villa Bella, Bahia, Tapajos, Surinam (Mus. Comp. Zoöl.); Rio (Peab. Acad.); Surinam (my coll.).

Thunberg makes no mention of a dark outer border to the wings.

TITANACRIS (Τιτὰν, ἀκρίς).

Head small, compressed; space between eyes less than the shorter diameter of the eye; median frontal ridge as broad as the length of the first joint of the antennæ; breadth of labrum equal to the distance from upper edge of clypeus to the middle of the median frontal ridge, or barely more than the longer diameter of the eye, or as broad as long; lateral angles of front distinct but slight, divergent. Pronotum tapering considerably,—the difference between the breadth anteriorly and posteriorly, being as 1:1.32. Angle of posterior border less than a right angle; median crest forming a regular curve from front to hind border, but rather more prominent anteriorly; prosternal thorn stout, straight, rather long, slightly compressed laterally, neither pointed nor blunt. Tegmina nearly five and one half times as long as broad, the costal edge broad; secondary veins indistinct; internomedian vein furcate; basal branch of externomedian vein simple. Wings long and broad, immaculate; cross veins at tip regular, though much more frequent than in other parts of the wing; area between first and second branches of the anal vein not noticeably broad, broken by cross veins into spaces not more than half as long again as broad (♀), or unusually broad and broken by cross veins into spaces three times as long as broad (♂); second branch of anal vein regular, sending out from under surface one primary shoot and two secondary ones; intercalary longitudinal veins of anal area extending fully half way toward the base of the wing. Abdomen comparatively slender; outer surface of hind femora flat or even hollowed; terminal segment of male not greatly produced, compressed beneath into a sharp carina throughout its length.

1. T. carinata (Stoll') Scudder.

Gryllus carinatus Stoll', Repr. d. Spectr., etc., Saut. d. Pass., 12, pl. v[b], fig. 16.

Acridium albipes Burm., Handb. d. Entom., II, 628.

" " De Haan, Verh. Nat. Gesch. Ned. Bezitt., Zool., 141, 151.

Anteriorly the crest of pronotum is quadrilobed, each lobe well rounded, the edge covered with spinules. Wings violaceous purple posteriorly, dull purple anteriorly, the apex green. After Stoll'.

Expanse of tegmina, ♀ 187 mm. (Stoll').

West Indies, America (Stoll'); S. America (Burmeister, De Haan).

I place the reference to Burmeister here because in his description he says, "*loborum fastigio serrulato*."

2. T. albipes (De Geer) Scudder.

Acridium albipes De Geer, Mem., III, tab. 40, fig. 7.

? " " Goeze, Ent. Beitr., II, 113.

" " Latr., Gen. Crust. et Ins., III, 105.

Gryllus (*Locusta*) *cristatus* var. ϑ Linn., Mus. Ulr. Reg., 137.

Not *Acridium albipes* Burm.

Anteriorly the crest of the pronotum is quadrilobed, each lobe well rounded, smooth. Wings of a dark "solferino" color, or crimson purple; the whole of the apex, and a narrow band running thence to the base of the wing along the upper branch of anal vein, green, the band tinged with purplish.

Expanse of tegmina, ♀ 185 mm.; ♂ 130 mm.

Surinam (De Geer).

Para, Rio (Peab. Acad.); Lago Alexo (Mus. Comp. Zoöl.).

LOPHACRIS (λόφος, ἀκρίς).

Head large, full; space between eyes equal to or surpassing the shorter diameter of the eye; median frontal ridge broader than the length of the first joint of antennæ; breadth of labrum equal to the distance from the edge of clypeus to the upper limit of the median frontal ridge, or one and one half times the longer diameter of the eye, or broader than long; lateral angles of front not very distinct, barely divergent. Pronotum tapering but little, the anterior breadth being to the posterior as 1:1.13; angle of posterior border a right angle; median crest forming a regular curve from front to hind edge, but rather more prominent anteriorly; prosternal thorn stout, straight, blunt, rather short, not compressed laterally. Tegmina a little more than four times as long as broad, costal edge narrow, outer border not so obliquely docked as in *Tropidacris* and *Lophacris*; secondary veins indistinct; internomedian vein simple; basal branch of externomedian vein furcate. Wings short and broad, immaculate; cross veins at tip degenerating into an irregular anastomosis; area between first and second branches of anal vein noticeably broader than in the adjoining areas, and divided by cross veins into spaces twice as long as broad (♂ ♀); second branch of anal vein irregular; intercalary longitudinal veins of anal area extending not more than one third of the way to the base of the wing. Abdomen heavy; outer surface of hind femora swollen; terminal segment of male somewhat produced, broad, swollen beneath at the base, much broader at base than at tip, compressed on the apical half into a dull carina.

1. L. Olfersii (Burm.) Scudder.

Acridium Olfersii Burm., Handb. d. Ent., II, 628.

" *semirubrum* Serv., Orthopt., 653.

Gryllus (*Locusta*) *flavicornis* Stoll', Repr. d. Spectr., etc., Saut. d. Pass., 19, pl. VIII^{b}, fig. 16.

Crest of pronotum green, not high, the anterior four lobes well rounded, the portion behind serrulate. Wings brilliant carmine red posteriorly as far as the second branch of the anal vein; above that hyaline, tinged with green, especially toward apex, and on basal half faintly washed with carmine. Hind femora ornamented outside with a single row of roundish or quadrate white spots; hind tibiæ green above and below, the spines rosy, green at extreme base, black at extreme tip.

Expanse of tegmina, ♀ 137–145 mm.; ♂ 96 mm.

China (De Geer); Cayenne (Serville); Rio (Burmeister).

Rio (Peab. Acad., my coll.).

2. L. Velasquezii (Nieto) Scudder.

Acridium Velasquezii Nieto, Rev. et Mag. de Zool., 1857, 360; Nouv. Orth. de Mex., 2.

Acridium Olfersii Sauss., Rev. et Mag. de Zool., 1861, 162, 163; Orth. nov. amer., II, 13.

Crest of pronotum green, tipped with red, pretty high, the four anterior lobes rounded, the part behind serrulate, but anteriorly forming a fifth lobe. Wings much as in *L. Olfersii*. Hind femora ornamented externally with small white roundish spots arranged on the basal half in a double, and on the apical half in a single row; hind tibiæ roseate above, greenish beneath, the spines green, their tips blackish. After Nieto.

Expanse of tegmina 141 mm. (Nieto).

Vera Cruz, Mexico (Nieto).

Saussure refers this species, but I think incorrectly, to the preceding species.

3. L. Humboldtii Scudder.

Crest of pronotum very high; the four anterior lobes greatly compressed, well rounded, the portion posterior to them sharply serrulate. Wings pea green, with roseate veins on the posterior half, and perhaps slightly washed with roseate in this same portion. Outer side of the hind femora ornamented with a row of (apparently) quadrate whitish spots; spines on the upper half of the hind tibiæ tipped very slightly with black; those on the lower portion more distinctly.

Expanse of tegmina, ♀ 194 mm.

Guayaquil. Prof. Orton.

We can give but slight credence to the statements of the earlier authors concerning the home of the insects which they describe; and the same uncertainty and confusion of habitat, on a lesser scale, seems to have clung to these up to the present time. The species of the genus *Tropidacris* were indiscriminately located over the whole of northern South America, whereas it appears, by the sifting of evidence, that, with the exception of one (*T. cristata*), which is somewhat unique in its characters, and extends over the whole Brazilian coast, and to a certain degree into the interior, they are each characteristic of a separate zoölogical province, *T. Fabricii* being found on the Brazilian coast from Rio to Para, *T. Latreillei* in the interior, *T. dux* upon the isthmus of Panama and the surrounding region, and *T. rex* on the west coast. With the exception of the interior of Brazil, each of these provinces also harbors one species of Lophacris, viz.: *L. Olfersii* on the Brazilian coast, *L. Velasquezii* in Mexico, and *L. Humboldtii* in Ecuador. The genus *Titanacris* does not seem to follow the same rule; the special habitat of *T. carinata* has never been given, while that of *T. albipes* is on the Brazilian coast, specimens having been quoted from Rio, Lago Alexo, Para and Surinam.

I am indebted to the Museum of Comparative Zoölogy, the Peabody Academy of Science and this Society, for most of the material used in this study.

Mr. Edward Burgess stated that while collecting insects at Key West, Fla., at about noon of Jan. 31st, he found a ♀ larva of *Anisomorpha buprestoides* (Stoll') Gray, under a small piece of coral, and shortly afterwards, in a similar situation a ♂ and ♀ in coitu. On Feb. 3d, a friend found a large number of these insects under a log; and on the afternoon of the 5th, after a rainy morning, he discovered under a log another large family, about twenty in number, of all sizes from less than three fourths of an inch up to three inches in length; there were about five large females, all in the embrace of males. Say states that his specimens were all found on trees, but no trees were growing near the spot where the last family was found.

March 3, 1869.

Vice President, Dr. C. T. Jackson, in the chair. Thirty-seven members present.

Mr. Thomas Gaffield exhibited some cracked specimens of cruet stoppers, the cavities of which were filled with a considerable quantity of water.

Mr. Gaffield remarked that on the morning of Sunday, the 6th of September, a fire occurred in the glass-cutting establishment of J. M. Cook, in Congress St. On Monday morning he visited the ruins of the fire to search for any specimens exhibiting the devitrification of glass exposed to great and long continued heat.

He found nothing of this kind, but instead, in a pile of melted glass and cinders of wood, discovered some stopples of glass bottles, cracked on the outside and containing water. These stopples were originally made with a cavity containing a partial vacuum, as the air must have been enclosed when hot, and when cooled must have contracted and filled less space than previously.

Mr. Gaffield presumed that when the glass stopples were heated red hot by the fire around them, the stream of water from the engines coming in contact with them produced the cracks through which the water rushed in, in sufficient quantity to fill the partial vacuum. The glass was cooled by the water within, and the fire extinguished by the water without, and so the glass contracting to its original size has virtually almost hermetically sealed the imprisoned water. Mr. Gaffield thought that these specimens might throw some light upon the occurrence of crystals with cavities containing liquids, and of mineral geodes lined with crystals.

Section of Microscopy. March 10, 1869.

Mr. R. C. Greenleaf in the chair. Six members present.

Dr. H. Hagen made the following communication concerning his experience with the use of microscopes.

Having worked with the microscope more than thirty years for medical and scientific purposes,—following the gradual perfecting of the instrument—I was anxious to examine the power of American microscopes. But my occupation in the Museum and ignorance of the English language has prevented the accomplishment of my wishes. I ordered a new microscope of M. Hartnack in Paris, which was kindly forwarded to me by M. Milne-Edwards. The French instruments are noted throughout Europe for their power and finish, and in order to judge impartially, I chose one of these, rather than a German instrument. It is well known that nearly every nation claims for itself the highest degree of perfection in the manufacture of microscopes. No Englishman would acknowledge the superiority of a French instrument, nor a Frenchman that of an English instrument. In Germany alone, Prussian, Austrian, Saxon and Bavarian manufacturers all claim preëminence for their respective instruments, not only compared with each other, but with those of American and English manufacture. There has been no unanimity of opinion among scientific men in regard to this question. I think these conflicting claims are based upon something beyond mere national pride. In fact, microscopes finished by the most skillful opticians, have arrived at a high degree of perfection in nearly every country, and differ less than is generally supposed. During the past ten years there has been great competition among opticians, but in every case their progress has been arrested by one insurmountable obstacle. Since the recent improvement in correcting the objectives for the thickness of the cover-glasses, comparatively little has been done. Indeed it is always stated and accepted as a fact, that the proper means of obtaining a stronger power consists in securing a higher power of the objectives and a smaller focal distance with greater angular aperture, and in this opticians have arrived at a rare degree of perfection. Objectives of $\frac{1}{50}$ in. are made, and the greatest angular aperture, so far as I know, is in the $\frac{1}{12}$ objective by Spencer, with 175° angular aperture. But even here further progress is arrested. The increase of the angular aperture increases the two aberrations to be corrected, and materially weakens the penetrating power. Judging from an examination of the test plate of Nobert, it would appear that the best instruments of any country differ but little in power. It was stated, in a recent meeting, that Messrs. Stodder and Greenleaf had resolved the highest groups, a thing never before accomplished with any instrument. This statement, however, is doubted by their learned countryman, Dr. Woodward.

The test plate of Nobert, dividing the inch into more than one hundred and twelve thousand parts, is generally adopted as a very good test object. But even here a very important consideration in forming a thorough and correct judgment exists, and is almost constantly overlooked; I mean the difference in the aberration of the eyes of the observers. There is no doubt that different observers obtain different results from the same instrument; of course a greater dissimilarity arises in the use of the same test object with separate microscopes. All attempts to correct this personal aberration are still unreliable and unsatisfactory; therefore the microscopic photographs which are brought to so admirable a degree of perfection, are, in fact, the surest test objects now existing for the power of an instrument.

Besides this personal difference there exists a very considerable one resulting from the continual use by each observer of one particular instrument. In this connection I recall the striking fact, that as the celebrated microscope of Leeuwenhoek arrived at the Royal Society in London after his death, no one was able to see the objects observed and described by him. An experienced observer will often see much better with his own imperfect instrument, to which he is accustomed, than another person would do with a far superior microscope.

Doubtless the most important matter for microscopical science is the price for which the instrument can be obtained. The cheaper the instrument the larger the number of observers. In Europe, ten years ago, about two thousand large instruments were manufactured every year; now the number is more than double. Surely for a physician, and for many other observers, an amplification of moderate size, from two hundred and fifty to three hundred diameters is sufficient. Prof. Ehrenberg, in Berlin,—and I believe no living observer has made so much use of the microscope, uses almost constantly in his work an amplification of three hundred and fifty, and in some exceptional cases of seven hundred and fifty diameters. For histological purposes higher amplifications are necessary, but the physician and the naturalist will usually be contented with a good amplification of nearly three hundred diameters.

Every possessor of a microscope wishes to test the power of his instrument, but it is not, and never has been, my purpose to provoke competition between American and European microscopes. Certainly every step toward the perfection of the microscope is important, but when the improvements are so minute that they cannot be used and seen easily and everywhere, they are, I think, more interesting to the artificer than to the operator.

Indeed all over the world, first class microscopes have resolved the 14th, or even the 15th band of Nobert's test plates,—but should it be found that American microscopes, even with a $\frac{1}{8}$ in. objective, have resolved perfectly the 19th band, the superiority of these instruments would be so enormous that it could easily be proved in any place and at any time.

I wrote to Mr. Hartnack to send me a first class microscope for investigations in anatomy and natural history, and added that I intended to compare it carefully with the best American instruments. I did not fix the price, and left the choice entirely to him.

He has sent the instrument marked in his catalogue as No. VIII, a new small model, only differing from his great model by wanting the rack motion of the tube, by having but three eye-pieces, and by lacking two objectives of lower power.

The catalogue states that this new model, Hartnack's patent, differs materially in the optical and mechanical construction from his old Oberhauser microscope. I confess I have been unable to discover any difference, except that the fine moving screw is placed near the top of the tube instead of below. The sliding tube to be elongated by another tube has a diaphragm, which is also above the objective. The diaphragm under the stage may be removed by a sliding apparatus or by a sliding tube. The three eye-pieces, as in the Oberhauser instruments, have a low power, $2\frac{1}{2}$, $3\frac{1}{2}$, $5\frac{1}{2}$ nearly. The objectives are No. IV, $\frac{1}{2}$ in., No. VII, $\frac{1}{6}$ in., and No. IX, $\frac{1}{12}$ in., fitted for correction for the cover-glasses, and for immersion. Hartnack calculates the amplification for the first ranges from 70 to 480 with the lower eye-piece, and from 140 to 950 with the strongest. The camera lucida used with a fourth eye-piece, goes up to 1000 times. The lowest eye-piece has a glass micrometer.

This instrument costs 390 francs, about $104.00 in currency, and the camera and lens, 50 fr., about $14.00.

The catalogue sent with the microscope gives numbers of the objectives from 10 to 18, or from $\frac{1}{16}$ to $\frac{1}{50}$ inch. The $\frac{1}{16}$ costs 200 francs ($53), the $\frac{1}{50}$, 500 fr. ($134), and the other numbers vary accordingly.

The two stronger eye-pieces, 5 and 6, cost ten francs each. No. 5 magnifies seven and one half times. No. 6 is unknown to me.

My instrument is number 8066. Nineteen years ago, in March, 1850, Prof. Vrolik received from the same optician, number 1786. Since then he has delivered 6280 microscopes, 330 a year, or almost one a day. My instrument was received about six months after I ordered it.

The Section may be interested in seeing an old German microscope made in Berlin by Scheck, in 1837, and used by me for many years. The defining power is even now sufficient, but the penetrating power in all microscopes at that time was very low. In the old Nobert's test plate of ten bands, it resolved the 6th well, but the 7th is doubtful. At this time Scheck's microscopes were considered the best by the most experienced observers, especially by Ehrenberg. I am sorry I cannot exhibit a microscope in my possession, nearly two hundred years old, and now in good order. I have watched with great interest the growing demand for these instruments, and the surprising increase in the number manufactured during the last thirty years. Long ago I made my first observations on the scales of Lepidoptera and Coleoptera, with an old English microscope, perhaps of Martin, and only partly achromatic. Since then I have used first class microscopes of Ploesl, then those of Scheck (none of them is sufficient to show the transverse lines on the scales of Lepidoptera), later of Oberhauser and Nachet.

From this time almost every European naturalist gave up using microscopes mounted upon high stands, as observations with high objectives are more easily and accurately made in a sitting position, when the arms can be supported upon the table. The end is not attained by placing a microscope with a high stand upon a low table, because the hands are less readily guided at a distance from the eyes. The English opticians appreciated this, and arranged a strong wooden transverse rest for the hands, even in single microscopes.

I have noticed that foreign students entering the Institute for Pathological Anatomy, very soon exchange their high-stand, English microscopes for short-stand instruments, and even here I was not surprised to see the Professor of Pathological Anatomy using a short-stand French microscope.

Doubtless every observer will handle his own instrument to greater advantage, but for certain purposes particular constructions are preferable ; and indeed I know of no work that would actually require a high-stand microscope. I am the better able to judge, having examined microscopes of this kind in Germany and England, especially those of Frauenhofer, Ross, Smith, Amici and others, It may be interesting to mention that Nobert's instruments are not considered superior. I have examined a first-class microscope with an objective fitted for correction, and calculated by him to have a power of 500 diameters. The marked yellow light in the Nobert microscopes is very trying to the eyes. The mechanical work is good but not remarkable. A kind of screw for fine motion used by him is perhaps unknown. A long, strong, steel screw is used; the upper half of the thread of which is turned in the opposite direction from that on the under half, and the two halves differ somewhat in size. By this arrangement the motion of the screw moves the instrument only as far as the difference in the fineness of the two halves, and with a strong screw a very fine motion is obtained, and "dead point" is impossible.

The *Trichina spiralis* has singularly forwarded the manufacture of microscopes. Every physician and many other persons engaged in examining pork, tried to obtain a microscope as soon as possible. At first the manufacturers could not possibly meet the demand. Consequently the manufacture of these instruments has everywhere increased, and one can get a very good French or German student's microscope, amplifying 250 to 300 times for twenty-five dollars. I have seen instruments with a power of 150 to 200 times for twenty dollars or even less. The increasing number of instruments has been very advantageous to science, and I hope that the calamity of trichina, even now fearfully prevalent in Europe, will be compensated by a marked progress in science.

Mr. R. C. Greenleaf offered the following remarks on the double plate of *Aulacodiscus oreganus.*

Mr. Charles Stodder, in several communications to the Section, has called attention to the double plate of the various disk forms among the diatoms. A few days since, Mr. E. Samuels, who is again giving his attention to the cleaning and mounting of these beautiful objects, in preparing a single specimen of *Aulacodiscus oreganus*, after placing it on the slide, found that it had divided, the upper shell slipping off from the under. This is the most perfect specimen of the division of this class of diatoms I have ever seen, and the most authentic, as the divisions really took place under the eye.

This is a very interesting object, because it proves, if proof were needed, that these disks are formed of two shells, and thus conclusively, to my mind, revealing the fact that many species have been named by microscopists as new, that are only the thin under layers of the shells of species already classified. I am confident that many of the species named by Dr. Greville, although he was one of the most skilful and diligent of observers, are merely these thin shells removed from their connections.

In the January number of the "London Quarterly Journal of Microscopical Science," there is a figure given by Dr. Greville exactly like this under shell, which he calls *Aulacodiscus orientalis*.

Since writing the above remarks I have seen a letter from Professor Eulenstein to Mr. Charles Stodder, in which he alludes to the paper of Dr. Greville, on *Aulacodiscus orientalis*, to which I have referred above.

Prof. Eulenstein, at first thought as I did, that *A. orientalis* was the inner plate of *A. oreganus*, but after a more careful examination of the form, decided it was a new species. He had a slide containing the object. I had only seen the drawing.

Mr. Stodder is of the same opinion. He says that the granules in *A. orientalis* differ in form from those of *A. oreganus*, being square or oblong, and not arranged exactly in the same order. This last variation I noticed in the drawing, but by a careful adjustment of the focus, the variation in this particular is small. Prof. Eulenstein says there is a chance of error in examining these disk forms, in mistaking an immature frustule, separating from the parent, for the inner plate.

I should be inclined to hold to my first impression, but must defer to higher authority at present.

Mr. Greenleaf also stated that he had received from Mr. Samuels several slides of diatoms from a gathering made in Ashley River, S. C., by Dr. Coues, which he had allowed him to report upon.

This dredging is very rich in rare and beautiful forms. I have carefully examined four slides and inserted in the following list every thing of interest that I found.

Bacteriastrum furcatum.
" nodulosum.
" hyalinum.
Hyalodiscus stilliger.
Surirella Febegeri.
Eupodiscus argos.
" radiatus.
Amphiprora elegans.
Cyclotella—various and new.
Triceratium favus — beautiful specimens.
Triceratium punctatum.
Biddulphia rhombus.
" Baileyii and valve.
" Tuomeyi.
" radiatus.
Pleurosigma baltica.
" angulata ?
" fasciola.
" strigosum.
Amphitetras ornata.
Campylodiscus cribrosus.
" Hodgsonii.
Navicula musca.
Navicula permagna.
" ovalis.
" spectabilis.
" prætexta.
" punctulatum.
" didyma.
" lyra.
" Bohemica.
" incomperta.
Auliscus sculptus.
Actinocyclus Ralfsii.
Omphalopelta.
Plagiogramma.
Cocconeis, new.
Amphora, frequent.
Rhizosalenia, broken, no whole specimen.
Actinoptychus undulatus.
Nitzschia sigmoidea.
Coscinodiscus lineatus.
" in great variety.
Doryphora amphiceros and varieties.
Heliopelta.

March 17, 1869.

Vice President, Dr. C. T. Jackson, in the chair. Thirty-nine members present.

Mr. Thomas Gaffield offered some remarks upon the comparative capacity of different kinds of colored and colorless glass for passing the actinic rays of light.

Mr. T. T. Bouvé read a letter from a gentleman in Hull, Mass., who referred to the statement of the occurrence of shells at a great depth at Fort Warren, in Boston Harbor, made at the meeting of January 6, 1869, and added similar facts known to him in his own vicinity.

In reply, Mr. W. H. Niles stated that the occurrence of shells of existing species underneath Fort Warren was of interest, not so much because they were found at the mathematical depth of one hundred feet below the surface, but on account of their geological position and relations.

He then gave a general notice of the topography of many of the islands in the harbor. Their escarpments or precipitous slopes, are on those sides of the islands which face the greatest action of the ocean, while their gentler, grassy slopes are on the protected sides; thus showing the present destructive action of the waves. The specimens were obtained by Mr. G. E. Pierce, a member of the Society, while sinking a well in the centre of Fort Warren. For one hundred feet the excavation was through those loose materials of which the great mass of the islands in the harbor is formed. At this depth there was found a thin bed of indurated argillaceous material, immediately overlying the argillaceous slate of the vicinity of Boston. It was in this bed that well preserved specimens of *Natica heros*, *Cardita borealis* and *Venus mercenaria* were obtained. From the position in which the shells were found it becomes evident that the specimens were thus imbedded before the deposition of those overlying materials which constitute nearly the whole island. This is equivalent to saying, that the species must have existed here before any of the present features of the island were formed, and that they must have survived, not only those changes which were connected with the formation of the island, but also those mutations which have since reversed the action of the waters, and have caused a partial destruction of the islands in the vicinity.

Mr. W. H. Niles remarked that the recent development of the petroleum interest in our country has disclosed some interesting traces of ancient operations in the "Oil-region" of Pennsylvania.

With such facts, many persons living in the region, or connected with the oil business, have been familiar, but he thought that they were not generally well known among scientific men. He had become acquainted with the facts by travelling through the region, by conversation with those well acquainted with the country, and by some publications of a popular character. The best representation has been given by Rev. S. J. M. Eaton of Franklin, Pa., in his popular book entitled "Petroleum: A History of the Oil Region." In this book might be found a fuller statement of nearly all the facts with which he had become acquainted.

Artificial excavations or oblong pits are to be found in considerable numbers in sections of the Oil-creek valley. Sometimes the sections thus marked embrace hundreds of acres in extent. The pits are from four by six to six by eight feet in size, and although much filled by natural accumulations, are frequently from four to six feet in depth. Some of the larger ones were curbed with timbers. The bark was removed, and it is stated that sometimes the timbers were halved and rudely adjusted at the corners. In one instance, while excavating preparatory to the construction of a sawmill, some workmen came upon one of these pits where the timbers were twelve feet in length, and placed perpendicularly upon end. It is also stated that in some of these wells there have been found logs with notches cut in them, which may have served as steps for the descent and ascent of those who constructed and used them.

Such works are not found beyond the limits of what is known as the oil region, and that they were excavated for the purpose of obtaining petroleum, there scarcely can be a doubt. That petroleum was obtained is evident from the fact that the timbers used are thoroughly impregnated with it, and by it preserved in a good state of soundness, and frequently are almost free from decay.

But the interesting questions are, when were these wells formed and by whom were they used?

That they are works of ancient construction is quite apparent. The trees growing in the hollows of these pits never seem to be more recent than those of the surrounding country. In some instances the trees thus situated must have been two hundred years old, and there is no known reason for supposing that the date of the desertion of the wells could be fixed even here.

The fact that the timbers bore the marks of some cutting instruments caused some of the settlers to assume a modern origin, and attribute them to the French. But Fort Vernango was completed about the year 1754, and it is highly probable that this was about the first of the operations of the French in this region. The antiquity indicated by the forest growth would therefore seem to render this theory untenable. Again, whatever might have been the object of the French in regions farther north, their only object here was to gain a military possession of the territory. They had no means for the transportation of the substance, neither could there have been any adequate market for it.

Another theory that has been entertained is, that they were constructed by the Indians. But at the time of the discovery of the region, they had no practice of collecting oil in this manner; nor did those of them who were friendly to the white man have any tradition of their use. They used no vessels in which they could either store or transport it in large quantities, while their uses for it were so limited that the surface oil would more than have supplied their wants. Cornplanter, a sagacious Indian chief, the last of the Seneca chieftains of this region, was a friend of the white man, and lived in the valley at the time that the French occupied it. He knew nothing of any oil searching operations by the French, and had no knowledge of the origin or the use of these pits, not even a tradition of them.

From these evidences, Mr. Niles believed that these works must be referred to the time of the ancient copper miners of the Lake Superior region, and of the mound builders of the West.

Section of Entomology. March 24, 1869.

Mr. Edward Burgess in the chair. Fourteen members present.

The Secretary presented the following paper:

Notes on Mexican Pompilidæ, with Descriptions of New Species. By E. T. Cresson.

Genus POMPILUS Fabr.

Subgenus Pompilus.

1. Pompilus philadelphicus.

Pompilus philadelphicus St. Farg., Hym. iii, p. 423. Cresson, Trans. Am. Ent. Soc., i, p. 87.

Pompilus cubensis Cress. (var.), Trans. Am. Ent. Soc., i, p. 93.

Hab.—Orizaba. (Prof. F. Sumichrast.) Eight ♀, four ♂ specimens. These specimens vary from blue to green, therefore rendering *cubensis* a mere variety, there being no structural difference of any importance.

2. Pompilus æthiops.

Pompilus æthiops Cresson, Proc. Ent. Soc. Phil., iv, p. 451; Trans. Amer. Ent. Soc., i, p. 87.

Hab. — Orizaba. (Prof F. Sumichrast.) One ♂ specimen. Does not differ from specimens found in the United States.

3. Pompilus lepidus.

Pompilus lepidus Say, Bost. Jour. Nat. Hist., i, p. 303. Cresson, Trans. Am. Ent. Soc., i, p. 94.

Hab.— Orizaba. (Prof. F. Sumichrast.) Four ♀, four ♂ specimens. This is very near *scelestus* Cress., but the males differ from those of the latter species by having the tarsal claws cleft, and the third marginal cell is much narrowed towards the marginal.

4. Pompilus fulgidus.

Pompilus fulgidus Cresson, Proc. Ent. Soc. Phil., iv, p. 131; Trans. Am. Ent. Soc., i, p. 94.

Hab.—Orizaba. (Prof. F Sumichrast.) Two ♀ specimens.

5. Pompilus simulans, n. sp.

♂. Same form as *cylindricus*; black, faintly bluish; head, thorax, base and apex of abdomen with thin black pubescence, thickest on the face; face and tip of metathorax silvery in certain lights; sides of thorax and base of legs silvery-sericeous; anterior margin of clypeus truncate; posterior margin of prothorax angular; metathorax smooth and rounded; wings long, narrow; fuscous, varied with subhyaline spots, and with a beautiful purple reflection; second submarginal cell obliquely quadrate, the third much narrowed towards marginal, being sometimes nearly triangular; four posterior tibiæ with long, scattered, spines; abdomen subcylindrical, shaped much as in *cylindricus*. Length four to four and one fourth lines.

Hab.—Orizaba. (Prof. F. Sumichrast. Coll. Am. Ent. Soc.) Four ♂ specimens. Larger than *cylindricus*, with same form of body, but with longer wings, which have differently shaped submarginal cells.

6. Pompilus novellus, n. sp.

♀. Black, subpruinose, having a thin sericeous silvery pile, more obvious on face, sides of thorax and base of legs; anterior margin of clypeus truncate; antennæ brown, paler beneath, black at base and apex; posterior margin of mesothorax arcuate; metathorax finely granulated, apex densely silvery, with a golden hue in certain lights; wings yellowish-hyaline, with a small fuscous cloud beneath stigma; marginal cell long, lanceolate; second submarginal pointed towards base of wing; third submarginal longer than the second, narrowed towards marginal, and receiving the second recurrent nervure one third from base; legs long, slender; coxæ, trochanters, anterior femora and base of middle femora, black; anterior tibiæ, tips of two posterior pair, and all the tarsi, brown; base of anterior tibiæ, apical half of middle femora, their tibiæ, and the posterior femora and tibiæ, fulvous; four posterior tibiæ and tarsi with numerous short spines; abdomen petiolate, ovate, convex, shining. Length three and one half lines.

Hab.—Orizaba. (Prof. F. Sumichrast. Coll. Am. Ent. Soc.) One ♀ specimen.

7. Pompilus gloriosus, n. sp.

♀. Black; head, except occiput, covered with a very brilliant silvery pile; clypeus truncate in front; antennæ black, scape more or less silvery; middle of prothorax, anterior half of mesothorax, scutellum, broad band across middle of metathorax, tegulæ, and anterior half of pleura, velvety black; remainder of thorax covered with a brilliant changeable silvery pile; prothorax prominent laterally, its posterior margin arcuate; metathorax rounded, with a finely impressed, central, longitudinal line, deep at base; disk finely, transversely striated; wings hyaline, with a beautiful opaline iridescence; across the middle of anterior pair a rather broad, even, entire, blackish band, and between it and the apex a large rounded blackish spot covering the base of marginal and whole of second and third submarginals, but not reaching the posterior margin of the wing; the posterior pair are dusky at apex, and a zigzag dusky line crosses the middle; marginal cell long, narrow, sublanceolate, second submarginal quadrate, the third larger, and narrowed nearly one half towards the marginal, receiving the second recurrent nervure one third from the base; legs long, slender, black, in certain lights conspicuously silvery cinereous; coxæ bright silvery; middle and hind tibiæ with a few short, scattered spines; claws deeply cleft, the teeth equal in length; abdomen subpetiolate, oblong ovate, convex, smooth and shining, black; posterior margin of three basal segments broadly black, remainder covered with a brilliant, changeable, silvery pile; apex silvery cinereous, pilose, terminal segment densely pitted on the dorsal middle, and with short stiff hairs. Length eight lines.

Hab.—Orizaba. (Prof. F. Sumichrast. Coll. Am. Ent. Soc.) Two ♀ specimens. This is the most beautiful species of this family that I have seen, the silvery ornamentation being exceedingly brilliant. Seems to be closely allied to the South American *P. nobilis*, which is said to have the anterior wings black at tip, whereas in the species above described, the apex is hyaline.

8. Pompilus confusaneus, n. sp.

♂. Black, covered with a dense, appressed, cinereous pubescence; vertex black, shining, thinly pubescent; anterior margin of clypeus broadly rounded; mandibles shining, reddish at tip; antennæ short, thickened, opaque black, subsericeous, two basal joints cinereous; prothorax large, cinereous, with a large triangular black mark on each side above, posterior margin arcuate, posterior angles prominent; mesothorax black, margined laterally and posteriorly with cinereous; scutellum black, the sides and postscutellum cinereous, as well as the metathorax except base, and the pleura except a space on each side, which are black; wings hyaline, apical third fuliginous, second submarginal cell quadrate, the third much larger, very slightly narrowed above, receiving the second recurrent nervure in the middle; legs black, more or less densely covered with cinereous pile; four posterior tibiæ sparsely spinose; abdomen subcompressed, densely cinereous, with a broad black band on posterior margin of first and second segments, much narrowed on the sides. Length four lines.

Hab.—Orizaba. (Prof. F. Sumichrast. Coll. Am. Ent. Soc.) One ♂ specimen. Closely allied to *unicus* Cresson, from Cuba, but is longer, with thorax much less gibbous; the cinereous pubescence rather more dense and darker in color; the shape of the submarginal cells is different, the third being much larger than the second, which latter is not narrowed towards the marginal; the abdomen is longer, subcompressed, the second segment not dilated; and the general ornamentation is different. It is, however, a closely allied species, and with the next, referable to a subgenus near *Ferreola.*

9. Pompilus connexus, n. sp.

♂. Size and general form of *unicus* Cresson; black, shining, silvery-sericeous, the silvery pile more dense on the face, anterior margin of mesothorax, apex of metathorax, pleura beneath, legs, and apex of abdomen ; clypeus broadly rounded in front ; antennæ short, thickened, opaque black, scape silvery; thorax unusually gibbous, the head being bent downwards; prothorax large, broadly rounded posteriorly; metathorax large, broadly rounded posteriorly;

metathorax broadly and deeply excavated behind, making the lateral angles prominent; wings hyaline, apical third fuliginous, and a band of same color across the middle, dilated posteriorly; marginal cell long, lanceolate, acutely pointed at tip, second submarginal cell quadrate, the third rather wider beneath, much narrowed above; legs black, silvery-sericeous, especially dense on tibiæ and tarsi; abdomen short, oblong-ovate, convex, first two segments shining black, their sides and the base of the first, silvery-sericeous in certain lights; remaining segments silvery-sericeous. Length three and one half lines.

Hab.—Orizaba. (Prof. F. Sumichrast. Coll. Am. Ent. Soc.) One ♂ specimen. This is more closely allied to *unicus* in general shape than the preceding species, but the second abdominal segment is not so much dilated; it differs, however, by the metathorax being excavated behind, by the longer and more pointed marginal cell, and by the ornamentation, the silvery-cinereous pile being distinct only on face, tip of metathorax, legs and tip of abdomen.

10. Pompilus coruscus.

Pompilus coruscus Smith, Brit. Mus. Cat. Hym., iii, 156. Cresson, Proc. Ent. Soc., iv, p. 128; Trans. Am. Ent. Soc., i, p. 103.

Pompilus juxta Cresson (var.), Proc. Ent. Soc. Phil., iv, p. 128; Trans. Am. Ent. Soc., i, p. 103.

Pompilus insignis Cresson (var.), Trans. Am. Ent. Soc., i, p. 103.

Hab.—Orizaba. (Prof. F. Sumichrast.) One ♀ specimen belonging to the variety *juxta.*

11. Pompilus flavopictus.

Pompilus flavopictus Smith, Journal of Entomology, i, p. 396. Cresson, Trans. Am. Ent. Soc., p. 97.

Hab.—Orizaba. (Prof. F. Sumichrast.) Eight ♀, one ♂, specimens. The ♂ is smaller and more slender than ♀, but resembles the latter very much in color and markings, except that the face is entirely yellow, and the antennæ are porrect and ferruginous; the abdomen is subdepressed. This species varies in length from five to seven lines.

12. Pompilus interruptus.

Pompilus interruptus Say, Bost. Jour. Nat. Hist., i, p. 365. Cresson, Trans. Am. Ent. Soc., i, p. 104.

Hab.—Orizaba. (Prof. F. Sumichrast.) One ♂ specimen.

13. Pompilus algidus.

Pompilus algidus Smith, Brit. Mus. Cat. Hym., i, p. 158. Cresson, Trans. Am. Ent. Soc., i, p. 101.

Hab.—Orizaba. (Prof. F. Sumichrast.) One ♂ specimen.

14. Pompilus marcidus.

Pompilus marcidus Smith, Journal of Entomology, i, p. 395. Cresson, Trans. Am. Ent. Soc., i, p. 110.

Hab.—Orizaba. (Prof. F. Sumichrast.) One ♀ specimen.

15. Pompilus torridus.

Pompilus torridus Smith, Journal of Entomology, i, p. 396. Cresson, Trans. Am. Ent. Soc., i, p. 110.

Hab.—Orizaba. (Prof. F. Sumichrast.) Two ♀ specimens.

Variety BURRUS. ♀. Abdominal segments more or less broadly banded apically with black. Length eight lines.

Hab.—Vera Cruz. (Dr. Chas. Sartorius. Coll. Am. Ent. Soc.) Three ♀ specimens.

Subgenus PRIOCNEMIS.

16. Pompilus flammipennis.

Pompilus flammipennis Smith, Brit. Mus. Cat. Hym., iii, p. 155. Cresson, Trans. Am. Ent. Soc., i, p. 119.

Pompilus ignipennis Cresson, Proc. Ent. Soc. Phil., iv, p. 121.

Hab.—Orizaba. (Prof. F. Sumichrast.) Two ♀, six ♂, specimens. The base of antennæ is always black in the specimens from Mexico; otherwise they seem not to differ from Cuban specimens.

17. Pompilus impiger, n. sp.

♀. Black, opaque, with a pale golden sericeous pile, most dense and obvious on face, cheeks, prothorax, pleura, apex of metathorax, and base of legs; anterior margin of clypeus truncate, depressed and shining; mandibles rufo-piceous near apex; antennæ golden sericeous at base; posterior margin of prothorax subangular; metathorax smooth and rounded, its apex brilliantly golden; tegulæ pale piceous; wings hyaline, apex white, a narrow fuscous band across anterior pair a little before the middle, and a broad one of same color across anterior third, covering the marginal cell, except tip, and the two submarginals entirely; nervures black; marginal cell lanceolate, acutely pointed at tip; second submarginal subquadrate, oblique, the third larger and narrowed nearly one-half toward marginal; legs black, silvery-sericeous, tarsi tinged with brown; abdomen ovate, convex, subpruinose, apex opaque, with long pale hairs. Length four lines.

Hab.—Orizaba. (Prof. F. Sumichrast. Coll. Am. Ent. Soc.) One ♀ specimen.

18. Pompilus rupex, n. sp.

♀.—Black, with a thin, silvery-sericeous pile, more obvious on face, metathorax and base of legs; anterior margin of clypeus truncate; tips of mandibles rufous; posterior margin of prothorax subangular; metathorax smooth and rounded; wings hyaline; extreme apex of anterior pair, a large cloud between middle and apex, covering the marginal, second and third submarginal, and part of discoidal cells, and a faint cloud before the middle, fuliginous; marginal cell long, lanceolate, third submarginal larger than second, and narrowed one-half towards marginal; cubital and discoidal nervures extending entirely to apical margin of the wing; legs black, silvery-sericeous, posterior femora, except extreme base, and their tibiæ, bright rufous; abdomen ovate, shining, entirely bright rufous; apex opaque, densely pilose. Length three lines.

Hab.—Orizaba. (Prof. F. Sumichrast. Coll. Am. Ent. Soc.) One ♀ specimen. Much like *P. alienatus* Smith.

19. Pompilus Sartorianus.

Pompilus Sartorianus Cresson, Trans. Am. Ent. Soc., i, p. 120.

Hab.—Vera Cruz. (Chas. Sartorius.) One ♀ specimen.

20. Pompilus cincticornis.

Pompilus cincticornis Cresson, Trans. Am. Ent. Soc., i, p. 120.

Hab.—Vera Cruz, (C. Sartorius); Orizaba, (Prof. F. Sumichrast). Nine ♀, six ♂, specimens. The golden pile on head and thorax is more or less brilliant, and the abdomen is often spotted with yellow. The ♂ is smaller and quite slender; the antennæ long, porrect, fulvous beneath; the coxæ beneath, the apex of first abdominal segment more or less, and a spot on each side of second and third segments, yellow; posterior tibiæ with numerous short spines on posterior edge. Length five to five and one half lines. In color and markings this species seems to be remarkably like *Agenia orbiculata* Smith.

Subgenus Agenia.

21. Pompilus azureus.

Pompilus azureus Cresson, Trans. Am. Ent. Soc., i, p. 131.

Hab.—Vera Cruz. (Chas. Sartorius.) One ♀ specimen.

22. Pompilus mexicanus.

Pompilus mexicanus Cresson, Trans. Am. Ent. Soc., i, p. 130.

Hab.—Vera Cruz, (C. Sartorius); Orizaba, (Prof. F. Sumichrast). Six ♀ specimens.

Variety FLORIDUS. Differs only by the thorax, abdomen and wings having a brilliant blue and purple reflection. Orizaba. (Coll. Am. Ent. Soc.) One ♀, one ♂, specimens.

23. Pompilus auripilis, n. sp.

♀. Black, covered more or less with a dense, brilliant golden sericeous pile; head and thorax minutely punctured, sparsely clothed with a golden pubescence; antennæ blackish, ferruginous at base; posterior margin of prothorax arcuate; metathorax rugose, with a shallow, central, longitudinal channel; tegulæ pale testaceous; wings pale yellowish hyaline, dusky at extreme apex, iridescent; legs bright pale honey yellow, coxæ, trochanters and apex of tarsi, blackish; abdomen smooth and shining, covered with a very fine golden sericeous pile, and with pale pubescence at apex. Length five and one half lines.

The ♂ is much more slender in form, and with the golden pile more dense and brilliant, sides of face, clypeus except central dusky line, scape beneath, tegulæ, coxæ, femora before and tibiæ, pale yellow testaceous; coxæ at base, trochanters, femora behind and the tarsi, black. Length four and one half lines.

Hab.—Orizaba. (Prof. F. Sumichrast. Coll. Am. Ent. Soc.) One ♀, one ♂, specimens.

24. Pompilus subvirescens.

Pompilus subvirescens Cresson, Trans. Am. Ent. Soc., i, p. 131.

Hab.—Vera Cruz (C. Sartorius); Orizaba (Prof. Sumichrast). Three ♀ specimens.

25. Pompilus chloris, n. sp.

♀. Metallic green, with blue reflections on pleura and metathorax; head and thorax densely punctured, thinly clothed with whitish pubescence; face clothed with silvery sericeous pile; antennæ brown, yellowish beneath at base; posterior margin of prothorax arcuate; metathorax rugulose, silvery at apex; tegulæ piceous; wings hyaline, dusky at tips, iridescent, and with a faint yellowish gloss; legs fulvo-ferruginous, coxæ blue green, trochanters, tarsi and apex of posterior tibiæ, blackish, the latter violaceous; abdomen smooth and shining, varied with silvery sericeous pile. Length four lines.

Hab.—Orizaba. (Prof. F. Sumichrast. Coll. Am. Ent. Soc.) One ♀ specimen.

26. Pompilus nubifer, n. sp.

♀. Black, shining; head and thorax clothed with golden pile, silvery on sides and apex of metathorax; anterior margin of clypeus (which is truncate), mandibles, palpi, four or five basal joints of antennæ, lateral margin of prothorax, tegulæ, and the anterior legs, except trochanters and tarsi, bright ferruginous; posterior margin of prothorax subangular; metathorax smooth and rounded; wings hyaline, anterior pair with a narrow, even, central, fuliginous fascia, and a broad one between it and the apex, covering the marginal cell except tip, the second and third submarginals, and a portion beneath; apex of wing white; legs silvery sericeous, tarsi brownish; abdomen ovate, smooth and shining, subpruinose, the apex with blackish pubescence. Length three and one half lines.

Hab.—Orizaba. (Prof. Sumichrast. Coll. Am. Ent. Soc.) Three ♀ specimens.

27. Pompilus levipes, n. sp.

♂. Small, slender, black, opaque, clothed with a silvery sericeous pile, brightest on face, sides of thorax, of metathorax, and on coxæ; face short; clypeus very transverse, truncate at apex; mandibles piceous; antennæ short, entirely black; posterior margin of prothorax arcuate; scutellum prominent; metathorax rounded, smooth, opaque, sides and apex bright silvery; tegulæ piceous; wings hyaline, apex dusky, marginal cell sublanceolate, acute at tip, second submarginal subconical, pointed towards base of wing, the third submarginal nearly quadrate, receiving the second recurrent nervure in the middle; legs long and slender, silvery sericeous, anterior tibiæ palish in front, posterior tarsi very long; abdomen small, elongate ovate, shining, silvery sericeous. Length three lines.

Hab.—Orizaba. (Prof. Sumichrast. Coll. Am. Ent. Soc.) Two ♂ specimens. Closely allied to *iridipennis* Cresson.

28. Pompilus calcaratus.

Pompilus calcaratus Cresson, Trans. Am. Ent. Soc., i, p. 128.

Variety ACCOLENS. ♂. Body more obviously silvery sericeous; legs black, the anterior tibiæ and tarsi palish in front, tips of intermediate femora, posterior pair except base, and sometimes base of their tibiæ, red; calcaria very white. Length three lines.

Hab.—Orizaba. (Prof. Sumichrast. Coll. Am. Ent. Soc.) Two ♂ specimens.

29. Pompilus Sumichrastii, n. sp.

♀. Head black, opaque; anterior orbits, uneven, posterior orbits, broad beneath, clypeus, mandibles except tips, and palpi, pale yellow; clypeus angular on each side, and obtusely pointed at tip; mandibles long and slender; antennæ black, strongly convolute, the fifth, sixth and seventh joints snow-white; thorax black, minutely punctured; angular mark on each side of prothorax, two spots on posterior margin (which is angular), central spot on mesothorax, round spot on scutellum, indented behind, transverse spot on postscutellum, also indented behind, subtriangular spot behind posterior wing, sides of metathorax, divided by the black suture, two large marks on each side of pleura placed obliquely, the upper one the smaller and rounded, and the tegulæ, pale lemon yellow; metathorax subdepressed, covered with a short, silvery sericeous pile, the upper surface with dense transverse striæ, wings long, hyaline, faintly dusky at apex, nervures black; wing-cells shaped as usual; legs long and slender, especially the posterior pair, pale yellow; line on all the coxæ behind, base of posterior pair in front, trochanters above, line on all the femora above, tibiæ except tips, four anterior tarsi, extreme base of second, third and fourth joints of posterior pair, and terminal joint except base, black; tibial spurs fuscous; posterior legs of a brighter yellow than the others; abdomen ovate, convex, shining, lemon yellow, each segment with a black band at base, very broad on the two basal segments, and gradually narrower and paler on apical segments; apical margin of the segments, except the last, with a fuscous band, angularly produced anteriorly on the disk. Length six and one half lines.

Hab.—Orizaba. (Prof. F. Sumichrast. Coll. Am. Ent. Soc.) One ♀ specimen.

Species not recognized.

30. **Pompilus regalis** Smith, Journal of Entomology, i, p. 396. Cresson, Trans. Am. Ent. Soc., i, p. 94.

Hab.—"Mexico."

31. **Pompilus apiculatus** Smith, Brit. Mus. Cat. Hym., iii, p. 157. Cresson, ibid., p. 103.

Hab.—"Vera Cruz."

32. **Priocnemis velox** Smith, Journal of Entomology, i, p. 398. Cresson, ibid, p. 121.

Hab.—"Oajaca."

33. **Agenia Montezuma** Smith, Journal of Entomology, i, p. 397. Cresson, ibid, p. 132.

Hab.—"Oajaca."

34. Agenia orbiculata Smith, Journal of Entomology, i, p. 397. Cresson, ibid., p. 132.

Hab.—" Mexico."

35. Agenia cærulipes Smith, Journal of Entomology, i, p. 397. Cresson, ibid., p. 132.

Hab.—"Orizaba."

Genus FERREOLA St. Farg.

1. Ferreola formosa.

Ferreola formosa Smith, Journal of Entomology, i, p. 399. Cresson, Trans. Am. Ent. Soc., i, p. 133.

Hab.—Orizaba. (Prof. F. Sumichrast. Coll. Am. Ent. Soc.) One ♀ specimen.

2. Ferreola azteca, n. sp.

♀. Black, shining, clothed with a very short, fine, ashy sericeous pile; clypeus, mandibles except tips, scape of antennæ, thorax, except tip of metathorax, and most of anterior legs, ferruginous; tip of metathorax silvery in certain lights; wings hyaline, the anterior pair with two black bands, the outer one double the width of the inner; apex of wing whitish, apex of posterior wing dusky; four posterior legs black; tips of posterior coxæ, tibial spurs, and outer basal half of posterior tibiæ, white; abdomen subpetiolate, two large subovate spots on base of second segment and a band at base of fifth segment, white. Length six and one half lines.

Hab.—Vera Cruz. (Chas. Sartorius. Coll. Am. Ent. Soc.) One ♀ specimen.

3. Ferreola lævifrons, n. sp.

♀. Black, with a brilliant blue and purple, silky pile; head flat, all below the ocelli black, smooth and polished; antennæ short, inserted in deep foveæ, black, scape polished; metathorax transversely wrinkled, tip truncate, with its disk concave; wings dark fuliginous, with a brilliant purple reflection; legs dark blue, tibiæ spinose; abdomen long, more or less strongly compressed beyond second segment. Length eight and one half lines.

Hab.—Orizaba. (Prof. Sumichrast. Coll. Am. Ent. Soc.) Two ♀ specimens. One specimen has the abdomen very much compressed at tip.

4. Ferreola variegata Smith, Journal of Entomology, i, p. 398. Cresson, Trans. Am. Ent. Soc., i, p. 133.

Hab.—" Mexico." Not seen.

Genus NOTOCYPHUS Smith.

1. **Notocyphus plagiatus** Smith, Journal of Entomology, i, p. 398. Cresson, Trans. Am. Ent. Soc., i, p. 134.

Hab.—"Mexico." Not seen.

2. **Notocyphus albopictus** Smith, Journal of Entomology, i, p. 398. Cresson, ibid., p. 134.

Hab.—"Mexico." Not seen.

Genus PLANICEPS Latr.

1. **Planiceps concolor** Smith, Journal of Entomology, i, p. 80. Cresson, Trans. Am. Ent. Soc., i, p. 137.

Hab.—"Mexico." Not seen.

2. **Planiceps notabilis** Smith, Journal of Entomology, i, p. 80. Cresson, ibid., p. 137.

Hab.—"Mexico." Not seen.

Genus CEROPALES Latr.

1. **Ceropales mexicana,** n. sp.

♂, ♀. Black, opaque, vertex shining; orbits, interrupted above and broad in front, face, clypeus, labrum entirely in ♂, only the sides in ♀, spot between antennæ, scape beneath, spot on each side of prothorax, its posterior margin, spot on scutellum, another on postscutellum, extreme posterior angles of metathorax, spot on tegulæ, four anterior coxæ beneath, two lines on outer side of posterior pair, confluent at tip, tips of femora more or less, anterior tibiæ in front, base and apex of middle tibiæ, base of four anterior tarsi, a sublunate mark on each side of first abdominal segment (sometimes narrowed anteriorly and interrupted, and sometimes confluent with fascia on apical margin), a fascia on apex of remaining segments, squarely notched on each side anteriorly, and sometimes interrupted,—all lemon-yellow; mesothorax with large, deep, scattered punctures; metathorax obliquely truncate, subcanaliculate, apical angles with golden sericeous pile; wings pale yellowish hyaline, faintly dusky at apex; legs, except coxæ, bright fulvous, hind pair very long; abdomen smooth and shining. Length four to five lines.

Hab.—Orizaba. (Prof. F. Sumichrast. Coll. Am. Ent. Soc.) One ♀, two ♂, specimens.

2. Ceropales albopicta, n. sp.

♂. Black, somewhat shining; head impunctate, face silvery; narrow posterior orbits, broad anterior orbits, face, clypeus, labrum, dot on base of mandibles, scape beneath, spot on each side of prothorax, its posterior margin, dot on scutellum, transverse spot on postscutellum, and extreme posterior angles of metathorax, white, the latter silvery sericeous; anterior margin of clypeus broadly arcuate; apical joints of palpi reddish; mesothorax with large, deep, seattered punctures; metathorax broadly excavated down the middle; pleura and coxæ silvery sericeous; tegulæ piceous; wings hyaline, apex slightly dusky; legs fulvo-ferruginous, posterior pair very long, their tarsi dusky at tips; coxæ and trochanters black, the four anterior coxæ in front, tips of posterior pair, spot at apex of four anterior femora, anterior tibiæ in front, and basal joint of four anterior tarsi, white; abdomen black, shining, a large spot on each side of first segment at tip, slightly notched behind, and a fascia at tip of remaining segments, dilated laterally, and more or less deeply notched on each side anteriorly, white; the fascia on two apical segments interrupted on each side, dividing each into three spots, the middle one the larger; venter immaculate. Length three and one half to four lines.

Hab.—Orizaba. (Prof. Sumichrast. Coll. Am. Ent. Soc.) Two ♀ specimens.

3. Ceropales femoralis, n. sp.

♀. Black, shining; face, pleura, metathorax and coxæ, more or less silvery sericeous; face short; clypeus transverse, anterior margin arcuate; narrow posterior orbits, anterior orbits broad above antennæ, spots on each side of clypeus, and scape beneath, white; thorax sculptured and ornamented as in *albopicta*, except that the metathorax is more depressed behind; wings hyaline, dusky at tips; second and third submarginal cells shorter than usual, being nearly quadrate in form; legs subrobust, black; spot on anterior coxæ in front, spot on tip of two posterior pairs, and spot on tip of four anterior femora, white; anterior legs in front, stain on middle femora above, base of their tarsi, and posterior femora except extreme base, ferruginous; abdomen smooth, convex, silvery sericeous in certain lights; each segment with a lateral, apical, transverse, sublunate, white mark. Length three lines.

Hab.—Orizaba. (Prof. F. Sumichrast. Coll. Am. Ent. Soc.) One specimen. In this, the second and third submarginal cells are shorter than in the two preceding species, and each receives a recurrent nervure in the middle; whereas in the other two the recurrent nervures are more approximate.

4. Ceropales agilis.

Ceropales agilis Smith, Journal of Entomology, ii, p. 269. Cresson, Trans. Am. Ent. Soc., i, p. 142.

Hab.—Orizaba. (Prof. F. Sumichrast. Coll. Am. Ent. Soc.) Two ♀ specimens.

Genus MYGNIMIA Smith.

1. Mygnimia mexicana.

Mygnimia mexicana Cresson, Trans. Am. Ent. Soc., i, p. 143, ♀.

♂. Form slender, opaque black, thinly clothed with black pubescence; face, clypeus, antennæ, except base above, posterior margin of prothorax and anterior legs, except base, yellow; intermediate tibiæ in front tinged with yellow; posterior tibiæ with a few very short spines on outer edge; abdomen elongate, subclavate, subopaque; wings more blackish at apex than in ♀. Length eight and one half lines.

Hab.—Vera Cruz, ♀, (Chas. Sartorius); Orizaba, ♂, (Prof. Sumichrast). One ♀, one ♂, specimens. In both sexes the first discoidal cell has, at base, a subhyaline space, surrounding an opaque yellow spot.

2. Mygnimia ustulata.

Hemipepsis ustulata Dahlb., Hym. Eur., i, p. 123.

Mygnimia ustulata Smith, Brit. Mus. Cat. Hym., iii, p. 189. Cresson, ibid.

Hab.—"Mexico." Not seen.

Genus PEPSIS Fabr.

1. Pepsis Sommeri.

Pepsis Sommeri Dahlb., Hym. Eur., i, p. 465. Cresson, Trans. Am. Ent. Soc., i, p. 146.

Hab.—Vera Cruz; (C. Sartorius.) One ♀ specimen. This species is quite abundant in Guatemala.

2. Pepsis Montezuma.

Pepsis Montezuma Smith, Brit. Mus. Cat. Hym., iii, p. 199. Cresson, ibid.

Hab.—"Mexico." Not seen.

3. Pepsis cærulea.

Sphex cærulea Linn. Syst. Nat., i, p. 947. Fab. Ent. Syst., ii, 219.

Sphex auripennis De Geer, Ins., iii, p. 585.

Sphex rubra Drury, Ins., ii, p. 75; pl. XXXIX, fig. 6.

Pepsis cœrulea Fabr., Syst. Piez., p. 214. St. Farg., Hym., iii. p. 475. Smith, Brit. Mus. Cat. Hym., iii, 190. Cresson, ibid., p. 147.

Pepsis speciosa Beauv., Ins. Afric. et Amér., p. 95; pl. II, fig, 5.

Hab.—" Mexico; St. Domingo." Not seen.

4. Pepsis prismatica.

Pepsis prismatica Smith, Brit. Mus. Cat. Hym., iii, p. 200. Cresson, ibid., p. 148.

Hab.—" Mexico." Not seen.

Mr. C. S. Minot read a paper upon the limits of genera, and presented in a tabular form the total and average number of species and genera in several orders of North American insects.

The figures are based upon Scudder's List of Orthoptera, Grote and Robinson's List of Lepidoptera (Sphingidæ to Bombycidæ inclusive), LeConte's List of Coleoptera, Cresson's Catalogue of Hymenoptera and Osten Sacken's List of Diptera.

	Number of Genera.	Number of Species.	Average No. of Species to Genera.	Genera represented by 1 Species.	Do. by 2 Species.	Do. by 3 Species.	Number of Species in the following Genera.
Orthoptera	196	872	4.438	69	25	19	Acridium 49; Blatta 71; Gryllus 47.
Lepidopt.	149	402	2.698	48	25	16	Ægeria 21; Heterocampa 16; Arctia 21.
Coleoptera	1113	5097	4.579	314	142		Hydroporus 91; Platynus 101; Corymbites 78.
Hymenopt.	250	1672	6.688	95	19	17	Ichneumon 83; Formica 58; Odynerus 99.
Diptera	347	2020	5.821	83	25	10	Tabanus 118; Anthrax 85; Tachina 115; Musca 76.

The number of species in each genus is shown by the table to be usually very small, a large number of genera being represented by only one, two or three species. The author regretted this condition of things, feeling that it was a cause of great discouragement to many who would otherwise become students of natural science.

Mr. Ernest Papendiek exhibited a specimen of the European *Silpha atrata*, one of twenty specimens taken from the dead body of a toad in Milton, Mass.

Dr. H. Hagen remarked that Prof. Ratzeburg had recently stated, in a letter to him, that he had carefully studied "Ichneumonosis," or the prevalence of hymenopterous parasitism, in the insects injurious to forest trees, and found that for many years it had carried off ten per cent. of the number of such insects. In 1867 and 1868, years in which the forests had suffered unusually from obnoxious insects, this ratio had been reduced to between one and two per cent., while, at the same time, "Mycetinosis," or the prevalence of fungoid parasitism, had increased to between forty and fifty per cent.; a balance of destructive power seemed to be always maintained between the two forms of parasitism. Mycetinosis had especially checked the ravages of the very destructive caterpillar of *Bombyx pini*.

April 7, 1869.

Vice President Mr. T. T. Bouvé in the chair. Twenty-four members present.

Mr. William Foster of Brookline and Mr. Henry Cutter of Boston were elected Resident Members.

On behalf of the author, the Secretary presented the following paper:—

On New and Imperfectly Known Echinoderms and Corals. By A. E. Verrill.

ECHINOIDEA.

Agassizia subrotunda Gray.

Catalogue of recent Echinida of the British Museum, p. 63, pl. III, fig. 2, 1855.

Two specimens collected at La Paz, Gulf of California, by Capt. J. Pedersen, agree perfectly with Gray's description and figure of this species. The larger one has almost exactly the same size and outline as the specimen figured. It is therefore probable that the locality given ("Australia?") is erroneous.

Perhaps *A. ovulum* Lütk, is only the young of this species, although more oblong in form.

The larger specimen is 1.70 inches long; 1.55 broad; 1.25 high. The smaller one 1.50 long; 1.35 broad; 1.05 high.

Brissus obesus Verrill.

Transactions Connecticut Academy, Vol. I, p. 316, 1867.

A larger specimen, with part of its spines, has been received from Capt. Pedersen, collected at La Paz. It agrees well in form and other characters with the original specimens. The spines are silvery white and slender, on the upper side decreasing regularly in length from the peripetalous fasciole to the margin; the upper ones being .10 or .12 long, the lower ones .25 to .28. Those near the margin beneath are quite long, .35 to .38, those near the mouth largest. This specimen is 2.65 inches long; 2 broad; 1.40 high.

Desoria nodosa Verrill, sp. nov.

Irregularly broad oval, subangulated; the anterior end deeply emarginate; the posterior truncate, slightly oblique, a little concave below the anal area. On each of the four, lateral, interambulacral regions of the upper surface are two radiating series of distant, slightly elevated, nodular elevations or ridges, which give the surface an irregular appearance, and by their continuation downward to the lower surface, give a somewhat angular appearance to the margin.

Posterior interambulacrum elevated in the middle, with a series of three or four slightly raised nodes. Tubercles of the upper surface small and nearly uniform, except on each side of the anterior ambulacral furrow, where there are several irregular rows of larger ones, about equal in size to those near the margin on the lower surface. Anterior ambulacrum considerably depressed, with a row of double pores on each side, which extend to the mouth. Anterior lateral ambulacra more sunken, narrow, elongate, the end curved forward; posterior lateral ambulacra scarcely shorter, narrow, elongated, the outer ends considerably curved and divergent, the inner portion suddenly narrowed, and with minute pores, as in the anterior pair. Ovarial openings four, rather large, the posterior pair a little larger and farther apart, the madreporic plate extending between them. Peripetalous fasciole angular and sinuous, each angle situated on one of the prominences or nodes in the interambulacra. In the posterior interambulacrum the bend of the fasciole extends inward only one sixth of the length of the posterior ambulacral furrows, and in the lateral interambulacra it extends inward less than half the length, and then forming an obtuse angle, passes obliquely downward and across the interambulacral region in a straight line, for nearly half an inch, to another angle near the margin of the anterior lateral ambulacra, from whence it passes outward for .1 of an inch, diverging a little from the furrow, to another angle where it joins the lateral fasciole. From this angle it approaches the furrow again in a slightly curved line, passing around and close to its end. In the anterior lateral interambulacra it forms but one broad round angle, at about three tenths the distance between the end of the anterior lateral furrows and the centre. The lateral fasciole is somewhat sinuous, passing under the anal area in a broad curve. Anal area broad, elliptical, higher than broad, situated toward the upper part of the truncated posterior end, its plane nearly perpendicular to the lower surface. Plastron broad shield-shaped, only slightly narrowed behind.

Length 2.10; breadth 1.95; height 1.45; from apex to anterior margin, in ambulacral furrow, 1.10; apex to posterior margin, at anal area, 1.70; apex to end of anterior lateral ambulacral furrows .1; to end of posterior lateral .95; apex to inner angle of the fasciole in the anterior interambulacra .70; to inner angle in lateral interambulacra .55; to same in posterior interambulacrum .73; breadth of anal area .24; height .36; length of plastron 1.55; breadth .95.

Locality unknown.

This species agrees well with *D. australis* Gray, the type of the genus, but shows good specific differences in its more angulated form, more emarginate anteriorly; in its less eccentric apex; in its broader plastron, much less narrowed posteriorly; in its more squarely truncate and less oblique posterior, and larger and less ventral position of the anal area; and especially in the form of the peripetalous fasciole, which does not extend nearly so far toward the centre in the interambulacral regions.

Mellita longifissa Michelin.

Since the publication of my "Notes on the Echinoderms of Panama and West Coast of America," I have seen quite a number of specimens of this species, which was then unknown to me. These are from La Paz, Capt. Pedersen; Gulf of California, Robt. E. C. Stearns; Acajutla (Corinto), McNiel.

This species is the Pacific analogue of *M. pentapora* of the Atlantic coast. It is remarkable for the thinness or flatness of the outer portion of its shell, the deeply sunken grooves of the lower surface, and the length and narrowness of its five perforations, and especially of the odd posterior one. The posterior side is somewhat truncate, but a little rounded in the middle, and the posterior lateral perforations are curved. The largest specimen from Gulf of California (Stearns) is 3.8 inches in diameter; another is 2.95 wide, 2.70 long, .45 high; the anterior pair of perforations .54 and .56 long; the posterior pair .55 and .60; the posterior odd one .78 long; .09 wide.

Scaphechinus mirabilis (Barnard MS.) A. Agassiz.

Proc. Philad. Acad. Nat. Sci., 1863, p. 359.

Two specimens of this species, received from Robt. E. C. Stearns, Esq., are from Yokohaina, Japan.

Echinarachnius asiaticus Mich., Rev. and Mag. Zoöl., 1859.

A specimen, apparently of this species, collected at the Aleutian Islands, by W. G. W. Harford, on the U. S. Coast Survey, has been received from Mr. Stearns.

It differs from *E. parma*, of the New England coast, in having a thicker form, especially toward the margin, and much broader and more open ambulacral rosettes.

Tripneustes depressus A. Agassiz.

Verrill, Trans. Conn. Acad., I, p. 375, 1868.

Capt. Pedersen has sent several more large and fine specimens of this species, collected at La Paz. The largest specimen is 5.15 inches in diameter, and 2.60 high.

They agree well with the one previously described, except that one specimen has much larger ovarial plates than the others, and consequently a larger abactinal region. The ovarial plates are also more pointed, giving the abactinal area a more stellate form. The difference is possibly sexual.

ASTERIOIDEA.

Gymnasteria spinosa Gray.

Annals and Mag. Nat. Hist., 1840, p. 278; Synopsis of Species of Starfishes in British Museum, p. 8, 1866.

A starfish sent from La Paz, by Capt. Pedersen, seems to be identical with this species, originally collected at Panama by Mr. H. Cuming.

Form pentagonal, with rather broad, tapering, somewhat depressed, triangular rays. Radii as 1:2.2. The skeleton, both above and below, consists of moderately large, rounded and polygonal plates, joined by their edges, so as to leave small spaces between, with their surface roughened by very small, granule-like prominences, and covered with a thin membranous skin, which allows the roughness of the plates to show through it. The dorsal plates on each ray are stout, rather rhomboidal, and bear a row of eight or ten stout, elevated, blunt spines. The sides of the rays are formed by about four series of plates, near the base, in the two median rows rounded, in the upper and lower ones with lateral prolongations, which articulate with the dorsal and marginal plates in such a way as to leave rather large openings between, marginal plates stout, prominent, projecting laterally, and rounded on the outer side, much broader than high, alternating in two rows, about twelve on each side of the ray, each one bearing a stout, elongated, subconical spine. Plates of the lower side rounded and subpolygonal, unequal, some of them bearing a very small central tubercle. Each interambulacral plate bears an outer, stout, oblong spine, compressed or wedge-shaped at the tip, and an inner group of five slender ones, of which the two lateral are very short, and the middle one considerably longest, all connected together by a thin web. On each margin of the mouth there is a group of five, rather slender, subequal spines connected together by a web. Near the margin of disk and rays, above and below, there are many rather large pedicellariæ, oblong or subcylindrical in form, obtuse at tips.

The dried specimen is light red above, yellowish below.

Radius of disk .68 inch; of rays 1.50; length of dorsal and marginal spines .10 or .12; diameter .05 or .06; diameter of upper and lower plates .05 to .10, mostly about .08.

Acanthaster Ellisii nob.

Echinaster Ellisii Gray, Annals Nat. Hist., 1840, p. 281; Synopsis, Starfishes of British Museum, p. 12, 1866.

Acanthaster solaris (*pars*) Duj. et Hupé, Hist. nat des Zooph. Ech., p. 352, 1862.

A small thirteen-rayed specimen, received from Capt. Pedersen, who collected it at La Paz, appears to belong to this rare species. The spines are long (.15 inch) and quite slender. The diameter is 1.5 inches; length of rays .40.

There are five madreporic plates, which are small, round and prominent. The plates of the lower surface between the spines are granulated, the granules extending over the rays and on the upper part of the margin. Color light red, the upper spines rose-red;

those below pink with white tips; the general color of the lower surface yellowish white.

Echinaster spinulosus Verrill, sp. nov.

A species with five long, tapering rays, covered with very numerous, small, blunt spines, arranged in many rows.

The rays are slender, elongated and regularly rounded, gradually tapering. Radius of disk to that of rays about as 1:4.5. Spines of the upper surface small and very numerous, short, mostly blunt, arranged in many somewhat irregular rows, two or three often grouped together upon one plate, the whole number in each row being forty or more. The whole number of rows, above and below, exclusive of those near the grooves, varies according to the age, from fifteen to twenty-one or more. The interambulacral plates bear an inner very small and slender spine, and outside of this two much larger ones, similar to those of the upper surface, one being placed farther back than the other, so as to form two alternating rows. Outside of these there is a row of similar spines, which are somewhat appressed to the surface and point toward the margin of the ray. The plates of the upper surface are prominent and finely granulated. A medium sized specimen measures from centre to edge of disk .45 inch; to end of rays 2.10; length of dorsal spines .02 to .03. The largest specimens are about six inches in diameter.

Egmont Key, west coast of Florida, common; E. Jewett.

This species is more nearly allied to *E. multispina* Gray (sp.) (*E. Braziliensis* M. and Tr.) than to the other Atlantic species. The latter differs, however, in having fewer rows of spines (nine to eleven), while the spines themselves are larger, more conical, and acute. The rays, also, as described by Gray, are "short, depressed, broad, rather more than twice as long as the width of the body, blunt at the end," but in this species they are long, round and tapering, the form being quite constant in more than one hundred specimens, which are in the collection.

E. spinosus, from the Florida Reefs and the West Indies, differs in its much stouter form, with shorter and much larger rays, and very much larger and fewer, sharp spines, which form only about ten or twelve longitudinal rows, with about twelve or fifteen spines in each row.

Pteraster Danæ Verrill, sp. nov.

Upper surface moderately convex; radius of disk to that of rays as 1:1.18; rays broad, subtriangular, the tips recurved so as to expose the end of the ambulacral grooves on the upper side. The dorsal membrane is perforated by minute scattered pores, and numerous small, slender, acute spines project from its surface at regular intervals; these are larger on the disk and quite small on the outer part of the rays. Central opening small, somewhat rounded, surrounded by small spines. Dorsal paxillæ, as seen when the dorsal membrane is removed, elevated and rather stout, surmounted at the summit by six to ten, slender, acicular, divergent spinules, one of which is usually larger, and projects through the membrane. Rays beneath bordered on each side by about thirty slender, transverse, spine-like ribs, which project but slightly beyond the margin, and are connected by the web-like membrane quite to their ends. Interambulacral plates thin, each bearing usually four very slender, elongated spines, many of them with small pedicellariæ near the tips; the inner one considerably shortest; all connected together by a web, which retreats between the points to a considerable extent; near the mouth there are often five spines. At each interradial corner of the mouth there are ten long, slender, pointed spines, the six middle ones about equal in length, the two outer ones on each side much smaller, the outermost considerably smaller than the preceding; just back of these, and side by side, are two long, slender, somewhat curved, acute spines, about equal in length to the longer ones of the group in front of them.

Radius of disk .37 inch; of rays .57; width of rays at base .50; elevation of back .35; length of longest transverse ribs of the rays beneath .15; of interambulacral spines .06 to .08; of the spines at mouth angles, about .08.

Rio Janeiro (?); J. D. Dana, U. S. Expl. Expedition.

Heliaster Kubiniji Xantus.

Proceedings Phil. Acad. Nat. Sciences, 1860, p. 568; Verrill, Trans. Conn. Acad., I, p. 292, 1867.

Capt. Pedersen has sent one good specimen of this rare species, obtained at La Paz. It has twenty-three rays, and is eight inches in diameter; the rays are 1.5 to 2 inches long; the disk six inches broad.

On the upper side the rays, especially near the end, are thickly covered with small oval pedicellariæ, mixed with other very minute ones of similar form.

OPHIUROIDEA.

Astrophyton panamense Verrill, op. cit., p. 251.

Three large specimens of this species, previously known only from

Panama, and Zorritos, Peru, have been collected at La Paz, by Capt. Pedersen. They occurred, as usual, adhering firmly to the branches of *Muricea*.

The largest specimen has a disk three inches in diameter.

Astrophyton Stimpsonii Verrill, sp. nov.

A large species allied to *A. Lamarckii*, with crowded, large, rounded granules on the ribs and arms, larger scattered ones on the disk between the ribs, and smaller scattered ones on the interradial spaces below.

The ten ribs are long and narrow, nearly equidistant, extending to very near the centre, narrowed at the inner end, and but slightly enlarged close to the outer end, entirely covered with crowded, large, prominent, round-topped grains; a border of similar grains surrounds the edge of the disk, connecting with those at the end of the ribs. Centre of disk crowdedly covered with similar granules; the spaces between the ribs with distant, unequal, larger, round grains, or small tubercles, irregularly grouped. Region around the mouth and lower side of arms smooth; interradial regions with scattered, round granules, smaller than those on the ribs, upper side of arms covered throughout with closely crowded, prominent, rounded granules, a little smaller than those on the ribs. Arm-spines, between the first and second fork of the arms, in groups of four or five, subequal, short, obtusely pointed; between the second and third forks, in groups of five or six, nearly equal.

Color of the dry specimen brownish yellow; lower side of disk and arms reddish brown.

Diameter of disk 3.10 inches; length of ribs 1.50; breadth at middle .20; diameter of rib granules .03 to .04; of largest disk granules .05; radius from centre of mouth to first division of the arms 1.35; to second fork 1.70; subsequent forkings at irregular distances.

Ochotsk Sea; Robt. E. C. Stearns, 1867.

A smaller specimen with the disk 1.25 inches in diameter, is in the collection of the Chicago Academy. It was collected by the North Pacific Exploring Expedition in the Arctic Ocean, north of Behring's Straits. The central part of the disk is less granulous, and the spaces between the mouth and interbrachial areas are finely granulose. Outside the genital openings are from three to six prominent, sharp grains.

Ophiarachna maculata Verrill, sp. nov.

A large yellowish brown species, with stout arms, finely spotted with darker on the upper surface.

Radius of disk to that of arms as 1: 9 or 10.

Disk large and thick, the interradial regions swollen and a smaller lobe bordering each side of the arms at base; upper surface and interradial spaces below covered throughout with small, closely crowded, rounded or slightly polygonal granules; radial shields not visible; at the base of each arm a few naked, imbricated, unequal scales. Mouth-shields broad-cordate, broader than long, the inner end obtusely rounded, the sides slightly incurved, the broad outer end emarginate. The accessory plates outside the mouth-shields either two and nearly equal, or three and uneqnal, in the same specimen; when there are two they form together a narrow, slightly oblong ellipse, much narrower than the mouth–shields; when there are three, the middle one has a broad, rounded triangular form, and the two lateral pieces are small, unequal, and irregular in size and form. Mouth-papillæ seven or eight on each side of the mouth, the inner one elongated, irregularly oval, somewhat pointed; the next much larger than the others, broader than long, somewhat quadrilateral and irregular, the outer edge narrower and flattened; the third a little longer than the first, irregular in form, somewhat pointed at each end; the three or four following are a little smaller, and about equal in size and similar in form, rather oblong, somewhat irregular and wedge shaped, the outer edge being flattened, those toward the centre a little shorter; these are frequently followed by a small rounded one, which is sometimes wanting; the last one is short and rounded. The narrow space between the mouth-papillæ and mouth-shields is covered with small rounded granules, except about opposite the first, where the side shields are partly exposed. The teeth have been much injured, but there appear to be five, which are stout, broad, the lower ones somewhat squarish, with rounded angles when seen from above, the end flattened or wedge-shaped, truncate or bevelled. The arms are well rounded, stout at base, regularly tapering to the ends, but not becoming slender. Under arm-plates eight sided, slightly overlapping, the first eight or ten broader than long, followed by a number that are as long as broad, the length gradually increasing, so that at the twenty-fifth plate the length is decidedly greater than the breadth. Inner tentacle-scales oblong, shorter than the arm-plates, toward the disk very broad and stout, truncate, farther out gradually becoming more slender and pointed; outer tentacle-scale very short and broad, about half as long as the inner; those at the base of arms broader than long, the inner side and outer end nearly rectilinear, the articulated edge rounded. Upper arm-plates very broad and comparatively short, the breadth equal to about five times the length; the outer edge with a slight notch or emargination; many of the plates are irregularly broken into two or three pieces. Two arm-spines on the first plate; three on the second; four on the third; five on the fourth; seven on the fifth; eight on the sixth; nine on the seventh; ten on the eighth; and eleven on the succeeding ones, as far as the middle of the arms. These spines are closely crowded, appressed, mostly oblong, with blunt points, about two thirds as long as the breadth of the side arm-plates; the upper ones smaller and shorter; the lowest one larger and stouter than the rest.

Color of the disk uniform yellowish brown in the dry specimen, arms, above, brownish yellow with an orange tinge, thickly covered with small, round, purplish brown spots, some of which occur also on the upper arm-spines and upper part of the side arm-plates. Lower surface uniform dull yellow.

Radius of disk .80 inch; length of arms from centre of disk 7.25 to 8; breadth of arm at base .32; height .30; length of upper arm-plates .08; length of middle arm-spines .05; length of third under arm-plate .07; breadth .09; length of tenth .07; breadth .08; length of mouth-shield .16; breadth .21; length of second mouth-papilla .06; breadth .08.

New Zealand; Chas. Cheever, 1848. (Coll. Essex Institute).

Ophionereis porrecta Lyman.

Catalogue of Ophiuridæ and Astropht. of Mus. of Comp. Zoölogy, p. 147, 1865.

Ophionereis crassispina Ljungman, Ophiuroidea Viventia, Öfv. Kongl. Vet.-Akad. Förhandl., 1866, p. 311.

Through the courtesy of Mr. Lyman I have been able to compare one of his original specimens with several in the Museum of Yale College, dredged at Maui, by Dr. C. Pickering. They agree perfectly in all respects, so that there can be no doubt but that its true locality is the Hawaiian Islands. It was doubtfully given as a Florida species by Mr. Lyman.

Ljungman's description of *O. crassispina* agrees perfectly with our specimens of the same size (disk 8 mm. in diameter). His specimens were from Honolulu.

O. squamata Ljung., from the same locality, appears from the description to differ but slightly, except in size (disk 13 mm. in diameter), and may well prove to be only the mature form of the same species.

Hemipholis gracilis Verrill.

Trans. Conn. Acad., I, p. 262 (read Jan., 1867, published March, 1867).

Hemipholis affinis Ljung., op. cit., p. 322 (read Nov. 1866, published 1867, note on fly-leaf dated May 18, 1867).

Ljungman's species, from Guayaquil, appears to be identical with *H. gracilis*. Judging from the date of Prof. Lóven's note, our name has priority of actual publication.

Ophiothela Danæ Verrill, sp. nov.

A small, slender species, with six long arms, strongly granulous above, and twelve large, prominent radial shields, which occupy the whole of the disk, except a small central area.

Disk somewhat star-shaped, with six rounded, emarginate angles, formed by the radial shields; and concave sides, in the interbrachial regions; the small central area depressed, the radial shields elevated; both the central area and radial shields bearing small, rounded, scattered granules, which are often wanting in the dry specimens. Radial shields very convex, in contact along the whole length, except at the outer end, where they are very slightly separated, leaving a notch between; each pair usually have a broad oval, or slightly cordate, form; in the largest specimens more elongated, the outer end more acute, with an angle at the point where they meet the adjacent shields in the interradial region; their surface, seen under a lens, is minutely roughened with rounded elevations, and usually bears some rounded, scattered granules. The arms are covered above with scattered, unequal, prominent granules, the central series largest; the plates are concealed by a continuous thin skin. Beneath, the plates around the mouth are united so as to form a continuous ring around it, and are entirely covered with a thin skin. The mouth-shields are small, the visible part squarish. The jaws are naked and conspicuous, without mouth-papillæ, but with numerous small teeth. Side arm-plates prominent, bearing about five small, rough spines, the lower ones shortest, bent downward, and bearing sharp spinules on the lower side, which serve as hooks for adhesion.

Color yellowish white with blotches of dark greenish, centre often dark; arms yellowish white crossed by bands of dark green at irregular distances. Diameter of disk of largest specimens .18 to .20 inch; length of arms about 1 inch.

Feejee Islands, in large numbers on *Melitodes virgata* Verrill (*Melitæa ochracea* Dana); J. D. Dana.

MADREPORARIA.

Astropsammia Verrill, gen. nov.

Corallum massive, consisting of Astræa-like corallites, united quite to their summits by an abundant, very porous cœnenchyma. Walls scarcely distinct from the cœnenchyma, very porous. Septa in four cycles, with some members of a fifth, those of the fourth uniting to those of the third. Columella usually well developed, composed of loose, convoluted and twisted lamellæ and trabiculæ. Cells at times shallow, the interseptal spaces cut off below by thin transverse septa, which often nearly coincide in all the chambers. Budding chiefly marginal and interstitial.

This genus is very remarkable for its abundant cœnenchyma, which is quite exceptional in the family, *Eupsammidæ*.

Astropsammia Pedersenii Verrill, sp. nov.

Corallum massive, convex above, covered with large, unequal, round cells, which do not rise above the surface, unequally separated by an abundant, very openly and coarsely porous cœnenchyma, which sometimes equals in thickness the diameter of the cells. Walls indistinct; septa not projecting, rather thin, in the large cells four fully developed cycles with the rudimentary ones of the fifth in about half the systems. The primary and secondary septa are nearly equal, and with those of the third, join the columella; those of the fourth cycle unite to those of the third about half way to the columella. Columella large in the adult corallites, composed mostly of coarsely convoluted lamellæ and spinose projections from the edges of the septa. Transverse septa thin and distant, often closing up the chambers near the surface.

Diameter of largest specimen 3.5 inches; height 2; diameter of largest cells .40 to .50; of smallest .15 to .25; distance between cells .15 to .30.

La Paz, Gulf of California; Capt. J. Pedersen.

I have dedicated this interesting species to Capt. James Pedersen, whose extensive collections, made in the Gulf of California, have contributed very much to our knowledge of the marine animals of that region, and who has discovered many new and very remarkable species.

A young specimen about one inch in diameter has sixteen cells, the largest of which are .3 in diameter, and very deep, with a rudimentary columella. One cell appears to have divided by fissiparity.

Dendrophyllia surcularis Verrill, sp. nov.

Corallum low, rounded above, consisting of a large number of divergent, elongated, cylindrical corallites, varying greatly in size and length, and all united together into a thick base, which, on the sides, is seen to be made up of numerous, short and thick, closely branched trunks, partially united together laterally, and budding from all parts of the sides, and from the common basal tissue between the corallites of the upper surface, many of the longer corallites also bud on the sides and near the summit. The largest corallites are .6 to .8 inch in diameter, and project 1 to 1.4 above the base. Walls thin, very porous, covered externally with fine, subequal, scabrous costæ. Cells very deep and open, often nearly as deep as broad, the septa not projecting above the margin. Septa in four complete cycles, often with narrow rudimentary septa of the fifth cycle. Primary and secondary septa nearly equal, narrow, thin, the lower part perpendicular, the upper part narrowed rapidly to the edge of the cell; those of the third cycle similar but smaller; those of the fourth much narrower, except far within the cell, where they join the columella; those of the fifth very narrow and thin. None of the septa unite together, so far as can be seen from the surface, but those of the fourth and fifth cycles are slightly bent.

Columella well developed, with a regular convex surface, composed of a fine, spongy tissue.

Color of the unbleached coral nearly black.

Height 3 inches; breadth 5.25.

Pearl Islands, Bay of Panama, brought from six to eight fathoms by divers; F. H. Bradley.

Paracyathus Stearnsii Verrill, sp. nov.

Corallum with an expanded base, above which it is somewhat constricted, and then expands rapidly to the edge of the broad, shallow cup, which is broad oval in form, the edge bent into slight lobes or undulations. Exterior with very numerous, prominent, subequal, scabrous costæ, which extend from the summit to the outer edge of the base; on the basal portion three or five smaller ones often alternate with one more prominent; toward the summit some of them have a tendency to rise into crests; all are covered with several series of small, sharp granulations, similar to those on the sides of the septa. Five complete cycles of septa, with some small ones in some of the systems belonging to the sixth cycle, so that the whole number is about one hundred and twenty. The primary and secondary septa are considerably broader than the others, broadly rounded and somewhat exsert at summit, narrowed toward the base and divided into two or three unequal, broad, stout, paliform lobes, which are rough and lacerately spinulose at summit, and covered on the sides with coarse rough granulations. The septa of the succeeding cycles are successively narrower, thinner, and less exsert, with similar but smaller, rough, paliform teeth. Columella small, papillose, the papillæ slender, prominent, lacerately spinulose at summit.

Height .60; diameter of narrowest part .38 by .50; diameter of cup .50 by .72; depth of cup .25.

Monterey, California; Robert E. C. Stearns.

Paracyathus Caltha Verrill, sp. nov.

Corallum turbinate, with an expanding base; pedicel about one half the width of the summit. Cup elliptical with flattened sides, the ratio of the axes as 100:140; the summit of the longer axis somewhat lower than that of the shorter. Septa in five regular cycles; those of the first and second subequal, rather broad and stout, thickened uniformly, rounded at the summits, projecting about .02 inch, finely granulated on the sides. The other septa diminish regularly in width and height, equidistant, the last thin and narrow. Columella formed by numerous stout, styliform processes, rounded at tip, not crowded. The pali are similar in size, but more prominent and flattened, increasing in width and height as the septa diminish, their inner edges denticulate. They are present before all the septa except those of the fifth cycle. Costæ of all the septa prominent near the margin of the cup and dentate; below represented only by lines of granules.

Height of largest specimen .5 inch; greatest diameter .45.

Monterey, Cal.; J. Xantus. (From Smithsonian Inst.)

Pavonia gigantea Verrill, nov. sp.

Corallum very large, thick, encrusting, near the edges often somewhat free; upper surface nearly flat or variously undulated and uneven, covered with large, distant, stellate cells, which are either irregularly scattered, or sometimes in somewhat regular rows for a short distance, and in the latter case contiguous laterally, but the rows are separated by spaces equal to once or twice the diameter of the cells, which are united by very prominent septo-costal lamellæ. Septa in the largest cells usually twenty-four, in three regular cycles, often twelve, sometimes only eight or ten, and frequently in irregular numbers between twelve and twenty-six, but in all cases they are alternately large and small. The larger septa are very stout, much thickened at the margin, tapering to a sharp edge within, the sides and edge roughly granulous; the costal part is very prominent, thick, but less so than the marginal part, sharp edged, and almost always continuous with one of the large septa of an adjacent cell. The alternating small septa are not more than half as wide, thin, much less prominent, slightly thickened at the margin, and extend, as thin, costal lamellæ between the much thicker and more prominent primary ones, to adjacent cells, but they are often interrupted and variously branched. Stout trabiculæ are often visible at the surface between the costal lamellæ. Columella represented by a small central tubercle, which is often wanting, and a deeper, large, solid portion, which fills the centre of the cell below, and unites with the inner edges of the septa. Endotheca represented by distinct, regular, thin, nearly horizontal, transverse septa, as in many Astræans. These are about .03 to .05 inch apart in the same interseptal chamber, as seen in a vertical section. The radiating septa are solid and continuous.

The largest specimen is nearly three feet long, two feet broad, and eight inches thick in the middle; diameter of cells mostly .08 to .12; distance between them, in the direction of the costal plates, generally .10 to .16.

Pearl Islands; brought from seven fathoms by Mr. Clarke, a pearl collector; F. H. Bradley.

Pavonia clivosa Verrill, sp. nov.

Corallum thick and massive, lobate, or rising into very large rounded eminences or oblong ridges, thickly covered with stellate cells, which are smaller and nearer together than in the preceding species. Cells mostly uniformly scattered, often closely crowded and contiguous on the summits of the prominences, usually separated on other parts at distances about equal to their own diameter. Septa generally from sixteen to twenty-four, alternately larger and smaller; the larger ones rather thin, but little thickened, even at the margin, roughly granulous on the sides; their costal prolongations elevated and rather thin. Smaller septa about half as wide, a little thinner and less elevated, as are also their costal prolongations. Columella a small tubercle, often prominent, sometimes flattened. Internal structure as in the preceding, but the transverse septa are nearer together.

The largest specimens are ten inches to two feet in diameter; and often a foot thick or high; some of the prominences or lobes are from four to six inches in diameter, and nearly as high; diameter of cells mostly .05 or .06; distance between them commonly .05 to .08.

Pearl Islands, at extreme low water of spring tides; F. H. Bradley.

More detailed descriptions of some of the preceding species will soon be published, with figures, in the Transactions of the Connecticut Academy, New Haven, Conn.

Mr. W. T. Brigham presented a paper upon Volcanic Manifestations in New England.

At various periods of our history earthquakes have convulsed New England and the adjacent parts of Canada, and several mountains have been reported of volcanic origin; indeed, within historic times one has been said to emit smoke and ashes. Dykes of trap are common in Vermont and Massachusetts, and seem to point out definite lines of volcanic dislocation. The discussion of these matters, both from historical and geological standpoints was attempted in this paper.

The following communication was read from Dr. P. R. Hoy, of Racine, Wisconsin, concerning the nidification of Cooper's Hawk:—

In May last, I had the rare fortune to find not less than four nests of the Cooper's Hawk. As the evidence thus obtained was highly interesting, to me at least, I will make full extracts from notes taken at the time.

May 4th, 1868. This morning I found the nest of a Cooper's Hawk situated in the fork of a large sugar maple, nearly sixty feet from ground; the bird was on the nest. I passed that way in the afternoon, and found the hawk on still; next day I visited the locality with the same result. May 7th, sent a climber to procure the eggs; I obtained but three, two of which were fresh, the remaining one slightly bloodshot. May 8th, C. Jackson found a nest on a pin-oak, (*Q. palustris*) thirty feet from ground, the hawk on the nest. May 9th, I climbed the tree, found the bird on, and obtained four eggs, two of which were fresh, the remaining two bloodshot. May 10th, nest found by S. Ackalum, situated on a small pin-oak, fifteen feet high, the bird on the nest. Next day I climbed the tree, found the hawk on, and obtained two eggs, both of which were fresh. May 24th, a nest was found by C. Ozahu, situated on a small sugar maple, twenty-five feet from the ground, the bird on the nest. I climbed the tree and discovered three eggs, which were not molested; the next day I visited the locality and found the bird on. After this Ozahu passed by the tree every morning and evening, and never failed to notice the long tail of the hawk projecting over the nest. On the 27th he climbed the tree, and found five eggs. In emptying the eggs I was careful to note that one was fresh, the balance in various stages of incipient incubation. In not a single instance was a nest visited without finding the parent bird occupying the nest. These facts, in connection with the various conditions in which I found the contents of the eggs, warrant me in saying, without a shadow of doubt, that Cooper's Hawk continues to occupy her nest as soon as she commences to lay.

These nests were composed of sticks, rudely lined with strips of bark and a few bunches of lichen (*Usnea barbata*). The nests were quite shallow and rather small for a hawk. The eggs were sprinkled sparingly with umbre brown. The eggs procured from the last nest were also blotched with bluish green, which was conspicuous while the eggs were fresh, but has now nearly faded out. While the nests were being molested, the parent hawks would fly from tree to tree, keeping well out of gunshot the while, uttering in rapid succession "guick-guick, guick-guick," almost precisely like the call of the golden-winged woodpecker. The male bird, during the nesting season, is frequently seen high in air, sporting, vaulting and turning somersets on the wing, which habit has given it the name of Tumbler Hawk. No hawk is harder to shoot, and none commit greater havoc among the barnyard fowls than Cooper's Hawk. I saw one strike a large hen while she was flying wildly for safety and kill her on the spot; but the hawk was obliged to abandon the game as it proved too heavy.

Section of Microscopy. April 14, 1869.

The Curator in the chair. Thirteen members present.

Dr. H. Hagen remarked that he had recently received a communication from Dr. Benecke, stating that a young and still unknown optician, Mr. Gundlach of Berlin, had succeeded in making more powerful and much cheaper objectives than those of Mr. Hartnack or any other optician; his objective No. 7, price $20, is unquestionably better than Hartnack's No. 9 or 10, price $45 and $60. It possesses a higher amplifying power, has more light and a greater focal distance, and is excellent in every respect. Mr. Max Schultze, the editor of the Microscopical Archives of Bonn, declares that Gundlach's No. 8, price $40, surpasses Hartnack's No. 14, price $120.

April 21, 1869.

Vice President Dr. C. T. Jackson in the chair. Forty-five members present.

The Secretary read the following extracts from a letter addressed to Dr. S. Kneeland by Mr. Henry McGuier, concerning the antiquity of man as shown by excavations made at the High Rock Spring in Saratoga Springs, New York: —

I have noticed in the accounts of the proceedings of the College of Scientists at its session at Chicago, in August last, while considering the subject of "The Antiquity of Man" upon the American Continent, that reference was made to the developments during the excavation at the "High Rock Spring" at this point, and that the same account appeared in the "Annual of Scientific Discovery" for 1869.

From what I am able to gather from both of the above named sources, there does not appear to be that clear comprehension of all the facts presented during the aforesaid excavation, so necessary to a proper appreciation of the value of the evidences thus afforded of the antiquity of man at this point. In all probability the error is one of my own; and desiring to be set right upon the record, permit me to say that in all probability the failure to comprehend all the essential facts in the case has grown out of the inapposite use of a metaphor in a little work written by myself for the proprietors of the High Rock Spring.

Presuming upon your indulgence, I propose to give you a statement (which admits of the clearest legal verification) of the developments at this famous spring.

In 1865, Messrs. Ainsworth and McCaffrey became the proprietors of the Spring, and immediately commenced to remove the rock or cone, and excavate quite down to the solid rock, out of which the jet of water issued, to establish again, if possible, the overflow of the fountain, at the same time extending to me an invitation to watch the progress of the excavation and note the developments thereof, which invitation I accepted, and the following are the results;—

1. Seven feet of commingled muck and tufa were passed through, length of time requisite to deposit which not estimated.

2. Two feet of compact tufa, estimated time requisite to deposit which, six hundred years. (See pamphlet, p. 12.)

3. About two feet of muck, in which was imbedded a tree (*Pinus albus*) having one hundred and thirty annular rings of growth, with its upper surface smooth, as if having been trodden upon, lying in close proximity to the jet of water; age of the tree estimated, but not of the muck.

4. Three feet of compact tufa, time requisite to deposit which estimated at nine hundred years.

5. A stratum of muck two feet thick, time of depositing not estimated, resting upon clay containing boulders.

Upon the surface of this clay, and beneath all of the before enumerated strata, I discovered a rude, primitive fireplace, the stones of which it was composed bearing evident marks of the action of fire; some of the stones had been removed by the workmen, but most of them were in place. Within the circle was found a considerable quantity of charcoal.

Stone arrow-heads were obtained during the progress of the excavation (one of which I have), precisely resembling those found upon the surface of this region occupied by a portion of the Iroquois Confederacy.

Now if the data, upon which I have based my computation of the time requisite to deposit the cone of the spring and the two strata of tufa beneath (five feet in the aggregate), are correct, we have the sum of five thousand three hundred and forty years, and if to this we add the further sum of one hundred and thirty years, the age of the tree, we shall have a total of five thousand four hundred and seventy years; which is in all probability quite within the true sum, as no allowance has been made for erosive action during all this time.

Nor can I see any occasion to be startled at this large sum, or any place for incredulity, when it is remembered there has been left out of the estimate the time necessary to deposit eleven feet of muck, and the time also which must have elapsed between the abandonment, by its architects, of this ancient fireplace, and the time when the surface upon which it was builded became prepared to receive its first peaty burden.*

Saratoga Springs, March 29, 1869.

Dr. T. M. Brewer read the following extract from a letter from Dr. P. R. Hoy of Racine, Wisc., in regard to the Rough-winged Swallow, *Cotyle serripennis*, and the Yellow-bellied Flycatcher, *Empidonax flaviventris* Baird.

On the 10th of June I found the nest of the Rough-winged Swallow, a solitary nest—it was situated on the bank of a creek, two miles from the lake. The hole penetrated the bank three feet, terminating in an excavation to the right of eight inches in diameter and four high. The nest was large, well constructed of fine marsh grass or carex, the blades of which were evenly bound around; there were six white eggs; the nest is compact and large, unlike the straggling straw and feather nest of the Bank Swallow.

I shot a specimen of the *Empidonax flaviventris*, a very charming songster—that is for a flycatcher,—the best of any of the family. This is the first specimen I have procured. I was attracted to the bird by his song. In all probability the female was nesting near by, as it was the 11th of June, but I did not succeed in finding its nest.

Dr. Brewer added that the information was interesting, establishing an additional breeding place for this little-known swallow, only known before as breeding near Carlisle, Pa.

That a bird marked as a *Clamator* and not an *Oscen*, should be a good singer, was also a fact to be noticed. He had himself met this flycatcher in Nova Scotia and in Grand Menan, in both places finding its nest, and had noticed its song. Mr. G. A. Boardman of St. Stephens, N. B., had previously informed him that this species is a good singer. According to systematists, the Crow, Jay, Raven, etc., are, or ought to be, singers, while the Flycatcher should not be one.

Dr. B. Joy Jeffries called attention to the incorrectness of the statements of Dr. Eliot Coues in the "American Naturalist," in reference to the method of accommodation in the eyes of birds.

The refractive power of the eye must be increased to focus on the retina the diverging rays of light coming from near objects. This is there stated to be done by the swelling up of the marsupium or pecten, and its pressure on the lens behind, the external muscles compressing the globe and rendering the cornea more convex. The error of statement is perhaps due to what Prof. Owen has said in his Comparative Anatomy of Vertebrates, who does not seem to be aware of, at least has not noticed, the investigations of recent observers on this point, either in man or the lower animals. He refers to Crampton's observations in 1813, upon the muscle in the interior of the eye discovered by him, and since then bearing his name.

Crampton's theory was that this muscle by its action flattened the cornea. Prof. Brücke, in studying this muscle, came to exactly the opposite conclusion. In man, accommodation takes place by the crystalline lens becoming more convex on its anterior surface. This is done through the action of the ciliary muscle, exactly how is not yet proved. In the act of accommodation or bringing diverging rays to a focus on the retina, the cornea does not change its curve, the iris has nothing to do with it, the lens does not change its position but simply its shape, and this through the action of the ciliary muscle. Unity of design would lead us to expect a similar method of action in those animals which, from their habits, we judge need the power of active and rapid accommodation. So far experiment and observation seem to confirm this. The pecten or marsupium cannot be an active agent in accommodation, since in many birds it is quite rudimentary, not reaching the lens at all. Its tissue is vascular, not muscular. The external muscles of the globe can not affect accommodation, since it takes place when the eyeball is removed. The experiments of Cramer and Trautvetter show that the cornea does not change its curve during accommodation; the latter observer found also that the lens changed its shape as in man, that the iris did not affect it, and finally that the motor oculi nerve was the nerve of accommodation. This nerve supplies the ciliary or Crampton's muscle within the globe, and thus we have the same elements in the bird's eye as in man. Brücke, Donders, Cramer, Mannhardt and Müller, have specially studied this muscle in its various development in animals. There has been considerable dispute in reference to its anatomical relation in birds, but the recent researches of Hüttenbrenner of Vienna reconcile the statements of the several observers by showing the variations of the muscle in different species of birds. Thus there seems to remain but little doubt that whatever its anatomical subdivisions, this is the muscle of accommodation, and that it acts as in man. Dr. Jeffries said he was unwilling to allow the statements of Dr. Coues and Prof. Owen to pass by unchallenged in this Society, since he had twice discussed the question of accommodation in man and other animals at previous meetings, and illustrated the researches of Helmholz, Donders and others. Dr. Jeffries exhibited enlarged drawings of sections of the eyes of man, various birds and other animals, in support of the points he sustained.

Capt. N. E. Atwood addressed the Society upon some points in the natural history of a few of our edible sea fish, and particularly of the halibut and blue-fish.

In 1865 Capt. Atwood stated to the Society[1] that the halibut fisheries (*Hippoglossus vulgaris*) extended from Nantucket shoals to Cape Sable. The northernmost point at which this fish had been found on the American coast was the island of Belle Isle, situated in the straits of that name. Since then it has been discovered in great abundance nine hundred miles further north, on the west coast of Greenland; but the fishermen complain that in this northern fishing ground, halibut dying on the trawl are completely eaten out in a single day by the "sea fleas." The fishermen were driven to this new place from the growing scarcity of the fish; for, although nine tenths of the halibut are females, and each female lays a prodigious quantity of very small eggs, few come to maturity, and trawl fishing is rapidly decimating this number; on the other hand, haddock (*Morrhua æglefinus*), where one sex does not seem to preponderate, and which lay a smaller number of eggs, have been taken in the same enormous quantities for twenty years. The halibut fishery was first carried on extensively in 1845, and the fish then brought but three cents per pound; two years ago eighty-nine vessels fitted out for the cod fishery brought home incidentally sixteen thousand quintals of salted halibut; the following year sixty vessels obtained but six thousand quintals. Hundreds of vessels from the town of Gloucester alone have been engaged in the halibut fishery; and being carried on partly in the

[1] See these Proceedings, Vol. X, p. 182.

winter time it has proved a very dangerous one. In a single year sixteen Gloucester vessels with one hundred and thirty-eight men were lost, leaving seventy widows and one hundred and forty-seven orphans; scarcely a year passes but one or more vessels are lost with all their crews.

Until within a few years, Capt. Atwood had never seen a halibut weighing less than ten pounds; now much smaller specimens are common in Quincy Market. Other smaller species of this family are found in our waters, and are used for food, although they are not so desirable as halibut. A species of plaice (*Platessa oblonga*) was once an abundant fish, and he had formerly attempted to introduce it largely into the market during the warm season; but was prevented by the introduction, in 1848, of halibut packed in ice. He had formerly taken as many as two thousand pounds in an afternoon; now only a few remain, because they have disappeared before the blue-fish (*Temnodon saltator*), which have quite changed the character of our fisheries; not because the blue-fish devour the plaice, but its natural food, the squid.

The history of the blue-fish is quite remarkable. In 1764 they disappeared from New England waters, and were not seen for sixty years. When they returned,—at first to the waters south of Cape Cod, afterwards, in 1847, to Massachusetts Bay,—they were few in number, tender, and disappeared with the first cold; now they are quite acclimated, comparatively hardy, and remain later in the season. Another consequence of their reappearance is the rapid diminution of the mackerel during the spawning season, which they then devour in vast numbers, and also the tenfold increase of the lobster, the young of which were devoured by mackerel. The previous balance of numbers of these different animals is now entirely changed.

Messrs. C. J. Sprague and R. C. Greenleaf and Dr. J. B. S. Jackson were appointed a Committee to nominate officers for the ensuing year.

Mr. F. W. Putnam called the attention of the members to the approaching meeting of the American Association for the Advancement of Science, in Salem, Mass., and suggested the appointment of a Committee of arrangements to unite with other institutions in inviting the members of the Association to visit Boston and vicinity. The following gentlemen were appointed a Committee: Dr. Jeffries Wyman, Dr. C. T. Jackson, Mr. T. T. Bouvé, Mr. E. Pickering, Dr. T. M. Brewer and Mr. S. H. Scudder.

Section of Entomology. April 28, 1869.

Mr. Edward Burgess in the chair. Nine members present.

The following paper was read: —

Report upon a Collection of Diurnal Lepidoptera made in Alaska by the Scientific Corps of the Russo-American Telegraph Expedition under the Direction of Lieut. W. H. Dall. By Samuel H. Scudder.

The diurnal Lepidoptera mentioned below were obtained by Mr. Dall, during two successive summers, on different parts of the Yukon River, from Fort Yukon near the British Boundary to the mouth of the river. It is hardly probable that they embrace all the species occurring there, since half of the species are represented in this collection by only a single specimen.

The "Ramparts" mentioned below are cañons, commencing two hundred miles below Fort Yukon, where the river is narrow, deep and swift, running for one hundred and fifty miles between high mountains; neither birds nor many butterflies were found there. The "Mission" is situated a little above the broad southern bend which the river makes near its mouth.

In addition to the species enumerated here, Mr. Dall writes that he frequently saw *Lycænæ* so high in the air as to be difficult to catch, and which may not have been the species mentioned below. He also saw a single specimen of *Vanessa Antiopa* at Nulato, May 20 (?), but could not obtain it. One caught at the same place in July, was afterwards given him, but lost. He also thinks he saw the larva of the same species crawling on the snow on the banks of the Unalakleet River (flowing into Norton Sound), Nov. 26th, when the thermometer registered −15° Fahr.

The species of *Erebia*, *Pieris* and *Papilio*, always appeared in large flights, never singly. Many of the specimens were brought to him by the Indians, which accounts for their poor condition.

Erebia discoidalis Kirby.

Five specimens taken just above the Ramparts, June 15th and 16th, a little above Nowikákat, June 5th, and at Nulato in the latter part of May.

Erebia Mancinus Doubl.

Five specimens taken at Nulato, May 20th, and at the lower end of the Ramparts, June 7th and 10th.

Grapta gracilis Gr. and Rob.

A single worn ♀ of this species was taken June 6th, on the Yukon River, fifty miles above Nowikákat; the ♀ has never been noticed before, but I have other specimens from Lake Winnipeg and New England; it resembles the ♀ of *G. Faunus* Edw., more than that of *G. C-argenteum.*

Melitæa Helvia nov. sp.

Upper surface blackish fulvous, covered with dull white and fulvous spots, mostly arranged in transverse rows. Primaries with a marginal row of roundish fulvous spots; next to it two curved rows of dull whitish spots, curved apically on the upper half and basally on the lower half of the wing; the spots of the inner of these two rows are larger, and those of the outer are smaller than those of the marginal row; a minute fulvous double spot just beyond the tip of the cell, and beyond this two short transverse bands of three spots each, the inner whitish, the outer of mixed fulvous and whitish spots; three spots in the cell,—the inner of mixed whitish and fulvous scales, the next fulvous, and the outer whitish bordered with fulvous; between the median and submedian two whitish spots. Secondaries with four rows of spots on the outer half of the wing, following each other in close succession; the outer marginal row is composed of fulvous spots, the next of whitish, the third of fulvous, and the inner of obscure whitish mixed with some fulvous spots; besides these two or three obscure fulvous and whitish spots in the cell; outer edge of both wings black, the fringe white, dark fuscous at base, interrupted with fuscous at the nervule tips. Beneath cinnamon brown, deeper in tint on the secondaries; primaries with a submarginal row of whitish lunules edged apically with black, and followed basally by a broad band of whitish spots, broken and obscure on the under half of the wing; markings of the cell obscurely repeated. Secondaries with a submarginal row of very large white lunules edged with black, and a bent and somewhat irregular whitish band just beyond the middle, edged on both sides with black; within this four or five large whitish spots edged with black and irregularly disposed. Expanse of wings 1.5 in. It is closely allied to *M. Anicia* Doubl.

One specimen was taken June 15th, at the upper end of the Ramparts.

Melitæa sp.

One specimen, too much injured to be determined with accuracy, but perhaps belonging to *M. Palla* Boisd., was taken at Fort Yukon June 25th.

Lycæna Lucia Westw.

Four worn ♀ specimens seem to be referable to this species. Two of them were taken June 6th, fifty miles above Nowikákat, and one June 2d, at the mouth of the Melozikakat River.

Pieris venosa Scudd.

The specimens from Alaska on an average seem to be darker than those from California, and as in that country, the ♂ is apparently the more abundant sex. In passing down the valley of the lower Yukon, between the Mission and the sea, Mr. Dall saw no other species of butterfly. The species of Papilio and the other showier butterflies were confined to the more wooded portions of the river above.

Fifteen ♂, five ♀. Most of the specimens were taken at Nulato, but also farther down the river, between June 14th and June 30th.

Anthocaris lanceolata Boisd.

One greatly damaged specimen, apparently belonging to this species, was taken on the upper Yukon River.

Colias interior Scudd.

One ♂ taken at Fort Yukon June 25th.

Papilio Turnus Linn.

The specimens from Alaska are remarkably uniform in character, and, unless slightly smaller, differ in no respect from New England individuals; they hardly exhibit so much variation as one often finds among specimens in a limited district,—about the White Mountains of New Hampshire, for instance. In one specimen, however, (taken June 15th, at the upper end of the Ramparts), and in others to a less degree, all the submarginal lunules of the upper surface of the secondaries are distinctly orange-fulvous like the anal spot, instead of being colored like the centre of the wing.

Seventy-two specimens were brought home, all but one of which were collected in June, mostly on the 6th and 7th, but also on the

1st and 5th, and from the 13th to the 16th, inclusive; they were obtained on the upper Yukon River, all the way from Nulato, where they are rare, to Fort Yukon, where they are common, except in the Ramparts. One specimen was taken at Nulato May 12th.

Papilio Aliaska nov. sp.

This species is of the same size and facies as *P. Zolicaon* Boisd., but differs from it in the following points: the base of the upper surface of the primaries is powdered as far as the yellow band with greenish yellow, instead of being simply black; the transverse yellow band is much larger, and the space between this and the submarginal row of roundish spots is of nearly equal width across the whole wing, while in *P. Zolicaon* it broadens considerably in approaching the inner border; the anal spot of the hind wings is of an uniform deep fulvous color, bordered basally with blue, and on the opposite side outwardly with black, and inwardly with a yellow spot; while, in *P. Zolicaon*, the color is paler apically, very distinctly pupiled with black and bordered apically with black only; on the under surface of the wings the black is much less conspicuous than in the Californian species, and in particular there is a more or less distinct, large, yellow spot occupying the basal half of the cell of the primaries, which is wholly wanting in *P. Zolicaon.*

Sixteen specimens were obtained; most of them at Nulato, May 20th–24th, but others June 5th, 6th and 14th, at a short distance below the Ramparts, and also just above them.

Mr. W. H. Edwards sent me a specimen from the east coast of Hudson's Bay, so that this insect occurs over a wide extent of country.

Parnassius Eversmannii Ménétr.

The single specimen, taken June 15th, at the upper end of the Ramparts, does not altogether agree with the illustrations and descriptions given by Ménétries of his single individual from Kansk. In particular, the spots on the under surface of the secondaries differ from those of Ménétries' figure, as those of his representation of *P. Wosnesenskii* do, only the red is of a deep tint, as in the figure of *P. Eversmannii*—that is, the basal spot is not black, but of a bright red edged with black, and the spot at the inner angle is also not black, but bright red bordered with black.

This list of species, though short, is instructive, since it shows that the lepidopteran fauna of the Alaskan peninsula is not nearly so arctic in its character as might have been imagined. Three of the twelve species occur abundantly in New England, three more extend nearly or quite as far south as the Great Lakes and the St. Lawrence, and two or three are found in California; three occur in, or are intimately allied to others inhabiting the Rocky Mountain region near our own parallel, and one of them has been previously described only from central Siberia. On the whole the fauna does not seem to be a distinctive one, but to unite in itself the characters of the elevated portions of the whole of boreal America, from ocean to ocean, and, in part, those of the neighboring portions of the Asiatic continent; the foundation, however, is formed of types characteristic of the great interior of the continent north of the United States. Judging by the specimens brought home, the three most abundant species are *Papilio Turnus*, *Pieris venosa* and *Papilio Aliaska*; and it is a little remarkable that each of these species is characteristic of one of the three great divisions,—eastern, western and central boreal America.

Mr. S. H. Scudder presented the following notice of a new cave insect from New Zealand.

The long limbed Locustarian of the Mammoth Cave in Kentucky was described at about the same time by de Saussure and by myself as a species of Rhaphidophora; subsequently I showed that this insect was the type of a distinct genus, which I called Hadenœcus, and suggested that one of the cave-Locustarians of Europe, which I had never seen in nature, might belong to the same genus. Specimens of each species received since then have shown both that Rhaphidophora palpata (Sulz.) Charp., belongs to Hadenœcus, and that R. cavicola (Koll.) Fisch., belongs to the genus Ceuthophilus; therefore no true species of Rhaphidophora occurs either in Europe or America.

It gives me pleasure to announce an additional species of Hadenœcus from quite another quarter of the globe.

Hadenœcus Edwardsii nov. sp.

Body uniform brownish fuscous; front pale fuscous; palpi, tarsi and apical third of tibiæ pale; antennæ brownish fuscous. Length of pronotum 6 $^{mm.}$; of thoracic nota together 11.5 $^{mm.}$; of antennæ 120 $^{mm.}$; of maxillary palpi 18.5 $^{mm.}$; of fore tibiæ 23 $^{mm.}$; of hind tibiæ 40 $^{mm.}$.

One imperfect specimen of this species, much the largest of the genus, was presented to me by my friend, Mr. Henry Edwards, who captured it himself in a limestone cave at Collingwood, Massacre

Bay, Middle Island, New Zealand. The cave is close to the sea shore, and near a very large coal deposit, which occasionally crops out in the interior. The Hadenœci were rather numerous, but very difficult to catch, disappearing in the crevices of the rocks on the approach of lights. They appeared to be most abundant near the streams of water which percolated through the rocks. The sex of my specimen cannot be determined.

The genus Hadenœcus is of peculiar interest, for its members are confined to the deepest caves, and no other Orthopteran genus is known to be limited in this way. Up to this time three species have been discovered, from very distinct localities; they are the following: —

1. **Hadenœcus palpatus** Scudder.

Locusta palpata Sulz., Abgek. Gesch. Ins., 83, tab. IX, fig. 2.
Gryllus pupus europæus de Villers, Entomol., I, 451.
Phalangopsis araneiformis Germ., Burm., Handb. d. Entom., II, 722.
Rhaphidophora araneiformis Burm., Handb. d. Entom., II, 1014.
Phalangopsis araneiformis Herr.-Sch., Nomencl., II, 15, 26.
Rhaphidophora palpata Charp., Orth. descr. et dep., tab. XLIV; Germ., Zeitschr., III, 319.
Rhaphidophora palpata Fisch., Orthopt. Eur., 200, tab. XI, fig. 1, 1.

European caves.

2. **Hadenœcus cavernarum** Scudder.

Rhaphidophora cavernarum Sauss., Ann. Soc. Ent. de Fr., [4] I, 492.
Rhaphidophora subterranea Scudd., Proc. Bost. Soc. Nat. Hist., VIII, 8; Gen. Rhaph., 3.
Hadenœcus subterraneus Scudd., Bost. Journ. Nat. Hist., VII, 441.

North American caves.

3. **Hadenœcus Edwardsii** Scudder, supra.

New Zealand caves.

Mr. F. G. Sanborn exhibited a pair of the rare and curious little Neuropterous insect, *Boreus brumalis* of Fitch.

They were captured at Medford early in the month, and presented to the Society by Dr. Edward P. Colby. One specimen only, a male, was in the Society's museum, and no others, save those in the cabinet of Dr. Asa Fitch, were known to exist in public or private collections. Its structural peculiarities are very great, belonging to the group of which the *Panorpidæ* afford our most common examples; it is totally incapable of flight, the male being furnished in place of wings with long curved appendages studded with fine teeth on the inner edge, and the female apterous. Its feet are long and powerful in proportion to the size of the insect, enabling it to display a considerable amount of activity. Its prominent eyes and elongated tapering rostrum, remind one in profile of the *Scolopacidæ* among birds. Its colors are black and a lustrous metallic hue of blue or greenish. Only one other species of this singular genus is known, *Boreus hyemalis* of Europe.

Mr. C. S. Minot exhibited two cocoons; one, of *Samia Cecropia*, was almost perfectly spherical, instead of being subfusiform; this may have been the result of disease, for the larva had apparently died after its completion, and no parasites, nor any sign of their former presence, were to be seen. The other, of *Callosamia Promethea*, was suspended horizontally between two branches, the bottom of the cocoon partially resting upon one, but distinctly attached to it by a few silken threads.

LIST OF ILLUSTRATIONS.

ERRATA.

Page 98, lines 1 and 9. *For* September 22 *read* September 23.
Page 157, line 3. *For* only specimen *read* only perfect specimen.
Page 174, second line from the bottom, after "Canadian Fauna" insert "and beyond which they do not appear to exist."
Page 175, lines 2 and 3. Dele "and beyond which they do not appear to exist."
Page 178, line 26. *For* Pleistodon laticeps *read* Plestiodon fasciatus.
Page 181, 9th line from bottom. *For* New England *read* Massachusetts.
Page 204, 2d column.

For	12. Salamandra erythronota Gm.	*read*	12. Salamandra erythronota Gm.
	13. " symmetrica Harl.		13. " glutinosa Green.
	14. " dorsalis Harlan.		14. " symmetrica Harl.
	15. " venenosa Barton.		15. " dorsalis Harlan.
	16. " fasciata Green.		16. " venenosa Barton.
	17. " glutinosa Green.		17. " fasciata Green.

Page 261, line 13. *For* posterier dorsals elevated *read* dorsals rounded, posterior elevated.
Page 261, line 28. *For* posterior lumbars *read* vertebræ.
Page 276, line 1. *Dele* P. transversus Stimps.
Page 276, 8th line from bottom. *For* crenatas *read* crenatus.
Page 285, 10th line from bottom. *For* first *read* first and.

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